DOMINION DIAMOND

April 7, 2015

Mackenzie Valley Environmental Impact Review Board
200 Scotia Centre
P.O. Box 938
Yellowknife, NT
X1A 2N7

Attention: Chuck Hubert, Senior Environmental Assessment Officer

Re: EA1314-01 Jay Project, Dominion Diamond Corporation Developer's Assessment Report – Responses to Information Requests

Dear Mr. Hubert:

Dominion Diamond is pleased to provide the responses to the Information Requests (IRs) received following the submission of the Jay Project Developer's Assessment Report.

With reference to my letter on March 20, 2015 and as outlined in the MVEIRB's Work Plan and Schedule, an updated Online Review System (ORS) Excel spreadsheet is included for the MVEIRB ORS. Accompanying this letter, we have also included the following documents:

- IR Responses to the following parties: Fisheries and Oceans Canada (DFO), Environment Canada (EC), the Government of the Northwest Territories – Lands (GNWT), the Kitikmeot Inuit Association (KIA), Independent Environmental Monitoring Agency (IEMA), Łutselk'e Dene First Nation (LKDFN), the Mackenzie Valley Environmental Impact Review Board (MVEIRB), the North Slave Métis Alliance (NSMA), Tłı̨chǫ Lands Protection Department, Transport Canada (TC), and the Yellowknives Dene First Nation (YKDFN).
- Appendices to this IR submission, which encompass the following:
    - Appendix A – Updated Socio-Economic Model
    - Appendix B – Jay Project Compendium of Supplemental Water Quality Modelling
    - Appendix C – Traffic Associated with the Jay Project

- Appendix D – Temporal versus Spatial Cumulative Effects from the Jay Project on Caribou
- Appendix E – Jay Project Pre-feasibility Dike Design
- Appendix F – Power Supply
- Appendix G – Stakeholder Engagement, Diavik Diamond Mine Inc.

- 2014 Baseline Update reports for Hydrology, Water Quality and Sediment Quality, Plankton, Benthic Invertebrates, Fish and Fish Habitat, and Aquatic Health.

Dominion Diamond is committed to work diligently with the MVEIRB and other parties to provide information and responses in a timely manner throughout the remainder of the process.

Regards,

Richard Bargery
Manager, Permitting Jay Project
Dominion Diamond Corporation

DOMINION DIAMOND

Information Request Number:	DAR-DFO-IR-01
Source:	Fisheries and Oceans Canada Information Requests
Subject:	Sampling Methodology for Fish; Fish Species Presence and Abundance.
DAR Section(s):	Annex XIV

Preamble (DAR):

Sampling methods were not consistent among all lakes. For example, in Duchess Lake, only Gill net was used, but in Lake E1, B1, B4 and B15 Gill nets, backpack electrofishing and minnow traps were used. It is important for Fisheries and Oceans Canada to understand why some sampling methods were not used. Some fish species might have been missed because of the methods used for sampling the various lakes. Also, the abundance estimation for each fish species might be underestimated, because of the choice of sampling methods.

Request (DAR):

Fisheries and Oceans Canada-Fisheries Protection Program recommends that the proponent provide a justification as to why different sampling methods were used for each lake sampled. Fisheries and Oceans Canada recommends the proponent identifies its confidence in the estimates of fish species and abundance for each waterbody sampled, considering that it used different sampling methods. Also, Fisheries and Oceans Canada requests information on how the proponent corrected for the use of different sampling methods when providing information of their sampling (e.g. Catch per unit effort, abundance of species, size of species caught, etc.).

Response:

Dominion Diamond Ekati Corporation (Dominion Diamond) is confident that the baseline database for fish and fish habitat provides the required information for a reliable assessment of Project effects on fish valued components (VCs). The baseline database for fish and fish habitat for the Jay Project represents a comprehensive summary of data collected during recent field programs (e.g., 2006 to 2014 studies), combined with other sources of existing and historical information; for example, over 38 documents were reviewed in Annex XIV (Fish and Fish Habitat Baseline Report of the Developer's Assessment Report [DAR]), such as earlier baselines and monitoring programs at the Ekati and Diavik mines. Baseline reports include the Fish and Fish Habitat Baseline Report (Annex XIV) where there is a summary of historical reports and results reported from the 2013 program, and the 2014 Fish and Fish Habitat Supplemental Baseline Report, which provided new information collected from directed studies in 2014 (Golder 2015).

The overall goal of the baseline studies to-date was to collect data in sufficient detail to describe fish population characteristics and habitat in lakes and streams near the proposed Project for a future environmental assessment. Thus, the field studies were designed to collect data to support the design engineers in planning the layout of the mine, to meet regulatory expectations (including the conditions in fishing permits approved by Fisheries and Oceans Canada [DFO]), and to provide baselines against

which to evaluate the potential effects of the Project. To meet the objectives of the baseline programs, study designs (e.g., sampling efforts, locations, gear types) were developed to reliably describe the abundance and distribution of anticipated VCs occurring in lakes and streams near the proposed Project (with consideration that the spatial layout of the mine plan may change), and also to describe the fish community in lakes and streams that may be directly affected by the proposed Project footprint. These priority sites included Lac du Sauvage, Stream B0 (downstream of Stream B1), Stream Ac35, and Stream Ac4. Dominion Diamond is confident that the baseline data (2006 to 2014) for the Jay Project is robust and has satisfied the objectives for the baseline programs.

The study design also considered sampling locations that were downstream and upstream of the Proposed footprint to understand the broader spatial patterns of a fish community across a watershed and potential indirect effects from the Project on a population (e.g., through changes in habitat connectivity, habitat quality). The primary objective of the baseline data collection in habitats not directly affected by the Project is to collect presence/absence information. However, recognizing that in some cases, fisheries technicians working on a baseline program may be the first fisheries technician to sample the stream or lake in question, the final study design for any field program considers the input by technicians in the field where decisions are often made to modify sampling efforts or gear types to best meet the objectives of the program based on the conditions present at the time of sampling. For example, a common scenario for a team sampling a small lake that is close to the Project but may not be affected by the Project (e.g., no residual effects are expected) will include a plan to consider the use of gill nets, minnow traps, and a transect for shoreline electrofishing to confirm fish presence. The field crew may confirm the presence of large-bodied fish (e.g., Lake Trout, Lake Whitefish) with the use of gill nets and not deploy additional sampling at that site as the objectives of the program were satisfied. This approach of surveying until detection is a cost-effective way for sampling many sites across broader geographic areas, providing opportunities for insight on factors influencing species distribution. Using this approach, data from over 36 lakes and streams in the Baseline Study Area (2006 to 2014) were analyzed as part of the Fish and Fish Habitat Baseline Report (Annex XIV) and the Fish and Fish Habitat Supplemental Baseline Report (Golder 2015). In the example referred to in the preamble, supplemental gear types were not deployed for Duchess Lake because it will not be directly affected by the Project and because sufficient information was collected on the composition of small-bodied fish species in nearby lakes, including Lac du Sauvage (where Dominion Diamond is confident that the collected data provides a reliable assessment of VCs).

Standard methods for sampling fish communities were always deployed in the streams and lakes sampled in the Baseline Study Area (Section 3.1.4 in Annex XIV) and because effort was also recorded with catch data, catch-per-unit effort (CPUE) was reported for comparisons among sites and for future comparisons with data collected from monitoring programs. It is generally not recommended to compare CPUE data derived from one method, such as gill netting, to another method, such as angling, and so these comparisons were avoided in the baseline report. Furthermore, any comparisons of species relative abundance, measured as proportion of a species of total catch, between lakes or between years were done with consideration of differences in sampling effort and gear types (e.g., see Section 3.2.3.3 in Annex XIV), and although relative abundance data can be informative for understanding the ecology of local species of fish, the pathways assessed for fish and fish habitat often relied only fish species presence/absence data for the affected lakes and streams under examination (combined with habitat descriptions).

As Lac du Sauvage is the focal waterbody where the Jay Pit will be developed, a suite of standard gear types used for fisheries inventories were deployed (Table 1-1) and were combined with data from hydroacoustic surveys in 2013 to calculate population densities and sizes for fish species for the DAR. In 2014, supplemental gill netting was performed to augment the gill netting CPUE and life history databases for Lake Trout and Lake Whitefish. The hydroacoustic surveys were performed in Lac du Sauvage because a reliable estimate of fish population sizes (or fish densities) was required to predict effects from the diked and dewatered footprint on fish VCs. As described in Section 3.1.5 (Annex XIV), the hydroacoustic surveys targeted numerically abundant pelagic species, such as Cisco, and other numerically abundant species that may be demersal and only occasionally pelagic, such as Lake Trout, Arctic Grayling, Lake Whitefish, and Round Whitefish. The surveys were also designed to detect fish as small as yearlings and older (i.e., fish greater than 90 mm in length). The level of effort performed for the hydroacoustic surveys (over 132 km of transects crossing all locations of Lac du Sauvage) was higher than recommended coverage targets for this survey method. There is no reason to believe that assessment underestimated the number of fish (greater than 90 mm in length) in Lac du Sauvage.

Table 1-1 Summary of Fish Sampling Effort and Catch in Lac du Sauvage, 2006 to 2013 (adapted from Table 3.2-17 in Annex XIV)

Sampling Method	Effort	LKTR	ARGR	NRPK	CISC	RNWH	LKWH	BURB	NNST	SLSC	Total	Total CPUE
GN	131.28 net-units	87			7	27	50				171	1.30 fish/ net-unit
EF	3,231 s		1			1			1	9	12	0.37 fish/ 100 s
AN	108.77 rod-h	83		1							84	0.77 fish/ rod-h
MT	182.95 trap-d					1		3		1	5	0.03 fish/ trap-d
Total		170	1	1	7	29	50	3	1	10	272	

CPUE = catch-per-unit-effort; GN = gill net, EF = backpack electrofishing, AN = angling, MT = minnow trapping;1 net-unit = 100 m^2 of net set for 1 hour; s = seconds; rod-h = rod hour; 1 trap-unit = one minnow trap set for 24 hours; LKTR = Lake Trout; ARGR = Arctic Grayling; NRPK = Northern Pike; CISC = Cisco; RNWH = Round Whitefish; LKWH = Lake Whitefish; BURB = Burbot; NNST = Ninespine Stickleback; SLSC = Slimy Sculpin.

In 2014, the main goal of the supplemental baseline program was to address data gaps on fish population characteristics and habitat in lakes and streams near the proposed Project, with a focus on populations and their habitat directly or indirectly affected by the proposed Sub-Basin B Diversion Channel (Table 1-2). Field studies focused on Stream B1, B0, Ac35, and Ac4, small streams potentially affected by the proposed Sub-Basin B Diversion Channel for the Project (DAR Section 3; also see Section 9). Relative abundance estimates from electrofishing surveys were calculated for all sites, and for Streams B0 and B1, fish abundance was also quantified using two, two-way net traps (i.e., fyke and hoop styles) installed to capture fish moving in upstream and downstream directions during spring and summer periods (for 756 traps hours in total). Stream flows at Streams Ac4 and Ac35 were too low for trap nets; both streams had minimal flows during the spring period and Stream Ac4 was almost completely dry by the summer period. Note that for this example, the level of effort and type of gear deployed at the stream reflected the type or conditions of habitat under examination (not just whether the site would be directly affected by the Project footprint).

Table 1-2 Summary of Fish Sampling Effort and Catch In Stream Ac4, Ac35, B0, and B1 in 2014 (adapted from Table 2.2-4 in Golder [2015])

Season	Location	Method	Effort	ARGR	BURB	NRPK	LKCH	LKTR	RNWH	SLSC	Total	Total CPUE	Unit
Spring	Stream Ac4	EF	229	-	-	-	-	-	-	-	0	0.00	fish/100 s
	Stream Ac35	EF	1,468	9	-	-	-	-	-	-	9	0.61	fish/100 s
	Stream B0	EF	802	4	-	-	-	-	-	-	4	0.50	fish/100 s
	Stream B0	FN	240.1	430	-	1	-	1	-	-	432	1.80	fish/trap-h
	Stream B1	EF	439	10	-	-	-	-	-	-	10	2.28	fish/100 s
	Stream B1	HN	208.8	7	-	-	1	-	1	4	13	0.06	fish/trap-h
	Stream B1	MT	4.2	-	-	-	-	-	-	-	0	0.00	fish/trap-d
Summer	Stream B0	FN	166.5	282	38	-	-	1	-	-	321	1.93	fish/trap-h
	Stream B0	MT	5.3	-	-	-	-	-	-	-	0	0.00	fish/trap-d
	Stream B1	HN	140.6	2	9	-	70	-	1	3	85	0.60	fish/trap-h

- = none caught; CPUE = catch-per-unit-effort; AN = angling; EF = backpack electrofishing; FN = fyke style trap net; GN = gill net; HN = hoop style trap net; MT = minnow trapping; 1 net-unit = 100 square metres (m^2) of net set for 1 hour; s = seconds; 1 trap-d = 1 minnow trap set for 24 hours; rod-h = angling-h x # rods being used; fish/100 s = #fish/(EF seconds/100); ARGR = Arctic Grayling; BURB = Burbot; NRPK = Northern Pike; NNST = Ninespine Stickleback; LKCH = Lake Chub; LKTR = Lake Trout; LKWH = Lake Whitefish; RNWH = Round Whitefish; SLSC = Slimy Sculpin.

In summary, Dominion Diamond is confident that the baseline database for fish and fish habitat provides the required information for an environmental assessment of fish VCs for the Jay Project. The fisheries database provides a reliable description of the species composition and abundance for lakes and streams to be directly affected by the Project, as well as species inventory data across a broad geographic area. The level of effort and gear type that were deployed reflected baseline objectives, site conditions (e.g., flows, water levels), and fishing permits approved by DFO.

References:

Golder (Golder Associates Ltd). 2015. 2014 Fish and Fish Habitat Supplemental Baseline Report for the Jay Project. Prepared by Golder Associates Ltd for Dominion Diamond Ekati Corporation, Yellowknife NT. 66 pp + Appendices.

Information Request Number:	DAR-DFO-IR-02
Source:	Fisheries and Oceans Canada Information Requests
Subject:	Consultation. Reference Documents for the Jay Project
DAR Section(s):	Annex XVII

Preamble (DAR):

The references used in the report are mainly dated from the 1990s or provide information not related to the impacted area. Fisheries and Oceans Canada understands that consultations are undertaken annually regarding traditional and current use of aquatic resources. If more recent information is available, this would support the review of the potential impacts of a mine expansion on aquatic resources and use by impacted communities in the area.

Request (DAR):

Fisheries and Oceans Canada-Fisheries Protection Program recommends that the most recent information on aquatic resource use in the area around Ekati Mine by impacted communities be provided.

Response:

Dominion Diamond Ekati Corporation (Dominion Diamond) used publicly available sources of Traditional Knowledge (TK) for the development of the Traditional Land Use and Traditional Knowledge Baseline Report (Annex XVII of the Developer's Assessment Report [DAR]). Many of the references cited for the TK Baseline were developed in the 1990s and early 2000s as part of the effort to document Traditional Land Use (TLU) and TK information prior to, and in response to, the development of the diamond mines. Following these early studies, TLU in the vicinity of Lac de Gras may have changed based on recent conversations summarized further below. The community of Kugluktuk, however, continues to actively use the Coppermine River and the waters of the Coppermine watershed, which are located immediately downstream of the Ekati Mine, for fishing and drinking water. This ongoing use is discussed during engagement activities with the Kitikmeot Inuit Association (KIA) that have been conducted by Dominion Diamond (see Appendix 4B of the DAR for a list of engagement activities with each community).

The Lac de Gras and Lac du Sauvage areas remain part of the traditional landscape of the Subarctic Dene, Inuit, and Métis people. They remain an important part of their traditional territories embodying many social and cultural memories and connections. As the Yellowknives Dene and Tłı̨chǫ have stated, the Ek'ati area is like a bank or a freezer, a place where resources are dependable and abundantly available. The local communities hope that the area around the Ekati Mine will again be available for use upon mine closure (Section 3.5.8).

Since Dominion Diamond acquired the Ekati Mine, the focus of the Community Engagement Programs has been on Aboriginal involvement in the environmental monitoring programs. The overall intent of the Community Engagement Programs is to demonstrate environmental initiatives and provide hands-on experience for community members (Elders, adults, and youth) so that they may gain a general awareness, as active participants, on how the Ekati Environment Department conducts its day-to-day environmental monitoring programs. Community participation in these programs provide the opportunity

for ongoing aquatic resource use and management in a new capacity and provide the opportunity for community members to share information on traditional resource use in the area.

Site-based community engagement programs related to aquatic resources include youth and Elder participation in fish sampling and assessment programs for the Aquatic Effects Monitoring Program (AEMP) which takes place every three years. For example, on June 6-7, 2012 community members participated in a Community Engagement Freshet Tour which included an examination of the water management operations carried out during the spring freshet; and on August 8-29, 2012 community members participated in a Non-lethal Fish Sampling Community Engagement Program to demonstrate and provide hands-on-experience on the new program.

In 2013, a "report of the traditional knowledge camp for the Diavik Aquatic Effects Monitoring Program" was released (Thorpe Consulting Services 2013). This report brings together results from traditional knowledge and scientific knowledge shared during a 2012 camp held near the Diavik Diamond Mine at Lac de Gras, which included participation from: the Kitikmeot Inuit Association; Łutselk'e Dene First Nation; North Slave Métis Alliance; Tłı̨chǫ Government; and Yellowknives Dene First Nation. This report includes observations and knowledge on the health of fish and water in Lac de Gras using new indicators grounded in both scientific knowledge and TK (Thorpe Consulting Services 2013). Water quality results from scientific study and TK support the same general conclusion that the water is still good in Lac de Gras.

Additionally, in preparation for submission of the DAR, Dominion Diamond carried out a series of Community Engagement Workshops with the Kitikmeot Inuit Association, Łutselk'e Dene First Nation, North Slave Métis Alliance, Tłı̨chǫ Government, and Yellowknives Dene First Nation in March, June, and July 2014. Workshops in March were held in Yellowknife while workshops in June and July were held in the communities of Lutsel K'e, N'Dilo, Behchokǫ̀, Yellowknife, and Kugluktuk.

The objectives for the March workshops related to aquatic resources included:

- Introduce and discuss the proposed Jay-Cardinal Project;
- Obtain input on the methods for the Jay-Cardinal Fish-Out and the options for the Jay-Cardinal Offsetting Plan; and,
- Incorporation of Traditional Knowledge.

The objectives for the June and July workshops related to aquatic resources included:

- Discuss the new description of the Jay Project;
- Obtain input on the methods for the Jay Fish-Out Plan and options for the Jay Offsetting Plan; and,
- Incorporation of Traditional Knowledge.

Throughout the course of the meetings, community participants expressed the need for community involvement in the Jay Project Fish-Out Plan and Offsetting Plan and offered information and advice based on learned experiences from using the land, some of which was specific to the Ekati area. Where

applicable, this feedback was included in the development of the Conceptual Fish-Out Plan (Section 9B) and Conceptual Offsetting Plan (Section 9A). Examples of the received feedback during engagement workshops includes the following:

> *That Narrows area is where my dad and grandfather would fish and trap, all the way to MacKay Lake, Courageous Lake and Contwoyto Lake. That whole area is like a bank – lots of white furs to make money. Also like a freezer because all the animals go by there.*
>
> *This side of the north: you cannot catch the fish more than once. You have to be careful of the nets and your hands. There's not much here for the fish to eat, they need to take care of themselves*.
>
> *I learned fish behaviors from my elders. Before the gillnet, we built fish traps made of bows or willows. In the fall they set the traps and collect fish in the morning. That's when they start spawning. Fall fish have lots of fish eggs. They can be used for making soup or bannock. The wood needed to stay moist, not dry or you would have no net. When the spring comes there's open water at the mouth of rivers where fish spears could be used. If you're dewatering the lake, our people should be involved*.
>
> *I stayed on an island in the south end of Lac du Sauvage when I was 19. My ancestors are from here. It is part of a traditional canoe route that leads to Contwoyto Lake*. *There are gravesites in the area… A lot of the Yellowknives stories are centered on Lac de Gras, Lac du Sauvage and Contwoyto Lake. We used to live there, were born there, and died there.*
>
> *The deepest part of the lake is where the fish are in the winter. In the summer you'll find them in the shallow waters. The fish will spoil quickly in the summer so it will have to be done quickly. It needs to be planned over several seasons… There are methods to catch certain fish species. It depends on the depth, temperature and sediment. It can be done, but you need to know in advance what you need to do as soon as the fish are out of the water… The best time to catch ciscos is in the middle of July when they come together in schools to mate at the top of the water column. In the fall, winter and spring they're more scattered around.*
>
> *I go to those areas you are talking about, Kugluktukuaruk and Noahognik. My in-laws bring me there. The char from Kugluktukuaruk and Noahognik are all ocean char. At Contwoyto they are land locked and there meat and texture are different. They are not as oily as ocean char and are leaner*.
>
> *As soon as you start changing the water level, the fish will all go to the deeper end.*
>
> *We could dry them there, process them there and give them away. Everyone loves fish smoked and dried properly*.

The ongoing interest in aquatic resources in the area, the desire to participate in aquatic resources management programs, and the recent sharing of traditional land use and TK information demonstrates the changing roles communities have regarding aquatic resource use in the vicinity of the Jay Project. Although Lac de Gras and Lac du Sauvage are not currently being actively used for traditional land use and harvesting activities, the lakes and surrounding watershed remain a significant part of their traditional territories and the expectation is that they will be available for resuming traditional land use activities in

the future. Dominion Diamond's continued commitment to community engagement has been, and will be a key part of the success of the Jay Project. Any new information obtained on traditional land use and TK will be considered in the Final Fish-Out Plan and Final Offsetting Plan for the regulatory phase of the Jay Project.

References:

Thorpe Consulting Services. 2013. At Night we Slept on Diamonds: Report of the traditional knowledge camp for the Diavik Aquatic Effects Monitoring Program. Thorpe Consulting Services Ltd., Yellowknife, NWT, Canada.

DOMINION DIAMOND

Information Request Number: DAR-DFO-IR-03

Source: Fisheries and Oceans Canada Information Requests

Subject: Impacts on Watercourses B0 and Ac35.

DAR Section(s): 1.4

Preamble (DAR):

It is mentioned in table 1.4-2 that "a fisheries authorization will be required for the dike construction, fish-out and dewatering of a diked area of Lac du Sauvage, and construction and operation of the Jay Pit"..

Request (DAR):

Fisheries and Oceans Canada-Fisheries Protection Program recommends that the proponent provide a justification as to how it was determined that the destruction of part of watercourses B0 and Ac35 will not require a *Fisheries Act* authorization.

Response:

Dominion Diamond Ekati Corporation (Dominion Diamond) would like to clarify the bullet referred to in Table 1.4-2 in Section 1 (Introduction) of the Developer's Assessment Report (DAR). A *Fisheries Act* Authorization will be required for the temporary operation of the Sub-Basin B Diversion Channel, as well as dike construction, the fish-out, the dewatering of the diked area of Lac du Sauvage, and construction and operation of the Jay Pit. As stated in Section 9A1.1 of the Conceptual Offsetting Plan (Appendix 9A of the DAR), the construction and operation of the mine will cause serious harm to fish (as defined in the *Fisheries Act*) in the Lac du Sauvage watershed. The affected areas include a portion of Lac du Sauvage and adjacent watercourses within the watershed (including Stream B0 and Stream Ac35). The stream lengths affected by the temporary diversion of Stream B0 and Ac35 around the dewatered area in Lac du Sauvage during operations are included in Table 9A3.3-1 and the residual effects are reported in Section 9A4 of the Conceptual Offsetting Plan (Appendix 9A).

The Final Offsetting Plan will be produced during the permitting phase of the Project and will be submitted to Fisheries and Oceans Canada (DFO) as part of the Application for Authorization under the *Fisheries Act*. Dominion Diamond will continue to engage with DFO and local communities on the offsetting plan for the Project.

DOMINION DIAMOND

Information Request Number: DAR-DFO-IR-04

Source: Fisheries and Oceans Canada Information Requests

Subject: Fish-out

DAR Section(s): Annex XVII

Preamble (DFO):

It is mentioned in annex XVII - Traditional land use and traditional knowledge baseline report for the Jay project that some Aboriginal groups are not supportive of the transfer of fish during fish-out because of the mortality rates and injuries of fish. The proponent proposes to transfer fish from the portion inside the dykes to the remainder of Lac du Sauvage.

Request (DFO):

Fisheries and Oceans Canada-Fisheries Protection Program recommends that the proponent confirm whether or not Aboriginal groups have concerns with the proposal to transfer fish outside of the dyked area within Lac du Sauvage, and the basis of those concerns. Fisheries and Oceans Canada also recommends the proponent provide fish-out statistic showing mortality rates and injuries to support the transfer of fish to the other portion of Lac du Sauvage.

Response:

Dominion Diamond Ekati Corporation (Dominion Diamond) would like to clarify the concerns referred to in the Traditional Land Use and Traditional Knowledge Report (Annex XVII of the Developer's Assessment Report [DAR]). The concerns are interpreted by Dominion Diamond as a general warning of the potential effects of catch-and-release angling practices and were likely intended to advise Dominion Diamond that the capture and handling of fish should be done in manner that minimizes stress or mortality incurred during any salvage of fish from the diked area.

From Page 3-11 of Annex XVII:

> "The YKDFN [Yellowknives Dene First Nation] have also warned against the use of catch-and-release practices to relocate fish. Fish can die from the wounds inflicted by large hooks, from starvation as a result of large mouth wounds, or from hypothermia if they are handled too much, resulting in the removal of the slimy coating covering their bodies (Weledeh Yellowknives Dene 1997)."

From Page 3-67 of Annex XVII:

> "During the environmental assessment for the Ekati Mine, the Inuit provided advice to BHP Billiton on how to handle the fish coming from the lakes needing to be dewatered. The Inuit do not practice catch and release and were not, in general, in support of fishing out the lakes for relocation."

> *I don't like…catch and let the fish go. I don't like that. It hurts the fish, if they're [going to] sport fish and not get it for themselves – they should give [fish] to the people instead* (BHP 1995: 11).

All large-bodied fish captured during the Jay Project fish-out will be harvested for distribution to local communities. It is expected that the only fish that would be considered for relocation during the Jay fish-out would be small-bodied fish caught in trap nets or by electrofishing where injuries to the fish would be mitigated, so concerns around catch-and-release injuries from fish hooks would not apply. Furthermore, the concern raised by local Inuit on fish relocation may not necessarily apply to the Jay Project where fish would only be moved from within the diked area in Lac du Sauvage to a location outside the diked area (i.e., fish will remain in the same waterbody). The concern raised by the Inuit would appear to apply to the transfer of fish from one lake to another. If any fish (such as small fish) are to be salvaged in Lac du Sauvage, Dominion Diamond is committed to best practices that minimizes stress and mortality incurred during the capture and handling of fish.

Dominion Diamond's engagement with local aboriginal communities and Fisheries and Oceans Canada (DFO) are ongoing. In March, June, and July of 2014, Dominion Diamond held workshops at the various affected communities where presentations were delivered to introduce the Project, including the proposed methods for the removal of fish from the diked area prior to dewatering. The presentations were followed by an opportunity for community members to provide comments and ask questions. Some community members were concerned about the effects of the transfer (relocation) of fish from the diked area to other locations in Lac du Sauvage, while others recommended that the small fish (or non-harvestable fish) be relocated to minimize impacts on populations.

Examples of comments related to the removal of fish from the diked area included the following:

> "*Moving the fish from one area to another is a disaster*." (Tłı̨chǫ community member, Behchokǫ̀, June 24, 2014)

> "*It is important to maintain the balance of the lakes, but there is probably an opportunity to salvage fish*." (Yellowknives Dene First Nation community member, Yellowknife, June 15, 2014)

> "*If you take out 15,000 fish out of the lake, could you possibly put say 3,000 back over into the lake, could it support it? It would be easier and you would preserve the fish stocks*." (North Slave Metis Alliance community member, Yellowknife, June 26, 2014)

> "*With all the technology you have can you just push the fish out before you complete the dike? There has to be a way without killing them*." (Łutselk'e Dene First Nation community member, Lutsel K'e, June 17, 2014)

Any feedback received during the 2014 workshops such as the above was considered in the Conceptual Fish-Out Plan in the DAR (Appendix 9B), and the final plan will consider any new input received from the communities and DFO as the Jay Project moves into the regulatory phase. The final detailed fish-out plan will be prepared before the fish-out begins and will include an implementation plan for relocation of fish, if that remains a specific objective of the fish-out. Additional details on the handling of fish during the fish-out will be determined in the application for an animal use permit from DFO. It is expected that all fish-out crews will have experience with fish handling and processing, and will include community members.

Expected survival rates of fish that may be salvaged from the diked area were derived from McEachern et al. (2003). As noted in Section 9.4.3.1.2 of the DAR, the fish salvage from the A154 Dike in 2002 at the Diavik Diamond Mine (McEachern et al. 2003) showed a survival rate of approximately 50 percent (%) of 5,049 fish captured by gill netting during the salvage and fish-out operation. Survival rates were highest for Burbot (71.1%), Lake Trout (63.6%), and Round Whitefish (52.9%). The lowest survival rate from gill netting observed during the salvage stage was for Cisco (40.5%). Other researchers found similar rates of survival for Lake Trout captured and released from gill nets, ranging from 68% to 77% after 48 hours of holding (Gallinat et al. 1997). Although statistics on the type of injuries and number of fish sustaining injuries during the fish salvage are unavailable, it is expected that a proportion of larger fish were exposed to dermal disturbance (scale and mucous loss) during the A154 fish salvage, and that a subset of these fish likely endured sub-lethal or lethal effects (e.g., Barthel et al. 2003). Larger bodied fish are more prone to injury (particularly caudal fin abrasion) and related mortality from gill netting; however, no large-bodied fish are being proposed for relocation for the Jay Project. All large-bodied fish captured during the fish-out will be sacrificed immediately upon retrieval and processed for distribution.

The Conceptual Fish-Out Plan submitted with the DAR (Appendix 9B) follows DFO's fish-out protocols and will rely on the use of gill nets, likely set overnight, as the primary fishing method during the initial phase of the fish-out. As such, it is expected that fish captured during the initial phase will be comprised primarily of large-bodied fish that will be sacrificed and processed for distribution. The second phase of the fish-out will involve a broad range of fishing gear and will target smaller-bodied fish more directly. The use of trap nets during the second phase will increase survivorship for captured fish and it is recommended that number of handled fish (for length and weight measurements) be kept to an absolute minimum to increase fish survival (McEachern et al. 2003). Considering the findings from previous fish removal programs, the possibility exists that most fish (particularly smaller bodied fish) could be safely captured and moved to other regions of Lac du Sauvage to reduce the potential for serious harm to the fishery. This option would depend on the approval of DFO and input from local Aboriginal communities to confirm if this remains a desired outcome of the fish-out.

References:

Barthel BL, Cooke SJ, Suski CD, Philipp DP. 2003. Effects of landing net mesh type on injury and mortality in a freshwater recreational fishery. Fish Res 63, 275-282.

BHP (Broken Hill Proprietary Company). 1995. Inuit Perceptions of the Project: Individual Responses. Traditional Knowledge and Environmental Impact Assessment Study Agreement interview compilation results, NWT Diamonds Project. Kugluktuk, NU, Canada.

Gallinat MP, Ngu HH, Shively JD. 1997. Short-term survival of lake trout released from commercial gill nets in Lake Superior. N Am J Fish Manage. 17, 136–140.

McEachern LJ, Matthew GK, Madsen E. 2003. Fish Salvage Activities Related to Diamond Mine Construction in the NWT. Produced for Diavik Diamond Mines Inc (DDMI). 11 pp.

Weledeh Yellowknives Dene. 1997. Weledeh Yellowknives Dene: A Traditional Knowledge Study of Ek'ati. Yellowknives Dene First Nation Council, Dettah, NWT, Canada.

DOMINION DIAMOND

Information Request Number: DAR-DFO-IR-05

Source: Fisheries and Oceans Canada Information Requests

Subject: Valued Components

DAR Section(s): 9

Preamble (DFO):

It is mentioned that: "As Arctic Grayling, Lake Trout, and Lake Whitefish are fish species that can be part of a commercial, recreational, or Aboriginal fishery, the inclusion of these species as VCs in the environmental assessment of the Jay Project is consistent with Fisheries and Oceans Canada's (DFO's) legislation and policy." Fish that "support" these fisheries are also subject to the fisheries protection provisions of the Fisheries Act, and therefore, forage fish important to those fish identified as VECs should also be included in the assessment.

Request (DFO):

Fisheries and Oceans Canada-Fisheries Protection Program recommends that the proponent consider fish species that "support" a commercial, recreational or Aboriginal fishery in their assessment and that one be included as a valued components.

Response:

Please see the response provided to Information Request DAR-MVEIRB-IR-66 for information about the selection of Valued Components (VCs) (including Arctic Grayling, Lake Trout, Lake Whitefish and aquatic life other than fish) for the assessment of fish and fish habitat for the Jay Project Developer's Assessment Report (DAR). As stated in that response, the criteria for the selection of valued components are presented in Section 9.1.3 of the DAR.

Forage species that support fisheries are included in the assessment, which is explained in Section 9.1.3, page 9-6 of the DAR. Forage species are included as a measurement indicator for Arctic Grayling, Lake Trout, and Lake Whitefish, and tributaries that may support forage fish for VCs in Lac du Sauvage and Lac de Gras were included in the effects study area. Any changes to the measurement indicator were then assessed for the VC species, if applicable (e.g., habitat for key prey species that the VC requires to complete its life cycle and contribute to the ongoing productivity of the fisheries). Analysis of the VCs also captures effects to other species with similar habitat requirements and sensitivities that were not selected as VCs, such as Cisco and Slimy Sculpin.

Dominion Diamond is confident that by using a suite of VCs representing various components of the lake ecosystems, the DAR provides a reliable assessment of effects to the ongoing productivity of fisheries important to Aboriginal groups. In other words, the consideration of forage species as a VC in the DAR would not change the outcome of the assessment. The magnitude and duration of residual impacts would not exceed current predictions, rather, impacts would be less than what is currently reported in the DAR given the species life history characteristics of forage species (e.g., they mature quicker and have shorter lifespans relative to the selected VCs).

DOMINION DIAMOND

Information Request Number: DAR-DFO-IR-06

Source: Fisheries and Oceans Canada Information Requests

Subject: Crossing

DAR Section(s): 9

Preamble (DAR):

It is mentioned "to minimize the potential for sediment entrainment and deposition, where possible, road crossing construction in areas of potential spawning habitat will take place outside the spawning period for Arctic Grayling (approximately early May to mid-June).

Request (DAR):

Fisheries and Oceans Canada-Fisheries Protection Program recommends that the timing windows when work should be avoided for Arctic Grayling include the incubation/hatch time. DFO also recommends the proponent confirm that no other species of fish use the watercourses where the crossing will occur as this could influence timing of in stream works. If other species are using these watercourses their spawning and incubation/hatch time will need to be considered.

Response:

Nine stream crossings for seven individual streams in sub-basins Ac4, Ac35, and B are proposed to support infrastructure development for the Jay Project (Table 6-1; Map 6-1). The effects of construction of these roads and utility crossings were assessed as secondary pathway in Section 9.3.2.2.2 in the Developer's Assessment Report (DAR): *Release of sediment during road construction at watercourse crossings and from land disturbance may cause a change in habitat quality, affecting fish and aquatic life in downstream lakes and streams and Lac du Sauvage.*

Table 6.1 Summary of Streams Affected by Road Crossings

Name	Crossing Type	Species[a]
Stream B5	Haul, Power	Unlikely
Stream B7	Access Road, Pipeline	Unlikely
Stream B8	Access Road, Pipeline	Unlikely
Stream B26	Haul, Pipeline, Power	Unlikely
Crossing #1	Haul[b]	Arctic Grayling, Lake Trout, Burbot, and Northern Pike[c]
Crossing #2	Operations[b]	Arctic Grayling, Lake Trout, Burbot, and Northern Pike[c]
Crossing #3	Haul, Pipeline, Power[b]	Arctic Grayling, Lake Trout, Burbot, and Northern Pike[c]
Stream Ac35	Haul, Pipeline, Power	Arctic Grayling
Stream Ac4	Haul	Unlikely

a) Based on previous studies (DAR Annex XIV), and the 2014 Fish and Fish Habitat Supplemental Baseline Report for the Jay Project (Dominion Diamond 2015)

b) Crossing for Sub-Basin B Diversion Channel

c) The diversion channel is designed to provide passage for Arctic Grayling to upstream spawning locations; Lake Trout, Burbot and Northern Pike may also use the diversion.

535000 537500 540000 542500 545000

7167500 7165000 7162500 7160000 7157500

Lake C1
Lake C17
Lake C3
Lake B15
Lake B1 (Christine Lake)
Lake B0
Stream B1
Lake Ac4
Lake B16
Lake B4 (Cujo Lake)
Lake B12
Lake B11
Lake B8
Lake B6
Lake B7
Lake Ac36
Lake Ac35
Lac du Sauvage
Lac de Gras
Hammer Lake
King Pond Settling Facility

Proposed Jay Waste Rock Storage Area
Proposed Laydown
Proposed Jay Dike Alignment
Proposed Jay Pit
Proposed Misery Discharge Diffuser Location
Proposed Waste Haul Road
Ac4
Proposed Jay Magazine
Proposed Mine Inflows Pumping System
Crossing #3
Proposed Runoff Pumping System
Crossing #2
Crossing #1
Ac35
Proposed Sub-basin B Diversion Channel
Proposed Ore Transfer Pad
Proposed Jay Road, Pipeline and Power Line
Existing Misery Road
Proposed Ore Stockpile and Transfer Pad
B26
Proposed Jay Road and Power Line
B5
B8
B7
Lynx Waste Rock and Overburden Stockpile Area
Proposed Lynx Magazine
Misery Waste Rock Storage Area
King Pond Settling Facility
Misery Operation
Proposed Jay Pipeline and Access
Misery Pit
Proposed Misery Discharge Pumping System (After Approx. 5 Years of Operations)
Existing Winter Road
Lynx Pipeline
Lynx Pit

N

LEGEND

- EKATI MINE FOOTPRINT (MISERY OPERATION)
- WINTER ROAD
- BATHYMETRY CONTOUR (5 m INTERVAL)
- ELEVATION CONTOUR (10 m INTERVAL)
- WATERCOURSE
- WATERBODY
- ESKER

JAY PROJECT FOOTPRINT

- EXISTING SHORELINE OF DEWATERED AREA
- POWER LINE
- PROPOSED JAY PROJECT INFRASTRUCTURE
- PROPOSED JAY ROAD NORTH (HAUL ROAD)
- PROPOSED JAY ROAD (HAUL ROAD AND POWER LINE)
- PROPOSED JAY ROAD (HAUL ROAD, PIPELINE AND POWER LINE)
- PROPOSED JAY PIPELINE ROAD (ACCESS ROAD AND PIPELINE)
- PROPOSED OPERATION ROADS

LYNX PROJECT FOOTPRINT

- EXISTING SHORELINE OF DEWATERED LYNX LAKE
- LYNX PIPELINE
- LYNX PROJECT INFRASTRUCTURE
- WATERCOURSE CROSSING

NOTES

ROAD, PIPELINES, AND POWER LINE ARRANGEMENT TO BE DETAILED AS PART OF FURTHER PRE-FEASIBILITY DESIGN. APPROXIMATE CORRIDOR WIDTHS ARE SHOWN.

REFERENCE

JAY PROJECT CONCEPTUAL ENGINEERING REPORT, EKATI MINE, DOC#: 1313280041-E14037-R-REV0-4060, DATED: MAY 13, 2014
JAY PROJECT DESIGN BASIS MEMORANDUM FOR PRE-FEASIBILITY DESIGN OF PROJECT ROADS AND PIPELINE BENCHES, DOC#: 1313280041-E14031-TM-REVD-2020, DATED: AUGUST 1, 2014
LIDAR AND BATHYMETRIC DATA OBTAINED FROM AURORA, 2013
WATER OBTAINED FROM CANVEC © NATURAL RESOURCES CANADA, 2012
DATUM: NAD83 PROJECTION: UTM ZONE 12N

DOCUMENT

DAR-DFO-IR-6

1 0 1
SCALE 1:40,000 KILOMETRES

PROJECT
DOMINION DIAMOND™
JAY PROJECT
NORTHWEST TERRITORIES, CANADA

TITLE
PROPOSED JAY PROJECT INFRASTRUCTURE AND WATERCOURSE CROSSINGS

Golder Associates

PROJECT		1419751	FILE No. POSTDAR_IR_Aqua_006_GIS	
DESIGN	CS	23/05/15	SCALE AS SHOWN	REV 0
GIS	ANK	02/04/15		
CHECK	CS/KC	02/04/15	MAP 6-1	
REVIEW	KM	02/04/15		

G:\CLIENTS\DOMINION\DDEC_Jay and Lynx Projects\Figures\13-1328-0041 Jay & Lynx EA\Aquatics\POST-DAR (Rs\POSTDAR_IR_Aqua_006_GIS.mxd

Of the proposed stream crossings, four will be over watercourses previously characterized as fish-bearing. The road network will include a haul road crossing at Stream Ac35 (an Arctic Grayling spawning stream), a haul road crossing at the start of the Sub-Basin B Diversion Channel where flows will be diverted from Stream B0, an operations crossing (for small vehicle use) for the diversion channel above the diversion connection to Stream Ac35, and a haul road crossing above the mouth of diversion channel as it enters Lac du Sauvage (Map 6-1). Although the diversion channel is expected to support the same fish community described for Stream B0, a community dominated by Arctic Grayling (with smaller contributions of Burbot, Northern Pike, and Lake Trout), the diversion channel will be designed as a migration corridor, facilitating upstream passage of Arctic Grayling from Lac du Sauvage to known spawning locations in streams B1 and Ac35. Arctic Grayling was the only fish species recorded in Stream Ac35.

Possible effects of the crossings on fish and fish habitat are assessed in Section 9.3.2.2.2 of the DAR. As described in the DAR, instream works for construction of watercourse crossings will be minimized, and restricted to frozen or non-flowing conditions where possible. However, if water is present at the time of construction of the crossing in areas of potential spawning habitat, instream works will occur outside the spawning period (typically mid-May to early-June) for Arctic Grayling (DFO 2015). Dominion Diamond will also extend the restricted activity timing window into mid- or late June to avoid effects to the early stages of incubating Arctic Grayling eggs where required. This mitigation measure will be applied to the proposed crossing on Stream Ac35. Arctic Grayling are known to use Stream Ac35 for spawning and there is potential for spawning to occur near the proposed crossing. Construction of crossings across the diversion channel will occur prior to the connection of the diversion channel to Stream B0, and as a result, no fish will be present in the diversion channel during construction and no additional instream construction timing windows will need to be considered.

In addition to following a restricted activity timing window, all construction activities will be subject to a sediment control plan, and management practices will include standard erosion and sediment control measures (e.g., erosion mats, silt curtains). Erosion and sedimentation protection will also be implemented during the decommissioning phase of the watercourse crossings. Construction and decommissioning practices will follow the advice of Fisheries and Oceans Canada (DFO) on erosion and sediment control to avoid causing serious harm to fish (DFO 2014). Through the use of appropriate management practices and monitoring during construction, operation, and decommissioning activities, effects to fish habitat quality are expected to be negligible.

The remaining crossings will be on ephemeral streams that are unlikely to support fish, including Stream Ac4, B5, B7, B8, and B26. Streams B5, B7, B8, and B26 are small ephemeral streams in the headwaters of sub-basin B near the Misery site, with limited to no connectivity to other fish-bearing lakes or stream (Map 6-2). Furthermore, streams B5, B7, and B8 fall within the sub-basin of the King Pond Settling Facility where the hydrology and connectivity have been altered from existing and approved infrastructure (i.e., the dike for the King Pond Settling Facility), and the likelihood of fish presence is very low (Map 6-2). No additional timing windows would be considered necessary for construction at these crossing locations.



LEGEND

- EKATI MINE FOOTPRINT (MISERY OPERATION)

JAY PROJECT FOOTPRINT

- POWER LINE
- PROPOSED JAY PROJECT INFRASTRUCTURE
- PROPOSED JAY ROAD (HAUL ROAD AND POWER LINE)
- PROPOSED JAY ROAD (HAUL ROAD, PIPELINE AND POWER LINE)
- PROPOSED JAY PIPELINE ROAD (ACCESS ROAD AND PIPELINE)

LYNX PROJECT FOOTPRINT

- EXISTING SHORELINE OF DEWATERED LYNX LAKE
- LYNX PIPELINE
- LYNX PROJECT INFRASTRUCTURE
- WATERCOURSE CROSSING

NOTES

ROAD, PIPELINES, AND POWER LINE ARRANGEMENT TO BE DETAILED AS PART OF FURTHER PRE-FEASIBILITY DESIGN. APPROXIMATE CORRIDOR WIDTHS ARE SHOWN.

REFERENCE

JAY PROJECT CONCEPTUAL ENGINEERING REPORT, EKATI MINE, DOC#: 1313280041-E14037-R-REV0-4060, DATED: MAY 13, 2014
JAY PROJECT DESIGN BASIS MEMORANDUM FOR PRE-FEASIBILITY DESIGN OF PROJECT ROADS AND PIPELINE BENCHES, DOC#: 1313280041-E14031-TM-REVD-2020, DATED: AUGUST 1, 2014
ORTHOIMAGERY OBTAINED FROM AURORA, 2013
DATUM: NAD83 PROJECTION: UTM ZONE 12N

DOCUMENT

DAR-DFO-IR-6

250 0 250
SCALE 1:12,000 METRES

PROJECT
DOMINION DIAMOND™
JAY PROJECT
NORTHWEST TERRITORIES, CANADA

TITLE
ROAD INFRASTRUCTURE IN THE HEADWATERS OF SUB-BASIN B DURING OPERATIONS

Golder Associates

PROJECT		1419751	FILE No. POSTDAR_IR_Aqua_007_GIS	
DESIGN	CS	23/05/15	SCALE AS SHOWN	REV 0
GIS	ANK	02/04/15		
CHECK	CS/KC	02/04/15	MAP 6-2	
REVIEW	KM	02/04/15		

G:\CLIENTS\DOMINION\DDEC Jay and Lynx Projects\Figures\13-1328-0041 Jay & Lynx EA\Aquatics\POST-DAR IRs\POSTDAR_IR_Aqua_007_GIS.mxd

For more information on the fish and fish habitat in Stream Ac35 and Stream B0, please see the response to DAR-DFO-IR-12, and for more information on Stream Ac4, please see the response to DAR-DFO-IR-08. The 2014 Fish and Fish Habitat Supplemental Baseline Report (Dominion Diamond 2015) also provides detailed results of the 2014 field surveys performed at streams and lakes in sub-basins Ac4, Ac35, and B. The report includes results from stream crossing surveys performed at Streams Ac4, Ac35, B0, and B26. Generally, the bank composition at the proposed stream crossings was primary fines, with riparian vegetation consisting of shrubs and grasses (Photos 6-1 to 6-4).

Photo 6-1 Looking Downstream from Proposed Road Crossing on Stream Ac4, June 16, 2014



Photo 6-2 Looking Upstream at Stream Segment with Low Flow and Silt and Organic Substrate at Proposed Road Crossing Location on Stream Ac35, August 26, 2014



Photo 6-3 View of Vegetation Cover at Proposed Road Crossing Location on Stream B0, August 25, 2014



Photo 6-4 Looking Downstream at Proposed Road Crossing Location on Stream B26, August 27, 2014



References

DFO (Fisheries and Oceans Canada). 2014. Measures to avoid causing harm to fish and fish habitat. DFO, Winnipeg, MB. Website: http://www.dfo-mpo.gc.ca/pnw-ppe/measures-mesures/index-eng.html. Accessed July 21, 2014.

DFO. 2015. Northwest Territories Restricted Activity Timing Windows for the Protection of Fish and Fish Habitat. http://www.dfo-mpo.gc.ca/pnw-ppe/timing-periodes/nwt-eng.html. Accessed March 24, 2015.

Dominion Diamond (Dominion Diamond Ekati Corporation). 2015. 2014 Water and Sediment Quality Supplemental Baseline Report for the Jay Project. Prepared by Golder Associates Ltd., April 2015. Yellowknife, NWT, Canada.

DOMINION DIAMOND

Information Request Number: DAR-DFO-IR-07

Source: Fisheries and Oceans Canada Information Requests

Subject: Waste Rock Storage Area

DAR Section(s): 9

Preamble (DFO):

It is mentioned that "The footprint of the WRSA will reduce the watershed area by 83 ha (7% of the total sub-basin area), potentially affecting water levels and flows at downstream locations.
Downstream effects may extend to Stream C1, which drains east from Lake C1 for 2.1 km before entering Lac du Sauvage internal basin Ac, and provides habitat for Arctic Grayling and forage species, such as Slimy Sculpin." Also, on Map 4-Jay Project Site Layout, it appears that the southern part of the waste rock storage area will cover a small portion of a watercourse.

Request (DFO):

Fisheries and Oceans Canada-Fisheries Protection Program recommends that the proponent quantify the likely extent of impacts on water levels and flows in downstream systems due to the reduction in watershed size. In particular, the potential reductions in flows in Stream C1 and the impacts on fish and fish habitat. The proponent should also identify if they anticipate any infilling of fish habitat due to the waste rock storage area.

Response:

The potential downstream effects to fish habitat from the waste rock storage area (WRSA) are summarized in Section 9.3.2.2 of the Developer's Assessment Report (DAR) under the following pathway: *indirect effects from dewatering and placement of the waste rock storage area may cause changes in water levels and surface discharges in nearby tributary lakes and streams (i.e., sub-basin C), affecting available habitat for fish and other aquatic life.* The potential effects to water levels and flows were assessed at the outlet of Lake C1 and Lake C17 in DAR Section 8.5.3.2, following a conservative assessment approach. Potential effects to flows and water levels within sub-basin C presented in the DAR were determined for the contingency of adaptively managing the WRSA seepage within the Jay sump. Under the contingency plan, seepage from the WRSA footprint in sub-basin C would be collected and managed and the WRSA footprint would reduce the contributing drainage area of Stream C1 downstream of the Lake C1 outlet by 7 percent (%). The contingency adaptive management plan was included in the hydrology regional water balance model, but does not represent the likely effects to water levels and flows under the proposed Jay Project Mine Water Management Plan (Appendix 3A of the DAR).

The likely effects to flows and water levels in lakes and streams in sub-basin C are expected to be less than what is presented in Section 8.5.3.2 of the DAR. As described in the response to DAR-GNWT-IR-24, the seepage runoff from the WRSA is not expected to be actively managed unless required based on seepage monitoring results. From a hydrologic perspective, the contingency plan of collecting the seepage runoff is conservative.

The Jay WRSA within sub-basin C is expected to contribute runoff to Lake C17, Stream C17, and Stream C1, and therefore, not reduce the contributing drainage area to Stream C1 (Section 8.5.3 of the DAR assumed a loss of contributing drainage area). Changes to the surface conditions, and therefore, runoff coefficients, of the Jay WRSA footprint within sub-basin C are not expected to result in measureable changes to the flow regime in Stream C1. Changes to flows in Stream C1 due to the WRSA are expected to be less than 4% and are within the range of natural variability and would not be a measurable change from baseline conditions. The predicted change to fish habitat conditions (i.e., water depth, velocity, stream width) due to the change in watershed area from the WRSA footprint is predicted to be negligible.

The final footprint of the WRSA will be designed such that there will not be any infilling of fish habitat. The toe of the Jay WRSA will be constructed a minimum of 100 metres (m) from Lac du Sauvage and a minimum of 30 m from other fish-bearing lakes and streams, to allow for attenuation of seepage and to provide space for construction of seepage management infrastructure, if required (Appendix 3A of the DAR).

DOMINION DIAMOND

Information Request Number: DAR-DFO-IR-08

Source: Fisheries and Oceans Canada Information Requests

Subject: Fish

DAR Section(s): 9

Preamble (DFO):

It is mentioned that Sub-basin Ac4 was initially considered as a potentially affected sub-basin, but was removed from the assessment because it is unlikely to support populations of VCs. Sub- basin Ac4 covers a relatively small area (less than 300 ha), there are no waterbodies over 10 ha in the sub-basin, and previously completed surveys report low, dispersed flows (i.e., barriers to fish passage), and no defined bed or banks in Stream Ac4".

Request (DFO):

Fisheries and Oceans Canada-Fisheries Protection Program requests confirmation that no other fish species use the waterbodies in Sub-basin Ac4, during any parts of their life cycle.

Response:

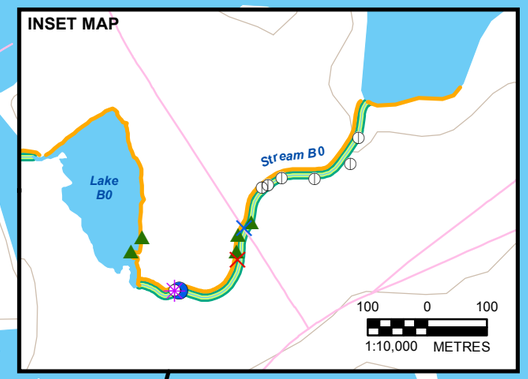
Sub-basin Ac4 is a small sub-basin of Lac du Sauvage and based on results from surveys performed throughout the baseline study area (2006 and 2013), the sub-basin was not expected to include streams or lakes that support populations of fish Valued Components (VCs) or forage fish that support populations of VCs (as noted in Section 9.1.4.2 in the Developer's Assessment Report and in Section 9A3.3 of the Conceptual Offsetting Plan [Appendix 9A]). One of the objectives of the 2014 studies was to confirm fish and fish habitat descriptions for selected small lakes and streams within the Ac4 sub-basin, including Stream Ac4 and Lakes Ac4, Ac5, Ac6, Ac7, Ac8, Ac9, and Ac10 (Map 8-1) (also see Dominion Diamond 2015). A summary of the information from the 2014 studies is provided below.

538000 539000 540000 541000 542000 543000

7166000 7165000 7164000 7163000 7162000

Lake C17
Lake Ac10
Lake Ac11
Lake Ac9
Lake Ac8
Lake Ac7
Lake Ac6
Lake Ac5
Lake Ac4
Stream Ac4
Lake Ac13
Lake Ac36
Lake Ac35
Stream Ac35
Lake B15
Stream B15
Stream B1
Lake B1 (Christine Lake)
Stream B2
Stream B3
Lake B2
Lake B3
Stream B4
Lake B4 (Cujo Lake)
Lake B25
Stream B26
Lake B26
Lake B12
Lake B11
Lake B6
Lake B0
Stream B0
Lac du Sauvage

INSET MAP

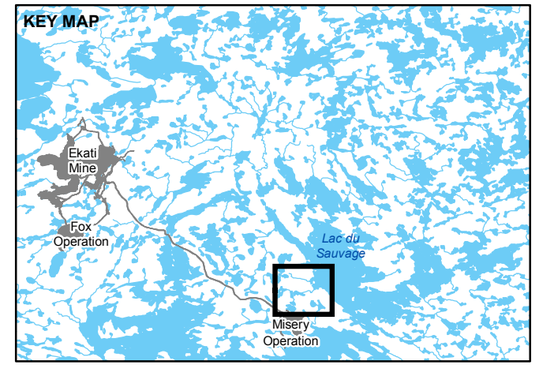


N

LEGEND

- EKATI MINE FOOTPRINT
- PROPOSED JAY ROAD
- ELEVATION CONTOUR (10 m INTERVAL)
- WATERCOURSE
- WATERBODY
- CROSSING ASSESSMENT - SPRING
- CROSSING ASSESSMENT - SUMMER
- DUAL DIRECTION FYKE NET
- GILL NET
- KICK SAMPLING
- LIMNOLOGY
- MINNOW TRAP
- WATER QUALITY SAMPLING LOCATION
- ELECTROFISHING
- FULL STREAM HABITAT ASSESSMENT - SPRING
- FULL STREAM HABITAT ASSESSMENT - SUMMER
- HABITAT ASSESSED LAKE

KEY MAP



DRAFT

REFERENCE

CANVEC © NATURAL RESOURCES CANADA, 2012
NATURAL RESOURCES CANADA, CENTRE FOR TOPOGRAPHIC INFORMATION, 2012
DATUM: NAD83 PROJECTION: UTM ZONE 12N

DOCUMENT

DFO IR 8

400 0 400
SCALE 1:20,000 METRES

PROJECT
DOMINION DIAMOND™
JAY PROJECT
NORTHWEST TERRITORIES, CANADA

TITLE
SAMPLING LOCATIONS FOR FISH AND FISH HABITAT SUPPLEMENTAL BASELINE STUDY AREA, SMALL LAKES AND STREAMS 2014 (ADAPTED FROM MAP 2.1-1B IN GOLDER 2015)

Golder Associates

PROJECT		1407256	FILE No. POSTDAR_IR_Aqua_002_GIS	
DESIGN	CS	19/01/15	SCALE AS SHOWN	REV 0
GIS	ANK	17/03/15		
CHECK			MAP 8-1	
REVIEW				

G:\CLIENTS\DOMINION\DDEC\Jay and Lynx Projects\Figures\13-1328-0041 Jay & Lynx EA\Aquatics\POST-DAR IRs\POSTDAR_IR_Aqua_002_GIS.mxd

Stream Ac4

A spring habitat assessment of Stream Ac4 was completed on June 11, 2014, along the entire length of the watercourse as it flows from Lake Ac4 to Lac du Sauvage. The watercourse had a bankfull width ranging from 0.4 to 5.0 metres (m), and a wetted width of 0.4 to 3.5 m, with a maximum water depth of 0.5 m. Shallow run habitat was dominant throughout Stream Ac4, with secondary shallow flat habitat present midway through the assessed area. Emergent aquatic vegetation was present, with areas of overhanging grasses and woody vegetation (Photo 8-1). The substrate was predominately clay/silt with small patches of organics, cobble, and boulder dispersed throughout (Photo 8-2). Potential barriers to upstream fish movement were noted approximately 25 m and 82 m upstream of Lac du Sauvage due to shallow water conditions in the stream.

Photo 8-1 Upstream View of Stream Ac4 with Overhanging Grasses and Woody Vegetation, June 11, 2014



Photo 8-2 View of Silt and Organic Substrate in Stream Ac4, June 11, 2014



Electrofishing was also conducted in Stream Ac4 starting near the confluence with Lac du Sauvage and extending upstream, along the eastern shore of Lake Ac4. No fish were captured during 229 seconds of electrofishing in Stream Ac4 and Lake Ac4.

Small Lakes in Ac4 Sub-basin

The small lakes in the Ac4 sub-basin were all shallow in depth (Table 8-1), with maximum depths ranging from 0.5 m deep (Lakes Ac4, Ac5, and Ac6) to 2 m deep (Lake Ac10). Based on the maximum depths, it is expected that these lakes freeze to, or close to, the bottom, suggesting that they do not provide overwintering habitat for fish.

The substrate around the shoreline of the lakes was primarily organic/silt, with some boulder in Lake Ac8 and Lake Ac10. The substrate in the littoral zone of the lakes was predominantly organic material or an organic-silt combination. There were no areas of cobble or boulder that would provide potential spawning habitat. All of the lakes had emergent vegetation, with Lake Ac7 and Lake Ac8 also showing submergent vegetation. The dominant riparian vegetation type was either grasses, shrubs, or sedges.

Table 8-1 Fish Habitat Summary for Small Lakes in the Ac4 Sub-Basin, 2014

Lake	2014 Survey Date	Lake Area (ha)	Maximum Depth (m)	Littoral Substrate Type	Shoreline Substrate Type	Emergent Vegetation Present	Submergent Vegetation Present	Dominant Riparian Vegetation Type
Ac4	August 27	0.11	0.5	Or/Si	Or/Si	Present	Absent	Grass
Ac5	August 27	0.15	0.5	Or/Si	Or/Si	Present	Absent	Grass/Shrub
Ac6	August 27	0.24	0.5	Or	Or	Present	Absent	Grass
Ac7	August 20	0.93	1.0	Or	Or	Present	Present	Sedge/Grass
Ac8	August 20	0.20	1.0	Or	Or/Bo	Present	Present	Sedge/Grass/ Shrub
Ac9	August 20	0.25	1.0	Or/Si	Or/Si	Present	Absent	Grass
Ac10	August 20	0.91	2.0	Or	Or/Si/Bo	Present	Absent	Grass/Shrub

ha = hectare; m = metre; Or = organics, Si = Silt, Bo =Boulder.

In summary, the 2014 supplemental field studies support what was stated in the Conceptual Offsetting Plan in the DAR (Section 9A3.3), specifically that Stream Ac4 is an ephemeral, non-fish bearing stream within sub-basin Ac4 (also see Rescan 2007). The 2014 field studies also suggest that the small lakes in sub-basin Ac4 provide low-quality habitat and are unlikely to support fish because of the poor connectivity to Lac du Sauvage (that would otherwise connect to a source population) and the shallow depths that would preclude the overwinter survival of fish.

References:

Dominion Diamond (Dominion Diamond Ekati Corporation). 2015. 2014 Fish and Fish Habitat Supplemental Baseline Report for the Jay Project. Prepared by Golder Associates Ltd for Dominion Diamond Ekati Corporation, Yellowknife NT. 66 pp + Appendices.

Rescan (Rescan Environmental Services Ltd.). 2007. Ekati Diamond Mine 2006 Jay Pipe Aquatic Baseline. Prepared for BHP Billiton Canada Inc. Yellowknife, NWT, Canada.

DOMINION DIAMOND

Information Request Number: DAR-DFO-IR-09

Source: Fisheries and Oceans Canada Information Requests

Subject: Offsetting Plan

DAR Section(s): Appendix 9A

Preamble (DFO):

It is mentioned that "The scale of the assessment in the DAR (Section 9) was also extended to include tributaries that may support spawning, foraging, and rearing habitat for fish in Lac du Sauvage and Lac de Gras." According to the *Fisheries Act* "fish habitat" means spawning grounds and any other areas, including nursery, rearing, food supply and migration areas, on which fish depend directly or indirectly in order to carry out their life processes."

Request (DFO):

Fisheries and Oceans Canada-Fisheries Protection Program recommends that the proponent clarifies if other types of habitats, as defined in the Fisheries Act, were assessment and found in the tributaries.

Response:

Dominion Domination Ekati Corporation would like to clarify that effects to fish habitat, as defined in the *Fisheries Act*, were assessed in Section 9 of the Developer's Assessment Report (DAR) and considered in the Conceptual Offsetting Plan (Appendix 9A of the DAR). The assessment considered spawning grounds and any other areas, including nursery, rearing, food supply and migration areas, on which fish depend directly or indirectly in order to carry out their life processes. As described in DAR Section 9.4.2.1 and the Conceptual Offsetting Plan, tributary streams Ac4, Ac35, B0 will be directly affected by the Project footprint. Habitat information on these tributaries is summarized in the following locations in the DAR and the 2014 Fish and Fish Habitat Supplemental Baseline Report for the Jay Project (Dominion Diamond 2015):

Stream Ac4:

- 2014 Fish and Fish Habitat Supplemental Baseline Report for the Jay Project, within Section 2.2.1.1.1 (including Table 2.2-1, and Photo 2.2-1 to 2.2-2), Section 2.2.4 (including Photo 2.2-17, and Table 2.2-5), and see Appendix B for detailed habitat maps
- Conceptual Offsetting Plan (Appendix 9A), within Section 9A3.3 (see page 9A-13)

Stream Ac35:

- 2014 Fish and Fish Habitat Supplemental Baseline Report for the Jay Project, within Section 2.2.1.1.1 (including Table 2.2-1, and Photo 2.2-3 to 2.2-5), and Section 2.2.4 (including Photo 2.2-18, and Table 2.2-5), and see Appendix B for detailed habitat maps
- Conceptual Offsetting Plan (Appendix 9A), within Section 9A4.4.4 (including Photo 9A4.3-1 to 9A4.3-4)

Stream B0:

- Fish and Fish Habitat Baseline Report (Annex XIV), within Section 3.2.3.3 (including Table 3.2-12 and Map 3.2-15); note that the length of Stream B0, B1, and Lake B0 was described as Stream B1 in Annex XIV
- 2014 Fish and Fish Habitat Supplemental Baseline Report for the Jay Project, within Section 2.2.1.1.2 (including Table 2.2-1, and Photo 2.2-6 to 2.2-7), Section 2.2.1.3 (including Table 2.2-3, and Figure 2.2-1 to 2.2-2), Section 2.2.2.1 (see paragraph on Page 2-41), Section 2.2.4 (including Photo 2.2-19, and Table 2.2-5), and see Appendix B for detailed habitat maps
- Conceptual Offsetting Plan (Appendix 9A), within Section 9A4.4.3 (including Photo 9A4.2-1 to 9A4.2-4)

References:

Dominion Diamond (Dominion Diamond Ekati Corporation). 2015. 2014 Fish and Fish Habitat Supplemental Baseline Report for the Jay Project. Prepared by Golder Associates Ltd., April 2015. Yellowknife, NWT, Canada.

DOMINION DIAMOND

Information Request Number: DAR-DFO-IR-12

Source: Fisheries and Oceans Canada Information Requests

Subject: Offsetting Plan

DAR Section(s): Appendix 9A

Preamble (DFO):

It is mentioned in table 9A3.3-1 that streams B0 and Ac35 would be affected by the project and that they are fish-bearing.

Request (DFO):

Fisheries and Oceans Canada-Fisheries Protection Program recommends that the proponent provide information on the species of fish found in streams B0 and Ac35 and the types of habitat present in each stream.

Response:

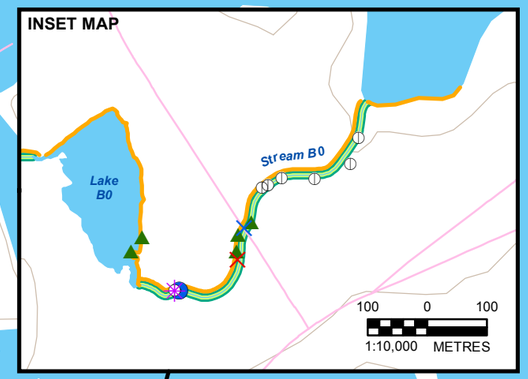
The baseline summaries in the Developer's Assessment Report (DAR) included descriptions of fish and fish habitat for lakes and streams in sub-basins of Lac du Sauvage, including the B sub-basin (Section 9.2.4.2.1 and Section 9.2.4.2.4 of the DAR). Studies performed in 2013 showed that tributary streams to Lac du Sauvage are typically characterized by a fish community dominated by Arctic Grayling, with some Round Whitefish and Slimy Sculpin present (e.g., Table 9.2-9, Table 9.2-10 of the DAR). Supplementary baseline studies for the Jay Project were performed during the spring and summer of 2014 (Dominion Diamond 2015). One of the objectives of the 2014 studies was to conduct fish and fish habitat baseline sampling and habitat mapping at fish-bearing streams that may be directly affected by the proposed Sub-Basin B Diversion Channel. The surveys included an evaluation of fish and fish habitat in Stream Ac35 and B0 in spring and summer (Map 12-1). A summary of the 2014 studies for Stream Ac35 and B0 is provided below.

538000 539000 540000 541000 542000 543000

7166000 7165000 7164000 7163000 7162000

Lake C17
Lake Ac10
Lake Ac11
Lake Ac9
Lake Ac8
Lake Ac7
Lake Ac6
Lake Ac5
Lake Ac4
Stream Ac4
Lake Ac13
Lake Ac36
Lake Ac35
Stream Ac35
Lake B15
Stream B15
Stream B1
Lake B1 (Christine Lake)
Stream B2
Stream B3
Lake B2
Lake B3
Stream B4
Lake B4 (Cujo Lake)
Lake B25
Stream B26
Lake B26
Lake B12
Lake B11
Lake B6
Lake B0
Stream B0
Lac du Sauvage

INSET MAP

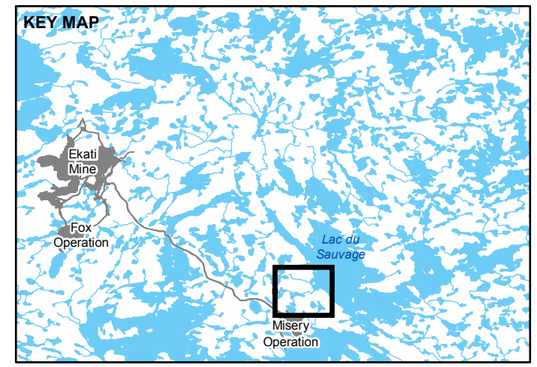


N

LEGEND

- EKATI MINE FOOTPRINT
- PROPOSED JAY ROAD
- ELEVATION CONTOUR (10 m INTERVAL)
- WATERCOURSE
- WATERBODY
- CROSSING ASSESSMENT - SPRING
- CROSSING ASSESSMENT - SUMMER
- DUAL DIRECTION FYKE NET
- GILL NET
- KICK SAMPLING
- LIMNOLOGY
- MINNOW TRAP
- WATER QUALITY SAMPLING LOCATION
- ELECTROFISHING
- FULL STREAM HABITAT ASSESSMENT - SPRING
- FULL STREAM HABITAT ASSESSMENT - SUMMER
- HABITAT ASSESSED LAKE

KEY MAP



DRAFT

REFERENCE

CANVEC © NATURAL RESOURCES CANADA, 2012
NATURAL RESOURCES CANADA, CENTRE FOR TOPOGRAPHIC INFORMATION, 2012
DATUM: NAD83 PROJECTION: UTM ZONE 12N

DOCUMENT

DFO IR 12

400 0 400
SCALE 1:20,000 METRES

PROJECT
DOMINION DIAMOND™
JAY PROJECT
NORTHWEST TERRITORIES, CANADA

TITLE
SAMPLING LOCATIONS FOR FISH AND FISH HABITAT SUPPLEMENTAL BASELINE STUDY AREA, SMALL LAKES AND STREAMS 2014 (ADAPTED FROM MAP 2.1-1B IN GOLDER 2015)

Golder Associates

PROJECT		1407256	FILE No. POSTDAR_IR_Aqua_003_GIS	
DESIGN	CS	19/01/15	SCALE AS SHOWN	REV 0
GIS	ANK	17/03/15		
CHECK			MAP 12-1	
REVIEW				

G:\CLIENTS\DOMINION\DDEC_Jay and Lynx Projects\Figures\13-1328-0041 Jay & Lynx EA\Aquatics\POST-DAR IRs\POSTDAR_IR_Aqua_003_GIS.mxd

Fish Habitat

A fish habitat summary for 2014 sampling in Stream Ac35 and Stream B0 is provided in Table 12-1.

Table 12-1 Fish Habitat Summary for Stream Ac35 and Stream B0, 2014

Name	Total Stream Length (m)[a]	Transect Length (m)	2014 Survey Date	Mean Maximum Depth (m)[b]	Habitat Type		Substrate Type (%)[c]							In-Stream Cover (%) [c]					Potential Barrier[d]
					Primary Habitat Type	Secondary Habitat Type	Organics	Clay/Silt	Sand	Gravel	Cobble	Boulder	Bedrock	Woody Debris	Substrate	Submergent Aquatic Vegetation	Emergent Aquatic Vegetation	Depth / Turbidity	
Ac35	1,335	499	Jun 13	0.28	Run	Boulder Garden	5	0	19	25	22	29	0	4	5	5	14	0	Yes
		1,313	Aug 26	0.24	Flat	Pool	72	5	5	6	4	10	0	1	9	7	25	0	Yes
B0	600	543	Jun 12	0.56	Run	Boulder Garden	0	4	1	6	8	78	3	2	40	3	0	33	No
		634	Aug 25	0.33	Flat	Riffle	9	52	4	9	6	20	0	4	20	1	27	26	No

a) Stream length derived from 1:50,000 CanVec data in a GIS (Geographic Information System).

b) Mean of all maximum depths across habitat units.

c) the substrate type (%) and in-stream cover (%) are averages from all the habitat units that were present in the assessed section of stream and have been weighted by the length of each habitat unit; in-stream cover proportions may exceed 100% because more than one layer of cover may be provided in a stream (e.g., by both substrate and aquatic vegetation).

d) barriers were identified as potential barriers to fish passage (except during periods of high flow, such as an above-average spring freshet); in other words, the potential barriers may represent impediments for fish travel throughout the season or may represent only seasonal barriers, blocking fish passage during periods of low-flow.

% = percent; m = metre.

Stream Ac35

During the spring survey, the bankfull width at the upstream end of Stream Ac35 by Lake Ac35 was 8 metres (m), narrowing to approximately 0.5 m. The wetted width remained relatively uniform throughout the assessed area at 0.7 m, with a maximum water depth of 0.35 m. The lower section of Stream Ac35 consisted primarily of shallow run habitat with some boulder garden near the confluence with Lac du Sauvage (Photo 12-1). Substrate contained relatively equal portions of boulder, cobble, and gravel, with small amounts of organics (Photo 12-2). Instream cover for fish consisted predominately of emergent vegetation, with undercut banks, overhead grasses, and woody vegetation providing overhead cover. Potential barriers or impediments to upstream fish movements were observed during the spring, including a boulder garden approximately 134 m upstream of Lac du Sauvage.

In the summer survey, the bankfull width ranged from 3.0 to 1.2 m, with a wetted width ranging from 0.3 to 3.0 m, and a maximum water depth of 0.5 m. The watercourse consisted predominately of slow moving flat habitat with sections of dry channel isolating shallow pools, braiding as it flows into Lac du Sauvage. Substrate was predominately organics with small pockets of clay or silt, gravel, cobble, and boulder. Spawning gravel was present in pockets at the upstream end of the stream. Instream cover consisted of emergent vegetation, with small amounts of submergent vegetation and boulder. Overhanging riparian grasses and woody vegetation provided overhead cover.

Although young-of-the-year (YOY) Arctic Grayling were observed in shallow flat and pool habitat approximately 100 m upstream of Lac du Sauvage, numerous naturally-occurring drop structures (small cascades) were present in this downstream section of stream. In the upstream section of the stream, dry sections of the channel likely act as seasonal barriers to both upstream and downstream movement.

Photo 12-1 View of Shallow Run Habitat with Boulder Substrate at Stream Ac35, June 13, 2014



Photo 12-2 Potential Spawning Sized Gravel at Upstream End of Stream Ac35 June 13, 2014



Stream B0

In the spring survey, Stream B0 consisted predominantly of shallow run habitat, with some boulder garden midway through the assessed area. The bankfull width varied from 1 m to approximately 9 m at a pool habitat unit, with a wetted width of 1 to 3 m and maximum water depth of 0.7 m. Substrate consisted primarily of boulder with some gravel, cobble, and bedrock. Boulder substrate, depth and turbulence provided instream cover, with overhanging woody vegetation and undercut banks providing overhead cover.

In the summer survey, the bankfull width ranged from 0.9 to 5 m and the wetted width ranged from 0.7 to 5.0 m, with a maximum water depth of 0.5 m. The channel width widened to 75 m as the stream braids into Lac du Sauvage. The watercourse consisted of alternating flat and riffle habitat, with small sections of shallow pool habitat. The substrate consisted predominately of clay/silt and boulder, with organics, sand, gravel, and cobble dispersed throughout. Instream cover consisted of boulder substrate, emergent vegetation, and turbidity, with overhead cover consisting primarily of overhanging woody vegetation. No potential barriers to fish movement were observed during the spring or summer surveys.

Photo 12-3 Aerial View of a Representative Section of Stream B0, August 24, 2014



Photo 12-3 Downstream View of Overhanging Woody Vegetation and Submergent Vegetation at Stream B0, August 24, 2014



Fish Use

Methods followed standard protocols for sampling streams for fish and included two-way trap nets, minnow traps, backpack electrofishing, kick sampling (for Arctic Grayling eggs), and visual observations. A two-way net trap was installed on Stream B0, but could not be installed on Stream Ac35 because of minimal flows in the creek.

Stream Ac35

During the spring program, Stream Ac35 was backpack electrofished for 1,468 seconds and nine Arctic Grayling were captured. Multiple locations along Stream Ac35 were also kick-sampled for the presence Arctic Grayling eggs (n = 11), and of these, two locations were identified with eggs (both locations upstream of the proposed diversion channel). Incidental observations of YOY were made at multiple stream locations in Stream Ac35 during the summer program.

Stream B0

The stream was electrofished during the spring program and four Arctic Grayling were captured in 802 seconds of effort. Multiple locations along Stream B0 were kick-sampled for the presence Arctic Grayling eggs (n = 7), but no recently deposited eggs were recorded. No fish were captured during minnow trapping during the summer program in 5.3 trap days of effort.

The two-way trap nets were installed on Stream B0 on June 11, 2014 and monitored twice daily for 10 days during the spring program. The trap nets were then re-installed on August 19, 2014 and monitored daily for seven days for the summer program. Key findings from the two-way trap nets are reported below (see Dominion Diamond [2015] for additional information).

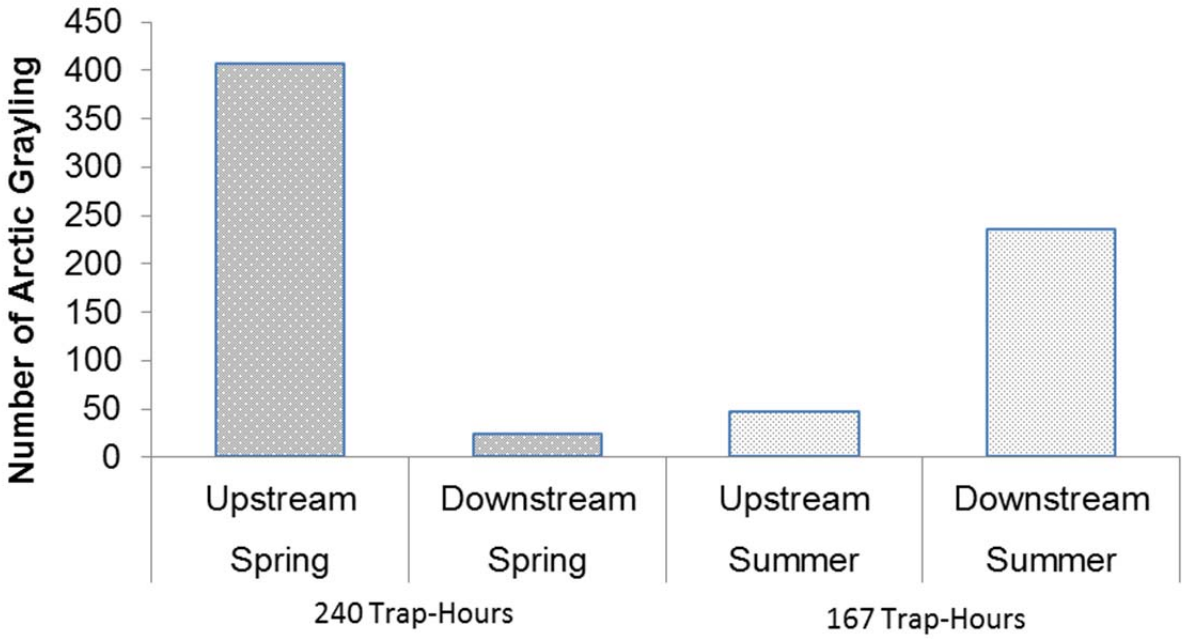
Spring two-way trap results included the following:

- 432 fish were captured in 240 hours of effort using the two-way trap in Stream B0 during the spring.
- The most common fish caught was Arctic Grayling (n = 430).
- Arctic Grayling were captured moving upstream and downstream in the two-way trap during the spring program (Figure 12-1); 406 Arctic Grayling were captured moving upstream and only 24 Arctic Grayling were captured moving downstream.
- Approximately 50 percent (%) of the Arctic Grayling captured at Stream B0 during the spring program were identified as yearlings (i.e., one year old fish).
- One Lake Trout and one Northern Pike were also captured during the spring program moving in an upstream direction.

Summer two-way trap results included the following:

- 321 fish were captured in 167 hours of effort using the two-way trap.
- The most common fish caught was Arctic Grayling (n = 282) followed by Burbot (n = 38) and Lake Trout (n = 1).
- Arctic Grayling were captured moving upstream and downstream in the two-way trap (Figure 12-1); 47 were captured moving upstream and 235 were captured moving downstream.
- Of the Arctic Grayling captured at Stream B0 during the summer program, approximately 82% were identified as yearlings and YOY fish.
- Of the Burbot captured, 2 Burbot were moving upstream and 36 Burbot were moving downstream; the one Lake Trout was captured moving downstream.

Figure 12-1 Movement of Arctic Grayling in Stream B0, 2014



References:

Dominion Diamond (Dominion Diamond Ekati Corporation). 2015. 2014 Fish and Fish Habitat Supplemental Baseline Report for the Jay Project. Prepared by Golder Associates Ltd., April 2015. Yellowknife, NWT, Canada.

DOMINION DIAMOND

Information Request Number:	DAR-EC-IR-01
Source:	Environment Canada: Susanne Forbrich
Subject:	Air Quality Modelling Input and Output Data
DAR Section(s):	Annex I

Preamble (EC):

The quality of model predictions is dependent on the quality of the input data used in the model. The selection of model options and the configuration of model domains and grids can also affect the quality of predictions. To provide confidence in the air quality model predictions provided in the DAR, all input and output data and selected model options and configurations must be reviewed.

Request (EC):

EC requests that the Proponent provide all input and output model data files used to generate the air quality predictions presented in the DAR. All input and output files for CALMET, CALPUFF and CALPOST should be provided in a model-ready format.

Response:

The requested model input and output files will be provided to Environment Canada in a portable hard drive (to be hand delivered by Golder Associates Ltd.). The files to be provided are based on the Developer's Assessment Report (DAR). Where DAR results have been subsequently updated, the files that produced the updated results have been provided (Golder 2015). Please see the File_description.docx on the hard drive for a list and the folder structure of all files provided.

References:

Golder (Golder Associates Ltd.). 2015. Technical Memorandum. Jay Project Air Quality Assessment Update. Prepared for Dominion Diamond Ekati Corporation. Yellowknife, NWT, Canada. January 19, 2015. Submitted to the Mackenzie Valley Environmental Impact Review Board on January 19, 2015.

DOMINION DIAMOND

Information Request Number: DAR-EC-IR-02

Source: Environment Canada: Susanne Forbrich

Subject: Air Quality Baseline monitoring section

DAR Section(s): 7

Preamble (EC):

In Table 5.1-2 and Table 5.2-1 the Proponent reports 1 hour and 24 hour averages of NO2 and SO2 measured at the Polar Explosives continuous air monitoring station (CAMS). To compare to the all of the ambient air quality standards present in Table 2.4-1 additional metrics are needed. Table 5.4-2 reports PM2.5 monitoring data from CAMS for 2009, 2010, and 2011. Over the 3 year period there was 7 months of data from 2009, no data from 2010, and 2 months of data from 2011. The Proponent should explain why the capture rate was so poor and what has been done to improve the capture rate. CAMS data from Polar Explosive station has been provided for 2009, 2010, and 2011. More recent data from 2012, 2013 and 2014 would be useful in understanding the current air quality.

Request (EC):

EC requests that the Proponent provide the following information from the Polar Explosives continuous air monitoring station: • annual NO2, • monthly and annual SO2, • explanation of the poor data capture rate for PM2.5 and what has been done to improve it, and • monitoring data from 2012, 2013, and 2014.

Response:

The annual nitrogen dioxide (NO_2) concentrations measured at the Polar Explosives station from 2009 to 2011 as well as NO_2 concentrations measured from a more recent period of 2012 to 2014 is presented in Table 2-1. The annual sulphur dioxide (SO_2) concentrations measured at the same station from 2009 to 2011, as well as SO_2 measurements from a more recent period of 2012 to 2014. Between 2009 and 2014, all NO_2 and SO_2 measurements are in compliance with the Government of the Northwest Territories Ambient Air Quality Standards and without any distinguishable increasing or decreasing trend, is presented in Table 2-2.

Table 2-1 NO_2 Concentrations Measured at Polar Explosives CAMS Station, 2009 to 2014

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2009 Annual average (µg/m³)	16.5											
2010 Annual average (µg/m³)	19.9											
2011 Annual average (µg/m³)	8.6											
2012												
1-hour maximum (µg/m³)	112.6	101.3	115.7	134.0	70.3	82.5	48.8	42.5	54.1	95.2	84.6	103.5
24-hour maximum (µg/m³)	59.4	67.0	67.3	36.9	27.1	27.8	13.6	16.1	18.8	19.3	48.7	61.0
Annual average (µg/m³)	9.3											

Table 2-1 NO_2 Concentrations Measured at Polar Explosives CAMS Station, 2009 to 2014

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2013												
1-hour maximum (µg/m³)	85.8	122.1	123.5	87.7	94.6	73.6	54.5	77.4	57.1	40.4	115.9	164.7
24-hour maximum (µg/m³)	16.0	68.2	58.2	40.4	27.7	45.6	19.8	22.6	21.7	7.2	49.9	25.5
Annual average (µg/m³)	7.7											
2014												
1-hour maximum (µg/m³)	100.8	129.7	87.5	116.8	81.2	64.8	57.4	50.5	49.6	88.1	103.9	111.4
24-hour maximum (µg/m³)	28.5	60.5	45.6	47.5	25.1	35.2	17.8	17.9	29.7	48.5	36.7	46.3
Annual average (µg/m³)	8.0											

Source: Lee (2015a,b,c,d).
Note: NWT AQS for 1-hour, 24-hour and annual NO2 are 400, 200 and 60 µg/m³ (GNWT-ENR 2014), respectively.
µg/m³ = micrograms per cubic metre.

Table 2-2 SO_2 Concentrations Measured at Polar Explosives CAMS (2009 to 2014)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2009												
Monthly average (µg/m³)	1.0	0.2	1.0	0.3	0.9	1.9	0.9	2.6	3.2	3.9	3.1	0.3
Annual average (µg/m³)	1.6											
2010												
Monthly average (µg/m³)	1.2	1.6	1.8	1.0	2.7	3.4	4.4	2.7	3.6	2.3	1.3	2.7
Annual average (µg/m³)	2.4											
2011												
Monthly average (µg/m³)	2.0	1.0	0.6	0.8	0.3	0.2	3.1	2.2	0.9	0.8	3.1	2.4
Annual average (µg/m³)	1.5											
2012	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
1-hour maximum (µg/m³)	27.8	16.1	20.4	27.0	18.6	19.0	35.7	42.2	14.8	17.1	13.7	21.8
24-hour maximum (µg/m³)	7.7	7.9	6.3	6.1	5.5	5.6	23.7	30.0	7.5	7.9	6.3	11.3
Monthly average (µg/m³)	2.5	0.9	2.2	0.9	1.6	3.9	1.5	10.7	6.3	4.2	1.1	1.9
Annual average (µg/m³)	2.9											
2013												
1-hour maximum (µg/m³)	11.0	28.2	21.4	17.8	17.0	26.0	8.5	14.0	11.4	4.1	20.5	20.5
24-hour maximum (µg/m³)	3.2	8.9	6.7	2.1	3.6	3.5	3.0	5.6	5.8	1.7	3.2	2.6
Monthly average (µg/m³)	1.3	3.3	1.3	0.7	1.1	1.2	1.4	3.2	2.4	0.4	0.7	0.9
Annual average (µg/m³)	1.5											

Table 2-2 SO_2 Concentrations Measured at Polar Explosives CAMS (2009 to 2014)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2014												
1-hour maximum (µg/m³)	12.3	23.0	18.9	26.6	10.8	12.7	4.4	11.1	6.7	12.5	12.0	15.4
24-hour maximum (µg/m³)	4.2	6.2	7.2	6.5	3.3	2.9	0.5	1.5	4.6	5.8	2.9	4.9
Monthly average (µg/m³)	1.4	0.9	1.5	2.1	1.5	1.4	0.0	0.1	0.3	1.7	0.7	1.9
Annual average (µg/m³)	1.1											

Source: Lee (2015a,b,c,d).
Note: NWT AQS for 1-hour, 24-hour and annual SO2 are 450,150 and 30 µg/m³ (GNWT-ENR 2014), respectively.
µg/m³ = micrograms per cubic metre.

As indicated in the 2011 Air Quality Monitoring Program Report (covering years 2009 to 2011), the majority of measurements of particulate matter of mean aerodynamic diameter less than 2.5 microns ($PM_{2.5}$) at the Polar Explosives CAMS air quality station recorded negative values, likely due to a combination of tape tension errors and miscalibration (BHP Billiton 2012). The $PM_{2.5}$ analyzer was removed for inspection and calibration on August 18, 2011. The unit was reinstalled and began recording data on March 25, 2012. Since the reinstallation, data acquisition has been consistent with only brief periods of equipment down time or invalid data. Data completeness for SO_2, NO_2, and $PM_{2.5}$ between 2012 and 2014 after the reinstallation of the $PM_{2.5}$ analyzer has been between 88 percent (%) to 98%.

References:

BHP Billiton (BHP Billiton Canada Inc.). 2012. Ekati Diamond Mine: 2011 Air Quality Monitoring Program. Prepared for BHP Billiton Canada Inc. by Rescan Environmental Services Ltd. Yellowknife, NWT, Canada.

GNWT-ENR (Environment and Natural Resources, Government of the Northwest Territories). 2014. Guideline for Ambient Air Quality Standards in the Northwest Territories. Yellowknife, NWT, Canada, 5 pp.

Lee C. 2015a. Superintendent – Environment, Environment and Communities, Dominion Diamond. Email data transfer, subject “CAM data 2009”. March 26, 2015.

Lee C. 2015b. Superintendent – Environment, Environment and Communities, Dominion Diamond. Email data transfer, subject “CAM 2010”. March 26, 2015.

Lee C. 2015c. Superintendent – Environment, Environment and Communities, Dominion Diamond. Email data transfer, subject “CAM 2011”. March 26, 2015.

Lee C. 2015d. Superintendent – Environment, Environment and Communities, Dominion Diamond. Email data transfer, subject “Jay IR request”. March 26, 2015.

DOMINION DIAMOND

Information Request Number:	DAR-EC-IR-03
Source:	Environment Canada: Susanne Forbrich
Subject:	Air Quality monitoring
DAR Section(s):	7

Preamble (EC):

The Proponent has presented air quality modelling predictions indicating exceedances of GNWT ambient air quality standards for NO2, TSP, PM10, and PM2.5 resulting from emissions from the Jay project. The Proponent states that the Air Quality Management and Monitoring Plan (AQMMP) can be expanded to encompass the project. However no details have been provided on how the AQMMP will be revised to cover the air quality concerns.

Request (EC):

EC requests that the Proponent provide detailed information on how the AQMMP will be expanded to address the air quality issues identified in its air assessment.

Response:

The DAR provides Dominion Diamond's intention to amend the Air Quality Monitoring and Management Program (AQMMP) to address monitoring and mitigation of air quality for the Jay Project. This will build on the current Ekati Mine AQMMP. Detailed changes to the AQMMP will be developed as part of the regulatory permitting based on the outcome of the Environmental Assessment. The Government of the Northwest Territories, Environment Canada, aboriginal communities, and other organizations will be engaged during the amendment of the AQMMP.

DOMINION DIAMOND

Information Request Number: DAR-EC-IR-04

Source: Environment Canada: Susanne Forbrich

Subject: Air Quality NO2 predicted concentrations

DAR Section(s): 7

Preamble (EC):

In Table 7.4-14 the predicted NO2 concentrations will exceed GNWT ambient air quality standards for 1 hour NO2 325 times during the 1 year model period. It is unclear if the 325 exceedances include both spatial and temporal counts or if the ambient standard was exceeded for a total of 325 hours (about 2 weeks). In Annex I: Air Quality and Meteorological Baseline Report for the Jay Project, Table 2.4-1 the Alberta ambient standard for 1 hour NO2 is presented as 300 ug/m3, which is more stringent that the current GNWT ambient standard at 450ug/m3. The exceedance frequency of the Alberta ambient standard should also be provided. Haul trucks are a major source of NOx emissions at the mine site. The assumptions, such as emission factors and load factors, used to estimate NOx emissions can greatly affect the predicted concentrations. Information on these assumed factors would be helpful in interpreting the modelling results and the air assessment.

Request (EC):

EC requests that the Proponent provide the following:

- frequency maps of predicted NO2 exceedances of both the GNWT and Alberta ambient air quality standards for 1 hour NO2
- the assumptions used to estimate haul truck emissions including the number of trucks and their tier rating, emission factors, and load factors.

Response:

Tables 7.4-14 and 7.4-23 of Section 7 of the Developer's Assessment Report (DAR) summarized the predicted frequency and area above the applicable Government of Northwest Territories (GNWT) nitrogen dioxide (NO_2) ambient air quality standards, contained typographic errors. The errors have been corrected and the revised values are presented in Tables 4-1 and 4-2 below. The predicted maximum NO_2 concentrations presented in the DAR are correct. Overall, the frequency of predicted 1-hour NO_2 concentrations exceeding the GNWT standard have decreased from 14 hours per year to 1 hour per year in the Base Case and the Construction Case, 325 hours per year to 5 hours per year in the Application Case. The frequency of predicted 24-hour concentrations exceeding the GNWT standard changed from 1 day per year to 2 days per year in the Application Case and remained unchanged (no exceedance) in the other assessment cases.

As shown in DAR Section 7, Maps 7.4-6, 7.4-8 to 7.4-10, and 7.4-25 to 7.4-27, the areas exceeding GNWT standards are confined to relatively small areas, between less than 1 and 29 hectares, along the perimeter of the Jay Pit and within a few hundred metres of the disturbance footprint.

Due to the low frequency of predicted NO_2 concentrations exceeding the GNWT standards and the fact that maps showing the small areas of exceedance are already provided in the DAR (Section 7, Maps 7.4-6, 7.4-8 to 7.4-10, and 7.4-25 to 7.4-27), no additional maps showing the frequency of exceedances over the GNWT NO_2 standards are further provided in this Information Request response.

The Alberta Ambient Air Quality Objective (AAAQO) for 1-hour NO_2 is 300 micrograms per cubic metre ($\mu g/m^3$), more stringent than the Northwest Territories Ambient Air Quality Standards (NWT AAQS) of 400 $\mu g/m^3$. The AAAQOs were listed in the Appendix I: Air Quality and meteorological Baseline Report of the DAR as a comparison of the current NWT AAQS with criteria from other jurisdictions. However, the AAAQO is not applicable in the GNWT and compliance with air quality objectives should be based on GNWT objectives; therefore, no frequency maps of the predicted NO_2 exceedances of AAAQO are provided.

Table 4-1 Revised Base Case and Application Case Frequency and Area of NO_2 Predictions Above the Northwest Territories Ambient Air Quality Standards

Study Area	Averaging Period	Parameter	Base Case	Application Case	Change
LSA	1-hour	Frequency (hours per year)	1	5	4
		Area (ha)	6	10	4
	24-hour	Frequency (days pear year)	0	2	2
		Area (ha)	0	29	29
	Annual	Frequency (year)	N/A	N/A	N/A
		Area (ha)	0	0.5	0.5
RSA	1-hour	Frequency (hours per year)	1	5	4
		Area (ha)	6	10	4
	24-hour	Frequency (days per year)	0	2	2
		Area (ha)	0	29	29
	Annual	Frequency (year)	N/A	N/A	N/A
		Area (ha)	0	0.5	0.5

Note: Frequency of annual exceedance is not expressed in number of years above the applicable NO_2 standards over the number of years in the Project life. Only one-year of meteorological data was used in the dispersion modelling.

NO_2 = nitrogen dioxide, LSA = local study area, RSA = regional study area, N/A = not applicable, ha = hectare.

Table 4-2 Revised Construction Frequency and Area of NO_2 Predictions Above the Northwest Territories Ambient Air Quality Standards

Study Area	Averaging Period	Parameter	Construction Case
LSA	1-hour	Frequency (hours per year)	1
		Area (ha)	6
	24-hour	Frequency (days pear year)	0
		Area (ha)	0
	Annual	Frequency (year)	N/A
		Area (ha)	0

Table 4-2 Revised Construction Frequency and Area of NO_2 Predictions Above the Northwest Territories Ambient Air Quality Standards

Study Area	Averaging Period	Parameter	Construction Case
RSA	1-hour	Frequency (hours per year)	1
		Area (ha)	6
	24-hour	Frequency (days per year)	0
		Area (ha)	0
	Annual	Frequency (year)	N/A
		Area (ha)	0

Note: Frequency of annual exceedance is not expressed in number of years above the applicable NO_2 standards over the number of years in the Project life. Only one-year of meteorological data was used in the dispersion modelling.

NO_2 = nitrogen dioxide, LSA = local study area, RSA = regional study area, N/A = not applicable, ha = hectare.

Methods and assumptions used to calculate on-site vehicle emissions are described in Appendix 7B, Sections 7B3.2.2 and 7B3.3.3 of the DAR. The on-site vehicles primarily have nonroad diesel engines; therefore, their emissions were calculated based on United States Environmental Protection Agency (US EPA) NONROAD emission model. The NONROAD model estimates emission rates for an individual off-road diesel engine based on the following equation:

Vehicle Emissions = Engine Horsepower × Zero-Hour, Steady-State Emission Factor × Gross Operating Hours × Load Factor × Transient Adjustment Factor × Deterioration Factor

The emissions of these vehicles were estimated based on the vehicle total operating hours for each vehicle model rather than the number of vehicles. The total operating hours for each vehicle model as well as the parameters used in the emission calculations are presented in Tables 4-3 to 4-7.

In addition to the NONROAD model used to estimate vehicles' nitrogen oxides (NO_X), carbon monoxide (CO), particulate matter with a mean aerodynamic diameter of 10 microns (µm) or smaller (PM_{10}) and particulate matter with a mean aerodynamic diameter of 2.5 µm or smaller ($PM_{2.5}$) emissions, the sulphur dioxide (SO_2) and polycyclic aromatic hydrocarbons (PAH) emissions were estimated based on the following approaches:

- sulphur emissions were estimated based on gross operating hours-derived diesel consumption. Diesel fuel was assumed to have a sulphur content of 15 parts per million weight (ppmw).
- PAH emissions were calculated based on diesel consumption rates and emission factors from the *Technical Reference for the Meteorology, Emissions and Ambient Air Quality in the Athabasca Oil Sands Region* (Golder and Conor Pacific 1998).
- greenhouse gas emissions were calculated based on fuel consumption rates and emission factors from the *National Inventory 1990-2011* (Environment Canada 2013) as described in Appendix 7B, Section 7B3.5 of the DAR .

Below are sample calculations for NO_X, SO_2, and PAH emissions from CAT 789C haul trucks which will be used for hauling ore and waste rock from the Jay Pit in the Application Case.

Application Case CAT 789C NO_X Emission Calculations:

Engine size = 2,100 horsepower

Engine Tier = Tier 2 (assumption)

NO_X Emission factor = 4.1 g/bhp-hr

Annual gross operating hour = 110,516 hours

Load Factor = 0.58

Transient Adjustment Factor = 0.95

Deterioration Factor = 1.009

$$NO_X = 2{,}100\ hp \times 4.1\frac{g}{hp \cdot hr} \times 110{,}516\frac{hr}{yr} \times 0.58 \times 0.95 \times 1.009 \times \frac{tonne}{10^6 g} = 529\frac{tonne}{yr}\ or\ 1.45\frac{tonne}{d}$$

Application Case CAT 789C SO_2 Emission Calculations:

Fuel consumption rate = 46,515,184 L/yr

Diesel density = 838.9 kg/m³

Diesel sulphur content = 15 parts per million (ppm)

Molecular weight of sulphur = 32.064

Molecular weight of SO_2 = 64.0628

$$SO_2 = 46{,}515{,}184\frac{L}{yr} \times \frac{m^3}{10^3 L} \times 838.9\frac{kg}{m^3} \times \frac{15}{10^6} \times \frac{64.0628g\ SO_2}{32.064g\ S} \times \frac{tonne}{10^3 kg} = 1.17\frac{tonne}{yr} or\ 0.0032\frac{tonne}{day}$$

Application Case CAT 789C PAH Emission Calculations:

PAH emission factor = 0.0044 kg/10³ L

$$PAH = 46{,}515{,}184\frac{L}{yr} \times 0.0044\frac{kg}{10^3 L} \times \frac{tonne}{10^3 kg} = 0.204\frac{tonne}{yr} or\ 0.000561\frac{tonne}{d}$$

DOMINION DIAMOND

Table 4-3 Base Case Vehicle Emission Estimate Parameters

Mining Equipment	Fuel Type	Horsepower	US EPA Emission Standard	Load Factor[a]	Equipment Category	BSFCss (lb fuel/hp-hr) [a]	BSFC TAF[a]	Gross Operating Hours	Zero-Hour, Steady-State Emission Factors (g/bhp-h)		
									NO_X[a]	CO[a]	PM_{10}[a]
Crane	Diesel	353	Pre-Tier	0.43	None	0.367	1.01	150	8.38	2.7	0.402
Crew Bus	Diesel	440	Pre-Tier	0.58	Crawler Dozer	0.367	1.01	898	8.38	2.7	0.402
Dozer, Cat D10	Diesel	646	Pre-Tier	0.58	Crawler Dozer	0.367	1.01	9,370	8.38	2.7	0.402
Dozer, Cat D10	Diesel	700	Pre-Tier	0.58	Crawler Dozer	0.367	1.01	1,048	8.38	2.7	0.402
Dozer, Cat D6	Diesel	153	Pre-Tier	0.58	Crawler Dozer	0.367	1.01	714	8.38	2.7	0.402
Drill	Diesel	1,180	Pre-Tier	0.43	None	0.367	1.01	12,849	8.38	2.7	0.402
Excavator	Diesel	1,086	Pre-Tier	0.53	Excavator	0.367	1.01	16,545	8.38	2.7	0.402
Fire Truck	Diesel	525	Pre-Tier	0.58	Crawler Dozer	0.367	1.01	10	8.38	2.7	0.402
Ford E-350	Diesel	305	Pre-Tier	0.58	Crawler Dozer	0.367	1.01	185	8.38	2.7	0.402
Ford F-350 Crewcab 4x4	Diesel	400	Pre-Tier	0.58	Crawler Dozer	0.367	1.01	8,464	8.38	2.7	0.402
Ford F-550 4x4	Diesel	300	Pre-Tier	0.58	Crawler Dozer	0.367	1.01	630	8.38	2.7	0.402
Forklift	Diesel	68	Pre-Tier	0.48	Rubber-tired Loader	0.408	1.01	2,588	8.3	3.49	0.722
Grader	Diesel	275	Pre-Tier	0.58	Crawler Dozer	0.367	1.01	12,018	8.38	2.7	0.402
Haul Truck, Cat 730	Diesel	375	Pre-Tier	0.58	Crawler Dozer	0.367	1.01	3,994	8.38	2.7	0.402
Haul Truck, Cat 777B	Diesel	920	Pre-Tier	0.58	Crawler Dozer	0.367	1.01	1,599	8.38	2.7	0.402
Haul Truck, Cat 777D	Diesel	1,000	Pre-Tier	0.58	Crawler Dozer	0.367	1.01	5,328	8.38	2.7	0.402
Haul Truck, Cat 777F	Diesel	1,016	Pre-Tier	0.58	Crawler Dozer	0.367	1.01	33,983	8.38	2.7	0.402
Haul Truck, Cat 777G	Diesel	1,025	Pre-Tier	0.58	Crawler Dozer	0.367	1.01	4,642	8.38	2.7	0.402
Haul Truck, Cat 789C	Diesel	1,900	Pre-Tier	0.58	Crawler Dozer	0.367	1.01	3,823	8.38	2.7	0.402
Haul Truck, Cat Haul Max	Diesel	787	Pre-Tier	0.58	Crawler Dozer	0.367	1.01	2,857	8.38	2.7	0.402
Haul Truck, Cat/Elphinestone AD45	Diesel	589	Pre-Tier	0.58	Crawler Dozer	0.367	1.01	9,437	8.38	2.7	0.402
Loader	Diesel	555	Pre-Tier	0.48	Rubber-tired Loader	0.367	1.01	30,123	8.38	2.7	0.402
Loader, Cat 993K	Diesel	1,050	Pre-Tier	0.48	Rubber-tired Loader	0.367	1.01	1,845	8.38	2.7	0.402
Man Lift	Diesel	49	Pre-Tier	0.21	Backhoe Loader	0.408	1.01	455	6.9	5	0.8
Scooptram	Diesel	353	Pre-Tier	0.58	Crawler Dozer	0.367	1.01	13,670	8.38	2.7	0.402
Service Truck	Diesel	550	Pre-Tier	0.58	Crawler Dozer	0.367	1.01	612	8.38	2.7	0.402
Service Truck	Diesel	600	Pre-Tier	0.58	Crawler Dozer	0.367	1.01	1,276	8.38	2.7	0.402
Truck, Explosives, Peterbuilt PE 303	Diesel	500	Pre-Tier	0.58	Crawler Dozer	0.367	1.01	416	8.38	2.7	0.402
Truck, Getman	Diesel	220	Pre-Tier	0.58	Crawler Dozer	0.367	1.01	2,984	8.38	2.7	0.402
Truck, HIAB L8000 Ford 5 Ton	Diesel	250	Pre-Tier	0.58	Crawler Dozer	0.367	1.01	307	8.38	2.7	0.402
Truck, HIAB L9000 Ford 10 Ton	Diesel	350	Pre-Tier	0.58	Crawler Dozer	0.367	1.01	92	8.38	2.7	0.402
Truck, Toyota	Diesel	128	Pre-Tier	0.58	Crawler Dozer	0.367	1.01	9,048	8.38	2.7	0.402

a) Source: USEPA NONROAD Methods (USEPA 2004, 2005).

BSFC TAF = Brake Specific Fuel Consumption Transient Adjustment Factor; BSFCss = Brake SpecificFuel Consumption, steady state.

NO_X = nitrogen oxides; CO = carbon dioxide; PM_{10} = particulate matter with particle diameter less than 10 µm; g/bhp-h = grams per brake horsepower per hour; lb fuel/hp-hr = pounds fuel per horsepower hour.

Table 4-4 Application Case Vehicle Emission Estimate Parameters

Mining Equipment	Fuel Type	Horsepower	US EPA Emission Standard	Load Factor[a]	Equipment Category	BSFCss (lb fuel/hp-hr) [a]	BSFC TAF[a]	Gross Operating Hours	Zero-Hour, Steady-State Emission Factors (g/bhp-h)		
									NO_X[a]	CO[a]	PM_{10}[a]
240T Roadtrain	Diesel	1,520	Tier 2	0.58	Crawler Dozer	0.367	1.01	25,994	8.38	2.7	0.402
Crane	Diesel	353	Pre-Tier	0.43	None	0.367	1.01	150	8.38	2.7	0.402
Crew Bus	Diesel	440	Pre-Tier	0.58	Crawler Dozer	0.367	1.01	898	8.38	2.7	0.402
Dozer, Cat D10	Diesel	646	Pre-Tier	0.58	Crawler Dozer	0.367	1.01	9,370	8.38	2.7	0.402
Dozer, Cat D10	Diesel	700	Pre-Tier	0.58	Crawler Dozer	0.367	1.01	1,048	8.38	2.7	0.402
Dozer, Cat D6	Diesel	153	Pre-Tier	0.58	Crawler Dozer	0.367	1.01	714	8.38	2.7	0.402
Drill	Diesel	156	Pre-Tier	0.43	None	0.367	1.01	12,849	8.38	2.7	0.402
Excavator	Diesel	1,086	Pre-Tier	0.53	Excavator	0.367	1.01	16,545	8.38	2.7	0.402
Fire Truck	Diesel	525	Pre-Tier	0.58	Crawler Dozer	0.367	1.01	10	8.38	2.7	0.402
Ford E-350	Diesel	305	Pre-Tier	0.58	Crawler Dozer	0.367	1.01	185	8.38	2.7	0.402
Ford F-350 Crewcab, Flatbed 4x4	Diesel	400	Pre-Tier	0.58	Crawler Dozer	0.367	1.01	8,464	8.38	2.7	0.402
Ford F-550 Regular Cab 4x4	Diesel	300	Pre-Tier	0.58	Crawler Dozer	0.367	1.01	625	8.38	2.7	0.402
Forklift	Diesel	68	Pre-Tier	0.48	Rubber-tired Loader	0.408	1.01	2,588	8.3	3.49	0.722
Grader	Diesel	275	Pre-Tier	0.58	Crawler Dozer	0.367	1.01	12,018	8.38	2.7	0.402
Haul Truck Cat 777	Diesel	1,016	Tier 2	0.58	Crawler Dozer	0.367	1.01	32,119	8.38	2.7	0.402
Haul Truck, Cat 730	Diesel	375	Pre-Tier	0.58	Crawler Dozer	0.367	1.01	1,244	8.38	2.7	0.402
Haul Truck, Cat 777B	Diesel	920	Pre-Tier	0.58	Crawler Dozer	0.367	1.01	1,599	8.38	2.7	0.402
Haul Truck, Cat 777F	Diesel	1,016	Pre-Tier	0.58	Crawler Dozer	0.367	1.01	2,094	8.38	2.7	0.402
Haul Truck, Cat 789C	Diesel	2,100	Tier 2	0.58	Crawler Dozer	0.367	1.01	110,516	8.38	2.7	0.402
Haul Truck, Cat/Elphinestone AD45	Diesel	589	Pre-Tier	0.58	Crawler Dozer	0.367	1.01	0	8.38	2.7	0.402
Haul Truck, Tow Haul, Cat 789C	Diesel	1,900	Pre-Tier	0.58	Crawler Dozer	0.367	1.01	396	8.38	2.7	0.402
Loader	Diesel	555	Pre-Tier	0.48	Rubber-tired Loader	0.367	1.01	30,123	8.38	2.7	0.402
Loader, Cat 993K	Diesel	1,050	Pre-Tier	0.48	Rubber-tired Loader	0.367	1.01	1,845	8.38	2.7	0.402
Man Lift	Diesel	49	Pre-Tier	0.21	Backhoe Loader	0.408	1.01	455	6.9	5	0.8
Scooptram	Diesel	353	Pre-Tier	0.58	Crawler Dozer	0.367	1.01	0	8.38	2.7	0.402
Service Truck	Diesel	600	Pre-Tier	0.58	Crawler Dozer	0.367	1.01	4,809	8.38	2.7	0.402
Truck, HIAB L8000 Ford 5 Ton	Diesel	250	Pre-Tier	0.58	Crawler Dozer	0.367	1.01	136	8.38	2.7	0.402
Truck, HIAB L9000 Ford 10 Ton	Diesel	350	Pre-Tier	0.58	Crawler Dozer	0.367	1.01	92	8.38	2.7	0.402
Truck, Peterbuilt PE 303	Diesel	500	Pre-Tier	0.58	Crawler Dozer	0.367	1.01	416	8.38	2.7	0.402

a) Source: USEPA NONROAD Methods (USEPA 2004, 2005).

BSFC TAF = Brake Specific Fuel Consumption Transient Adjustment Factor; BSFCss = Brake SpecificFuel Consumption, steady state.

NO_X = nitrogen oxides; CO = carbon dioxide; PM_{10} = particulate matter with particle diameter less than 10 µm; g/bhp-h = grams per brake horsepower per hour; lb fuel/hp-hr = pounds fuel per horsepower hour.

Table 4-5 Construction Case Vehicle Emission Estimate Parameters

Mining Equipment	Fuel Type	Horsepower	U.S. EPA Emission Standard	Load Factor[(a)]	Equipment Category	BSFCss (lb fuel/hp-hr)[(a)]	BSFC TAF[(a)]	Gross Operating Hours	Zero-Hour, Steady-State Emission Factors (g/bhp-h)		
									NO_X[(a)]	CO[(a)]	PM_{10}[(a)]
Atlas Copco DM45	Diesel	630	Tier 3	0.43	None	0.367	1.01	9,720	8.38	2.7	0.402
CAT 345C	Diesel	345	Tier 3	0.53	Excavator	0.367	1.01	689	8.38	2.7	0.402
CAT 385L	Diesel	513	Tier 3	0.53	Excavator	0.367	1.01	17,931	8.38	2.7	0.402
CAT 777 F	Diesel	1,016	Tier 2	0.58	Crawler Dozer	0.367	1.01	21,562	8.38	2.7	0.402
CAT 789 D	Diesel	2,100	Tier 3	0.58	Crawler Dozer	0.367	1.01	33,120	8.38	2.7	0.402
CAT 993D Loader	Diesel	1,039	Tier 4	0.48	Rubber-tired Loader	0.367	1	13,494	8.38	2.7	0.402
CAT D10T	Diesel	646	Tier 3	0.58	Crawler Dozer	0.367	1.01	4,098	8.38	2.7	0.402
CAT D8T	Diesel	359	Tier 4	0.58	Crawler Dozer	0.367	1	8,740	8.38	2.7	0.402
CAT TL1055C	Diesel	142	Tier 4	0.43	None	0.367	1	6,480	8.38	2.7	0.402
Crane	Diesel	353	Pre-Tier	0.43	None	0.367	1.01	150	8.38	2.7	0.402
Crew Bus	Diesel	440	Pre-Tier	0.58	Crawler Dozer	0.367	1.01	898	8.38	2.7	0.402
Crew Bus	Diesel	250	Pre-Tier	0.58	Crawler Dozer	0.367	1.01	956	8.38	2.7	0.402
Dozer, Cat D10	Diesel	646	Pre-Tier	0.58	Crawler Dozer	0.367	1.01	9,370	8.38	2.7	0.402
Dozer, Cat D10	Diesel	700	Pre-Tier	0.58	Crawler Dozer	0.367	1.01	1,048	8.38	2.7	0.402
Dozer, Cat D6	Diesel	153	Pre-Tier	0.58	Crawler Dozer	0.367	1.01	714	8.38	2.7	0.402
DP 1500i	Diesel	385	Tier 4	0.43	None	0.367	1	5,400	8.38	2.7	0.402
Dragflow DRH400E23	Diesel	630	Pre-Tier	0.43	None	0.367	1.01	3,000	8.38	2.7	0.402
Drill	Diesel	1,180	Pre-Tier	0.43	None	0.367	1.01	12,849	8.38	2.7	0.402
Excavator	Diesel	1,086	Pre-Tier	0.53	Excavator	0.367	1.01	16,545	8.38	2.7	0.402
F-350 Pick-up	Diesel	440	Pre-Tier	0.58	Crawler Dozer	0.367	1.01	41,549	8.38	2.7	0.402
Fire Truck	Diesel	525	Pre-Tier	0.58	Crawler Dozer	0.367	1.01	10	8.38	2.7	0.402
Ford E-350	Diesel	305	Pre-Tier	0.58	Crawler Dozer	0.367	1.01	185	8.38	2.7	0.402
Ford F-350 Crewcab 4x4	Diesel	400	Pre-Tier	0.58	Crawler Dozer	0.367	1.01	8,464	8.38	2.7	0.402
Ford F-550 4x4	Diesel	300	Pre-Tier	0.58	Crawler Dozer	0.367	1.01	630	8.38	2.7	0.402
Forklift	Diesel	68	Pre-Tier	0.48	Rubber-tired Loader	0.408	1.01	2,588	8.3	3.49	0.722
Grader	Diesel	275	Pre-Tier	0.58	Crawler Dozer	0.367	1.01	12,018	8.38	2.7	0.402
Haul Truck, Cat 730	Diesel	375	Pre-Tier	0.58	Crawler Dozer	0.367	1.01	3,994	8.38	2.7	0.402
Haul Truck, Cat 777B	Diesel	920	Pre-Tier	0.58	Crawler Dozer	0.367	1.01	1,599	8.38	2.7	0.402
Haul Truck, Cat 777D	Diesel	1,000	Pre-Tier	0.58	Crawler Dozer	0.367	1.01	5,328	8.38	2.7	0.402
Haul Truck, Cat 777F	Diesel	1,016	Pre-Tier	0.58	Crawler Dozer	0.367	1.01	33,983	8.38	2.7	0.402
Haul Truck, Cat 777G	Diesel	1,025	Pre-Tier	0.58	Crawler Dozer	0.367	1.01	4,642	8.38	2.7	0.402
Haul Truck, Cat 789C	Diesel	1,900	Pre-Tier	0.58	Crawler Dozer	0.367	1.01	3,823	8.38	2.7	0.402
Haul Truck, Cat Haul Max	Diesel	787	Pre-Tier	0.58	Crawler Dozer	0.367	1.01	2,857	8.38	2.7	0.402
Haul Truck, Cat/Elphinestone AD45	Diesel	589	Pre-Tier	0.58	Crawler Dozer	0.367	1.01	9,437	8.38	2.7	0.402
Komatsu 1250	Diesel	688	Tier 3	0.53	Excavator	0.367	1.01	912	8.38	2.7	0.402

Table 4-5 Construction Case Vehicle Emission Estimate Parameters

Mining Equipment	Fuel Type	Horsepower	U.S. EPA Emission Standard	Load Factor[(a)]	Equipment Category	BSFCss (lb fuel/hp-hr)[(a)]	BSFC TAF[(a)]	Gross Operating Hours	Zero-Hour, Steady-State Emission Factors (g/bhp-h)		
									NO_X[(a)]	CO[(a)]	PM_{10}[(a)]
Liebherr LR 1160	Diesel	362	Tier 4	0.43	None	0.367	1	438	8.38	2.7	0.402
Loader	Diesel	555	Pre-Tier	0.48	Rubber-tired Loader	0.367	1.01	30,123	8.38	2.7	0.402
Loader, Cat 993K	Diesel	1,050	Pre-Tier	0.48	Rubber-tired Loader	0.367	1.01	1,845	8.38	2.7	0.402
Man Lift	Diesel	49	Pre-Tier	0.21	Backhoe Loader	0.408	1.01	455	6.9	5	0.8
MDT 140B	Diesel	162	Tier 3	0.43	None	0.367	1.01	10,800	8.38	2.7	0.402
Rockmaster 100 DTH	Diesel	150	Tier 3	0.43	None	0.367	1.01	8,640	8.38	2.7	0.402
Scooptram	Diesel	353	Pre-Tier	0.58	Crawler Dozer	0.367	1.01	13,670	8.38	2.7	0.402
Service Truck	Diesel	550	Pre-Tier	0.58	Crawler Dozer	0.367	1.01	612	8.38	2.7	0.402
Service Truck	Diesel	600	Pre-Tier	0.58	Crawler Dozer	0.367	1.01	1,276	8.38	2.7	0.402
Truck, Explosives, Peterbuilt PE 303	Diesel	500	Pre-Tier	0.58	Crawler Dozer	0.367	1.01	416	8.38	2.7	0.402
Truck, Getman	Diesel	220	Pre-Tier	0.58	Crawler Dozer	0.367	1.01	2,984	8.38	2.7	0.402
Truck, HIAB L8000 Ford 5 Ton	Diesel	250	Pre-Tier	0.58	Crawler Dozer	0.367	1.01	307	8.38	2.7	0.402
Truck, HIAB L9000 Ford 10 Ton	Diesel	350	Pre-Tier	0.58	Crawler Dozer	0.367	1.01	92	8.38	2.7	0.402
Truck, Toyota	Diesel	128	Pre-Tier	0.58	Crawler Dozer	0.367	1.01	9,048	8.38	2.7	0.402

a) Source: USEPA NONROAD Methods (USEPA 2004, 2005).

BSFC TAF = Brake Specific Fuel Consumption Transient Adjustment Factor; BSFCss = Brake SpecificFuel Consumption, steady state.

NO_X = nitrogen oxides; CO = carbon dioxide; PM_{10} = particulate matter with particle diameter less than 10 µm; g/bhp-h = grams per brake horsepower per hour; lb fuel/hp-hr = pounds fuel per horsepower hour.

Table 4-6 Transient Adjustment Factors for NONROAD Diesel Engines

Equipment Category	Transient Adjustment Factors		
	NO_X	CO	PM
Pre-Tier to Tier 2			
Crawler Dozer	0.95	1.53	1.23
Rubber-tired Loader	0.95	1.53	1.23
Excavator	0.95	1.53	1.23
Backhoe Loader	1.10	2.57	1.97
None	1.00	1.00	1.00
Tier 3			
Crawler Dozer	1.04	1.53	1.47
Rubber-tired Loader	1.04	1.53	1.47
Excavator	1.04	1.53	1.47
Backhoe Loader	1.21	2.57	2.37
None	1.00	1.00	1.00
Tier 4			
Crawler Dozer	1.00	1.00	1.00
Rubber-tired Loader	1.00	1.00	1.00
Excavator	1.00	1.00	1.00
Backhoe Loader	1.00	1.00	1.00
None	1.00	1.00	1.00

Source: USEPA NONROAD Methods (USEPA 2004, 2005).

NO_X = nitrogen oxides; CO = carbon monoxide; PM = particulate matter.

Table 4-7 Deterioration Factors for NONROAD Diesel Engines

Equipment Category	Deterioration Factors[(a)]		
	NO_X	CO	PM
Pre-Tier	0.024	0.185	0.473
Tier 1	0.024	0.101	0.473
Tier 2	0.009	0.101	0.473
Tier 3+	0.008	0.151	0.473

Source: USEPA NONROAD Methods (USEPA 2004, 2005).

a) Engines are assumed to be at the end of their median life to have conservative deterioration factors in calculations.

NO_X = nitrogen oxides; CO = carbon monoxide; PM = particulate matter.

References:

Golder and Conor Pacific (Golder Associates Ltd. and Conor Pacific Environmental Technologies Inc.). 1998. Technical Reference for the Meteorology, Emissions and Ambient Air Quality in the Athabasca Oil Sands Region. Prepared for Suncor Energy Inc. May 1998.

Environment Canada. 2013. National Inventory Report: 1990-2011, Greenhouse Gas Sources and Sinks in Canada, Part 2. Pollutant Inventories and Reporting Division, Environment Canada.

United States Environmental Protection Agency (USEPA). 2004. Exhaust and Crankcase Emission Factors for Nonroad Engine Modelling – Compression Ignition. Prepared by the Office of Transportation and Air Quality, Research Triangle Park, NC, USA. Report No. NR-009c.

USEPA. 2005. Technical Highlights – Frequently Asked Questions About NONROAD2005. Prepared by the Office of Transportation and Air Quality, Research Triangle Park, NC, USA. Report No. EPA420-F-05-058.

DOMINION DIAMOND

Information Request Number:	DAR-EC-IR-05
Source:	Environment Canada: Susanne Forbrich
Subject:	Camp Waste
DAR Section(s):	3

Preamble (EC):

The EKA PLA.2120 Incineration Management Plan (2014/05/05) should be updated to include annual reporting of operational data and a schedule for stack testing the incinerators. EC understands that the Proponent is planning to start composting food waste on site. EC requests details on the composting program and how it will affect the incineration of waste.

Request (EC):

EC requests that the Proponent provide the following information:

- annual reporting of incineration operational data,
- schedule for future incineration stack tests, and
- details of the planned food waste composting program.

Response:

Operation of the Ekati Mine Incinerator, including operational monitoring and maintenance of the Incinerator Management Plan, is an operational matter regulated directly by the Wek'èezhìı Land and Water Board (WLWB). The WLWB approvals of the Incinerator Management Plan include a public/regulatory review process. The incinerator would be operated the same way for the Jay Project as it was during Ekati Mine operations, and therefore, this Information Request is more properly a matter for the WLWB regulatory review process of updates to the Incinerator Management Plan. Further information is provided below for the Review Board's information.

As per Part B, Item 4 of Water Licence W2012L2-0001, the Waste Management Plan and Incinerator Management Plan is reviewed annually and updated if required. Version 2.0 of the Incinerator Management Plan will be updated in July 2015. As per the Incinerator Managemen Plan approval, updates to the Plan will be included in the Environmental Agreement and Water Licence Annual Report.

Maintenance data, pre-operational checks, operational checks, and monthly checklists are completed and records are maintained at the Ekati Mine for auditing purposes. Incinerator ash is collected daily and a composite samples are submitted for laboratory analysis quarterly. Scrubber water is also sampled and analyzed quarterly.

As the waste streaming process is changing, stack testing will occur after the composting system is in place and the new waste streaming has been rolled out. Current operations of the incinerator have not changed from when the stack testing was completed in June 2013.

The composter is expected to arrive on this season's Winter Road and will be commissioned for use during summer/fall 2015. During this time, a new waste management education program will be rolled out at Ekati to introduce the new waste streaming for composting, and as a reminder of the proper waste management. The new waste streaming program will include an additional bin for compostable material which will be located at all the waste stations around the Ekati Mine.

Dominion Diamond has decided to install a composter as it is safe, easy to maintain, environmentally friendly, and a cost-effective method for the disposal of organic waste (food waste, paper, cardboard). Installing a composter at the Ekati Mine may eliminate the need to run two incinerators and save the use of diesel that powers the incinerators, and result in a reduction of emissions. The composter unit is 32 inches long and 6 inches (81 x 15 centimetres) in diameter and able to process more than 2,000 pounds (746 kilograms) of waste per day and will be located inside the Incinerator Building. The food waste, cardboard, and paper collected from the composting bins are broken down and mixed using an agricultural mixer. The material is then fed in to the composter by conveyor where it does one full revolution per hour to feed air in to the unit. Bacteria live off the oxygen, the nitrogen-rich food waste, and the carbon-rich cardboard/paper, thereby breaking down the material into compost. The end material is odour-free, nutrient rich, safe to handle, and not a wildlife attractant.

In 2012, Ekati removed all plastics from site and replaced them with compostable material (take-away containers, garbage bags), and therefore, this does not need to be adjusted for the new waste streaming.

DOMINION DIAMOND

Information Request Number:	DAR-EC-IR-06
Source:	Environment Canada: Susanne Forbrich
Subject:	Neutralization Potential
DAR Section(s):	4, Annex VIII

Preamble (EC):

The Proponent states that the Neutralization Potential to Acid Potential (NP/AP) ratio of diabase samples is presented in Figure 4.2-3. A total of 75 diabase samples were analyzed for NP and AP, of which 72 diabase samples (96%) had NP/AP ratios greater than 2 and are classified as non-PAG (Table 4.2-2). Four diabase samples had NP/AP ratios between 1 and 2. Therefore, diabase is non-potentially acid generation (non-PAG). Given that the proponent has classified all the diabase samples as non-PAG, it is not clear how the samples that fall within the uncertain range would be managed.

Request (EC):

EC requests the Proponent provide details as to how the samples that show potential to generate acid would be managed.

Response:

The neutralization potential (NP) / acid potential (AP) ratio is commonly used as a screening criterion to identify materials that may have a potential for acid generation. Samples of materials with an NP/AP ratio less than 1 are assumed to have a long-term acid generation potential, as AP exceeds the NP available in a sample. Materials with an NP/AP ratio between 1 and 2 are assigned an uncertain acid generation potential to account for an inherent “factor of safety” in the classification of samples. Uncertainty, in this case, considers factors such as the occurrence and availability of minerals that contain NP (i.e., carbonate minerals) in a sample, and the rate of reaction of minerals that contribute AP (i.e., sulphide minerals) versus the rate of reaction of NP-bearing minerals.

Based on the information presented in Appendix B of the Geochemistry Baseline Report for the Jay Project (Annex VIII of the Developer’s Assessment Report), 75 samples of diabase were collected from the Ekati Mine, including 4 samples from the Jay Pipe. Of the 75 diabase samples, 3 samples had NP/AP ratios between 1 and 2 (4% of all samples). Owing to the low proportion of samples with an NP/AP between 1 and 2, diabase was considered non-potentially acid generating (non-PAG) overall. Furthermore, all samples collected from the Jay pipe had NP/AP ratios greater than 2; as such, diabase from the Jay pipe is considered non-PAG.

In general, diabase accounts for a minor proportion of the waste rock that will be generated from the Jay Project. Diabase occurs as mafic dykes, which intrude the country rock. Operational segregation of diabase during mining is unlikely, owing to the nature of the diabase occurrence within the Jay pipe. Diabase will be mixed with host rock (either granite or metasediment) as rock is blasted during mining, and end-dumped within the Jay Waste Rock Storage Area.

The Ekati Diamond Mine Waste Rock and Ore Storage Management Plan (WROMP) (Dominion Diamond 2014) is expected to be expanded to include the Jay Project area. The verification and monitoring component of the WROMP includes collection of supplemental samples of waste rock from the active mining areas. If samples of diabase from the Jay open pit are found to have geochemical characteristics outside the range reported in the Geochemistry Baseline Report for the Jay Project (Annex VIII), supplemental geochemical characterization will be recommended as part of the annual reporting. The results of supplemental geochemical characterization will be used to identify requirements for adaptive management, according to the process described in the WROMP for the Ekati Mine.

References:

Dominion Diamond (Dominion Diamond Ekati Corporation). 2014. Ekati Diamond Mine Waste Rock and Ore Storage Management Plan. Version 4.1, May 2014.

DOMINION DIAMOND

Information Request Number:	DAR-EC-IR-07
Source:	Environment Canada: Susanne Forbrich
Subject:	Metal Analysis, Uranium and Thorium
DAR Section(s):	4, Annex VIII

Preamble (EC):

Tables 4-2-3 to 4-2-6 show the Summary of Metal Analysis Results of Overburden, Waste Rock, Diabase, Granite, and Metasediment Samples from the Ekati Mine Parts A & B, (in comparison to crustal abundances); Summary of Metal Analysis Results of Kimberlite Samples From the Ekati Mine parts A & B; as well a Summaries of Results of Shake Flask Extraction Leach Testing of Samples From the Jay Pipe Parts A & B for in comparison to CCME guidelines. In places, Uranium and/or thorium are marginally higher or in some cases the maximum value are higher than the crustal abundance in diabase, granite, metasediments, Kimberlite and coarse processed Kimberlite. However, the concentrations of uranium (thorium not reported in table) are lower than CCME guidelines in the leachates as reported in the table. If with time, or should the concentration of uranium in the leachate become higher than the CCME guideline, is there a contingency plan to deal with that exceedance given the radioactive nature of uranium and/or thorium.

Request (EC):

EC requests the Proponent commit to developing a contingency plan to deal with any exceedance of Uranium and/or thorium in the leachate should that occur.

Response:

The results of solid phase analysis of waste rock and kimberlite were compared to the average crustal abundance of metals in crustal rock to identify parameters that may require further consideration with regard to metal leaching potential in the Geochemistry Baseline Report for the Jay Project (Annex VIII of the Developer's Assessment Report [DAR]). The results of short-term leach tests (such as shake-flask extraction tests), conducted on select samples, were then evaluated to identify readily soluble components of a sample. While the results of shake flask extraction are useful for indicating the short-term metal leaching characteristics of a material, these results cannot be used to evaluate long-term weathering if transient processes, such as sulfide oxidation, are expected to occur. Ultimately, the results of field-scale monitoring are the most useful reference for identifying the long-term metal leaching potential of a material.

Select results of field-scale monitoring of seepage from the Misery waste rock storage area (WRSA) were used to develop the waste rock contact water input to the water quality predictions for the Jay Project DAR. Thorium was not measured in WRSA seepage, and therefore, was not included in the water quality predictions.

Uranium concentrations in the waste rock contact water input ranged from 0.018 mg/L (mean) to 0.43 mg/L (maximum). Waste rock discharge water qualities used for input to the water quality model are presented in Table 8E4.2-2 (Appendix 8E of the DAR; Site Discharge Water Quality Monitoring Report). The maximum predicted concentration in discharge for 99th percentile modelled scenario was 0.1 mg/L in the site discharge water quality predictions. Discharge concentrations are presented in Table 8E4.1-1 (Appendix 8E Site Discharge Water Quality Monitoring Report).

The Ekati Diamond Mine Waste Rock and Ore Storage Management Plan (WROMP; Dominion Diamond 2014) is expected to be expanded to include the Jay Project area. The verification and monitoring component of the WROMP includes seepage monitoring during the freshet and the fall. Monitoring of seeps identified as “potentially problematic” will continue where necessary on a bi-weekly basis during the open water season. The objectives of seepage monitoring include detection of undesirable changes in chemistry and unacceptable high concentrations of specific elements. Adaptive seepage management strategies will be implemented as necessary to remedy undesirable water quality trends. Uranium and thorium will be included in the seepage monitoring program to identify short-term and long-term water quality trends for the purpose of identifying any needs for further testing, monitoring, or adaptive management.

References:

Dominion Diamond (Dominion Diamond Ekati Corporation). 2014. Ekati Diamond Mine Waste Rock and Ore Storage Management Plan. Version 4.1, May 2014.

DOMINION DIAMOND

Information Request Number: DAR-EC-IR-08

Source: Environment Canada: Susanne Forbrich

Subject: Water Balance of Misery Pit Inflows/Outflows

DAR Section(s): Appendix 3A

Preamble (EC):

The filling and discharging of the Misery pit undergoes several stages over the life of mine. Initially the TSS-laden water from the dewatering of Lac du Sauvage will be pumped to Misery to allow the solids to settle out. Once mining commences the groundwater seepage through the walls of the Jay pit will be pumped to Misery. As capacity of Misery is reached the balance is maintained by pumping mine contact water from the Jay pit to the bottom of Misery, while withdrawing water for discharge into Lac du Sauvage from the top. As water is being deposited and discharged simultaneously, the conditions in Misery pit will also change, and the water quality will decrease. The rates of pumping will become important during these later stages to ensure stratification occurs and the chemocline does not break down. Figures 6-2 and 6-3 of the mine water management plan show the inflows and outflows of the Misery pit through to late operations. From the figures, the inflows and outflows can be estimated but no precise numbers are provided as to the volumes to be deposited and withdrawn from Misery on a daily, monthly and annual basis.

Request (EC):

EC requests that with regards to the water balance within Misery Pit:

- How will pumping to the bottom of the pit be implemented so that the TSS from dewatering of the diked area are not re-suspended into the water column?
- What are the estimated volumes to be pumped into Misery and out of Misery at each stage of mining on a daily, monthly, and annual basis?
- How will mixing be prevented while water is being deposited and withdrawn simultaneously?
- How will the chemocline be monitored in Misery?
- What contingency plans are in place if the rate of inflows to Misery exceeds the rate of discharge?

Response:

- **How will pumping to the bottom of the pit be implemented so that the TSS from dewatering of the diked area are not re-suspended into the water column?**

To minimize the potential for re-suspension of the total suspended solids (TSS) in the Misery Pit:

- the pipeline that transports minewater to the bottom of the Misery Pit will terminate approximately 10 metres (m) above the base of the pit;

- the last 10 m of the pipeline will have a larger diameter to decrease flow velocity; and,
- pressure control valve(s) on the pipeline will allow flow pressure to be regulated to reduce velocities at the discharge, to the extent practical.

The TSS concentrations within the Misery Pit will be monitored throughout the operations phase of the Project.

- **What are the estimated volumes to be pumped into Misery and out of Misery at each stage of mining on a daily, monthly, and annual basis?**

Annual water volumes transferred during the various stages of the Jay Project are provided in Table 6.1 in the Appendix 3A of the Developer's Assessment Report (DAR) (Mine Water Management Plan). Monthly flow rates into and out of the Misery Pit are provided in Table 8-1 below, with water initially being discharged into the Misery Pit beginning in September 2019. The water balance uses monthly climate inputs (precipitation and evaporation); as such, estimated daily flow rates are only representive of the average monthly flow characteristics. Daily flows can be estimated by dividing the monthly volumes by the number of days in the each month.

Table 8-1 Average Monthly Pumped Inflows and Outflows from Misery Pit (m^3/month)
Part A

Period	Year	January		February		March		April		May		June		July	
		Inflows	Outflows	Inflows	Outflows	Inflows	Outflows	Inflows	Outflows	Inflows	Outflows	Inflows	Outflows	Inflows	Outflows
Dewatering and Stripping	0	Not Applicable		Not Applicable		Not Applicable		Not Applicable		Not Applicable		Not Applicable		Not Applicable	
Operations	1	241,700	0	223,300	0	238,700	0	231,000	0	238,700	0	1,267,773	0	1,272,298	0
Operations	2	292,700	0	266,000	0	294,500	0	285,000	0	294,500	0	1,297,437	0	582,889	0
Operations	3	330,500	0	299,600	0	331,700	0	321,000	0	331,700	0	1,333,447	0	620,085	0
Operations	4	373,700	0	338,800	0	375,100	0	363,000	0	375,100	0	1,375,450	0	663,490	0
Operations	5	441,100	0	414,700	0	443,300	0	429,000	0	443,300	0	1,441,650	0	733,630	0
Operations	6	485,300	479,700	439,600	439,600	486,700	486,700	471,000	471,000	486,700	486,700	1,483,440	1,293,382	775,090	992,522
Operations	7	495,700	494,505	448,000	448,000	496,000	496,000	480,000	480,000	496,000	496,000	1,492,450	1,294,890	784,390	1,009,300
Operations	8	526,000	522,000	476,000	476,000	527,000	527,000	510,000	510,000	527,000	527,000	1,522,450	1,299,950	815,380	1,065,220
Operations	9	557,000	553,000	522,000	522,000	558,000	558,000	540,000	540,000	558,000	558,000	1,552,650	1,305,000	848,310	1,123,470
Operations	10	657,000	643,800	596,400	596,400	660,300	660,300	639,000	639,000	660,300	660,300	1,651,450	1,321,680	948,670	1,305,650
Closure	11	56,100	2,541,300	0	2,352,000	0	2,604,000	0	2,476,676	0	2,604,004	612,000	653,800	1,116,000	0
Closure	12	1,116,000	0	1,008,000	0	1,116,000	0	1,080,000	0	1,116,000	0	1,080,000	0	1,116,000	0
Closure	13	0	0	0	0	0	0	0	0	0	0	0	66,059	0	0
Closure	14	0	0	0	0	0	0	0	0	0	0	0	63,209	0	0

m^3/month = cubic metres per month.

Table 8-1 Average Monthly Pumped Inflows and Outflows from Misery Pit (m^3/month)
Part B

Period	Year	August		September		October		November		December		Annual	
		Inflows	Outflows	Inflows	Outflows	Inflows	Outflows	Inflows	Outflows	Inflows	Outflows	Inflows	Outflows
Dewatering and Stripping	0	Not Applicable		3,744,000	0	4,347,933	0	321,000	0	331,700	0	8,744,633	0
Operations	1	983,113	0	514,684	0	248,026	0	231,000	0	238,700	0	5,928,994	0
Operations	2	605,735	0	534,724	0	304,626	0	285,000	0	294,500	0	5,337,611	0
Operations	3	642,940	0	626,560	0	341,830	0	321,000	0	331,700	0	5,832,062	0
Operations	4	741,640	0	668,580	0	385,210	0	363,000	0	375,100	0	6,398,170	0
Operations	5	811,760	30,108	734,560	743,622	453,430	496,913	429,000	429,000	443,300	443,300	7,218,730	2,142,944
Operations	6	855,160	854,226	776,560	801,057	496,830	540,314	471,000	471,000	486,700	486,700	7,714,080	7,802,901
Operations	7	864,450	863,530	785,560	810,050	506,130	549,620	480,000	480,000	496,000	496,000	7,824,680	7,917,895
Operations	8	895,450	894,530	815,580	840,050	537,120	580,620	510,000	510,000	527,000	527,000	8,188,980	8,279,370
Operations	9	926,460	925,520	845,570	870,060	568,130	611,610	540,000	540,000	558,000	558,000	8,574,120	8,664,660
Operations	10	1,028,760	1,027,840	944,580	969,050	670,420	713,910	639,000	639,000	660,300	660,300	9,756,180	9,837,230
Closure	11	1,116,000	0	1,080,000	0	1,116,000	0	1,080,000	0	1,116,000	0	7,292,100	13,231,780
Closure	12	1,116,000	0	684,000	44,927	0	561	0	0	0	0	9,432,000	45,487
Closure	13	0	0	0	14,576	0	548	0	0	0	0	0	81,182
Closure	14	0	0	0	13,703	0	540	0	0	0	0	0	77,453

m^3/month = cubic metres per month.

- **How will mixing be prevented while water is being deposited and withdrawn simultaneously?**

Minewater inflow to the base of the Misery Pit will be injected at an elevation of approximately 150 metres above sea level (masl), while outflows are pumped from a barge on the surface of the Misery Pit at an elevation of 430 masl (i.e., vertical distance between the pumped inflows and outflows will be 280 m). The vertical distance and the pipeline design elements, described above, will all aid in reducing the potential for mixing. Given the vertical distance between inflows and outflows and the modelled stratification within the pit (Appendix 8G of the DAR), there is confidence that meromictic conditions will develop and be maintained in the pit during these activities.

The water quality model assumes a linear total dissolved solids (TDS) gradient between the bottom and the surface of the pit during mine operations as one of a number of conservative assumptions. This is in contrast to a more defined chemocline expected within the pit that separates low and high TDS waters. As a result of this assumption, modelled water quality projections carried forward into the receiving environment (i.e., the hydrodynamic Lac du Sauvage and Lac de Gras models) in the DAR do not under-estimate potential environmental effects.

- **How will the chemocline be monitored in Misery?**

Monitoring in the Misery Pit will include regular water quality monitoring in the upper part of the pit and periodic depth profiles through the water column. Once discharge to Lac du Sauvage begins, the final minewater discharge will be monitored for compliance against the effluent quality criteria defined in the Water Licence. The detailed schedules and parameters to be monitored will be determined as part of the regulatory permitting (i.e., water licencing) phase of the Project.

- **What contingency plans are in place if the rate of inflows to Misery exceeds the rate of discharge?**

The pumping system proposed for the discharge from the Misery Pit to Lac du Sauvage will have a pumping capacity of 3,550 cubic metres per hour (m^3/h). The maximum estimated inflow to the Misery Pit during operations is approximately 2,950 m^3/h (PS1 and PS2 combined pumping system capacity). This provides an excess capacity of approximately 600 m^3/h. Sumps associated within the PS1 and PS2 pumping stations have additional capacity to provide short-term storage capacity, if necessary. Additional operational contingency measures are not necessary.

DOMINION DIAMOND

Information Request Number: DAR-EC-IR-09

Source: Environment Canada: Susanne Forbrich

Subject: Runoff and Seepage from Waste Rock Storage Area

DAR Section(s): 8, Appendix 3A

Preamble (EC):

The Proponent proposes that seepage from the Waste Rock Storage Area (WRSA) will be monitored by samplers walking the toe in spring and fall, sampling any seepage streams. The use of a sump, ditch, or collection structure is only in place as a contingency measure. This sampling methodology and monitoring plan has the potential to miss or underestimate the amount of seepage or runoff that is occurring from the WRSA. Seepage from the south of the WRSA will flow to the diked area, while seepage and runoff from the north will naturally flow to Lac du Sauvage, so the north side is of primary concern for seepage and runoff. Additionally, during post-closure the WRSA will drain directly into Lac du Sauvage from both the north and south sides.

Request (EC):

EC requests that with regards to the waste rock storage area:

- what levels of seepage and runoff would trigger installation of the collection or control structures?
- how will the Proponent ensure that all waste rock seepage and runoff is suitable at that time when the dikes are breached and the diked area is reconnected to Lac du Sauvage?

Response:

Precipitation over the Jay waste rock storage area (WRSA) is generally anticipated to infiltrate into the pile and freeze resulting in a low proportion of surface minewater runoff. This assumption is consistent with observations at the existing WRSAs at the Ekati Mine. Runoff from the Jay WRSA will contribute to watershed yield in sub-basins Ac, B, and C.

The volume and timing of this runoff, and its chemistry profile, were accounted for in the Site Water Quality Model (Appendix 8E), which is an input into the Lac du Sauvage hydrodynamic water quality model (Appendix 8F). During construction and operations and early closure, runoff from the entire Jay WRSA is conservatively assumed to report to the diked area in Lac du Sauvage. In fact, seepage in the area of the WRSA that naturally flows to sub-basin C (a relatively small portion of the total seepage) would only be collected and pumped to the Jay diked area as an operational contingency measure. In late closure, when the diked area is reconnected to Lac du Sauvage, runoff will enter the lake environment.

The inputs from the Jay WRSA to the Site Water Quality Model were conservative. The chemistry profile of runoff from the Jay WRSA was assigned concentrations from WRSA seepage flow monitoring data collected from the Misery operations at the Ekati Mine (Section 8E3.4, Appendix 8E). Use of these data is considered conservative since the Misery WRSA contains a higher proportion of potentially acid

generating material compared to what will be placed in the Jay WRSA. The rock types stored in the existing Ekati Mine WRSAs are the same as what will be stored in the Jay WRSA; however, there is variability in their composition ratios and placement methods. Additionally, the quantity of WRSA runoff/seepage was conservatively estimated; the modelling assumed permafrost would not develop in the WRSA, leading to higher than anticipated seepage quantities. Runoff from the Jay WRSA was not predicted to present any potential risk to the receiving environment.

Dominion Diamond plans to extend the existing Ekati Mine Waste Rock and Ore Storage Management Plan (WROMP) Vers. 4.1 to include the Jay Project waste rock storage infrastructure (e.g., Jay WRSA) (Dominion Diamond 2014). Under the Ekati Mine WROMP, seepage/runoff surveys of all WRSAs and ore stockpiles at the Ekati Mine are conducted twice a year (during spring freshet, and again in late summer or fall before freeze-up), in accordance with the requirement of the Water Licence. The testing of seepage chemistry is designed to detect changes that may affect the receiving environment. The Jay WRSA will be included in these seepage surveys. Seepage monitoring will continue through the operation stage of the project, and for 10 years following the completion of mining, until closure objectives are met.

During the monitoring period, adaptive seepage management strategies will be implemented, if necessary, to remedy undesirable water quality trends. The adaptive management strategy outlined in the WROMP for the Ekati Diamond Mine includes the following components:

- Identification of issue, verification of trigger and development of a response plan.
- Additional studies to determine the extent of the impact of seepage (if any), and modification of the WROMP and seepage management program.
- Implementation of modified programs, and design / construction of mitigation structures and facilities (if required).

Seepage monitoring will continue through the operation stage of the project, and for 10 years following the completion of mining. The results of seepage monitoring will be used to confirm that waste rock seepage and runoff water quality is suitable at the time that the dikes are breached and the diked area is reconnected to Lac du Sauvage.

References:

Dominion Diamond (Dominion Diamond Ekati Corporation). 2014. Ekati Diamond Mine Waste Rock and Ore Storage Management Plan. Version 4.1, May 2014.

DOMINION DIAMOND

Information Request Number:	DAR-EC-IR-10
Source:	Environment Canada: Susanne Forbrich
Subject:	Effects Study Area for Water Quality
DAR Section(s):	8

Preamble (EC):

In determining the effects study area (ESA) for the Jay project water quality monitoring, a number of other reports were taken into account. Monitoring suggests that Lac du Sauvage is not currently affected by the Ekati or the Diavik mining operations. However, Lac de Gras is showing minor water quality changes from both direct mine-related discharges and the mine influences that flow through the Koala watershed. The Proponent indicates that although there have been changes in water quality in Lac de Gras, it is not anticipated that changes will be measurable at the outlet, therefore, the limit of the ESA for water quality was set at the outlet of Lac du Gras into the Coppermine River. EC notes that as minor effects have been observed in Lac de Gras, that the cumulative impact of the Jay expansion, plus existing mining operations, has the potential to cause changes beyond the outlet of Lac de Gras.

Request (EC):

EC requests the identification of the adaptive management measures that are in place to ensure that changes in water quality do not extend past the outlet of Lac du Gras into the Coppermine River. What thresholds would trigger sampling past the outlet?

Response:

The Developer's Assessment Report (DAR) for the Jay Project (the Project) and updated hydrodynamic modelling of Lac de Gras (Golder 2015) suggested that small changes to water quality may extend beyond the Lac de Gras outlet and into Desteffany Lake (Appendix B, Compendium of Supplemental Water Quality Modelling). Following the DAR submission, a supplemental water quality model was developed to predict the extent of influence that these changes in Lac de Gras may have on the water quality in Desteffany Lake (Appendix B). The updated Lac de Gras and Desteffany Lake water quality modelling results include conservatism consistent with the environmental assessment (EA) case presented in the DAR. This conservatism is directed towards overestimating projected water quality constituent concentrations in Lac de Gras beyond that which would be realistically expected. The results of the Desteffany Lake modelling supported the view that small changes in water quality may occur in this downstream lake; however, the modelled constituent concentrations in Desteffany Lake are lower than modelled at the outlet of Lac de Gras as a result of natural attenuation from the outlet of Lac de Gras.

To place some context on the EA case presented in the DAR, a further model was developed to present a reasonable estimate case (i.e., modelling inputs represented an average condition for concentrations and flows compared to the EA case that is much more conservative) (Appendix B). As expected, the constituent concentrations in Lac de Gras and Desteffany Lake were lower than results from the EA case.

Each of the modelled cases indicate potential for small changes to occur downstream of the Lac de Gras outlet prior to and during the Project. However, concentrations will remain lower than aquatic life and drinking water guidelines, and the maximum projected changes are not considered to present any risk to aquatic life nor the ability to drink the water.

Monitoring during the construction, operations, and closure phases of the Project will be conducted to track water quality throughout the mine site, within the water containment areas, and within the receiving environment through the Surveillance Network Program and the Aquatic Effects Monitoring Program (AEMP). Adaptive management measures associated with the monitoring of water quality under an AEMP are expected to be consistent with those currently applied by the Ekati Mine.

An Aquatic Response Framework for the Ekati Mine is currently under review by the Wek'èezhìi Land and Water Board. This document works with the AEMP to provide Low Action Levels that would trigger Adaptive Management response plans. It is envisaged that the Aquatic Response Framework for the Ekati Mine will be extended to Lac du Sauvage and other areas relevant to the Jay Project with pre-defined action thresholds and response plan requirements.

References:

Golder (Golder Associates Ltd.). 2015. Jay Project – Lac de Gras Hydrodynamic Model Updates. Technical Memorandum. Prepared by Golder Associates Ltd. For Dominion Diamond. January 2015.

DOMINION DIAMOND

Information Request Number: DAR-EC-IR-11

Source: Environment Canada: Susanne Forbrich

Subject: Shallow Groundwater Flow Systems

DAR Section(s): 8.2.1.2.3

Preamble (EC):

Using information from the Gahcho Kue project (136 km SE of the site) it is expected that TDS in the shallow groundwater around the Jay pipe will be less than 100 mg/L with low concentrations of dissolved metals. Although these estimations may be accurate of the local shallow groundwater conditions, it is a very small data set to base predictions on.

Request (EC):

EC seeks confirmation that regional information (Ekati or Diavik) that may be more indicative of the local conditions also been included in the shallow groundwater predictions.

Response:

Data collected in three shallow samples at the Diavik Mine at a depths of between 70 to 100 metres were also relatively fresh with an average total dissolved solids of approximately 170 milligrams per litre (Figure 5.2-1 of the Hydrogeology Baseline Report; Annex IX of the Developer's Assessment Report). These data are consistent with the data compiled from a number of sites in the Canadian Shield presented in Stotler et al. (2012) which show that shallow groundwater is much fresher than groundwater at greater depths. This result is expected due to the hydraulic connection in open talik areas with the overlying lake.

References:

Stotler R, Frape SK, Ruskeeniemi T, Pitkänen P, Blowes DW. 2012. The interglacial–glacial cycle and geochemical evolution of Canadian and Fennoscandian Shield groundwaters. Geochim Cosmochim Ac 76 (2012): 45–67.

DOMINION DIAMOND

Information Request Number:	DAR-EC-IR-12
Source:	Environment Canada: Susanne Forbrich
Subject:	Shallow Groundwater Flow Systems
DAR Section(s):	8, Annex IX

Preamble (EC):

The groundwater TDS profile that is used for modelling Jay groundwater concentrations is derived based on the groundwater quality analysis that was conducted on site, and then supplemented from other projects within the Canadian Shield. However, the groundwater sampling in questions includes only one Westbay multi-level monitoring well, for which samples were taken at several depths within a single borehole. Although samples were taken at different depths, this is still only a snapshot of one particular location and does provide enough information to reasonably model groundwater for the Project. The inclusion of only one location may over or underestimate the quality of groundwater by depth in the area. Groundwater seepage into Jay pit constitutes the majority of the water that will need to be managed on site. Since this water is such a large portion of the water management it is important that it is properly characterized in order to avoid incorrect estimation of water quality and quantity, leading to unnecessary water management plan alterations in the future.

Request (EC):

EC seeks confirmation as to whether there has been, or is there any planned, additional groundwater sampling to be conducted at the Jay project prior to construction in order to more accurately characterize the groundwater conditions.

Response:

The data from the Westbay monitoring well at the Jay Pit are compared to data collected at both Diavik and Ekati Panda and Koala mines in the plot presented in Figure 5.2-1 of Annex IX (Hydrogeology Baseline Report of the Developer's Assessment Report [DAR]). The data collected from the Diavik Mine, and the Ekati Mine Panda and Koala pits demonstrate that groundwater quality sampled from the Westbay located beneath Lac du Sauvage is within the range that has been observed at nearby mines, as well as other mines in the Canadian Shield. Groundwater near the Jay Pit is expected to have groundwater quality more comparable to Diavik than to Ekati Panda and Koala, as the Jay Pit is located within the talik beneath Lac du Sauvage similar to the Diavik A154 Pit which is located within the talik of Lac du Gras. As discussed in Section 5.2 of Annex IX, deep groundwater in open talik areas beneath lakes likely has lower total dissolved solids (TDS) than beneath permafrost due to the hydraulic connection with the overlying lake as has been suggested by Stotler et al. (2009). Samples collected in the Westbay well in three different depth intervals (ranging from approximately 300 to 450 metres depth) indicate that the TDS at the Jay Project is higher than observed at Diavik, but much lower than those observed at Ekati Panda and Koala pits where deep permafrost overlies the deep groundwater regime.

An additional round of sampling was conducted in the three intervals of the Westbay monitoring well in September 2014 (Golder 2014). In general, the concentrations of individual parameters in the water samples collected in September 2014 were similar to, or less than, the concentrations presented in the DAR (Annex IX, Appendix A) that were derived from sampling in September 2014. An additional round of sampling is planned for the spring of 2015. Results of these additional sampling events will be used in the detailed design of the water management facilities and development of the ground monitoring plan.

Dominion Diamond Ekati Corporation (Dominion Diamond) is confident that when combined with the other conservative assumptions about hydrogeological conditions in the DAR (Appendix 8A, Table 8A3-2), the groundwater quality profile used for the DAR is appropriately conservative for the purpose of ensuring that environmental effects have not been underestimated. For comparison, Dominion Diamond has provided a 'reasonable estimate case' water quality prediction that better represents Dominion Diamond's expectations (Appendix B, Compendium of Supplemental Water Quality). This further demonstrates that the data used in the DAR are conservative.

References:

Golder (Golder Associates Ltd.), 2014. Dominion Diamond Jay Project September 2014 Westbay System Sampling Program. Reference No. 1313280041-E14073-TM-Rev0-2010. February 3, 2015.

Stotler R, Frape S, Ruskeeniemi T, Ahonen L, Onstott TC, Hobbs MY. 2009. Hydrogeochemistry of groundwaters in and below the base of thick permafrost at Lupin, Nunavut. Can J Hydrol 373 (2009): 80–95.

DOMINION DIAMOND

Information Request Number:	DAR-EC-IR-13
Source:	Environment Canada: Susanne Forbrich
Subject:	Water and Sediment Quality
DAR Section(s):	Annex XI (Appendix A)

Preamble (EC):

The most recent baseline data collected from Lac du Sauvage was completed in the open water season of 2013 from late July to mid-September. However, during this sampling year there were no samples collected during the winter to characterize under-ice conditions. Under the existing Ekati AEMP there are only two Lac du Sauvage sampling stations (LDS2 and LDS1) in the monitoring plan. Although the AEMP sampling is completed in both open water and under-ice conditions, this provides only a limited amount of data for which to base under-ice conditions on, as they can be highly variable throughout the lake. From the data provided it appears that the most recent thorough under ice sampling investigation in Lac du Sauvage, aside from the monitoring conducted under the AEMP, took place in 2006 during the Jay Pipe Aquatic Baseline Study. This study included sampling 12 locations in Lac du Sauvage during ice covered conditions in February, March and May, and open-water conditions in July, August, and September. Although this sampling event may be sufficient to characterize the under ice conditions in Lac du Sauvage in 2006, the data is 9 years old and there are no other sampling years for comparison.

Request (EC):

EC seeks confirmation that with regards to under-ice water quality data,

- is additional under ice baseline water quality data available, currently underway, or planned prior to construction?
- are the methods comparable between the 2006 and the 2013 Lac du Sauvage baseline studies?

Response:

Under-ice water quality data for the Lac du Sauvage watershed were collected in 2014. These data were collected as part of the 2014 supplemental water quality monitoring program, which also included open-water (July, August, and September) sampling.

The 2014 winter water quality program was conducted at the end of April. Samples were collected to characterize under-ice water quality conditions at:

- Lac du Sauvage;
- the Lac du Sauvage outlet;
- lakes within the Lac du Sauvage basin: Duchess Lake, Christine Lake, Lake C1, Counts Lake, Lake E1, and Lake Af1; and,
- Paul Lake within the Lac de Gras basin.

In terms of sampling stations in Lac du Sauvage, the scope of the 2014 under-ice program was similar to that of the 2013 baseline open-water programs, with the exclusion of the shallow-depth stations in Lac du Sauvage. The 2006 study (Rescan 2007) mainly focused on Lac du Sauvage basin Ac (i.e., the central basin) and the lake outlet, while the 2013 and 2014 studies focused on all basins within Lac du Sauvage and the lake outlet. The location of the stations sampled in the 2006 and the 2013 studies are identified on Map 8.2-6 (Section 8.2.5 in the Developer's Assessment Report). For the 2014 study, under-ice and open-water samples were collected from the deep water stations in Lac du Sauvage (i.e., stations Aa-1, Ab-1, Ac-1, Ac-4, Ac-7, Ad-1, and Ae-1). There was little overlap in stations sampled for the 2006 and 2013/2014 studies but both baseline programs sampled water from within the main basin of the lake.

In regards to the sampled constituents, the same suite of field and laboratory water quality constituents were included in the 2013 and 2014 programs.

The Lac du Sauvage under-ice water quality data has been analyzed and reported, along with data from the 2014 open-water programs (Dominion Diamond 2015). Methods used for sample collection and data analysis were consistent between the 2013 and 2014 water quality programs.

Consistency in sampling and monitoring approach for under-ice water quality in Lac du Sauvage was noted between the 2006 (Rescan 2007) and 2014 winter programs:

- water samples were collected from discrete depths in the water column;
- water samples were analyzed by ALS Environmental at the Vancouver laboratory (Rescan 2007) and the Edmonton and Vancouver laboratories (2014 program);
- the range of constituents were similar between the programs, with similar analytical detection limits;
- the range of constituent concentrations and values for parallel sampling stations between 2006 and 2014 were similar; and,
- appropriate quality assurance and quality control practices were followed in both programs.

References:

Dominion Diamond (Dominion Diamond Ekati Corporation). 2015. 2014 Water and Sediment Quality Supplemental Baseline Report for the Jay Project. Prepared by Golder Associates Ltd., April 2015. Yellowknife, NWT, Canada.

Rescan (Rescan Environmental Services Ltd.). 2007. Ekati Diamond Mine 2006 Jay Pipe Aquatic Baseline. Prepared for BHP Billiton Canada Inc. Yellowknife, NWT, Canada.

DOMINION DIAMOND

Information Request Number: DAR-EC-IR-14

Source: Environment Canada: Susanne Forbrich

Subject: Site Discharge Criteria

DAR Section(s): Appendix 8E

Preamble (EC):

Misery Pit discharge criteria have been simulated, and there is mention that water will only be discharged once criteria is met, however, there is no mention of what the proposed discharge criteria will be. In order to evaluate whether the environmental effects from the Jay pipe have been fully characterized, the proposed discharge criteria should be available. EC notes that if the simulated maximum Misery Pit discharge concentrations were to occur that ammonia would be acutely lethal, and chloride may have chronic toxicity effects.

Request (EC):

EC requests the end of pipe discharge criteria from Misery Pit as proposed by the proponent.

Response:

The Developer's Assessment Report (DAR) describes the predicted minewater quality (Appendix 8E) based on conservative assumptions for the purposes of an environmental assessment. The DAR water quality assessment included the discharge of end of mine life Misery Pit water to Lac du Sauvage, and demonstrates that this minewater can be safely discharged to the receiving environment without significant adverse effects (Sections 8.5.4 and 8.5.5 of the DAR). Testing of site-specific simulated minewater (Appendix 8H) demonstrated that the minewater from open pit mining would not be acutely toxic, and hydrodynamic modelling of Lac du Sauvage demonstrated that chronic toxicity benchmarks would be achieved at a distance of 200 metres.

This approach is appropriate for an environmental assessment and has been deemed consistent with the Project Terms of Reference because effluent quality criteria (EQCs) will be determined by the Wek'èezhìı Land and Water Board during regulatory permitting following the successful completion of the environmental assessment. The Water Boards of the Mackenzie Valley determine and regulate EQCs according to their 2011 *Water and Effluent Quality Management Policy*. Dominion Diamond Ekati Corporation will operate the Jay Project in accordance with the Boards' Policy by only releasing minewater that is non-acutely toxic.

If unexpected issues were to arise, and effluent could not be released from Misery Pit to Lac du Sauvage, adaptive management would be implemented; see the response to DAR-EC-IR-20 for further information on this topic.

DOMINION DIAMOND

Information Request Number:	DAR-EC-IR-15
Source:	Environment Canada: Susanne Forbrich
Subject:	Contingency Planning for Water Discharge from Misery
DAR Section(s):	8, Appendix 8E

Preamble (EC):

The report indicates that mine water will be handled in a phased approach involving Misery Pit. The first phase will involve all mine water being stored in the pit until it reaches its maximum capacity, in approximately 5 years of operations. After this time, and for the remainder of the operation, mine water will be discharged year round from the surface of Misery Pit to Lac du Sauvage, as long as criteria are met. This mine water management plan relies on stratification within Misery to achieve the discharge criteria to Lac du Sauvage. With the dependence on Misery holding the water for 5 years and reliance on stratification, contingency plans become important in the event of unexpected volumes and concentrations.

Request (EC):

EC seeks clarification on contingency and adaptive management planning involving:

- where will water be stored if Misery reaches capacity prior to the 5 year time frame? Will water quality be suitable for discharge prior to 5 years if capacity is reached?
- what contingency measures are in place if groundwater quality is underestimated? What specific contingency treatment options are available if water quality indicates that the Proponent is unable to directly discharge to Lac du Sauvage?

Response:

Based on the conservative modelling assumptions used in the Developer's Assessment Report (DAR) for the Jay Project and the contingency storage in the pit, it is not expected that the capacity of the Misery Pit will be reached prior to year 5 of operations. Monitoring of water quantity and quality of the Misery Pit will be conducted during this period. This monitoring should provide an early warning indication if either the water quality is worse than predicted and if water quantity is greater than predicted. As such, this will provide some time to implement adaptive management strategies, if necessary.

However, if the capacity of the Misery Pit is reached prior to the 5 year time frame, water will be discharged to Lac du Sauvage earlier than predicted in the DAR, providing it is of acceptable water quality (i.e., meets the water licence criteria for discharge).

The primary source of water that is pumped to the Misery Pit, during operations, is groundwater that will inflow into the Jay Pit. Estimates of the volumes of groundwater inflows to the pit were obtained from the hydrogeological model that was developed in support of the DAR (Appendix 8A). Conservative assumptions were made for the hydrogeological model parameters resulting in conservatively high predictions of inflows to the Jay Pit (i.e., the Environmental Assessment Conservative Case). Thus, it is

considered unlikely that the Misery Pit will reach capacity prior to year 5. Groundwater inflows into the Jay Pit will be monitored throughout mining, as will the remaining storage capacity and water quality in Misery Pit. This will allow time to react if adaptive management planning becomes necessary.

The mine water management plan for the Jay Project is designed to pump water containing high concentrations of total dissolved solids (TDS) from the Jay Pit to the bottom of the Misery Pit. This strategy is intended to vertically displace water containing lower TDS concentrations upward, such that this water is discharged first and precluding the need to discharge water containing the highest concentrations of TDS that maybe encountered during the latter years of mining.

Throughout all project phases, water quality within the Misery Pit will be monitored at the surface and at depth to allow early identification of trends in water quality that may differ from expectations (predictions). If water quality is found to be worse than expectations, the adaptive management strategies outlined within the Mine Water Management Plan will be implemented (Section 8.3, Appendix 3A of the DAR). These strategies may involve improvement or modifications of the proposed minewater management plan, or temporary use of the contingency allowances included in the design of the water management structures. Possible adaptive management strategies that would be considered include the following:

- maintaining a storage contingency allowance in the existing King Pond throughout the construction and operations stage for use as an additional total suspended solids (TSS) management facility during construction and operations phase, or for short-term emergency minewater storage;
- maintaining the contingency storage in the Misery Pit (approximately 3 million cubic metres [m^3]) throughout the operations stage for use as emergency minewater storage (upper 10 metres [m] of the pit);
- maintaining pumping capacity and a pipeline between the Misery and Lynx pits throughout the operations stage to allow for lowering of the Lynx Pit water level to generate additional contingency minewater storage, if required;
- increasing storage capacity in the Jay runoff sump and mine inflows sump (e.g., constructing containment berms around the sumps) to augment temporary minewater storage capacity within the diked area;
- consideration of direct discharge to the environment from the Jay runoff sump, if water is found to meet established discharge criteria (the discharge locations used during the initial stages of dewatering would be used);
- use of storage capacity available at the Ekati site (e.g., construction of pumping and pipeline system from the Misery site to the Ekati site); and,
- treatment of parameters of concern prior to discharge to Lac du Sauvage.

These strategies, together with others that would be developed at that time based on the circumstances at hand, would allow for adjustments to the mine water management plan if necessary to maintain compliance with the Water Licence. In the unlikely event of water quantity and quality trends differing significantly from expectations, these strategies would also allow sufficient time to develop and implement additional adaptive management strategies, without significantly affecting mine operations.

DOMINION DIAMOND

Information Request Number: DAR-EC-IR-16

Source: Environment Canada: Susanne Forbrich

Subject: Explosive Residues

DAR Section(s): 8

Preamble (EC):

The use of explosives during blasting can leave residues of nitrate and ammonia on the blasted rock that can in turn be transported to other locations. If these blasting residues enter a water body, the ammonia and nitrate can cause water quality issues by causing toxicity if concentrations are high enough, or by enhancing the primary productivity. The potential for impacts to water from nitrate and ammonia from explosives has been acknowledged by the Proponent in the form of the Ekati Nitrogen Response Plan. However, it is unclear what mitigation the Proponent may employ to reduce the introduction of nitrate and ammonia into Lac du Sauvage during dike construction. There is the potential for ammonia and nitrate to enter the environment through runoff that has come in contact with the blasted rock as well as by rock placement in Lac du Sauvage during dike construction.

Request (EC):

EC seeks confirmation on how the Proponent will minimize the explosive residues on the rock that is used for dike placement. Will nitrates and ammonia be included in water quality monitoring during the construction of the dike?

Response:

The Ekati Mine operates under well-developed explosives management and blasting practices. These practices have evolved through 15 years of site-specific operating experience and are effective at maintaining low losses of nitrogen to water. Efficient blasting practices are a good means of source reduction for nitrogen compounds that could otherwise enter water as a result of spillage or incomplete detonation. A good example of an effective source control practice at the Ekati Mine is the use of a 70:30 mixture of emulsion and ammonium nitrate-fuel oil (ANFO) rather than 100 percent ANFO. The emulsion mixture greatly reduces wastage and water solubility as compared to ANFO.

The Ekati Mine has conducted extensive work to maintain low nitrogen losses to water and to appropriately assess potential effects in the receiving environment. Two primary components of the work have been: 1) two professional engineering audits of explosives management and blasting practices by Golder Associates Ltd. in 2008 and 2013; and 2) development of a site-specific water quality objective for nitrate in 2012. This work forms the basis of the Ekati Mine Nitrogen Response Plan that is in place with the Wek'èezhìı Land and Water Board (WLWB). The Nitrogen Response Plan describes the work done to date, the operating practices in place, and plans for ongoing assessment. This operational management plan will continue to evolve under the direct regulation of the WLWB.

Blasting in the Lynx Pit, in the Jay Pit, and in the Jay construction quarry will follow the Nitrogen Response Plan. This will ensure that the site-specific experience and good practices accumulated to date are applied to maintain low losses of nitrogen to water. Application of the Nitrogen Response Plan, including the blasting practices described therein, is a primary mitigation measure for the Jay Project.

Residual nitrate and ammonia that might be sourced from the dike rockfill was not considered as a source term in the construction phase of the Lac du Sauvage water quality modelling because any potential changes in Lac du Sauvage water quality would be small, localized and short-term. This approach is supported by studies conducted during the construction and operation of two dikes at the Diavik Mine (i.e., dikes A154 and A418). Monitoring studies determined that effects to water quality, sediment quality, and benthic invertebrate communities in the near vicinity of the dikes, due to leaching of material, were not discernible (DDMI 2011). Dominion Diamond Ekati Corporation's response to Information Request DAR-MVEIRB-IR-69 provides more information on the dike monitoring studies.

Water quality monitoring during dike construction will focus primarily on frequent sampling for total suspended solids and turbidity in the vicinity of the construction activities. Incidental monitoring of Lac du Sauvage will also take place during construction for the full suite of environmental parameters, including the common nitrogen compounds. In this way, information will be collected on the concentrations of all water constituents in the lake during construction.

References:

DDMI (Diavik Diamond Mines Inc.). 2011. Lakebed Sediment, Water Quality and Benthic Invertebrate Study, A154 Dike – Year 4 Results, A418 Dike – Year 2 Results. Submitted to Wek'èezhìı Land and Water Board. Yellowknife, NWT, Canada. August 2011.

DOMINION DIAMOND

Information Request Number: DAR-EC-IR-17

Source: Environment Canada: Susanne Forbrich

Subject: Location of Diffuser during Dewatering

DAR Section(s): 8

Preamble (EC):

The Proponent states that the location of the diffuser will differ between the dewatering and the operation stage. However, there appears to be inconsistencies in the proposed approach during initial construction where, “the dewatering discharge will be pumped through a piped outfall which will be located near the shoreline or containment dike where there is a high potential to cause erosion or the shoreline and/or dike materials.” There are no figures included that validate whether this statement is correct or was made in error. The location of the dike should be selected in a manner that has low potential to cause erosion.

Request (EC):

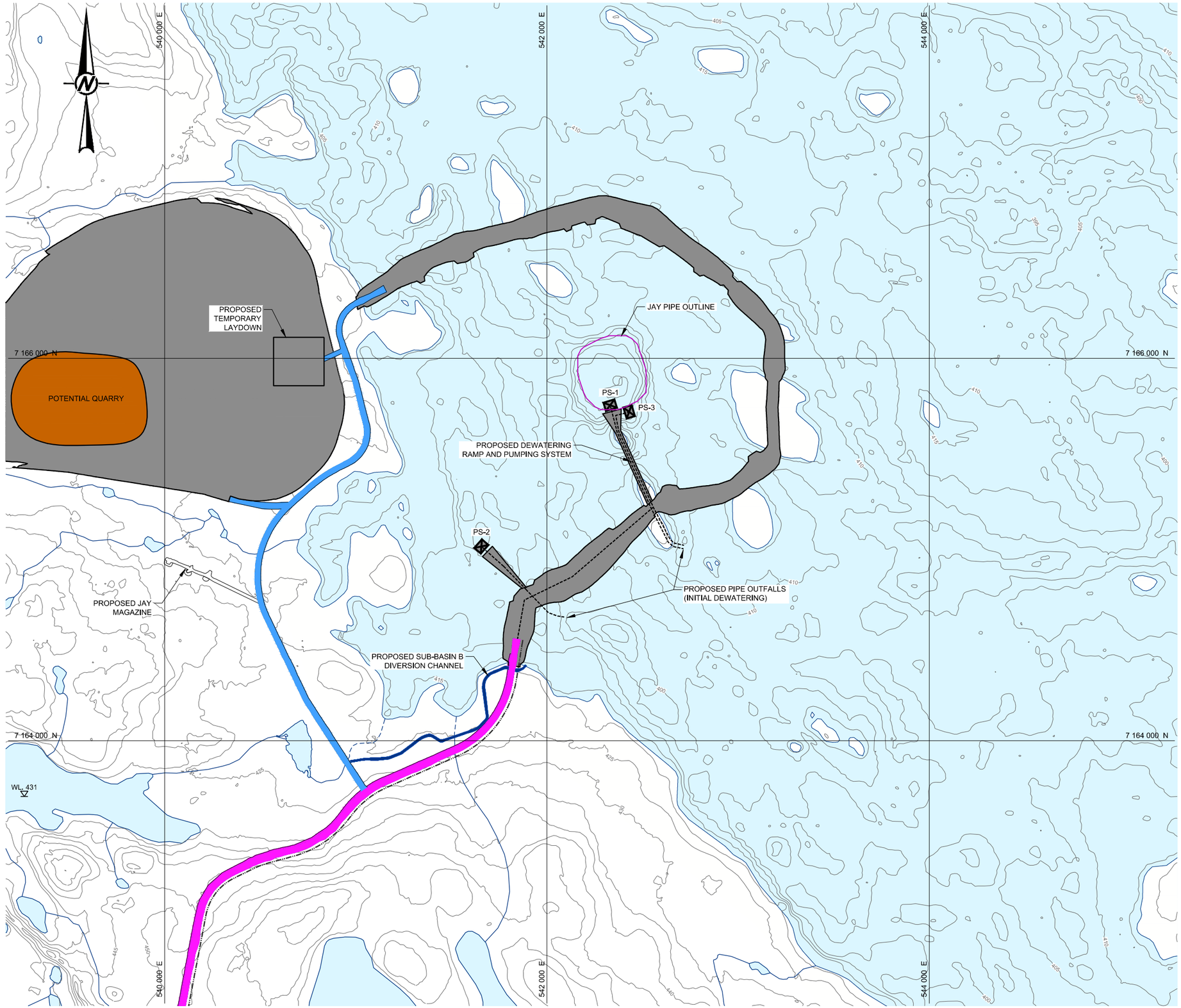
EC seeks clarification on the proposed location of the diffuser during the dewatering stage, and what configuration will be used to prevent disturbance of lakebed sediments.

Response:

The discharge during the initial phase of dewatering into Lac du Sauvage will occur through two piped outfalls. Two locations have been selected to reduce flow velocities at the discharge and the risk of re-suspension of lakebed sediments. The proposed discharge locations are shown in Map 3.5-1 in Section 3 of the Developer’s Assessment Report (DAR) (and in Figure 3-4 of Appendix 3A Mine Water Management Plan). Figure 17-1 shows a close up view of the proposed dike, pumping stations, and piped outfalls associated with the initial dewatering. Pumping stations, designated as PS1 and PS3, will discharge into the same area, for a combined flow rate of 4,900 cubic metres per hour (m^3/h), and PS2 will discharge in a different area at a flow rate of 1,600 m^3/h. Deeper water areas (depth of approximately 8 metres [m] or more) have been preferentially selected for the discharge locations. These locations are not close to the shoreline or containment dike. The outer portion of the dike is constructed of coarse rockfill and is therefore not readily erodible.

The diameter of the last 10 m of each pipeline will be increased, to reduce the discharge velocity, to 1 metre per second.

A floating structure (i.e., flexi-floats) that is placed under each piped outfall, similar to that used at the Diavik Mine (e.g., A418: DDMI 2006) may be used to assist in reducing plunging velocities of the piped outfalls, to mitigate the potential for disturbing the bottom sediments and the potential to affect water quality. This structure is an anchored, floating platform on which the discharge pipes are secured. The piped outfall is suspended over the float in open water at the discharge location, so that the discharged water falls onto the float and is dispersed onto the lake rather than directly plunging into the lake. As a result, disruption to lake bottom sediments is minimized. Photos 1 and 2 show examples of flexi-float discharge structures.



LEGEND

- WATERBODY
- WATERCOURSE
- ROAD
- WINTER ROAD - YEARLY CONSTRUCTION
- PROPOSED PUMPING SYSTEM
- WL WATER LEVEL ELEVATION

JAY PROJECT FOOTPRINT

- PROPOSED DIVERSION CHANNEL
- PROPOSED JAY PROJECT INFRASTRUCTURE
- PROPOSED JAY ROAD NORTH (HAUL ROAD)
- PROPOSED JAY ROAD (HAUL ROAD, PIPELINE AND POWER LINE)
- POTENTIAL QUARRY

NOTES

1. ELEVATIONS ARE IN METRES ABOVE SEA LEVEL (masl).
2. GROUND SURFACE AND BATHYMETRY CONTOURS ARE SHOWN AT 5 m INTERVALS.
3. COORDINATES ARE SHOWN IN DATUM: NAD 83, PROJECTION: UTM ZONE 12.
4. PIPELINES, AND POWER LINE ARRANGEMENT TO BE DETAILED AS PART OF FURTHER FEASIBILITY DESIGN. APPROXIMATE CORRIDOR WIDTHS ARE SHOWN.
5. POTENTIAL QUARRY MAYBE REQUIRED WITHIN THE FOOTPRINT OF THE PROPOSED JAY WASTE ROCK STORAGE AREA.
6. PROPOSED PIPE OUTFALLS AND DEWATERING SYSTEM LOCATIONS ARE PRELIMINARY TO BE ADVANCED DURING DETAILED DESIGN.

REFERENCES

1. CONTOUR AND BATHYMETRIC DATA PROVIDED BY AURORA GEOSCIENCES LTD., FILE: Final 1m Contours - Priority Area.dxf, DATE RECEIVED: OCTOBER 29, 2013
2. WATER OBTAINED FROM CANVEC NATURAL RESOURCES CANADA, 2012.
3. JAY PIPE LOCATION RECEIVED FROM DOMINION DIAMOND CORPORATION, FILE: jay_kimberlite_pipe_OL.dxf, DATED: JULY 19, 2013.

0 400 800 1,200
SCALE METRES

REV	DATE	REVISION DESCRIPTION	DES	CADD	CHK	RVW
2	2015-04-02	ISSUED FOR FINAL	PC	JK	FE	FD

PROJECT

DOMINION DIAMOND™

JAY PROJECT
NORTHWEST TERRITORIES, CANADA

TITLE

INITIAL DEWATERING PLAN

Golder Associates

PROJECT No.	1419751.3200.35		FILE No.	1419751-3200-35_17-1
DESIGN	PC	2015-03-24	SCALE	AS SHOWN
CADD	JK	2015-03-24	FIGURE	
CHECK	FE	2015-04-02		17-1
REVIEW	FD	2015-04-02		

N:\Gem\Dominion Diamond\Jay-Cardinal Project\99_PROJECTS\1419751\02_PRODUCTION\3200\35\1419751-3200-35_17-1.dwg | Layout: 17-1 | Modified: JKownacki 03/26/2015 11:26 AM | Plotted: jdeol 04/02/2015

Additional erosion protection strategies may be assessed during detailed design and could include, but are not limited to, discharge onto coarse material (e.g., rockfill platform), as rockfill is not prone to erosion and could facilitate energy dissipation before water reaches the lake bottom.

Photo 1 Example of Discharge to Lake Using Flexi-floats – Lateral View



Photo 2 Example of Discharge to Lake Using Flexi-floats – Discharge View



References:

DDMI (Diavik Diamond Mines Inc.). 2006. A418 Dewatering Program Report for Diavik Diamond Mines Inc. December 2006.

DOMINION DIAMOND

Information Request Number: DAR-EC-IR-18

Source: Environment Canada: Susanne Forbrich

Subject: Water Quality Screening Values

DAR Section(s): 8

Preamble (EC):

The Ekati site specific water quality objectives (SSWQO) that have been developed for previous projects at the Ekati Mine are also proposed to be used for the Jay Expansion. Although the SSWQO were suitable for use during previous projects it may be inappropriate to apply them to Jay since the project lies in a different watershed than that which they were developed for (Koala Watershed).

Request (EC):

EC seeks clarification on how the site specific water quality objectives that were derived for the Koala watershed were investigated for their applicability to Lac du Sauvage Watershed. Both generic and site-specific water quality objectives should be analyzed for the specific receiving environment in question.

Response:

The Ekati Mine Site-Specific Water Quality Objectives (SSWQOs) were initially developed for use in the Koala Watershed (including Slipper Bay of Lac de Gras), King-Cujo Watershed (including Lac du Sauvage), Nanuq Lake Watershed, and Counts Lake Watershed; however, these SSWQOs also apply generally to other freshwater bodies in the Northwest Territories. For instance, the Ekati Mine SSWQO for nitrate, following site-specific toxicity testing, was found to be suitable for Snap Lake, which is in an entirely different watershed, the Lockhart Watershed. This suitability was endorsed by Ecometrix, the independent consultant to the Mackenzie Valley Environmental Impact Review Board (MVEIRB) for the Snap Lake Mine's recent Water Licence Amendment (EA1314-02[1]). Similarly, the Ekati Mine SSWQO for chloride was endorsed by Ecometrix as suitable for Snap Lake (Ecometrix 2014, 2015).

The Ekati Mine SSWQOs for chloride, potassium, sulphate, nitrate, molybdenum, and vanadium were developed following the Canadian Councils of Ministers of the Environment (CCME; 2007) procedure and the use of short-term and long-term toxicity data (Elphick et al. 2011; Rescan 2012a,b,c,d,e). The Ekati Mine SSWQOs for chloride, sulphate, and nitrate also take into account the relationship between the constituent and hardness, and as such, the SSWQO equations can be applied to waters with hardness between 10 to 160 milligrams calcium carbonate per litre (mg $CaCO_3$/L). Water hardness of Lac du Sauvage and Lac de Gras are predicted to range up to 52 and up to 11 mg $CaCO_3$/L, respectively, during the Jay Project.

[1] File number for the Snap Lake Water Licence Amendment on the Mackenzie Valley Review Board.

Since the SSWQOs were developed following industry standard practice, and they have been accepted for use at the Ekati and Snap Lake mines, and the downstream waterbodies associated with those mines, it was determined that it was appropriate to use them as benchmarks to assess predicted water quality in the Developer's Assessment Report.

References:

CCME (Canadian Council of Ministers of the Environment). 2007. A Protocol for the Derivation of Water Quality Guidelines for the Protection of Aquatic Life. Canadian Council of Ministers of the Environment. Winnipeg, MB, Canada.

EcoMetrix (EcoMetrix Incorporated). 2014. Review of Amendment Application Submitted December, 2013 for the Snap Lake Mine. Submitted to the Mackenzie Valley Land and Water Board. Yellowknife, NWT, Canada. May 2014.

EcoMetrix. 2015. Review of Updated Application for Water License Limits for the Snap Lake Mine. Submitted to the Mackenzie Valley Land and Water Board. Yellowknife, NWT, Canada. February 2015.

Elphick JRF, Bergh KD, Bailey HC. 2011. Chronic toxicity of chloride to freshwater species: effects of hardness and implications for water quality guidelines. Environ Toxicol Chem 30: 230-246.

Rescan (Rescan Environmental Services Ltd.). 2012a. EKATI Diamond Mine: Site-Specific Water Quality Objective for Potassium. Prepared for BHP Billiton Canada Inc. Yellowknife, NWT, Canada.

Rescan. 2012b. EKATI Diamond Mine: Site-specific Water Quality Objective for Sulphate. Prepared for BHP Billiton Canada Inc. Yellowknife, NWT, Canada.

Rescan. 2012c. EKATI Diamond Mine: Site-Specific Water Quality Objective for Nitrate, 2012. Prepared for BHP Billiton Canada Inc. Yellowknife, NWT, Canada.

Rescan. 2012d. EKATI Diamond Mine: Site Specific Water Quality Objective for Molybdenum, 2011. Prepared for BHP Billiton Canada Inc. Yellowknife, NWT, Canada.

Rescan. 2012e. EKATI Diamond Mine: Site-specific Water Quality Objective for Vanadium. Prepared for BHP Billiton Canada Inc. Yellowknife, NWT, Canada.

DOMINION DIAMOND

Information Request Number:	DAR-EC-IR-19
Source:	Environment Canada: Susanne Forbrich
Subject:	Phosphorus Water Quality Objectives
DAR Section(s):	8, Annex XI Appendix A and Appendix E

Preamble (EC):

The report uses the CCME-developed Phosphorus framework that indicates “trigger ranges”, where water quality criteria have been exceeded, depending on the trophic status of the lake. Using this framework, the Proponent indicates that, given the potential for natural variability of phosphorus in Lac du Sauvage, and values of up to 0.018 mg-P/L, the CCME trigger for mesotrophic to meso-eutrophic status was used as the screening value. This corresponds to a value of 0.01 to 0.02mg-P/L. When analyzing the available 2013 sampling data from Lac du Sauvage, only one out of 45 samples collected during the 2013 sampling period exceeded 0.01 mg/L, with the other 44 samples being below. It is possible that this sample is an outlier and therefore drawing conclusions that water quality values for Lac du Sauvage should be based on mesotrophic to meso-eutrophic would be inaccurate. In the 2013 baseline water quality report the trophic status of Lac du Sauvage is analyzed using several different methods (Vollenweider, CCME, and Carlson) all of which classified the lake as oligotrophic. It is therefore inappropriate to set a trigger range that allows the lake to turn mesotrophic.

Request (EC):

EC requests that the phosphorus baseline dataset be reviewed, and the potential for outliers in the phosphorus data be analyzed. EC requests that the Proponent provide an assessment of the potential for project activities to change the trophic status of the lake, and identify mitigation measures to ensure the oligotrophic status is maintained.

Response:

1. Review of the total phosphorus data

The total phosphorus (TP) data available for Lac du Sauvage have been reviewed to identify outliers[1]; the data were transformed using the Box-Cox method (Box and Cox 1964) before completing the outlier analysis because the data were not normally distributed. No outliers were identified in the transformed full dataset (n=267), or the open-water transformed dataset (n=171), but one outlier (the lowest value) was identified in the transformed under-ice dataset (n=96). The summary statistics of the available TP data (with and without the one outlier) are included in Table 19-1. The distribution of data from full the dataset (un-transformed) is illustrated in a box and whisker plot[2] (Figure 19-1). The maximum value of the dataset (0.018 milligrams of phosphorus per litre [mg-P/L]) was not identified as an outlier because it is not substantially different from other measured results. Removal of the one outlier does not make a difference to the median or maximum values of the dataset and thus do not change the outcome of the assessment.

[1] Outliers were identified with the Generalized Extreme Studentized Deviate (GESD) test (Rosner 1983).

[2] Features of the box and whisker plot: box boundaries = 25th and 75th percentiles (inter-quartile range, IQR); horizontal line in box = median; whiskers = 1.5 x height of box (IQR); closed circles = values outside range of whiskers; number next to circle = count of data with the same value.

Dominion Diamond used the upper end of the mesotrophic trigger range (CCME 2004) as a screening guide for TP, since the baseline water quality dataset suggests some variability of TP concentrations across trophic boundaries in Lac du Sauvage; measured concentrations in the baseline data (2004 to 2014) range up to 0.018 mg-P/L. Based on CCME (2004), eight of the 171 TP results (approximately 5 percent [%]) are in the mesotrophic category. Within the literature, there is some variability in the oligotrophic trophic classification status according to TP concentrations; for example, Carlson (1977) considers mean TP concentrations up to 0.012 mg-P/L to be within the oligotrophic category, and Vollenweider (1970) considers TP concentrations up to 0.018 mg-P/L (with a mean of 0.008 mg-P/L) to be within the oligotrophic category. It is understood that the northern lakes in this region, such as Lac du Sauvage and Lac de Gras, are low productivity environments, and thus, fit the general description of oligotrophic. Nevertheless, the range of TP concentrations in these lakes appear more variable than suggested by TP ranges in trophic classification systems. Given the conservatism of the CCME system relative to Carlson (1977) and Vollenweider (1970), and the broad TP range measured in Lac de Sauvage, using the upper end of the CCME (2004) mesotrophic range as the TP screening concentration, as opposed to the upper end of the oligotrophic range, is appropriate and accounts for the natural variability of the lake.

Table 19-1 Base Case Total Phosphorus Concentrations in Lac du Sauvage, 2004, 2006, and 2010 to 2014

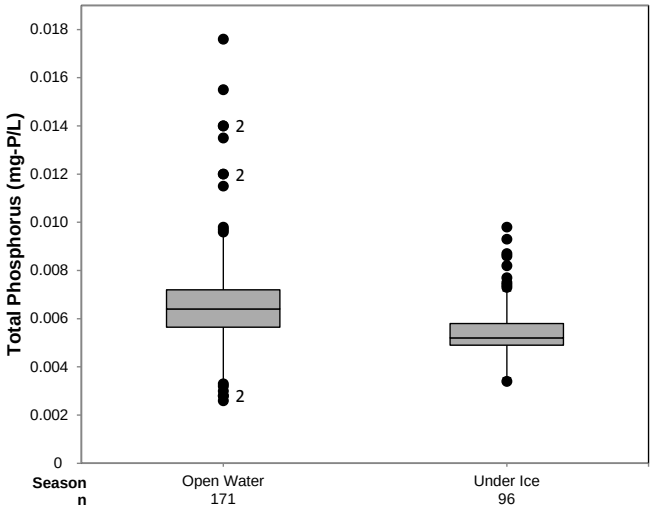
		Lac du Sauvage							
		Under-Ice				**Open-Water**			
Total phosphorus	**Unit**	**Count**	**Minimum**	**Median**	**Maximum**	**Count**	**Minimum**	**Median**	**Maximum**
All Data[(a)]	mg-P/L	96	0.0034	0.0052	0.0098	171	0.0026	0.0064	0.018
One outlier removed[(b)]	mg-P/L	**95[(b)]**	**0.0040[b]**	0.0052	0.0098	171	0.0026	0.0064	0.018

Note: DAR = Developer's Assessment Report

a) Updated from the DAR; also presented in response to DAR-MVEIRB-IR-26.

b) Summary statistics only change for the under-ice summary as one outlier was removed; statistics do not change for the open-water summary.

Figure 19-1 Base Case Total Phosphorus Concentrations in Lac du Sauvage, 2004, 2006, and 2010 to 2014[3]



mg-P/L = milligram of phosphorus per litre.

2. Potential to change the trophic status of the lake

The effects of increased nutrients on the trophic status of Lac du Sauvage were discussed in the Developer's Assessment Report (DAR; Sections 8 and 9) and in response to various information requests (DAR-MVEIRB-IR-26, DAR-IEMA-IR-15, DAR-KIA-IR-106). Section 8 of the DAR concluded that TP concentrations will change from baseline conditions in Lac du Sauvage between 2025 to 2033, particularly during the period of minewater discharge from Misery Pit, but that the peak TP concentration (0.012 milligrams per litre), which is predicted to occur at the end of mining (2029), is within the measured range of natural variability (Section 8.5.6.2.2, Figure 8.5-85). Section 9 concluded that as a result of these projected TP changes, the biomass of phytoplankton, zooplankton, and benthic invertebrates in Lac du Sauvage will likely increase during operations, but a clear, defined change in composition of plankton and benthic invertebrate communities would not be expected (Section 9.4.4).

Based on the predicted concentrations of TP, Lac du Sauvage is predicted to be remain oligotrophic to slightly mesotrophic (Section 8.5.4.2.2, p. 356). The DAR concluded that TP is not a constituent of potential concern because the Project is not anticipated to cause a change in the lake outside of the measured range of natural variability. The water quality modelling results are based on several inputs (surface flows, groundwater flows and seepage, baseline water quality, and geochemical characterization), all of which have inherent variability and uncertainty. The models include conservatism directed towards overestimating projected water quality constituent concentrations in Lac du Sauvage and Lac de Gras beyond concentrations that would be realistically expected.

3. Mitigation

Proposed mitigation for the Project was discussed in the DAR (e.g., Section 8.4, Section 9.3, Appendix 3A [Mine Water Management Plan]). Release of minewater to Lac du Sauvage is the main

[3] The single outlier from the under-ice dataset is included in this figure.

pathway for effects to receiving water quality (including changes to TP concentrations); therefore, management and controlled release is important. The main sources of minewater include open pit water (i.e., groundwater inflows to the Jay Pit and runoff from pit walls) (Appendix 3A, Section 3.1) and surface water (e.g., diked area runoff, including runoff from the waste rock storage area and portion of the roads, and Jay Dike seepage).

Key water management mitigations to reduce loads of nutrients and other constituents to the receiving environment include:

- continued use of the Long Lake Containment Facility (LLCF) for management of process water, treated effluent from the sewage treatment plant, and site runoff;
- use of the Lynx and Misery pits as containment areas for dewatering and Misery Pit for operational minewater generated during dewatering of the diked area and mining of the Jay Pit area;
  - For the first five operational years (i.e., 2019 to 2023), there will be sufficient volume in the Misery Pit to store minewater. This is a key water management strategy because it limits the requirement to discharge minewater to the receiving environment to the last five of the 10 years of operations, and therefore, the total volume of minewater that needs to be released. This storage strategy also allows time to track the water quality in the pits, which will be compared to DAR predictions.
- explosive management practices (e.g., storage and handling controls, spill and waste management, blast design efficiency, minimizing overloading, minimizing misfires) to mitigate and thus reduce loads of ammonium nitrate to the aquatic environment;
- silt (turbidity) curtains to reduce the transport of sediment from dike construction activities within Lac du Sauvage, and silt fences to reduce the transport of sediment from general land based land disturbance activities;
- a submerged, engineered diffuser outfall, during the operational phase of the Project (i.e., Years 5 to 10), to enhance increase mixing rates of released minewater in Lac du Sauvage and reduce peak plume concentrations.
- use of the Misery and Jay pits in closure to store water with elevated concentrations of total dissolved solids (TDS);
  - meromictic conditions will be generated in the pits by capping the high TDS water in the lower portion of the pit with a 60 metre freshwater cap.

Monitoring will be conducted to track water quality throughout the mine site, within the water containment areas, and within the receiving environment through the Surveillance Network Program and the Aquatics Effects Monitoring Program. As discussed in response to DAR-EC-IR-20, adaptive management and contingency measures will be applied should trends in water quantity and quality in Misery Pit differ from DAR predictions to the point of representing a risk to the receiving environment.

References:

Box GEP, Cox DR. 1964. An analysis of transformations. J R Stat Soc, Series B. 26: 211-252.

CCME (Canadian Council of Ministers of the Environment). 2004. Canadian Water Quality Guidelines for the Protection of Aquatic Life: Phosphorus: Canadian Guidance Framework for the Management of Freshwater Systems. In: Canadian Environmental Quality Guidelines, 2004. Publication No. 1299. Winnipeg, MB, Canada. ISBN: 1-896997-34-1.

Carlson RE. 1977. A trophic state index for lakes. Limnol Oceanogr 22: 361-369.

Rosner B. 1983. Percentage points for a generalized ESD Many-outlier procedure. Technometrics 25(2): 165-172.

Vollenweider RA. 1970, Scientific Fundamentals of the Eutrophication of Lakes and Flowing Waters, with Particular Reference to Nitrogen and Phosphorus as Factors in Eutrophication. OECD, Paris. Tech. Rpt. DA 5/SCI/68.27. 250 pp.

DOMINION DIAMOND

Information Request Number:	DAR-EC-IR-20
Source:	Environment Canada: Susanne Forbrich
Subject:	Toxicity Testing Results
DAR Section(s):	8, Appendix H

Preamble (EC):

The acute toxicity testing indicates that, using the projected maximum concentrations of TDS and major ions, that the simulated mine water from Misery is anticipated to be non-acutely toxic to Rainbow Trout and Daphnia magna. However, it should be noted that these test species may not be the most appropriate organisms to perform TDS toxicity tests on, as they are less sensitive to TDS and major ions in general. Additional tests using more sensitive organisms, such as Ceriodaphnia dubia, would provide more information on the potential for effluent toxicity at end of pipe into Lac du Sauvage. It is mentioned that chronic toxicity for Ceriodaphnia dubia and Pseudokirchneriella subcapitata will be completed in future monitoring but does not provide specifics on which stage of the project this testing will be implemented. The 48 hour LC50 was determined for Daphnia magna by a dilution series using 100%, 70.4%, 50%, 25%, 10% and 0% of the simulated end of open pit mining TDS concentrations (2740 mg/L). The results of the test indicated the D. magna LC50 to be at 89% effluent, and at 100% effluent concentration survival was 45%, which would be considered a fail.

Request (EC):

EC seeks confirmation that the effluent to be discharged from Misery Pit into Lac de Gras is non-deleterious, and has concerns that high TDS concentrations will not be acceptable for discharge.

1) Can the Proponent conduct chronic toxicity testing for Ceriodaphnia dubia and Pseudokirchneriella subcapitata prior to the water licencing stage?

2) What contingency measures does the Proponent have to avoid the release of high TDS effluent (i.e. treatment or water management)?

Response:

1) Chronic toxicity testing of the simulated Misery Pit minewater is not appropriate; chronic toxicity testing is only applicable to the mixture of pit water and water at the extent of the initial dilution zone (i.e., edge of the mixing zone). Consistent with the *Water and Effluent Quality Management Policy* (MVLWB 2011) that was issued, and implemented, by the Water Boards of the Mackenzie Valley, Dominion Diamond Ekati Corporation (Dominion Diamond) has proposed that a mixing zone in Lac du Sauvage be established during regulatory permitting along with discharge conditions including chronic toxicity testing requirements (i.e., as part of the Water Licence). The mixing zone is designed such that conservative chronic toxicity benchmarks are achieved at its limits.

2) Proposed mitigation for the Jay Project (Project) was discussed in the Developer's Assessment Report (DAR) (e.g., Section 8.4, Section 9.3, Appendix 3A [mine water management plan]). Release

of minewater to Lac du Sauvage is the main pathway for effects to receiving water quality (including potential toxicity); therefore, management and controlled release is important. One of the key mitigation strategies for the Project is the use of the mined-out Lynx and Misery pits as contingency containment areas for storage of operational minewater generated during mining of the Jay Pit area. For the first five operational years (i.e., 2019 to 2023), there will be sufficient volume in Misery Pit to store minewater. This provides time for Dominion Diamond to evaluate trends in minewater quality against predictions, and to adapt accordingly if necessary. During operations, water in the Misery Pit will be monitored for changes in chemical composition and acute toxicity well in advance of the planned discharge. Prior to discharge, monitoring of the water quality in Misery Pit will provide information to determine whether the composition of the pit water is in fact trending to the simulation examined in the environmental assessment case (i.e., Appendix 8E).

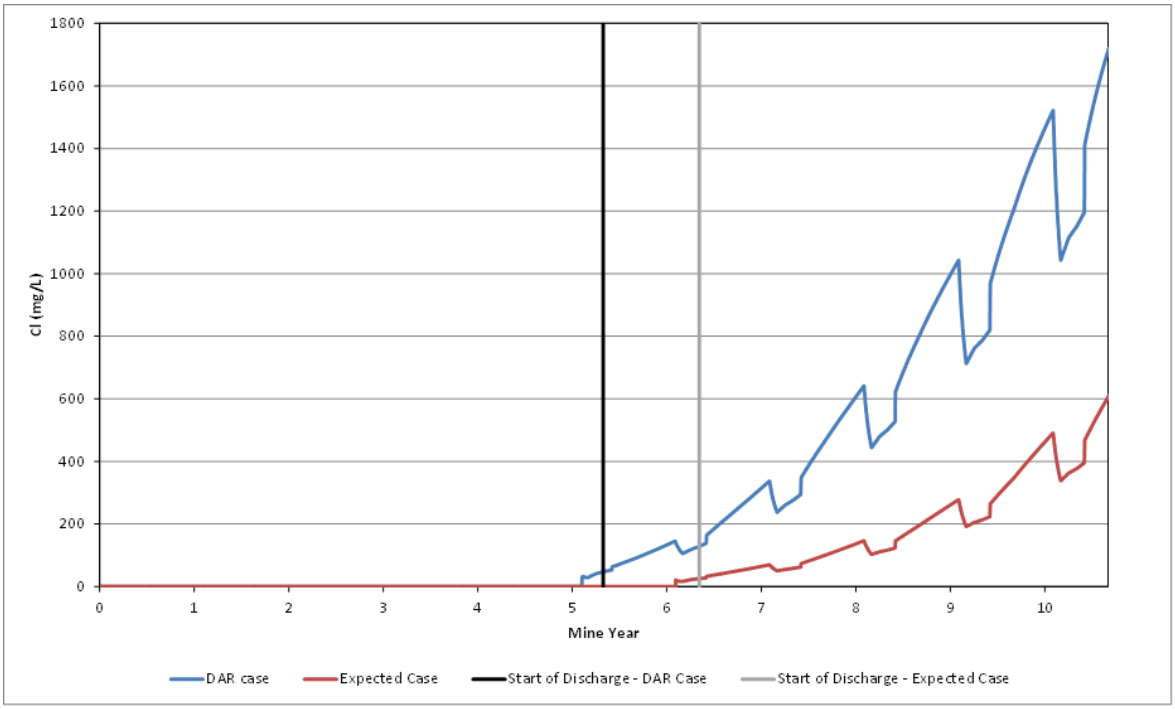
Consistent with the current requirements of the Ekati Mine Water Licence, acute toxicity testing will be conducted prior to any minewater discharge to Lac du Sauvage. No acutely toxic minewater will be released from the Misery Pit.

Should trends in water quality in Misery Pit indicate an unexpected and unacceptably high risk of harm to the receiving environment, adaptive management strategies would be applied that may involve improvement or modifications of the proposed Mine Water Management Plan, or temporary use of the contingency allowances included in the design of the water management facilities. Adaptive management and contingency measures applicable to the Misery Pit are outlined in the DAR (Appendix 3A; Section 3.5.5.2.1), and include:

- maintaining a storage contingency allowance in the existing King Pond throughout the construction and operations stage for use as an additional total suspended solids management facility during construction and operations phase, or for short-term emergency minewater storage;
- maintaining the contingency storage in the Misery Pit (approximately 3 million cubic metres) throughout the operations phase for use as emergency minewater storage (upper 10 metres of the pit);
- maintaining pumping capacity and a pipeline between the Misery and Lynx pits throughout the operations stage to allow for lowering of the Lynx Pit water level to generate additional contingency minewater storage, if required;
- increasing storage capacity in the Jay runoff sump and mine inflows sump (e.g., constructing containment berms around the sumps) to augment temporary minewater storage capacity within the diked area;
- consideration of direct discharge to the environment from the Jay runoff sump, if water is found to meet established discharge criteria (the discharge locations used during the initial stages of dewatering would be used);
- use of storage capacity available at the Ekati site (e.g., construction of pumping and pipeline system from the Misery site to the Ekati site); and
- treatment of parameters of concern prior to discharge to Lac du Sauvage.

The water synthesized for the acute toxicity testing in Appendix 8H of the DAR was representative of the maximum projected quality of the water in Misery Pit at the end of mine operations (under-ice conditions) (Appendix 8E, Table 8E4.1-1). The water tested simulated the potential maximum concentrations and composition of total dissolved solids and major ions modelled in the pit. As a result, the toxicity testing conducted was conservative and likely over-estimated the potential acute toxicity of the actual pit water. To provide context for the environmental assessment conservative case, a Reasonable Estimate Case (i.e., modelling inputs representing more reasonable expectations for concentrations and flows compared to the Environmental Assessment conservative case; the DAR Case) was also developed (Appendix B, Compendium of Supplemental Water Quality Modelling,). For this case, groundwater quality and quantity inputs to the Jay Pit (from which water is pumped to the Misery Pit) were revised to represent reasonably expected conditions. The resultant quality of the minewater in Misery Pit under the Reasonable Estimate Case, as compared to the DAR Case, is shown in Figure 20-1. The Reasonable Estimate Case shows that chloride concentrations are expected to remain well within acute toxicity limits, and that an additional year of site-specific data collection and assessment is expected (i.e., the start of minewater discharge from Misery Pit is deferred to year 6 of the 10-year mine operating schedule).

Figure 20-1 Chloride Concentrations in Misery Pit Discharge for the DAR Case and the Reasonable Expected Case



Cl = chloride; mg/L = milligrams per litre.

References:

MVLWB (Mackenzie Valley Land and Water Board). 2011. Water and Effluent Quality Management Policy. Yellowknife, NWT, Canada.

DOMINION DIAMOND

Information Request Number:	DAR-EC-IR-21
Source:	Environment Canada: Susanne Forbrich
Subject:	Erosion of Sediments due to Lake Drawdown
DAR Section(s):	8

Preamble (EC):

In early operations, the hydrology of the Lac du Sauvage watershed is altered. Lakes C1 and C17 are modelled to have decreased discharges from baseline of approximately 18% and 80%, respectively, based on 2 year and 200 year floods. Lake C17 specifically is anticipated to only discharge during freshet and during high rainfall events. Decreases in discharge from these small lakes can have implications on fish passage as well as exposure and erosion of sediments causing increased TSS.

Request (EC):

EC seeks clarification on how will erosion of sediments be managed due to the drawdown and reduced discharge from the smaller lakes surrounding Lac du Sauvage?

Response:

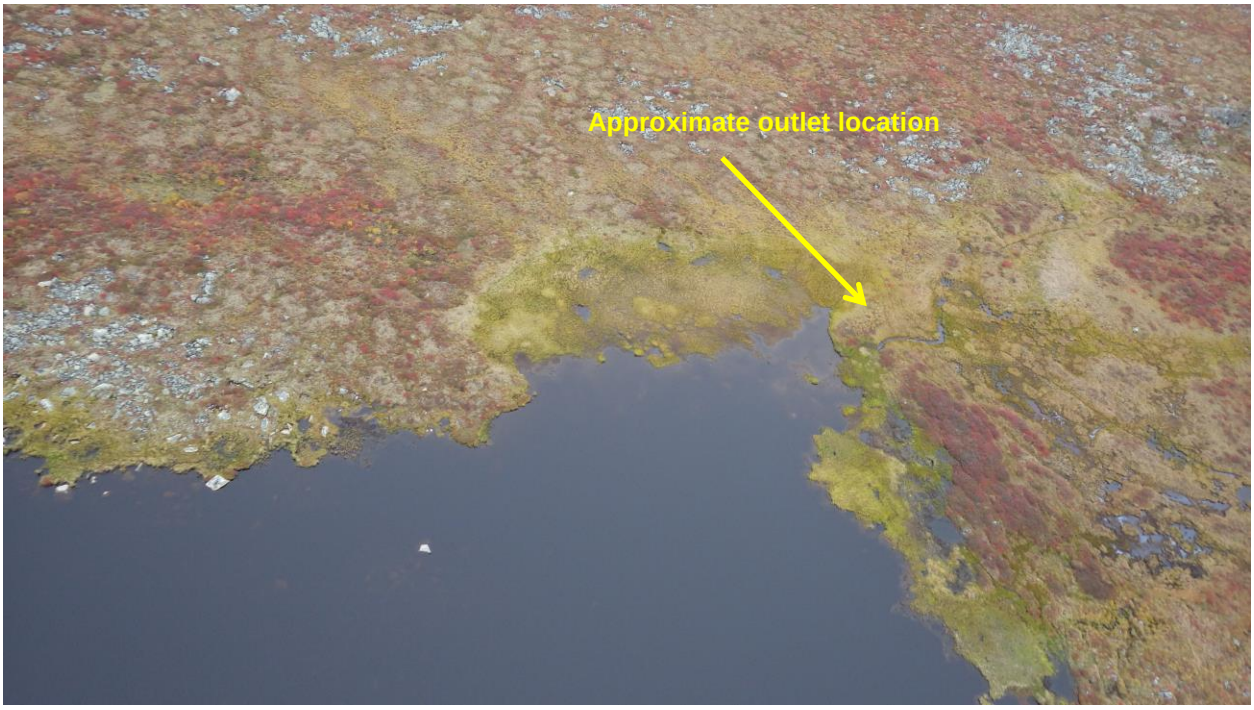
Enhanced risk for sediment erosion in these small lakes (i.e., Lakes C1 and C17) as a result of the altered water balance associated with the development of the Jay Project (Project) (i.e., reduced water levels and outlet flows) is not expected. Flows from these lakes are ephemeral, so these lakes are isolated in the winter period. The potential effects to water levels and flows were assessed at the outlet of Lake C1 and Lake C17 in the Developer's Assessment Report (DAR) following a conservative assessment approach. For additional discussion on the conservative assessment of flow within the C sub-basin, please see the response to DAR-DFO-IR-07.

As assessed in Section 8.5.3 of the DAR, projected changes to water levels in Lake C1 during early operations are small and within the natural range of variability (i.e., a reduction in the 2-year flood level of 0.06 metres [m] and a median monthly reduction range of 0.01 to 0.03 m in open water conditions), and are expected to change gradually. Downstream effects (i.e., increased total suspended solids loading) as a result of these water level and associated flow changes are not anticipated. It was concluded in Section 8.5.3 of the DAR that the projected water level or flow changes would not be expected to result in changes to bank stability or outlet conditions.

A habitat survey was completed for Lake C17 as part of 2014 supplemental baseline program (Dominion Diamond 2015). Lake C17 shoreline consisted of boulder substrate with sedges, grasses, and shrubs along its entirety. The littoral zone consisted mainly of organics and silt with boulders dispersed throughout. The maximum depth was approximately 0.5 m. Emergent vegetation was present along the shoreline, but submergent vegetation was absent. Existing outlet discharges from Lake C17, as described in Section 8.5.3 of the DAR, are very small (mean July/August discharge of approximately 1 to 2 litres per second), the outlet channel poorly defined, and it was considered unlikely that fish would use this stream as a migration corridor (Photo 21-1). Lake C17 is not anticipated to support a fish community due to the

small catchment area, small lake surface area, and shallow depth of the lake and fish passage and connectivity is not predicted to be an issue for the local fish population during early operations when discharge from the lake may be reduced. It was concluded in Section 8.5.3 of the DAR that the projected water level or flow changes would not be expected to result in changes to bank stability or outlet conditions and downstream effects as a result of these water level and associated flow changes are not anticipated.

Photo 21-1 Lake C17 Facing North Showing Shoreline Conditions and Approximate Outlet Location



Surface hydrology monitoring of small lakes within the Project area will be implemented during the Project. These monitoring programs are intended to track the hydrological conditions during the phases of the Project to verify the effects predictions for lake water levels, discharges, and basin connectivity, and to identify additional unanticipated effects and provide information for the implementation of adaptive management, if necessary.

References:

Dominion Diamond (Dominion Diamond Ekati Corporation). 2015. 2014 Fish and Fish Habitat Supplemental Baseline Report for the Jay Project. Prepared by Golder Associates Ltd., April 2015. Yellowknife, NWT, Canada.

DOMINION DIAMOND

Information Request Number:	DAR-EC-IR-22
Source:	Environment Canada: Susanne Forbrich
Subject:	Site Discharge
DAR Section(s):	Appendix 8E

Preamble (EC):

The closure and post-closure of the Jay and Misery Pits relies on high TDS water being isolated from the receiving environment through stratification and the application of a freshwater cap. This closure plan has little margin for error since incomplete stratification or turnover of the pit would result in high salinity water discharging directly into Lac du Sauvage, or overflowing into Lac de Gras, causing adverse effects. Characterization of the groundwater encountered in Jay, the rate of back flooding, as well as any upwelling that may occur with back flooding, are important factors on the success of the stratification. Previously at Ekati, several of the pits have been allowed to flood from inflows of groundwater upon closure. Information on the composition of the groundwater seepage encountered in other pits at Ekati, and if these pits stratified naturally would be valuable information to more thoroughly predict the conditions at Jay and Misery upon closure.

Request (EC):

EC requests, with regards to the stratification of the mined out pits,

- was any sampling previously conducted on the groundwater seepage of mined out pits that have been allowed to flood? Did stratification occur naturally?
- have alternatives been considered where high TDS water is not re-deposited into Jay?
- has modelling been conducted on the water quality that would be released into the receiving environment if the pits fail to stratify or if they turn over?
- how will the Proponent ensure that mixing during the re-flooding of Jay maintains the density gradient?
- has the concentration of TDS needed to maintain a stable density gradient in perpetuity been evaluated?
- is the lower salinity water from the top of Misery at closure sufficient to maintain the gradient?

Question 1: Was any sampling previously conducted on the groundwater seepage of mined out pits that have been allowed to flood? Did stratification occur naturally?

Response: There are currently no mined-out pits that are flooded at the Ekati Mine operations. However, there will be other mined-out pits at the Ekati Mine (i.e., Pigeon and Lynx pits) and, possibly, at other locations in the Northwest Territories (e.g., Diavik Mine and Gahcho Kué Project) that are planned to be back-flooded prior to the cessation of operations at the Jay Project (Project). Dominion Diamond will incorporate lessons learned from these operations into the management of back-flooding of the Jay pit

and the other open pits at the Ekati Mine. In addition, groundwater inflows to the Jay Pit will be monitored during operations. The operational monitoring results will be used to validate and modify water quality projections, as required.

Question 2: Have alternatives been considered where high TDS water is not re-deposited into Jay?

Response: The proposed pumping of some 'high-total dissolved solids (TDS)' water from Misery Pit to Jay Pit for closure is the preferred approach because it provides for secure closure of both pits, while also reducing the total amount of TDS (and constituents) to the receiving environment. Barring the opportunity for permanent storage of the 'high-TDS' water in the lower levels of the Misery and Jay pits, that water would need to be released to Lac du Sauvage. The proposed water management plan provides confidence in the beneficial formation of long term-stable meromixis in both pits.

The total storage capacity of the Jay Pit is 120 million cubic metres (m^3). As indicated in Section 8E2.1.1 of Appendix 8E of the Developer's Assessment Report (DAR), only 13.7 million m^3 of high TDS water will be pumped from the Misery Pit to the bottom of the Jay Pit at closure. The remaining 106.3 million m^3 of capacity in the Jay Pit will be recharged with groundwater inflows, catchment runoff, and freshwater pumped from Lac du Sauvage. Following refilling, this provides a freshwater cover of approximately 170 metres (m).

The stability of stratification in the Jay and Misery pits was analyzed using two methods:

1) Hydrodynamic modelling of the first 200 years after refilling, using CE-QUAL-W2 (Cole and Wells 2008); and,

2) Mass balance calculations over 15,000 years using a vertical slice spreadsheet model.

The CE-QUAL-W2 models indicate meromixis will develop in both the Jay and Misery pits following back-flooding and the pits remain stratified during the 200 year model period. Mass-balance modelling using the vertical slice spreadsheet model agrees with the hydrodynamic model results that meromixis will develop in the pits following back-flooding and the pits will remain stratified in the long-term. Hydrogeological modelling indicates that following back-flooding of both the Misery and the Jay pits, groundwater outflows from the back-flooded pits exceeds the groundwater inflows. Therefore, after approximately 3,000 years and 15,000 years in the Misery and Jay pit lakes, respectively, freshwater from the mixolimnion replaces high TDS water stored in the monimolimnion. Detailed results of this analysis are provided in Sections 8G2.4.2 and 8G2.4.3 in Appendix 8G of the DAR.

Use of the mined-out Jay Pit for storage of high TDS water is considered to be the most practical and environmentally favourable approach to managing Project water at closure.

Question 3: Has modelling been conducted on the water quality that would be released into the receiving environment if the pits fail to stratify or if they turn over?

Response: A hydrodynamic model was developed for the Jay and Misery Pits. The results of this modelling indicate that meromixis will occur in both pits and remain stable in the long-term. A brief overview of the modelling is presented above and a detailed description of the model development, inputs, assumptions, and results is presented in the Hydrodynamic Modelling of Jay and Misery Pits report provided in Appendix 8G of the DAR.

The model was evaluated for several sensitivity scenarios, which are included in Appendix B, Compendium of Supplemental Water Quality. The results of this sensitivity analysis provide confidence that meromictic conditions will occur in the Jay and Misery Pits. Therefore, a model scenario to account for a turnover or a fully mixed condition being discharged was not completed.

Question 4: How will the Proponent ensure that mixing during the re-flooding of Jay maintains the density gradient?

Response: The 13.7 million m^3 of water stored in the upper layer of the Misery Pit will be pumped to the bottom of the Jay Pit at closure. Following pumping of this water, both the Misery and Jay pits will be back-flooded with freshwater pumped from Lac du Sauvage. The pumping will be completed in a manner that will minimize mixing of the high TDS water in the bottom of the pits from mixing with the freshwater pumped from Lac du Sauvage. There are technically viable means of managing the entry of back-flooding water in a way that does not cause mixing of the pit lake. Detailed designs will be part of the back-flooding plan that will be developed for the Final Closure Plan based on site-specific and industry experience.

Question 5: Has the concentration of TDS needed to maintain a stable density gradient in perpetuity been evaluated?

Response: The modelling completed as part of the DAR is robust and concludes that strong meromixis will develop in the Jay and Misery pits, which will remain stable in the long-term. As noted in response to Question number 3 of this Information Request, the stability of the pit lakes was evaluated for several sensitivity scenarios (Appendix B). The results of this sensitivity analysis provide confidence that meromictic conditions will occur in the Jay and Misery Pits based on a range of expected TDS concentrations. Operational water quality modelling will be completed and used to validate the DAR and supplemental water quality predictions. If TDS concentrations are substantively less than predicted, the model can be updated to determine if meromictic conditions will occur based on actual concentrations. This approach confidently demonstrates that a broad range of potential TDS concentrations (including lower than anticipated) is more than adequate to cause and maintain meromixis in the Misery and Jay open pits, which makes this approach preferable to attempting to pre-define a 'threshold' for stable meromixis.

The reader is also referred to the response to DAR-GNWT-IR-62, which correlates the expected conditions in the Jay and Misery pits to other pit lakes that have developed meromictic conditions in other mining developments, including those in similar climate conditions to the Project.

Question 6: Is the lower salinity water from the top of Misery at closure sufficient to maintain the gradient?

Response: Based on the detailed pit lake modelling completed for the Jay and Misery pits (see Appendix 8G of the DAR), the density gradients in the Misery and Jay pit lakes are projected to be sufficient to maintain meromictic conditions in both pits in the long-term.

References:

Cole TM, Wells SA. (2008). CE-QUAL-W2: A Two-dimensional, Laterally Averaged, Hydrodynamic and Water Quality Model, Version 3.6 User Manual, August 2008.

DOMINION DIAMOND

Information Request Number:	DAR-EC-IR-23
Source:	Environment Canada: Susanne Forbrich
Subject:	Conceptual Aquatic Effects Monitoring Program
DAR Section(s):	Appendix 9C

Preamble (EC):

The conceptual aquatic effects monitoring plan (AEMP) gives an extremely brief overview of what is expected of Ekati to be included in the AEMP for the expansion, and that this final version will be based on the existing AEMP. However, as minimal locations in Lac du Sauvage are included in the existing AEMP, it would be useful to have tentative sampling locations identified in Lac du Sauvage and the surrounding area to ensure that all effects from the Jay expansion are properly identified and captured under the sampling plan. Additionally, details on the monitoring locations help determine if existing baseline data is appropriate or if additional sampling is required.

Request (EC):

EC requests identification of the proposed sampling locations that are to be included in the AEMP. How is sampling to occur at these locations and for what parameters?

Response:

As described in Sections 9C1.4 and 9C2.1 of the Conceptual Aquatic Effects Monitoring Program (AEMP) (Appendix 9C of the Developer's Assessment Report [DAR]), the existing Ekati Mine AEMP will be expanded to encompass monitoring for the Jay Project. While the detailed design of the AEMP for the Jay Project will be developed during the water licensing phase, it is anticipated to be consistent with the existing AEMP in terms of the core components (i.e., water and sediment quality, plankton, benthos, fish health/tissue chemistry), parameters, and frequency (Table 23-1). It is also anticipated that the AEMP design will change over the life of the Jay Project (i.e., through construction/dewatering, early/late operations, closure, and into post-closure) and the parameters and frequency may be modified accordingly with approval from the Wek'èezhìi Land and Water Board (WLWB). The Ekati Water Licence has a well-established requirement for 3-year review and amendment, including approval of the WLWB, of the AEMP Design Plan.

The AEMP is intended to monitor effects in the aquatic receiving environment and, as such, it is anticipated that the 'Jay update' to the AEMP will extend downstream into Lac du Sauvage from the area around the Jay Dike to the outlet. Monitoring in Lac du Sauvage is likely to include water quality and biological monitoring components beginning with the start of minewater discharge into the lake (i.e., year 5 of Jay Pit operations). AEMP monitoring for water quality is anticipated to also extend downstream into Lac de Gras, both at the east end (related to inflows from Lac du Sauvage) and at the west end (related to inflows from Koala watershed via Slipper Lake). Monitoring in the east end of Lac de Gras would be anticipated to begin with the start of minewater discharge into Lac du Sauvage from the Misery Pit (i.e., year 5 of Jay Pit operations). Monitoring in Slipper Bay of Lac de Gras is already underway under the current AEMP, and would be anticipated to continue through the Jay Project.

Extended monitoring in the west end of Lac de Gras, if necessary, would be anticipated to begin with the start of minewater transfer from the Panda/Koala pits to the Long Lake Containment Facility (i.e., about year 5 of Jay operations).

Table 23-1 Summary of Existing Ekati Mine Aquatic Effects Monitoring Program Design

Component	Parameters	Frequency
Hydrology (streams)	• manual flow measurements • automated stations • staff gauge measurements • hydraulic geometry surveys	• manual flow measurements: varies during the open-water season (May to September) • automated stations: installation prior to freshet and maintained during manual flow measurements • hydrometric levelling surveys: varies during open-water (May to September)
Water quality (lakes and streams)	• conventional parameters (pH, total alkalinity, hardness, conductivity, total dissolved solids, total suspended solids, and turbidity) • major ions (bicarbonate, carbonate, hydroxide, chloride, potassium, silicon, sulphate, and ion balance) • nutrients (total ammonia, nitrate, nitrite, orthophosphate, total phosphorus, total organic carbon, and total Kjeldahl nitrogen) • total metals (aluminum, antimony, arsenic, barium, beryllium, boron, cadmium, chromium, cobalt, copper, iron, lead, magnesium, manganese, mercury, molybdenum, nickel, selenium, silver, sodium, strontium, uranium, vanadium, and zinc)	• lakes: once per year under ice-cover (April) and once during open-water (August) • streams: varies during open-water (June, July, August, and September)
Limnology (lakes)	• Secchi depth (August) • dissolved oxygen (April and August)	• once during ice-cover (April) and once during open-water (August)
Sediment quality	• moisture content • particle size (percent gravel, sand, silt, and clay) • nutrients (total organic carbon, available phosphorus, and total nitrogen) • total metals (aluminum, arsenic, barium, boron, cadmium, chromium, cobalt, copper, iron, lead, manganese, mercury, molybdenum, nickel, phosphorus, selenium, silver, uranium, vanadium, and zinc)	• every 3 years

Table 23-1 Summary of Existing Ekati Mine Aquatic Effects Monitoring Program Design

Component	Parameters	Frequency
Phytoplankton and zooplankton (lakes)	• chlorophyll *a* • phytoplankton: density, diversity, community composition • zooplankton: biomass, density, diversity, and community composition	• annual (August)
Benthos (lakes and streams)	• density • diversity • community composition	• annual (August)
Fish Health (lakes)	• catch-per-unit-effort (CPUE) • stomach contents • modified deformities, eroded fins, lesions, and tumours (DELT) assessment • parasite prevalence • length, weight, and condition • age • growth rate • sex (mortalities only) • gonad weight (mortalities only) • liver weight (mortalities only • whole body total metal concentrations (slimy sculpin mortalities only) • muscle and liver total metal concentrations (lake trout and round whitefish only) • ethoxyresorufin-O-deethylase (EROD) activity	• every three years for Slimy Sculpin • every six years for Lake Trout and Round Whitefish

Source: ERM Rescan (2013).

References:

ERM Rescan (ERM Rescan Environmental Services Ltd.). 2013. Ekati Diamond Mine: Aquatic Effects Monitoring Program Plan for 2013 to 2015. Prepared for BHP Billiton Canada Inc., Yellowknife, NWT, Canada.

DOMINION DIAMOND

Information Request Number: DAR-EC-IR-24

Source: Environment Canada: Susanne Forbrich

Subject: Reclamation of Sediments

DAR Section(s): 8

Preamble (EC):

During the dewatering process of the diked area, sediments will become exposed and will need to be removed in order to access the Jay pipe. Sediments can be used on site for a variety of purposes including reclamation cover. There is no mention by the Proponent as to how the sediments will be dealt with.

Request (EC):

EC seeks clarification on how will the sediments be used once they are removed from Lac du Sauvage? Are the sediments to be disposed of, or stored and reclaimed at a later date?

Response:

Lakebed sediments are fine-grained materials, such as, silt, clay, and sand, that accumulate on lake bottoms, often with thicker accumulations in deeper areas of a lake. During the development of open pits at the Ekati Mine in the past, lakebed sediments were put aside for possible future use in reclamation. Lakebed sediments will be encountered during pit stripping and during dike construction associated with the Jay Project. The material will be placed in the Jay waste rock storage area. For the Project, segration and separate storage of this material is not planned as site-specific reclamation research at the Ekati Mine has shown that lakebed sediment is not a suitable reclamation material. If stockpiled separately, this material would create a reclamation liability, requiring reclamation of itself. The specific research findings as published in various technical reports are as follows:

- As part of the rock pad research program established in 2008, lake sediment materials were evaluated for their suitability as a top dressing material. Monitoring results to date indicate that lake sediment did not provide favorable conditions for plant growth. Specifically mixing of lake sediment with topsoil, has reduced performance of planted stock and seeded grasses and legumes (Martens 2014; EcoSense 2014).
- Lake sediments were tested for their ability to support plant growth in a field experiment at the Fox Portal starting in 1996, then later tested in greenhouse experiments in 1998. Field and greenhouse studies on lake sediments in 1996 and 1999 found that lake sediments have low organic content, low moisture holding capacity and low cation exchange capacity, and appeared to be the main factors responsible for poor growth at the Fox Portal Pilot Study (Kidd and Max 2000; Martens 2013).
- Vegetation monitoring on a seeded test area within the lake sediment stock pile area sediment was established in 2002. Initial growth monitoring results were poor and the test area was rototilled and a light application of native grass cultivars and fertilizer was re-applied. Overall rate of native

colonization of the lake sediments was deduced to be slow due to persistent crusted surface that persists on the lake sediments (Martens 2009).

References:

EcoSense (EcoSense Environmental Inc.). 2014. Ekati Diamond Mine: 2014 Vegetation Annual Report. Prepared for Dominion Diamond Ekati Corporation by EcoSense Environmental Inc. Lethbridge, AB, Canada.

Kidd JG, Max KN. 2000. Ekati Diamond Mine Reclamation Research Program, 1999, NT, Canada. Final report prepared for BHP Diamonds, Inc., Yellowknife, NWT, Canada, by ABR, Inc., Fairbanks, AK, USA.

Martens HE. 2009. Ekati Diamond Mine Revegetation Research Projects, 2008. Final report prepared for BHP Billiton Diamonds Inc., Yellowknife, NT, Canada by Harvey Martens and Associates, Calgary, AB, Canada.

Martens HE. 2013. Ekati Diamond Mine Revegetation Research Projects – 2012. Prepared for BHP Billiton Diamonds, Inc., Yellowknife, NT, Canada by Harvey Martens & Associates Inc. Calgary AB Canada.

Martens HE. 2014. Ekati Diamond Mine Revegetation Research Projects – 2013. Prepared for Dominion Diamond Ekati Corporation, Yellowknife, NT, Canada by Harvey Martens & Associates Inc. Calgary AB, Canada.

DOMINION DIAMOND

Information Request Number:	DAR-EC-IR-25
Source:	Environment Canada: Susanne Forbrich
Subject:	Fish-Out Plan - Waterbirds
DAR Section(s):	3 (Appendix 9B), Annex VII, Sable Addendum (Appendix I)

Preamble (EC):

The inadvertent harming, killing, disturbance or destruction of migratory birds, nests and eggs is known as incidental take. Incidental take, in addition to harming individual birds, nests or eggs, can have long-term consequences for migratory bird populations in Canada, especially through the cumulative effects of many different incidents. EC is concerned by the frequency of waterbird entanglement during fish-out operations at northern mines, including a previous incident at Ekati mine. In Section 3.5 of the Conceptual Fish-Out Plan (Appendix 9B), the Proponent notes the potential for incidental mortalities of diving waterbirds and proposes to include a mitigation strategy in the detailed fish-out plan. Section 2.3.3 of the Wildlife Baseline (Annex VII) describes the survey methods for a waterbird aerial surveys completed August 8 and 12, 2013 on Lac du Sauvage but that results were not yet available (Section 3.9). Section I2.2 of Appendix I (Sable Addendum) describes survey methods for a waterbird aerial survey conducted on July 11, 2014. Table I-3 of Appendix I (Sable Addendum) presents results of aerial and ground surveys of Lac du Sauvage and Islands for 2013 (June) and 2014.

Request (EC):

EC requests that the propoent provide:

- a clear summary of waterbird surveys conducted on Lac du Sauvage, including definitive survey dates, confirming and detailing survey methods (i.e. ground or aerial) and results of all years of waterbird surveys of Lac du Sauvage;
- the details of the diving bird mitigation strategy during fish-out operations to prevent entanglement.

Response:

Waterbird aerial surveys were completed on Lac du Sauvage in both 2013 and 2014. In 2013, a survey was completed on August 8 and another on August 12 (Section 2.3.3 of Annex VII, Wildlife Baseline Report of the Developer's Assessment Report). In 2014, one survey was completed on July 11 (Dominion Diamond 2014). Both the 2013 and 2014 surveys involved flying in a north-south direction along nine transects spaced 2 kilometres (km) apart. An aerial survey was also conducted around the complete shoreline contour. All surveys were flown by helicopter at 80 metres (m) above ground level at a speed of 80 to 100 km per hour. Observers recorded waterbirds present within 200 m of either side of the helicopter. The distribution of aerial transects and the results of waterbird aerial surveys (i.e., waterbird species, counts, and locations) are shown on Map 25-1. Results are presented in Table I-3 (Appendix I) of the Sable Addendum (Dominion Diamond 2014).

537500 540000 542500 545000 547500 550000 552500 555000 557500

7175000 7172500 7170000 7167500 7165000 7162500 7160000 7157500

Lake Af1

Duchess Lake

Lac du Sauvage

Lake B1 (Christine Lake)

Misery Operation

Hammer Lake

Lac de Gras

N

LEGEND

- EKATI MINE FOOTPRINT (MISERY OPERATION)
- PROPOSED JAY FOOTPRINT
- ELEVATION CONTOUR (10 m INTERVAL)
- ESKER
- WATERCOURSE
- WATERBODY

2013 WATERBIRD OBSERVATIONS

- BALD EAGLE, 1
- COMMON LOON, 1
- COMMON LOON, 2-5
- COMMON MERGANSER, 2-5
- COMMON MERGANSER, >25
- GOLDEN EAGLE, 1
- GULL SPP., 1
- GULL SPP., 2-5
- LONG-TAILED DUCK, 2-5
- PARASITIC JAEGER, 1
- PARASITIC JAEGER, 2-5
- TERN SPP., 1
- UNKNOWN DIVER, 1
- UNKNOWN LOON, 1
- YELLOW-BILLED LOON, 1
- YELLOW-BILLED LOON, 6-10

2014 WATERBIRD OBSERVATIONS

- COMMON MERGANSER, 1
- COMMMON MERGANSER, 2-5
- COMMON MERGANSER, 11-25
- GULL SPP., 1
- GULL SPP., 2-5
- GULL SPP., 6-10
- LONG-TAILED DUCK, 2-5
- NORTHERN HARRIER, 1
- TERN SPP., 1
- TERN SPP., 2-5
- TERN SPP., 6-10
- YELLOW-BILLED LOON, 1
- AERIAL TRANSECT
- AERIAL SHORELINE SURVEY

REFERENCE

CANVEC © NATURAL RESOURCES CANADA, 2012
NATURAL RESOURCES CANADA, CENTRE FOR TOPOGRAPHIC INFORMATION, 2012
DATUM: NAD83 PROJECTION: UTM ZONE 12N

DOCUMENT

DAR-EC-IR-25

1.5 0 1.5
SCALE 1:75,000 KILOMETRES

PROJECT
DOMINION DIAMOND
JAY PROJECT
NORTHWEST TERRITORIES, CANADA

TITLE
WATERBIRD AERIAL SURVEY RESULTS, 2013 AND 2014

Golder Associates

PROJECT		13-1328-0041	FILE No. POSTDAR_IR_Wild_020_GIS	
DESIGN	DC	01/03/15	SCALE AS SHOWN	REV 0
GIS	EN	13/03/15	MAP 25-1	
CHECK	DC	13/03/15		
REVIEW	BS	13/03/15		

G:\CLIENT\SDOMINION\DDEC-Jay and Lynx Projects\Figures\13-1328-0041 Jay & Lynx EA\Wildlife\POST-DAR IRs\POSTDAR_IR_Wild_020_GIS.mxd

The fish-out within the diked area of Lac du Sauvage will require a *Fisheries Act* Authorization from Fisheries and Oceans Canada, which will be part of permit applications following the environmental assessment review. To avoid the incidental take of birds protected by the *Migratory Birds Convention Act* during the fish-out, Dominion Diamond Ekati Corporation will develop a diving bird mitigation strategy with Environment Canada, which will be included in the final fish-out plan. Lessons learned from fish-outs at Ekati, Diavik, and Gahcho Kué will be considered and incorporated into the development of the diving bird mitigation strategy.

References:

Dominion Diamond (Dominion Diamond Ekati Corporation). 2014. Jay Project Developer's Assessment Report Sable Addendum. Prepared by Golder Associates Ltd., December 2014. Yellowknife, NWT, Canada.

DOMINION DIAMOND

Information Request Number: DAR-EC-IR-26

Source: Environment Canada: Susanne Forbrich

Subject: Migratory Birds and mine-altered water

DAR Section(s): 13

Preamble (EC):

Section 5.1 of the Migratory Bird Convention Act (MBCA) states that no person shall deposit a substance that is harmful to migratory birds, or permit such a substance to be deposited, in waters or an area frequented by migratory birds or in a place from which the substance may enter such waters or such an area. Section 13.3.2.2.1 predicts that the project will have no influence on the health of wildlife populations through ingestion of chemically altered water. The Proponent states that the prediction will be verified with the completion of an ecological risk assessment. Table 13.3-1 states that the small, intermittent water pond at the landfarm is covered with flagging to prevent bird landings as a mitigation measure.

Request (EC):

EC requests that the proponent provide:

- confirmation that the water pond at the landfarm is the only water within the proposed project, natural or man-made, in which there is a potential for any harmful “deposit”, as defined by the MBCA, to enter contact with migratory birds as a result of mining activities;
- the results on any monitoring to determine the effectiveness of the flagging to prevent bird landings; and,
- a list and/or map of any additional water within the proposed project in which there is potential for any harmful deposit to enter contact with migratory birds as a result of mining activities and whether water quality and migratory bird usage will be monitored at each.

Response:

There will remain only one landfarm at the Ekati Mine. A second landfarm is not proposed for Jay Project. The existing landfarm is located on the Panda/Koala waste rock storage area, and is not an area that has suitable habitat for waterfowl. Nonetheless, when ponded water is present, the small pond is made visible with rope and flagging. The contaminated snow containment facility is the second facility that could represent a potential contact for migratory birds (Photo 26-1, provided below). While there have been waterfowl mortalities at the Ekati Mine in the past (2002), none have been recorded since the ropes and flagging were installed.

There are no other water ponds at the Ekati Mine (inclusive of the future Jay Project) that are known to represent a harmful deposit in contact with migratory birds per the *Migratory Bird Convention Act*. Monitoring of migratory birds will continue to be carried out at the Ekati Mine through the Jay Project. The monitoring program during operation of the Jay Project will be based on current practice under the Ekati Mine Wildlife Effects Monitoring Program (WEMP) as this may evolve over time. Details and a map of migratory bird monitoring at the Ekati Mine will be provided in the "Jay Update" of the WEMP and Wildlife and the Wildlife Habitat Protection Plan, which are anticipated to be developed during the permitting phase of the Jay Project.

Photo 26-1 Ekati Mine Contaminated Snow Containment Facility, Showing Rope with Flagging Tape Covering the Containment Area



DOMINION DIAMOND

Information Request Number:	DAR-EC-IR-28
Source:	Environment Canada: Susanne Forbrich
Subject:	Migratory Birds – Incidental Take
DAR Section(s):	13

Preamble (EC):

The inadvertent harming, killing, disturbance or destruction of migratory birds, nests and eggs is known as incidental take. Incidental take, in addition to harming individual birds, nests or eggs, can have long-term consequences for migratory bird populations in Canada, especially through the cumulative effects of many different incidents. In Table 13.3-1, the Proponent states that if vegetation clearing is required, activities will be managed to comply with SARA and the MBCA and that siting and construction of the project will be planned to avoid environmentally sensitive areas to the extent practical. In section 13.3.2.2.2, the Proponent also states that bird nests, eggs, and/or birds could be destroyed during dewatering the diked area of Lac du Sauvage (i.e., flooding of downstream areas) but expects that mitigation policies and practices for dewatering activities will limit incidental take of migratory birds and nests. EC reminds the Proponent that any incidental take is non-compliant with the MBCA.

Request (EC):

EC requests information on:

- the mitigation measures that will be used to comply with the MBCA to prevent incidental take of migratory birds, their nests and eggs during any land clearing and any dewatering, where there is a risk of change in water levels, within the proposed project.

Response:

Details of the mitigation procedures to avoid incidental take of migratory birds, their nests and eggs to comply with the *Migratory Birds Convention Act* and specific details for the avoidance of incidental take will be identified in the wildlife and wildlife habitat protection plan and wildlife effects monitoring program that will be developed with Environment Canada during the Jay Project permitting phase.

Mitigation measures to reduce incidental take may include the following:

- to the extent practicable, land and vegetation clearing will occur outside of the general nesting season, which is defined as occurring from May 20 to August 13 in the Project area (zone N9; EC 2015);
- continuing with surveys for active nests on mine infrasturucture and open pits each spring;
- avoiding disturbance to active nest sites;
- preventing birds from nesting on mine infrastructure or in active open pits;
- continuing site worker environmental sensitivity training; and,

- identifying specific times and places where incidental take may occur, and proposing specific mitigation (such as nest sweeps, grubbing and use of bird deterrents).

References:

EC (Environment Canada) 2015. General Nesting Periods of Migratory Birds in Canada. Website: http://www.ec.gc.ca/paom-itmb/default.asp?lang=En&n=4F39A78F-1#_01_1. Accessed March 13, 2015.

DOMINION DIAMOND

Information Request Number:	DAR-EC-IR-29
Source:	Environment Canada: Susanne Forbrich
Subject:	Migratory Birds – Incidental Take
DAR Section(s):	Sable Addendum Appendix I

Preamble (EC):

Table I-2 presents a summary of 2013-2014 Environmental Setting Surveys observations. Map I-2 depicts the location of the 2014 Environmental Setting Surveys observations in broad categories (e.g. bird, bird sign, mammal and mammal sign) overlapping areas where most habitat loss would occur (i.e. proposed dewatered area, road alignment and WRSA). There is no map of the 2013 Environmental Setting Surveys observations.

Request (EC):

EC requests:

- a revised Map I-2 with comparable data resolution to Table I-2 (i.e. species and number of individuals observed for each location on the map).
- a map of 2013 Environment Setting Survey observations, similar to Map I-2, including revisions noted above
- clarity on proposed timing of land clearing and dewatering activities where there is habitat loss

Response:

The 2013 and 2014 wildlife observations collected during environmental setting surveys are shown by species and number of individuals on Map 29-1.

A detailed construction schedule for the Jay Project is not yet available. To the extent practicable, Dominion Diamond will plan to avoid vegetation clearing or causing other habitat loss during the migratory bird nesting season. The general nesting season is defined as occurring from May 20 to August 13 in the Project area (zone N9; EC 2015). Specific times and areas where migratory birds may be at risk, along with specific mitigation will be identified in the wildlife and wildlife habitat protection plan and wildlife effects monitoring program that will be developed with Environment Canada during the Jay Project permitting phase.

References:

EC (Environment Canada) 2015. General Nesting Periods of Migratory Birds in Canada. Website http://www.ec.gc.ca/paom-itmb/default.asp?lang=En&n=4F39A78F-1#_01_1. Accessed March 13, 2015.

537000 538000 539000 540000 541000 542000 543000

7167000 7166000 7165000 7164000 7163000 7162000 7161000

Lake B1 (Christine Lake)

Existing Misery Road

Misery Waste Rock Storage Area

N

LEGEND

- EKATI MINE FOOTPRINT (MISERY OPERATION)
- PROPOSED JAY FOOTPRINT
- ELEVATION CONTOUR (10 m INTERVAL)
- WATERCOURSE
- WATERBODY
- ESKER

2013 WILDLIFE OBSERVATIONS

- ARCTIC GROUND SQUIRREL, 1
- ARCTIC HARE, 1
- GRIZZLY BEAR, 1
- NORTHERN HARRIER, 1
- ROUGH-LEGGED HAWK, 1
- SHORT-EARED OWL, 1

2014 WILDLIFE OBSERVATIONS

- AMERICAN PIPIT, 1
- AMERICAN PIPIT, 2-5
- AMERICAN TREE SPARROW, 1
- AMERICAN TREE SPARROW, 2-5
- ARCTIC GROUND SQUIRREL, 1
- BAIRD'S SANDPIPER, 1
- COMMON LOON, 1
- COMMON/HOARY REDPOLL, 1
- GRAY-CHEEKED/BICKNELL'S THRUSH, 1
- GULL SPP., 1
- HARRIS'S SPARROW, 1
- HARRIS'S SPARROW, 2-5
- HORNED LARK, 1
- LAPLAND LONGSPUR, 1
- LAPLAND LONGSPUR, 2-5
- LEAST SANDPIPER, 1
- LEAST SANDPIPER, 2-5
- LEMMING, 1
- LONG-TAILED DUCK, 1
- LONG-TAILED JAEGER, 1
- PTARMIGAN SPP., 2
- RED-THROATED LOON, 1
- SAVANNAH SPARROW, 1
- SAVANNAH SPARROW, 2-5
- UNIDENTIFIED DUCK, 1
- WHITE-CROWNED SPARROW, 1
- WHITE-CROWNED SPARROW, 2-5
- YELLOW WARBLER, 1

NOTES

ROAD, PIPELINES, AND POWER LINE ARRANGEMENT TO BE DETAILED AS PART OF FURTHER PRE-FEASIBILITY DESIGN. APPROXIMATE CORRIDOR WIDTHS ARE SHOWN.

REFERENCE

JAY PROJECT CONCEPTUAL ENGINEERING REPORT, EKATI MINE, DOC#: 1313280041-E14037-R-REV0-4060, DATED: MAY 13, 2014
JAY PROJECT DESIGN BASIS MEMORANDUM FOR PRE-FEASIBILITY DESIGN OF PROJECT ROADS AND PIPELINE BENCHES, DOC#: 1313280041-E14031-TM-REVD-2020, DATED: AUGUST 1, 2014
LIDAR AND BATHYMETRIC DATA OBTAINED FROM AURORA, 2013
WATER OBTAINED FROM CANVEC © NATURAL RESOURCES CANADA, 2012
DATUM: NAD83 PROJECTION: UTM ZONE 12N

DOCUMENT

DAR-EC-IR-29

500 0 500
SCALE 1:25,000 METRES

PROJECT
DOMINION DIAMOND™
JAY PROJECT
NORTHWEST TERRITORIES, CANADA

TITLE
WILDLIFE OBSERVED DURING ENVIRONMENTAL SETTING SURVEYS, 2013 AND 2014

Golder Associates

PROJECT		13-1328-0041	FILE No. POSTDAR_IR_Wild_021_GIS	
DESIGN	DC	01/03/15	SCALE AS SHOWN	REV 0
GIS	EN	01/03/15		
CHECK	DC	01/03/15	MAP 29-1	
REVIEW	BS	16/03/15		

G:\CLIENTS\DOMINION\DDEC Jay and Lynx Projects\Figures\13-1328-0041 Jay & Lynx EAWildlife\POST-DAR IR\POSTDAR_IR_Wild_021_GIS.mxd

DOMINION DIAMOND

Information Request Number:	DAR-EC-IR-30
Source:	Environment Canada: Susanne Forbrich
Subject:	Migratory Birds and SARA - reporting of mortalities
DAR Section(s):	13

Preamble (EC):

In Section 13.2.1.1.7, the Proponent states that project-related wildlife mortalities on mine sites in the NWT are monitored by voluntary reporting by site personnel. The WEMP does not specify if reporting is voluntary or required by staff, but rather reports on efforts to improve level and detail of mortality incidents. Voluntary reporting of project-related wildlife mortalities, including migratory birds and species at risk, may underestimate the impacts of the project on wildlife. Voluntary reporting may also delay the implementation of mitigation measures to prevent further impacts on migratory bird and species at risk.

Request (EC):

EC seeks clarification:

- if reporting of wildlife mortalities, including migratory birds and species at risk, on site is voluntary or required by on-site staff

Response:

Reporting of all wildlife mortalities, including those of migratory birds and species at risk, is required by site personnel. Staff are educated on the importance to report all wildlife incidents, which includes mortality, during new employee orientations, and are reminded through on-going environmental awareness training on site. This commitment for mandatory wildlife mortality reporting will be reaffirmed in the wildlife and wildlife habitat protection plan and wildlife effects monitoring program that will be developed with Environment Canada during the Jay Project permitting phase.

DOMINION DIAMOND

Information Request Number: DAR-EC-IR-31

Source: Environment Canada: Susanne Forbrich

Subject: Migratory Birds

DAR Section(s): 13

Preamble (EC):

Section 5 of the Migratory Bird Regulations prohibits persons from “hunting” migratory birds except as authorized by the regulations. As defined in the regulations, “hunting” includes any attempt to chase, harass, capture or kill a migratory bird. Paragraph 6(a) of the Migratory Bird Regulations states that no one shall disturb or destroy the nests or eggs of migratory birds. In Table 13.3-1, the Proponent suggests that “birds showing nesting activity in areas of critical risk will be actively deterred” as a mitigation measure for bird valued components, including upland birds, waterbirds and raptors.

Request (EC):

EC seeks clarification:

- if this mitigation measure is being proposed for upland birds and waterbirds valued components If the mitigation measure is being proposed for migratory birds, as defined under the MBCA, please provide:
  - a rationale for not implementing avoidance as the mitigation measure

Response:

For each case, an assessment is made as to whether the risk to the migratory bird can best be mitigated through avoidance of the nest (such as when the nest is in an area of low activity), or deterring the birds from nesting (in cases when a nest site is in an area exposed to mining activity, blasting, or on unstable rock). This approach applies to all birds including upland and waterbirds.

At the Ekati Mine, there are examples of bird nests that have been successfully avoided and where activity and blasting around a nest have been restricted to avoid disturbing an active nest. On June 5, 2002, a pair of peregrine falcons were discovered nesting in an abandoned raven’s nest on the stairs of a fuel tank on the Fox Lake road. Two eggs were observed in the nest on June 16, and activity in the area was decreased in an effort to reduce disturbance to the birds (BHP Billiton 2003). On May 6, 2003, a raven’s nest that contained two chicks was observed on the Fox pit wall. The nest was marked, the area was avoided, and the nest was monitored regularly until the chicks fledged (BHP Billiton 2004). As well, in 2013, nests in pits have been covered with netting after nestlings fledged to deter additional use (ERM Rescan 2014).

References:

BHP Billiton (BHP Billiton Canada Inc.). 2003. EKATI Diamond Mine. 2002 Wildlife Effects Monitoring Program. Prepared by Golder Associates Ltd. for BHP Billiton Diamonds Inc. Yellowknife, NWT, Canada.

BHP Billiton. 2004. EKATI Diamond Mine. 2003 Wildlife Effects Monitoring Program. Prepared by Golder Associates Ltd. for BHP Billiton Diamonds Inc. Yellowknife, NWT, Canada.

ERM Rescan (ERM Rescan Environmental Services Ltd.). 2014. Ekati Diamond Mine: 2013 Wildlife Effects Monitoring Program. Prepared for Dominion Diamond Ekati Corporation by ERM Rescan: Yellowknife, NWT, Canada.

DOMINION DIAMOND

Information Request Number:	DAR-GNWT-IR-1
Source:	Government of Northwest Territories – Lands: Paul Mercredi
Subject:	Alternative energy - feasibility study of wind power to supplement energy requirements at the mine site
DAR Section(s):	2.5.3.1

Preamble (GNWT):

The NWT Greenhouse Gas Strategy sets sector goals for emissions reductions and renewable energy supply. It sets a target of 'a minimum of 10 percent renewable energy content in new power systems required for increased demand.' (NWT Greenhouse Gas Strategy, p. 25). The NWT target of 10% renewable energy penetration appears to be consistent with Ekati's commitment to environmental and social responsibility. Section 2.5.3.1 of the DAR appears to discount wind power as an alternative energy because wind power could not provide 100% of the power required (therefore standby power is required which doubles the capital cost) and wind turbines do not operate in low temperatures which could potentially prevent the turbines from working for several months of the year. The Diavik Diamond Mine Wind Project has provided tangible benefits to their mining operation. In 2014, the wind farm provided 11 percent of the mine's power needs, offset 4.9 million litres of diesel (approximately 100 B-train loads), and offset 14,068 tonnes of greenhouse gas emissions. Peak power levels, achieved for brief periods, have surpassed 50 percent – enough wind energy to power Diavik's underground mine. With temperatures in the winter as low as -40°C, the blades are all fitted with de-icing technology and represent a new benchmark for wind power in low temperatures. The diesel fuel savings from operating wind turbines provides a simple payback for the capital investment of 8 years (http://www.riotinto.com/ourcommitment/features-2932_12151.aspx). GNWT released a Solar Energy Strategy in 2012 to help guide the deployment of this technology in the territory. Solar photovoltaic (PV) power has been demonstrated to be cost competitive with diesel generation in many remote applications. The Northwest Territories Power Corporation is currently developing a high penetration Solar PV/Diesel hybrid system in the community of Colville Lake to demonstrate the ability of solar energy to offset imported diesel and the associated emissions. The Strategy also sets a goal to deploy low penetration solar systems sized up to 20% of the average load in diesel communities. A low penetration of solar energy into a diesel microgrid does not require complex control systems and, once integrated, offsets imported diesel.

Request (GNWT):

Can the Proponent provide additional information about the level of analysis performed to conclude that wind turbines cannot operate in low temperatures? Can the Proponent confirm whether they have analysed the simple payback of solar and wind renewable energy systems when used in conjunction with diesel generation? The Arctic Energy Alliance can perform a RETScreen analysis to determine the cost effectiveness of renewable energy options for industry. Can the developer confirm whether they have considered or carried out this type of analysis?

Response:

Dominion Diamond is aware of the Diavik studies and the successful implementation of the wind turbines at the Diavik Mine. The Jay Project does not significantly change the peak loads of the Ekati Mine, and as such it does not require new investment in power supply in the short term. The Jay Project does, however, lengthen the mine life, providing additional time to amortize investments in alternative power supply. Dominion Diamond will continue to evaluate the technical and economic feasibility of alternative power supply options in view of this benefit. Please see Appendix F, Power Supply, for additional information on power supply alternatives.

DOMINION DIAMOND

Information Request Number: DAR-GNWT-IR-3

Source: Government of Northwest Territories – Lands: Paul Mercredi

Subject: Incineration Facilities - Waste Incineration

DAR Section(s): 3.4.1.8.7

Preamble (GNWT):

It is GNWT's understanding that for this proposed project, the Proponent plans to use the Incineration Management Plan (IMP), embedded in the Ekati Waste Management Plan (WMP) dated April 24, 2014, to help manage the incineration of on-site waste and to reduce associated emissions. The IMP referenced above does not include a schedule for regular incinerator stack testing to ensure compliance with Canada-Wide Standards (CWS) for Dioxins, Furans and Mercury. Stack testing remains the most effective quantitative form of compliance testing available.

Request (GNWT):

GNWT requests that the Proponent confirm if the IMP plan embedded in the WMP dated April 24, 2014, is the current version of the plan to be used for this project. Additionally, GNWT requests that the Proponent provide a schedule for routine incineration stack testing.

Response:

The current version of the Waste Management Plan is dated April 24, 2014 and was submitted to the Wek'èezhìi Land and Water Board (WLWB) on May 7, 2014, along with the Incinerator Management Plan, the Hazardous Waste Management Plan, the Solid Landfill Waste Management Plan, and the Hydrocarbon Contaminated Materials Management Plan. The submitted plans were reviewed by the WLWB and approved on August 11, 2014.

As per Part B, Item 4 of Water Licence W2012L2-0001, the Waste Management Plan and associated Plans will be reviewed annually and updated if required. Version 2.0 of the Waste Management Plan and Incinerator Management Plan will be updated in July 2015 to account for the commissioning of the new composter during the summer of 2015.

As the waste streaming process is changing, stack testing will occur after the composting system is in place and the new waste streaming has been rolled out. Current operations of the incinerator have not changed from when the stack testing was completed in June 2013, and therefore, the emissions are expected to be the same as when the sampling was completed.

DOMINION DIAMOND

Information Request Number:	DAR-GNWT-IR-4
Source:	Government of Northwest Territories – Lands: Paul Mercredi
Subject:	Ambient Air Quality Monitoring Plan
DAR Section(s):	7.4.2, 7.7

Preamble (GNWT):

In Section 7.4.2 of the Air Quality Assessment, significant exceedances of ambient air quality standards are predicted for NO2, PM2.5 & TSP. Additionally, in section 7.7, the Proponent states that, "the existing Ekati Mine Air Quality Management and Monitoring Plan can be expanded to encompass the Project" and indicates that adaptive management can be implemented if required; however, preliminary plans for additional monitoring and an adaptive management framework have not been included.

Request (GNWT):

GNWT requests that the Proponent confirm if the Ekati Air Quality Management and Monitoring Plan dated March, 2009, is the current version of the plan. Additionally, please provide information for how the existing Air Quality Management and Monitoring Plan will be updated, including information on additional real-time NOx and PM monitoring, passive NO2 monitoring and additional dustfall monitoring. GNWT also requests that the proponent provide further details on their air quality adaptive management framework.

Response:

The Ekati Mine Air Quality Monitoring and Management Program (AQMMP) undergoes periodic review and update based on current monitoring information and changes to mine operating activities. The ‘2008 AQMMP’ is currently undergoing review based on the results of the most recent 3-year monitoring cycle that was conducted in 2014.

The Developer’s Assessment Report (DAR) provides Dominion Diamond Ekati Corporation’s intention to amend the AQMMP to address monitoring and mitigation of air quality for the Jay Project. This will build on the current Ekati Mine AQMMP. Detailed changes to the AQMMP will be developed as part of the regulatory permitting based on the outcome of the Environmental Assessment. The Government of the Northwest Territories, Environment Canada, aboriginal communities, and other organizations will be engaged during the amendment of the AQMMP.

DOMINION DIAMOND

Information Request Number:	DAR-GNWT-IR-05
Source:	Government of Northwest Territories – Lands: Paul Mercredi
Subject:	Acid Deposition
DAR Section(s):	7.4.2.2.6

Preamble (GNWT):

In section 7.4.2.2.6 of the Air Quality Assessment, the Proponent predicts approximately 346 hectares and 1440 hectares to experience acid deposition greater than 0.25 keq/ha/yr and 0.17 keq/ha/yr, respectively. Alberta classifies critical loads for sensitive ecological areas as 0.25 keq/ha/yr and a monitoring load of 0.17 keq/ha/yr which triggers monitoring and or additional research (Alberta Acid Deposition Management Framework, 2008). The Sensitivity of Western and Northern Canada Surface Waters to Acidic Inputs report (1987) concludes the Regional Study Area for the Project is located in an area sensitive to acidic deposition. However, the proponent does not provide any information on how impacts of acid deposition will be mitigated and monitored during the project.

Request (GNWT):

GNWT requests that the Proponent provide any plans for mitigating and monitoring potential impacts of acid deposition resulting from project activities.

Response:

In keeping with Dominion Diamond's focus on responsible development, a series of good practices have been identified that will be employed to mitigate air quality impacts. Consistent with other operating northern mines, Dominion Diamond follows the following general management approaches for air emissions from the Ekati Mine, which will be continued for the Jay Project (Project):

- Project mine equipment and haul vehicles will be regularly maintained to reduce emissions and maximize fuel efficiency;
- low-sulphur diesel will be used in fleet vehicles; and,
- energy conservation initiatives will be implemented such as heat recovery in the electrical powerhouse.

The existing Air Quality Monitoring and Management Program (AQMMP) will be expanded to encompass the Project. As part of the AQMMP, a 3-year report is completed and provides the results of air quality monitoring around the mine. The 2011 report show that there are small effects on air quality close to the mine, and that these effects are less than the relevant guidelines and reference values (BHP Billiton 2012). The most recent 3-year monitoring cycle was conducted in 2014 and those results will be available in April 2015. If monitoring or follow-up detects effects from the Project on air quality and on the receiving aquatic and terrestrial environments, then adaptive management will be implemented.

This may include increased monitoring, changes in monitoring plans, additional mitigation, or implementation of additional environmental design features.

References:

BHP Billiton (BHP Billiton Canada Inc.). 2012. EKATI Diamond Mine: 2011 Air Quality Monitoring Program. Prepared by Rescan Environmental Services Ltd., Yellowknife, NWT, Canada.

DOMINION DIAMOND

Information Request Number:	DAR-GNWT-IR-6
Source:	Government of Northwest Territories – Lands: Paul Mercredi
Subject:	Hydrogeology - Baseline Characterization and Conceptual Model Development
DAR Section(s):	8, Appendix 8A (Table 8A3-1), and Annex IX (Table 4.4-1)

Preamble (GNWT):

Based on the information presented in Table 8A3-1, many hydrogeological parameters used in the reference case have been determined using arithmetic or geometric means of available hydraulic testing results (hydraulic conductivity) or have been derived from values used in the Diavik numerical model. There is limited discussion regarding the methodology used in selecting or adjusting parameters from the Diavik model to the Jay model, and the referenced model report is not provided within the DAR package. Table 8A3-1 (Appendix 8A) presents Reference Case hydraulic conductivity values for competent bedrock units as 3×10-8 m/s (30 - 300 m) and 1×10-8 m/s (300 – 1,500 m). Table 8A43-2 presents hydraulic conductivity values for Lower Bound (2E-10 m/s), Upper Bound (5E-7 m/s) and "Value Assumed in Developer's Assessment Report" (3×10-8 m/s from 30 - 300 m, 1×10-8 m/s from 300 – 1,500 m). The same table provides the comment: "Conservative: The selected values represent 3 times the geometric mean calculated from in situ testing." Although hydraulic conductivity values are indicated to have been increased by a factor of 3 for the EA Conservative Scenario model, explicit values are not provided. Table 8A3-1 (Appendix 8A) states that the Enhanced Permeability Zones (EPZs) are "assumed to be trending northwest-southeast, and to be 60 m wide in the Reference Case, based on the properties of EPZs observed at the Panda, Koala, and Diavik A154 mines, and on geological evidence." Table 4.4-1 summarizes the identification/characterization of the EPZ as by "satellite imagery and hydrogeologic testing". However, within Annex 3 – Geology Baseline Report, no specific discussion can be found that demonstrates how the satellite imagery, or other structural geology characterization data was used to determine a predicted, or conservative estimate for the thickness, depth and lateral extent of the enhanced permeability zones identified through hydrogeologic testing. Although discussion regarding groundwater quality within Annex 9 – Hydrogeology Baseline Report includes presentation of various datasets demonstrating a profile of Total Dissolved Solids (TDS) concentrations with depth, the Jay Project baseline data appears to consist of only three groundwater samples, collected from 430 mbgs or shallower. Figure 5.2-1 within Annex 9 demonstrates the regional variability in measured TDS concentrations as more than an order of magnitude difference in values is observed between Ekati Panda/Koala and Diavik depth profiles. Based on the results of the model sensitivity analysis within Appendix 8A, application of the assumed TDS depth profile increased by a factor of two, which would be less than measured values at Ekati Panda/Koala, resulting in a 94% increase of TDS concentrations for inflows to the open pit. It is unclear from Appendix 8A how permafrost has been represented within the model. Although the depth to permafrost bottom was decreased to 200 mbgs as part of the sensitivity analysis, no initial value is explicitly stated. Discussion within Annex 9 suggests that an average thickness of permafrost within the baseline study area is assumed to be approximately 400 m, but it is uncertain how this average value was used to define zones of permafrost which vary from upland areas near the Misery Pit, to areas near the Jay Pit which is located within the limits of a Lac du Sauvage, a relatively large lake.

Request (GNWT):

GNWT requests the following information be provided:

a) The rationale for values used in the Reference Case model and provide a detailed description of how "parameter values were conservatively derived from the Diavik numerical model" where applicable. Please provide the reference report (Golder, 2004), for review. The specific reference is: Golder (Golder Associates Ltd.). 2004. Diavik Hydrogeologic Numerical Model December 2004 Re-Calibration. Submitted to Diavik Diamond Mines Inc.

b) The rationale for why the Reference Case model predictions should be considered conservative predictions for groundwater inflow quantity and quality for the Project as indicated in Appendix 8A.

c) Description of how the Lower Bound and Upper Bound values presented in Table 8A43-2 were determined, and how these values have been used in any of the model predictions presented.

d) A clear summary table listing model inputs parameters and assumptions for each model case simulation, including the post closure hydrogeological model. Clearly indicate all inputs and assumptions used in the model case from which results have been used in any impact assessment completed within the DAR. For any values described to be conservative, provide quantitative rationale.

e) In Table 8A3-2, the arithmetic mean of in situ testing results within the weathered bedrock unit appears to have been adopted for use in defining this material property within the model. This assumption is described as conservative within the table. Please provide rationale for why this value is considered to be conservative.

Response:

a) As stated in Section 4.6 of Annex IX (Hydrogeology Baseline) and Section 8A3.3 of Appendix 8A of the Developer's Assessment Report (DAR), where no site-specific information was available, data were supplemented by representative values from a range of sources within the literature or analogue sites (Maidment 1992; Guimerà and Carrera 2000; Golder 2004; Schulze-Makuch 2005; Stober and Bucher 2007). The Diavik Mine hydrogeologic model calibration report (Golder 2004) is a public document available on the Mackenzie Valley Land and Water Board website (see references below for web address) which details the Diavik Mine site wide groundwater model which was calibrated to groundwater inflow quantity and quality observed during operations. As noted in Table 8A3-1 of Appendix 8A, parameter values for which no site-specific data were available (specific storage, specific yield, kimberlite hydraulic conductivity, dispersivity, and effective porosity) were derived from both the Golder (2004) report and ranges given in the literature for each parameter. Where inconsistencies were present between the more conservative values given in literature and the Diavik report, the more conservative value in the literature was utilized. For example, the effective porosity used in the DAR was three times less than the value used in Golder (2004) based on the results of compilation of data provided by Guimerà and Carrera (2000).

   Please see the response to part C, below, for additional information.

b) The values summarized in Table 8A3-1 are considered conservative from the perspective of predicting mine inflow quantity and quality primarily because of the presence of the Jay enhanced permeability zone (EPZ), which has been assumed to be present over the entire model domain both vertically and laterally and to have a width of 60 metres (m). The assumed extent of the EPZ provides a hydraulic connection between the un-diked portion of Lac du Sauvage and the open pit and between the deep groundwater system and the open pit, promoting greater inflow quantity and higher saline water upwelling into the open pit. As demonstrated by the results of sensitivity analysis, presented in Appendix 8A (Section 8A3.7), the predicted quantity of groundwater inflow is more sensitive to the assumed properties of the EPZ than all other model parameters. Additional assumptions that provide conservatism (detailed in Table 8A3-2 and Table 6-1 below) include conservative values of porosity and specific storage of competent bedrock and neglecting density effects. However, to provide a sufficient level of conservatism that the effects on the environment were not underestimated, the Environmental Assessment (EA) Conservative Scenario (Section 8A4) was developed and evaluated throughout the DAR.

c) The lower bound and upper bound values provided in Table 8A3-2 were derived from the range in hydraulic testing data or from values found in published scientific literature (Stober and Bucher 2007; Maidment 1992; Illman and Tartovsky 2006; Guimerà and Carrera 2000) where site data were not available. The lower bound and upper bound values are provided primarily for context to illustrate the level of conservatism incorporated in both the Reference and EA Conservative cases.

   Table 8A3-2 in Appendix 8A of the DAR, which details the conservative assumptions of the model, is reproduced in Table 6-1, below, along with additional justification for each of the ranges provided. Where uncertainty was present, a value that would result in conservatively high predictions of groundwater inflow, and conservatively high total dissolved solids (TDS) was selected.

Table 6-1 Conservative Hydrogeological Assumptions in Numerical Hydrogeological Model

Parameter	Lower Bound	Upper Bound	DAR Value	Explanation
Porosity of competent bedrock[(a)]	0.001	0.023	**EA Conservative and Reference Case** 0.001	The upper and lower bound values shown were derived from literature values compiled by others. The range of values for granitic rocks compiled from four different sites by Stober and Bucher (2007) ranged from 0.003 to 0.023. Maidment (1992) provide a range from 0.0001 to 0.01 for unfractured rock; however, because porosity and hydraulic conductivity are correlated in bedrock a porosity value below 0.001 is less likely in bedrock with hydraulic conductivity on the order of 1×10^{-8} m/s or greater. Data compiled by Guimerà and Carrera (2000) from 90 tracer experiments performed in low permeability fractured media further corroborate that average porosity generally ranges from 0.0005 to 0.02, while porosity less than 0.0005 or greater than 0.02 is improbable. At Diavik, the porosity of competent bedrock was assumed to be 0.003 (three times higher). **Conservative**: Shorter travel times and greater saline upwelling.
Specific storage of competent bedrock (1/m)[(a)]	1.E-07	1.E-05	**EA Conservative and Reference Case** 1.E-05	This range in specific storage was initially derived from Maidment (1992) which gives a range of 1×10^{-7} m/s to 1×10^{-5} m/s. Values given in Illman and Tartovsky (2006), and Stober and Bucher (2007) are consistent with this range. **Conservative**: Greater release of water from storage in bedrock and greater calculated inflow quantity.
Hydraulic conductivity of weathered bedrock (m/s)	6.E-08	5.E-06	**EA Conservative and Reference Case** 4.E-06	The value used in the DAR was developed from the arithmetic mean of shallow bedrock measurements (less than 30 mbgs) as explained in Annex IX, Section 4.2. The geometric mean of measurements is much lower at 8×10^{-7} m/s. Utilization of the arithmetic mean value assumes that fractures in the shallow bedrock are well connected, and preferentially oriented. The upper and lower bound values were based on the range of hydraulic testing values, which were generally between 6×10^{-8} m/s and 5×10^{-6} m/s. **Conservative**: Higher hydraulic conductivities used in the model results in greater mine inflow quantity.

Table 6-1 Conservative Hydrogeological Assumptions in Numerical Hydrogeological Model

Parameter	Lower Bound	Upper Bound	DAR Value		Explanation
Hydraulic conductivity of competent bedrock (m/s)	2×10^{-10}	5×10^{-7}	**Reference Case** 3.E-08 (30 to 300 m depth); 1.E-08 (below 300 m depth)	**EA Conservative Case** 9.E-08 (30 to 300 m depth); 3.E-08 (below 300 m depth)	The values used in the Reference Case are equal to the geometric mean calculated from in situ testing. The EA Conservative Case values for hydraulic conductivity of competent bedrock are three times higher. As stated in the DAR Appendix 8A, Section 8A4, the geometric mean of single well response tests was conservatively multiplied by three to account for the difference in the scale of the hydraulic disturbance produced by the single well response tests and that produced by the open pit mine. The upper and lower bound values were based on the range of hydraulic testing values, which were generally between 2×10^{-10} m/s and 5×10^{-7} m/s. **Conservative**: Higher hydraulic conductivities used in the model results in greater mine inflow quantity.
Hydraulic conductivity of the EPZ (m/s)	9.E-07	5.E-05	**EA Conservative and Reference Case** 1.E-05 (25 to 400 m depth); 5.E-06 (400 to 750 m depth); 5.E-07 (750 to 1,000 m depth); 1.E-07 (below 1,000 m depth)		The shallow value of hydraulic conductivity represents the arithmetic mean of in situ testing. As stated above, use of the arithmetic mean assumes that fractures are well connected and preferentially oriented. The upper and lower bound values were based on the range of hydraulic testing values, which were generally between 2×10^{-10} m/s and 5×10^{-7} m/s. **Conservative**: Assigning high values of hydraulic conductivity for the EPZ will result in the promotion of greater inflow quantity and higher saline water upwelling into the mine workings.
Extent of the EPZ	limited extent	extending laterally and vertically over the entire model domain	**Reference Case** 60 m wide	**EA Conservative Case** 100 m wide	**Conservative**: Extension of the EPZ over the entire model domain will result in better connection between the open pit and Lac du Sauvage and deep groundwater system with higher saline water, and will promote greater inflow quantity and higher saline water up into the open pit.
			extending laterally and vertically over the entire model domain		
Density effect	-	-	freshwater (1,000 kg/m^3)		**Conservative**: Shorter travel times and more upwelling than if density effects were considered.

DAR = Developer's Assessment Report; EPZ = enhanced permeability zone; m = metre; m/s = metres per second; mbgs = metres below ground surface; kg/m3 = kilograms per cubic metre, % = percent; - = not applicable.

d) The input parameters and assumptions for the three dimensional model used to represent the baseline and operations phases are summarized in Tables 8A-1, 8A-2, and 8A3-3 of Appendix 8A of the DAR. The table included in the response to Item c. above provides additional information. The post-closure hydrogeological model for the Jay Pit presented in Appendix 8B of the DAR consists of a two-dimensional cross sectional model along the assumed location of the EPZ that intersects the Jay Pit. The input parameters and assumptions for this model are consistent with

those described above with the exception of the simulation of density effects. The selection of parameter values that is relevant for the two-dimensional post-closure model do not vary between Reference Case and EA Conservative Scenario as illustrated in the summary table below (Table 6-2).

Table 6-2 Jay Post-Closure Model Parameter Selection Summary and Rationale

Parameter	DAR Value – Post-Closure Model	Explanation
Initial Conditions (Heads)	Hydrostatic	Initially at closure, the bedrock surrounding the pit will be depressurized due the impact of pit dewatering, and initially there will be a hydraulic gradient between the back-flooded pit and the surrounding rock that will result in groundwater outflow from the pit. However, this condition will be relatively short-lived (less than 5 years), whereas density gradients will persist for much longer (100s of years).
Initial Conditions (Concentration)	Predicted End of Mining	This assumption results in conservatively high estimates of upwelling due to assumptions listed in Table 6-1, and therefore, the estimated time for equilibrium conditions to arise during post-closure is also conservative.
Orientation	Oriented along the assumed Jay EPZ	This orientation is conservative as flow in this zone will be much greater than in the competent rock due to the higher hydraulic conductivity. During mining approximately 70% of groundwater inflow to the pit is predicted to be through this zone (DAR Appendix 8A, Section 8A.7) and flow in the zone would be primarily along its alignment.
Porosity of EPZ	0.01	Maidment (1992) provides a range for porosity of 0.01 to 0.10 for fractured rocks. Data compiled by Guimerà and Carrera (2000) suggest that porosity in fractured granitic rocks with enhanced hydraulic conductivity (>2 x 10^{-6} m/s) is lower generally ranging from approximately 0.0001 to 0.08. The value selected is moderately conservative.
Hydraulic conductivity of the EPZ (m/s)	1.E-05 (25 to 400 m bgs); 5.E-06 (400 to 750 m bgs); 5.E-07 (750 to 1,000 m bgs); 1.E-07 (below 1,000 m bgs)	The shallow value of hydraulic conductivity represents the arithmetic mean of in situ testing. As stated above, use of the arithmetic mean assumes that fractures are well connected and preferentially oriented. The upper and lower bound values were based on the range of hydraulic testing values, which were generally between 2 x 10^{-10} m/s and 5 x 10^{-7} m/s. As stated above in Table 6-1, the high values of hydraulic conductivity in the EPZ will result in greater groundwater flow in response to density gradients at post-closure.
Extent of the EPZ	Extending laterally and vertically over the entire model domain	Extension of the EPZ over the entire model domain will result in better connection between the open pit and Lac du Sauvage and deep groundwater system with higher saline water, and will promote greater groundwater flow.
Density effect	Density Driven Flow	Density gradients at post-closure will drive the exchange of water of varying density within the back-flooded pit and groundwater.

EPZ = enhanced permeability zone; m = metre; m/s = metres per second; mbgs = metres below ground surface.

e) The arithmetic mean of hydraulic conductivity results will produce a higher hydraulic conductivity than would be calculated with a geometric mean. Therefore, the hydraulic conductivity value for weathered bedrock that was derived from the arithmetic mean value and used in both the EA Conservative Scenario and Reference Case is higher than would be calculated otherwise. A higher hydraulic conductivity value in the weathered rock will produce conservatively high predictions for the quantity of water reporting to the conductivity value in the weathered rock provides a hydraulic connection with the freshwater in the lake; therefore, the predicted TDS concentration of the groundwater discharging into the pit would be lower than would be predicted if the weathered rock had a lower hydraulic conductivity. Conservative predictions of the effects

on the environment are dependent on the combined effect of groundwater inflow quantity and quality; therefore, an additional sensitivity has been run to demonstrate the impact of the hydraulic conductivity values assigned to weathered bedrock.

This additional sensitivity simulation was performed on the Reference Case (DAR Appendix 8A) which is also referred to as the reasonable estimate case in water quality modelling (see Appendix B; Compendium of Supplemental Water Quality Modelling). In the sensitivity simulation, the geometric mean of hydraulic testing results in a hydraulic conductivity for the weathered rock of 1×10^{-6} metres per second (m/s) or four times lower than in the Reference Case. When this lower value for hydraulic conductivity is used in the Reference/reasonable estimate Case, the results of this sensitivity simulation indicate that that groundwater inflow quantity would be lower (maximum of 11,400 cubic metres per day (m^3/day) compared to 13,700 m^3/day in the Reference Case), but the groundwater quality would be higher (maximum of 9,100 milligrams per litre (mg/L) compared to 6,900 mg/L in the Reference/reasonable estimate Case). These results have been considered through the Site-Wide Water Quality model (documented in DAR Appendix 8E and updated for the reasonable estimate case in Appendix B) and the resulting predictions for the discharge to Lac du Sauvage indicate that this discharge would occur later in mine life and at lower concentrations than predicted in the DAR (Appendix B). Therefore, the assumed higher hydraulic conductivity for weathered bedrock presented in the DAR is conservative for the prediction of the effects on the environment.

References:

Golder (Golder Associates Ltd.). 2004. Diavik Hydrogeologic Numerical Model December 2004 Re-Calibration. Submitted to Diavik Diamond Mines Inc. Available at: http://www.mvlwb.ca/Boards/WLWB/Registry/1990s/N7L2-1645/H19/5-rep0204UpdateofModelPredictions.pdf Accessed: March 2015

Guimerà J, Carrera J. 2000. A comparison of hydraulic and transport parameters measured in low-permeability fractured media. J Contam Hydrol 41 (2000): 261-281.

Illman WA, Tartovsky DM, 2006. Asymptotic Analysis of Cross-Hole Hydraulic Tests in Fractured Granite. Groundwater. Vol. 44, No. 4: 555-563.

Maidment DR. 1992. Handbook of Hydrology. McGraw-Hill, New York, USA.

Schulze-Makuch D. 2005. Longitudinal Dispersivity Data and Implications for Scaling Behaviour. GROUND WATER May/Jun 2005; 43, 3; ProQuest Science Journals p. 443.

Stober I, Bucher K. 2007. Hydraulic properties of the crystalline basement. Hydrogeol J. 15:213-224.

DOMINION DIAMOND

Information Request Number:	DAR-GNWT-IR-8
Source:	Government of Northwest Territories – Lands: Paul Mercredi
Subject:	Hydrogeology - Numerical model framework and simulations
DAR Section(s):	Appendix 8A (Tables 8A3-5 and 8A4-1, Figure 8(A)4-4), Appendix 8B (Table 8B-3-3)

Preamble (GNWT):

Brines are noted to be present in the subsurface to great depth (Annex 9) but in the case of the 3D model (Appendix 8A) the fluid density of the water is assumed constant (as fresh water) and hydraulic heads, or pressures, are not linked to concentration. The 2D model developed to simulate post closure hydrogeological conditions has included coupling between fluid density and groundwater flow. This transition, where initial conditions of the 2D coupled model are based on predictions from the 3D uncoupled model, raises uncertainty regarding the influence of this significant change in governing equations on the influence to post closure model predictions in the short term (less than 10 years). Additional uncertainty results from the initial conditions for hydraulic heads defined within the 2D post closure model as they are not adopted from the 3D model and are assumed to be static or not flowing. The combination of these two conditions has potential to result in bias as to the correct starting values for heads and TDS in the 2D model. It is not clear as to how, or why, certain components of the models were determined and represented within the operations and post closure model simulations. More specifically, limited or no rationale is provided for the selection of the existing model mesh or the decision not to represent unsaturated flow. Further, the results of any benchmarking efforts do not appear to be provided. Explanation for the selection of key assumptions in the numerical model's development and explanation of the potential influences on predictive simulation results provide much needed context for the technical review of model predictions and their use in the impact assessment process. The timelines and inflow rates presented with Tables 8A3-5, 8A4-1, 8B3.3 and Figure 8A4-4 do not appear to be consistent. This makes it challenging to interpret the model predictions for inflow rates at the Jay Pit from the end of operations (dewatering) through flooding and post closure stabilization. It is also not clear in all instances what, if any, inflow/discharge rates to the Jay Pit are a result of active pumping from the Misery Pit or discharge from the upper region of the Jay Pit mixolimnion into the flooded diked area and Lac de Sauvage.

Request (GNWT):

GNWT requests that DDEC provide the following information:

a) Explain why the 3D hydrogeological model (Appendix 8A) did not run coupled simulations, whereas the 2D post closure model included coupling between fluid density and groundwater flow. Provide an explanation of potential implications on Jay Pit water quality from using the uncoupled 3D model predictions in defining initial conditions for the 2D coupled model.

b) Describe how the effects of pressure differences in the horizontal due to density variations were considered in the predictions of post closure water quality within the Jay Pit.

c) Provide additional details regarding the selection of the boundary conditions for heads or pressures applied to the mine pit face. Address in the response if the hydraulic heads considered the TDS concentration in the pit water.

d) Describe any benchmark calculations or simulations performed to examine the validity of assuming constant density and uncoupling fluid from transport. If none were completed, please provide rationale outlining why this was not completed.

e) Describe the vertical and horizontal mesh spacing in the finite element grid in terms of approximate locations. Explain and provide rationale for refinement of the mesh in the vicinity of the EPZ and if the mesh size is appropriate for the numerical simulations.

f) Provide explanation and rationale for exclusion of unsaturated flow within the model simulations. Describe the potential for any seepage faces developing at the pit face, and likely implications to the hydrogeological model results presented within the DAR.

g) Clarify the results for periods 12 through 14 in Tables 8A3-5 and 8A4-1 with Figure 8A4-4 as there appears to be inconsistencies with the illustrated flow rates and timeline. Detail the net flow rates occurring through hydrogeological pathways, as well as assumed flooding rates from pumping water stored in Misery Pit.

h) Clarify the timeline and groundwater inflow rates presented in Table 8B3.3 with respect to results presented in Table 8A3-5. Indicate the net flow rates occurring through hydrogeological pathways, as well as those through surface hydrology or any other fluxes in/out of the Jay Pit.

Response:

a) The 3-dimensional (3D) model in Appendix 8A of the Developer's Assessment Report (DAR) simulates groundwater flow and advective-dispersive transport of solutes (total dissolved solids [TDS]) during mining and pit flooding without consideration for the effects of solute density. This approach was adopted as, in addition to reducing model complexity and associated computational effort, it resulted in a conservative (i.e., high) prediction of TDS concentration in mine inflow. This is because with higher-salinity water present at greater depth beneath the open pit, density-related gravity effects are expected to somewhat offset the effect of upward hydraulic gradient created by pit dewatering. The 3D model does not include the density-related gravity effects, and as such, the predicted upwelling of more-saline groundwater from deep bedrock beneath the open pit is more pronounced than it would be in reality.

The importance of the density-related gravity effects on solutes transport was assessed in the early stages of model development using driving force ratio (DFR) methodology developed by United States Geological Survey (Open File Report 88-490, Davies 1989). The DFR examines the relative importance of density-related gravity effects and the pressure driven component of flow. This is essentially a ratio between the two terms in equation (14) of Post et al. (2007), which describes the vertical flow component when density contrasts are present:

$$q_z = -K_f \left[\frac{\Delta h_f}{\Delta z} + \left(\frac{\rho_a - \rho_f}{\rho_f} \right) \right]$$ (Equation 14 of Post et al. [2007])

The relative contributions of the two flow components can be assessed by the DFR as shown below:

Driving Force Ratio $= \frac{\frac{\rho_a - \rho_f}{\rho_f}}{\frac{\Delta h_f}{\Delta z}} = \frac{\Delta\rho|\nabla E|}{\rho_f|\nabla H_f|}$ (Equation 10.2 of Davies [1989])

Where:

- $\Delta\rho = \frac{\rho_a - \rho_f}{\rho_f}$ = the difference between the average fluid density of the groundwater between measuring points and the reference fluid density [M/L^3]
- $\left|\nabla H_f\right| = \frac{\Delta h}{\Delta z}$ = magnitude of the equivalent freshwater head gradient [dimensionless]
- $|\nabla E| =$ magnitude of the gradient of elevation [dimensionless] (equal to one for vertical flow)

This ratio provides an indication of the significance of the gravity effects on the flow compared to the pressure effects, with a DFR of less than approximately 0.5 being indicative of conditions when the density-related gravity effects are relatively small and could be neglected. The largest estimate of the DFR for the 3D model of 0.3 was calculated for the vertical profile (i.e., gravity gradient of 1) beneath the ultimate open pit; smaller DFR values were calculated for profiles that were not vertical. These calculations provided rationale for excluding gravity-related density effects in the 3D model and suggested that a model with or without these effects would provide predictions that are essentially the same (but, as explained above, the model without the density effect will tend to predict somewhat greater up-welling of high-TDS water).

The DFR calculated for the post-closure conditions that are expected immediately after the Jay open pit is flooded is much higher than the one estimated for the mining period. This is because, following the pit flooding, the large hydraulic gradients associated with pit dewatering will diminish rapidly, but the upwelling of the high-TDS groundwater during mining results in a large contrast in groundwater density near the pit bottom. Therefore, the 2-dimensional (2D) model that was used to represent groundwater conditions during post-closure, coupled the groundwater flow and solute transport via density. This provided adequate representation of density effects of the relatively slow “sinking” of the high-TDS groundwater from beneath the pit bottom and associated convective circulation of shallow groundwater near the pit walls.

b) The governing equations solved by the 2D model that was used to represent groundwater conditions during post-closure included the gravity-related density effects as stated in Appendix 8B, Section 8B3 of the DAR. Therefore, lateral differences in pressure resulting from density variations, and the resulting groundwater fluxes, were adequately represented in model predictions.

c) As presented in Appendix 8A (Section 8A3.5) of the DAR, in the 3D model that represented mining and pit flooding, the mine pit face was represented using time-dependent specified head conditions. During mining, these boundaries were progressively activated according to the mining schedule such that the pressure head at the pit face was equal to zero. In addition, boundary nodes were

constrained to allow only inflow of groundwater (to the mine) along the seepage faces that are expected to develop along the pit walls, and were automatically de-activated above the predicted location where the water table intersects the pit walls. During pit flooding, the hydraulic heads at boundary nodes below the pit lake level were varied over time according to the flooding schedule, and the boundary constraints were removed (i.e., both groundwater inflow and lake water outflow was allowed). Above the pit lake level, seepage faces were simulated using constrained specified head boundaries with pressure head set to zero, and the extent of these faces was modified as the pit lake level increased. The head values representing the flooded pit were not expressed in terms of freshwater head (i.e., based on lake TDS vs. depth profile) for consistency with the overall approach that excluded density effects from the 3D model. It should be noted that the maximum difference between the freshwater head calculated at the base of the fully flooded pit based on the lake TDS vs. depth profile relative to the lake level was approximately 0.3 metres (m); a difference that is negligible considering the large hydraulic head differentials that develop behind the pit walls during flooding.

As presented in Appendix 8B (Section 8B3.1) of the DAR, in the 2D model representing post-closure, the pit walls were assigned time-constant specified head boundaries that represented the pit lake elevation at post-closure. These boundaries were expressed as freshwater head that was calculated using the lake TDS versus depth profile. This is consistent with the modelling approach that included density-related gravity effects in the 2D model.

d) Please see response to A, presented above.

e) As presented in Appendix 8A (Section 8A3.2) of the DAR, in the 3D groundwater model, the horizontal mesh spacing near the open pit (within approximately 400 m of the pit crest) and the enhanced permeability zone (EPZ) is uniform at approximately 20 to 25 m, and the vertical mesh spacing varies between 5 m and 40 m. The spacing was expanded to approximately 50 m in the area of Lac du Sauvage where the dewatering will occur and then to 500 m along the model perimeter. This spacing was considered of appropriate density for simulating steep hydraulic gradients that are expected to develop along the pit walls and the EPZ, and moderate hydraulic gradients in the area of Lac du Sauvage. The Peclet number is defined as a ratio between grid spacing and the longitudinal dispersivity. For mass transport simulations, a Peclet number of 4 or less is generally recommended to limit the impact of numerical dispersion (Anderson and Woessner 1992). In the 3D groundwater model, the Peclet number is generally less than 3 in the refined area near the mine, and approximately 5 to 8 outside of this area where drawdown due to mining is predicted. Therefore, this mesh discretization is considered adequate to minimize numerical dispersion in the immediate area of the mine, and to limit numerical dispersion to a reasonable degree outside this area. The impact of mesh discretization has a negligible impact on the model predictions due to the scale of the mine, and distributed nature of the initial TDS concentrations in groundwater. An additional sensitivity simulation has been run to confirm this assertion. In this sensitivity simulation, the mesh was uniformly refined by a factor of 2 throughout the entire model domain. Results of this simulation confirm that mesh discretization has minimal impact on model predictions as predicted inflow quantity and quality from the refined model were within 2 percent of those presented in the DAR.

f) Seepage faces were represented in the 3D model using specialized boundary conditions, as discussed under Item C above. Unsaturated flow above the water table in the localized area between the perimeter dike and the pit walls was not simulated because the unsaturated fluxes are expected to be negligible in relation to the overall pit inflow.

g) The flow rates shown on Figure 8A4-4 represent predicted groundwater inflow into the Jay pit only and do not include inflows to the diked area. The inflows to both the Jay Pit and the diked area are presented in Tables 8A3-5 for the Reference Case and in Table 8A4-1 for the EA Conservative Scenario.

   The timelines between these tables and Figure 8A4-4 are consistent. For example, for the EA Conservative Scenario, the inflow of 21,300 cubic metres per day predicted for period 12 after 3,920 days (or 10.7 years) since the dike dewatering started, presented in Table 8A4-1, matches with the peak inflow plotted on Figure 8A4-4. Predictions for period 14 (which corresponds to Year 14 – 2033 of the water management plan) that represents back-flooding during closure when some surface water infiltrates into the subsurface, are not presented on Figure 8A4-4 for clarity. The assumed back-flooding rate from water stored in Misery Pit and other surface water fluxes during this period are documented in the Mine Water Management Plan (Appendix 3A, Table 6-1).

h) Table 8B3-3 provides predicted groundwater fluxes for the Jay Pit during post-closure, once the Jay Pit and diked area around the pit are back-flooded and the weathered bedrock and overburden are re-saturated. Year 1 in 2034 in this table represents the predicted conditions one year after the back-flooding is complete, which corresponds to the end of period 14 in Table 8A3-5. Surface water fluxes in the Jay Pit during post-closure are documented in Appendix 8G of the DAR, which presents the hydrodynamic modelling of the Jay pit under post-closure conditions.

References:

Anderson MP, Woessner WW. 1992. Applied Groundwater Modelling Simulation of Flow and Advective Transport. Academic Press Inc.

Davies PB. 1989. Variable-Density Ground-Water Flow and Paleohydrology in the Waste Isolation Pilot Plant (WIPP) Region, Southeastern New Mexico, US Geological Survey Open-File Report, 88-490.

Post V, Kooi H, Simmons C. 2007. Using hydraulic head measurements in variable-density ground water flow analyses. Ground Water, 45(6): 664-671.

DOMINION DIAMOND

Information Request Number:	DAR-GNWT-IR-10
Source:	Government of Northwest Territories – Lands: Paul Mercredi
Subject:	Uncertainty in Modeling Inflows
DAR Section(s):	8 (Figure 8.2-2), 8.2.1.2.3

Preamble (GNWT):

TDS groundwater concentrations are based on 3 measurements collected in the vicinity of the proposed Jay Pipe at depths not exceeding 500m. The slope of the TDS depth line is obtained from a regional scale database (Frape and Fritz profile, Figure 8.2-2) and the intercept of that regression line is adjusted to intercept the 3 available samples. The adjusted TDS depth regression is used to extrapolate TDS concentrations well below the sampled depth. These extrapolated concentrations do not incorporate uncertainty due to regression within the range of measured depths, let alone the additional uncertainty attributable to extrapolation. During discussions with Dominion Diamonds (February 3rd, 2015, Yellowknife) the “conservativeness” of the TDS predictions was discussed. One aspect of conservatism was due to use of a high estimated porosity based on experience with a nearby fault line. Given modeling limitations, a full Monte Carlo analysis is time prohibitive. However a limited number of simulations are still possible.

Request (GNWT):

GNWT requests that TDS concentrations in Jay Pipe water be predicted using the four combinations of low and high porosity estimates; and depth-specific upper and lower 95% confidence prediction limits. Those 4 scenarios would be carried through the sequence of models to predict TDS component concentrations at the 2m depth increments in at least the GEMSS model cell LDS1.

Response:

The four scenarios that are requested are as follows:

- Case 1: Lower porosity, lower total dissolved solids (TDS) profile
- Case 2: Lower porosity, higher TDS profile
- Case 3: Higher porosity, lower TDS profile
- Case 4: Higher porosity, high TDS profile

Appendix 8A of the Developer’s Assessment Report (DAR) describes a Reference Case, which represents Dominion Diamond’s reasonable expectation of hydrogeological conditions. This is in comparison to the more conservative DAR Environmental Assessment (EA) Conservative Scenario that was used as the basis of the environmental assessment. As shown in Table 8A3-6 in Appendix 8A (Section 8A3.7) of the DAR, sensitivity simulations performed on the Reference Case indicate that decreasing porosity by a factor of 5 resulted in predicted TDS of the groundwater inflow to the Jay Pit that was 50 percent (%) higher than in the Reference Case. Likewise, increasing the TDS depth profile by a

factor of 2 at all depths resulted in predicted TDS concentrations reporting to the Jay Pit two times higher. In both these sensitivities there was no change in the quantity of inflow.

These sensitivities demonstrate the following:

- Increasing the TDS profile by a factor of 2 (at all depths), results in an increase in predicted TDS concentration of groundwater inflow to the mine by 2. There is a linear relationship to the TDS Profile and the predicted TDS concentration. This means that if the TDS profile was to be reduced by a factor of 2 (at all depths), then the predicted TDS concentration of groundwater inflow to the mine would also be reduced by a factor of 2.
- Reducing the porosity by a factor of 5, results in the TDS increasing by a factor of 1.5. From this result, it can be inferred that by increasing the porosity by a factor of 5 would result in a 0.5 reduction in the TDS concentration.
- Predicted groundwater quality reporting to the mine is much more sensitive to changes to the TDS profile than changes in the porosity (5 times less porosity resulted in a 1.5 increase in TDS; whereas, a 2 times increase in the profile resulted in a 2 times increase in the TDS concentration).

A conservative approach (the EA Conservative Scenario) was used in the DAR, which provides a high level of confidence that potential environmental effects have not been underestimated. Considering the results of these sensitivity runs, Case 1 (Lower porosity/lower TDS profile) and Case 3 (Higher porosity/ lower TDS profile) will yield lower predicted TDS concentrations in the mine inflow and are less conservative than the EA Conservative Scenario; therefore, they are not considered relevant in this context. Similarly, Case 4 with higher porosity and higher TDS profile is less conservative than Case 2 with lower porosity and higher TDS profile.

The Reference Case is considered conservative with respect to hydraulic conductivity, although less conservative than the EA Conservative Scenario (as presented in Appendix 8A, Section 8A4). The greatest source of this conservatism in both these scenarios is the assumed presence of an enhanced permeability zone (EPZ) as demonstrated in results of sensitivity analysis presented in Table 83A-6 (Appendix 8A, Section 8A3.7) of the DAR. This zone is the primary pathway for saline water upwelling; as demonstrated in Table 83A-6, when the EPZ was truncated below 400 metres depth, the predicted TDS of groundwater inflow to the mine decreased by nearly 90%. It should be noted that this zone does not continue up through the lower permeable lakebed and weathered bedrock layers (thus limiting recharge of freshwater from the lake). The amount of upwelling is directly related to the hydraulic conductivity and inversely related to the porosity. Therefore, if the hydraulic conductivity is increased, then there is more upwelling whereas if the porosity is increased, there is less upwelling. In addition, it has been shown (Table 83A-6) that the predicted TDS concentrations are directly related to the TDS profile; two times higher profile yields two times higher TDS concentrations. Because conservative assumptions for the hydraulic conductivities of hydrostratigraphic units impact both the predicted groundwater quantity and the groundwater quality, unlike assumptions for porosity and TDS which only impact quality predictions, it is considered most prudent to employ conservative assumptions for hydraulic conductivity.

The Reference Case is considered reasonably conservative in regard to hydraulic conductivity; therefore, Case 4, with a 2 times higher TDS profile and a 5 times lower porosity is considered overly conservative, as lower porosity would be combined with conservative assumptions for hydraulic conductivity, and TDS.

Consequently, the sensitivity runs undertaken above, that is, with the porosity decreased and the Profile increased in separate sensitivities are more appropriate.

The sensitivity case where the TDS profile was increased by a factor of two at all depths yields predicted TDS concentrations of groundwater inflow to the pit that are two times higher than in the Reference Case (also referred to as the reasonable estimate case in water quality modelling [Compendium of Supplemental Water Quality Modelling; Appendix B]); therefore, this scenario along with the Reference/reasonable estimate Case has been be considered through the Site-Wide Water Quality model to assess the impact of higher TDS concentrations in groundwater on the quality of minewater discharged to the Misery Pit. As expected, results of this model run indicate that higher TDS in groundwater inflow results in higher TDS in the discharge from the Misery Pit to Lac du Sauvage than predicted in the DAR (Appendix B). However, due to the much lower groundwater quantity predicted in the Reference/reasonable estimate Case relative to the EA Conservative Scenario, discharge to Lac de Sauvage would occur later in mine life and at lesser concentrations than presented in the water quality assessment in the DAR (Section 8.5.4). Therefore, as stated in the DAR Appendix 8A Section 8A4, the EA Conservative Scenario presented in the DAR results in a level of conservatism that provides a high degree of confidence that the effects on the environment have not been underestimated.

As stated in the response to DAR-EC-IR-12, an additional round of groundwater sampling was conducted in the three intervals of the Westbay monitoring well in September 2014 (Golder 2014). In general, the concentrations of individual parameters in the water samples collected in September 2014 were similar to, or less than, the concentrations presented in the DAR (Annex IX, Appendix A) that were derived from sampling in September 2014. An additional round of sampling is also planned for the spring of 2015. Results of these additional sampling events will provide a check on the values assumed in the DAR that will be used in the detailed design of the water management facilities and development of the groundwater monitoring plan**.**

References:

Golder (Golder Associates Ltd.). 2014. Dominion Diamond Jay Project September 2014 Westbay System Sampling Program. Reference No. 1313280041-E14073-TM-Rev0-2010. February 3, 2015.

DOMINION DIAMOND

Information Request Number:	DAR-GNWT-IR-11
Source:	Government of Northwest Territories – Lands: Paul Mercredi
Subject:	Project impacts on hydrogeology and effects assessment
DAR Section(s):	8.6, Appendix 8A, Appendix 8B

Preamble (GNWT):

As discussed in the Section 8.6 of the DAR, a major underlying assumption in the predictions for water chemistry of effluent pumped from the Misery Pit to Lac du Sauvage during operations, and the water quality in both Misery and Jay Pits at closure, are the estimated values for groundwater inflow rates and the associated TDS concentrations at the Jay Pit during mining. Due to the lack of available data for model calibration or history matching, and the limitations associated with the sensitivity study presented for the 3D hydrogeological model, there is potential uncertainty regarding the performance of numerical models which have been used to develop predictions for project impacts. Although some discussion regarding the level of confidence and uncertainty is provided in this section and within the 3D and 2D hydrogeological model reports (Appendix 8A and 8B), there are some inconsistencies between model input parameters used (see IR#6) and unclear rationale as to why certain assumptions used in the modeling or a model simulation case (EA Conservative Scenario) have been determined to represent a "sufficient level of conservatism to provide a high level of confidence that the effects of the environment have not been underestimated". Discussion presented within the DAR outlined that the presence of permafrost and the absence of identified transmissive structures between Misery Pit and Lac de Gras provide natural protection against lateral seepage that would affect Lac de Gras. It is unclear what geological and hydrogeological characterization activities have been completed to confirm this assumption. No description of the level of confidence and/or uncertainties associated with this prediction appears to be provided. Additionally, it is unclear if this prediction for mass loading to Lac de Gras has been represented in the site water quality model (Appendix 8E). Water quality model predictions for Lac de Gras have represented estimated chemical loading inputs from the Panda and Koala Pits, but this appears to have been done only for the surface water pathway. Discussion of the potential impacts to groundwater quality at the Panda and Koala Pits from deposition of fine processed kimberlite originated at Jay Pit outlines that, "seepage quantities from the back-flooded pits to the deep groundwater regime are expected to be small, with travel times to Lac de Gras on the scale of hundreds of years". It is unclear what quantitative analysis was completed to develop these predictions, and no discussion regarding prediction confidence and uncertainty was apparent. This was rated to be a secondary pathway and no further analysis as part of the overall site water quality modelling was completed.

Request (GNWT):

GNWT requests that DDEC provide the following:

a) Provide a quantitative assessment of the level of confidence, and uncertainty associated with hydrogeological predictions for the Jay Pit, and potential implications to the residual effects analysis which has been presented in the DAR.

b) Provide predictions for seepage rates and quality from the Misery Pit (to groundwater) during operations and the expectations for deep groundwater discharges to Lac de Gras. Discuss how groundwater impacted by the Misery Pit during late operations through post closure was represented within the Lac de Gras water quality modelling.

c) Outline any planned hydrogeological characterization or monitoring activities expected to occur at the Misery Pit area to refine and/or confirm these initial predictions.

d) Provide explanation of the prediction confidence and uncertainty regarding seepage rates and quality from the Misery Pit to Lac de Gras through an appropriate post closure timeline.

e) Provide an explanation of the quantitative analysis completed to assess the effects of fine processed kimberlite deposition within the Panda and Koala Pits on the surrounding groundwater, and the potential for impacts to down gradient surface water quality. Include a description of the applicable prediction confidence and uncertainty.

Response:

a) Sensitivity simulations presented in Table 8A3-6 in Appendix 8A (Section 8A3.7) of the Developer's Assessment Report (DAR) provide a quantitative assessment of the uncertainty of the model predictions. These results demonstrate that the quantity of groundwater reporting to the pit is most sensitive to the hydraulic conductivity and assumed extent of the enhanced permeability zone (EPZ); whereas, the groundwater quality is most sensitive to these parameters and the baseline total dissolved solids (TDS) profile in groundwater.

Because of the difficulty in identifying the presence, extent, and hydraulic properties of an EPZ in advance of mining as evidenced by experience at other mines and the limited number of analogue sites (Annex IX, Section 4.4), it would not be meaningful to assign a quantitative probability for the likelihood of such a zone being encountered or for the properties of such a zone. Instead, a conservative approach has been employed where an EPZ is assumed to be present. This approach is considered to be appropriate for the conservative determination of effects on the aquatic environment.

The Reference Case is conservative, but less conservative than the Environmental Assessment (EA) Conservative Scenario (as presented in Appendix 8A, Section 8A4) which has been used in the resulting assessment of effects to water quality and quantity presented in Section 8 of the DAR. The EA Conservative Scenario provides a high level of confidence that the effects on the environment have not been underestimated. The EA Conservative Scenario predicts 60 percent (%) greater inflow and a 60% greater mass loading than the Reference Case at the end of mining.

b) As stated in Section 3.2 of Appendix 3A (Mine Water Management Plan), groundwater seepage to the Misery Pit is assumed to be negligible for the purpose of estimation of the annual water volume exchanges during operations. As stated in Section 8.2.1.2.4 of the DAR, groundwater inflow observed during mining of the Misery Pit has been relatively low at less than 300 cubic metres per day (m^3/day; 110,000 cubic metres per year [m^3/yr]) as the upper walls of the Misery Pit are surrounded by permafrost (SWS 2010), and the pit is being advanced in low hydraulic conductivity rock (Klohn Crippen 2004). In contrast, for the Jay Project, the minewater to be directed to the Misery Pit is

predicted to range from 10,600 m^3/day (3,900,000 m^3/yr) during dewatering up to 28,500 m^3/day (10,400,000 m^3/yr) in Year 10 (2029) as presented in Table 6-1 of Appendix 3A. Furthermore, groundwater inflows to the Misery Pit will decrease from those observed during mining as the pit is refilled and the hydraulic gradients in the pit walls decrease.

Groundwater seepage from the Misery Pit at post-closure was evaluated using the Misery Pit Lake Post-Closure model described in Appendix 8C of the DAR. As stated in Section 8C1.2, this model was carried out to achieve two objectives: to evaluate pit lake/deep groundwater exchange, and to assess the potential pathway between the Misery Pit and Lac de Gras at post-closure. The predictions of this model described in Section 8C4 were incorporated in the water quality modelling described in Appendix 8E and 8G.

c) As presented in the DAR Annex IX and Appendix 8C, previous hydrogeological and permafrost investigations carried out at the Misery Pit have included installation of thermistors, hydraulic testing, pit seepage surveys, and monitoring of groundwater inflow to the open pit during mining. Groundwater inflow will continue to be monitored as the pit is advanced. Mining of the Misery Pit is anticipated to continue until 2017 or 2018 as stated in Section 3.4.1.4.2 of the DAR. Because of the scale and magnitude of the hydraulic disturbance caused by mining, monitoring of groundwater inflow in the open pit provides a robust and complete observation of actual conditions. Additional hydraulic testing would be representative of hydraulic conditions on a much smaller scale, and therefore, would not add substantially to the hydrogeological characterization.

   During Jay Project operations, minewater monitoring will be conducted as part of the overall minewater management (i.e., Surveillance Network Program).

d) Similar to the approach taken in prediction of hydrogeologic conditions for the Jay Pit during mining and post-closure (described in part a. above), a conservative approach has been employed in the prediction of hydrogeological conditions in the area of the Misery Pit. This approach has been taken to provide a high level of confidence that effects to the environment have not been underestimated. As presented in the Appendix 8C of the DAR, the model conservatively assumes that most of the historical inflows originated from an EPZ which is conservatively assumed to extend southeast from the Misery Pit to Lac de Gras. This EPZ is assumed to provide an enhanced connection between the Misery Pit and Lac de Gras. As described in part a. above, this approach is considered to be appropriate for the conservative determination of effects on the aquatic environment.

e) The fine processed kimberlite will be deposited to a maximum elevation of 30 metres (m) below the final overflow, and will be overlain by a 30 m freshwater cap (Appendix 3B of the DAR). The Panda Pit and Koala Pit are surrounded by permafrost with an estimated depth of greater than 300 m below ground surface (Annex IV); therefore, any groundwater quality effects on surrounding lakes will require migration below permafrost into the deep groundwater flow regime. Both the Panda and Koala pits are connected to the deep groundwater flow regime below permafrost through the taliks beneath the lakebeds of the former Panda and Koala lakes, and underground workings developed in the kimberlite beneath the open pits.

   Generally, deep groundwater will flow from higher elevation lakes with taliks to lower elevations lakes with taliks. However, these hydraulic gradients will be countered by density gradients which will

oppose the migration of lower density water from the lakes downward into the higher density waters of the deep groundwater flow regime beneath permafrost. The Panda and Koala pits are surrounded by a number of nearby lakes which include: Bearclaw Lake (474 metres above sea level [masl]), Vulture Lake (475 masl), Grizzly Lake (468 masl), Upper Panda Lake (460.4 masl), Polar Lake (463 masl), and Kodiak Lake (451 masl). Kodiak Lake is the nearest lake that has a lower elevation than the water levels in the Panda (453 masl) and Koala (453 masl) pits at closure.

Analytical equations were used to quantitatively assess the gradients and travel times between the Panda and Koala pits conservatively neglecting the effect of density gradients. As stated in Section 8.4.2.4.2, seepage from the back-flooded pits would occur primarily along structural discontinuities. During mining in the Koala Pit, an EPZ associated with the NE-SW trending Lake Fault was identified and hypothesized to provide a hydraulic connection between the Koala Pit and Kodiak Lake (Klohn Crippen 2006). The fault was estimated to have a hydraulic conductivity of 1×10^{-6} m/s. The hydraulic gradient between the Koala Pit and Kodiak Lake is estimated to be 0.002 m/m, and the distance between the bottom of the Koala Pit and Kodiak Lake is approximately 900 m (600 m laterally and 300 m vertically). Assuming the Lake Fault and associated EPZ extend to 400 m depth at 50 m width, the estimated groundwater flux from the Koala Pit to Kodiak Lake is 1 m^3/d. Under this conservative hypothesis, groundwater flux to Kodiak lake would be negligible compared to the surface water hydrologic regime (i.e., would not have a discernible water quality effect).

Therefore, as stated in Section 8.4.2.4.2 of the DAR, seepage from these pits and the associated groundwater velocities will be low relative to surface water inputs.

References:

Klohn Crippen. 2004. Ekati Mine Hydrogeological Evaluation of Misery Pit and Underground. File: M08788 07.500.

Klohn Crippen. 2006. Ekati Mine 2005 Koala Feasibility Report Underground Mine Dewatering Final Report. File: A03040A02.500.

SWS (Schlumberger Water Services [Canada] Inc. 2010. Misery Resource Development Definition Study – Feasibility, Hydrology and Hydrogeology. Submitted to BHP Billiton Diamonds Inc.

DOMINION DIAMOND

Information Request Number: DAR-GNWT-IR-13

Source: Government of Northwest Territories – Lands: Paul Mercredi

Subject: Dike Construction Approach

DAR Section(s): 3.5.3.1 (Figure 3.5-1)

Preamble (GNWT):

Section 3.5.2.1 discussed the proposed approach for the development of the Jay open pit which requires the construction of a water-retaining dike (Jay Dike) that will isolate the local portion of Lac du Sauvage overlying the Jay pipe. Reference was made to the construction approach for the Diavik Mine dike and the Meadowbank Mine dike as follows: “The Project design concept for an isolation dike is similar to the approach used at the Diavik Mine, including a semi-circular ring dike extending from shoreline, with a cross-section and construction technique similar to that used at the Meadowbank Mine”. The construction approaches for the Diavik and Meadowbank mine dikes are described as: “The Diavik Mine dike design requires the use of specialized equipment. Construction would include dredging the dike footprint, placement of a granular filter layer on the dredged area from a barge, advance of a zoned rockfill shell, densification of the fill by vibrodensification, installation of a plastic concrete diaphragm wall down the centerline of the dike in panels using slurry wall excavation techniques with a hydrofraise, boulder removal, and finally jet grouting the contact between the plastic concrete wall and the bedrock.
The Meadowbank Mine dike design requires common construction equipment. Construction includes placing a broad rockfill shell along the dike alignment (no dredging), excavation of the central portion of the rockfill, advance of a zoned core into the excavation from the crest of the dike, densification of the core, slurry wall construction along a centreline to create a soil cement bentonite cut-off wall, and grouting of the contact between the bedrock and the cut-off wall. The Meadowbank Mine dikes extend from shore to islands and back again to allow dewatering of a larger area. The dike construction, grouting, and instrumentation are described in Esford et al. (2013), Bonin et al. (2013), and Esford and Julien (2013).”
The Jay Project conceptual dike design is described to include the following general components “a broad rockfill shell; a central zone of crushed granular fine and coarse filters; a composite low-permeability element along the centreline of the dike; cement soil bentonite cut-off wall; jet grouted columns extending from the base of the cement soil bentonite cut-off wall to the bedrock contact in locations where bedrock is deeper; and, grouting of the shallow bedrock and the contact between the bedrock and cut-off wall.”
It is not clear if the approaches and construction techniques proposed for the Jay Project are more similar to the Diavik Mine dike or the Meadowbank Mine dike. For example and without limitation, the Proponent notes “The Diavik Mine dike design requires the use of specialized equipment. Construction would include dredging the dike footprint ...”; however, no dredging is mentioned in the proposed conceptual dike design for the Jay Project.

Request (GNWT):

GNWT requests that DDEC describe in additional detail the conceptual design and construction techniques that apply specifically to the Jay-Pipe dike, including but not limited to: equipment, geometry and sequence of placement and densification of the various fill materials and layers shown on Figure 3.5-1, and cut-off walls/grouting methods for the impermeable core. Where applicable, inform how

the Jay-Pipe dike design and/or construction techniques are similar to the Diavik and/or Meadowbank Mine dikes. This information will provide a better means for understanding the requirements and constructability of the Jay Pipe dike.

Response:

Construction of water retaining dikes to isolate portions of a lake, for dewatering and open pit extraction of ore has been successfully completed in Arctic conditions, at both the Diavik Mine and Meadowbank Mine.

The Developer's Assessment Report (DAR) was prepared based on the conceptual design for the Jay Dike. A pre-feasibility design for the Jay Dike has now been completed (included in Appendix E) and is submitted along with the response to the Information Requests to provide additional details regarding:

- site conditions, including information about dike foundation soils and bedrock;
- design criteria
- Dike design and drawings;
- construction materials;
- construction method and sequence;
- analysis;
- turbidity management;
- instrumentation;
- construction schedule;
- construction sequence;
- quantities;
- construction quality assurance and quality control;
- closure and reclamation; and,
- recommendations for future work.

The design included the results of the initial geotechnical investigation carried out during the winter of 2014 (Golder 2014) along with the geophysical investigation conducted during the summer of 2014. The pre-feasibility design for the Jay Dike has similarities to the dikes constructed at both the Diavik Mine and Meadowbank Mine. The sequence of construction for the proposed Jay Dike is similar to that used for construction of the Bay-Goose Dike at the Meadowbank Mine. Between December 9 and December 12, 2014, Dominion Diamond Corporation hosted a series of engagement meetings with communities and regulators to present the Jay Project and provide an overview of the information contained within the DAR. The Project Description component of the presentation provided additional details regarding the Jay Dike design, construction sequence, and methodologies; this presentation (Dominion Diamond 2014) is available on the Mackenzie Valley Environmental Impact Review Board public registry.

A more extensive geotechnical investigation program is currently being carried out to supplement information obtained during 2014. This investigation began on February 18 and is expected to continue until approximately April 15, depending on ice conditions. This information will be used to prepare the detailed design for the dike, along with construction drawings and specifications.

References:

Dominion Diamond (Dominion Diamond Ekati Corporation). 2014. Jay Project Developer's Assessment Report. Project Description and Engineering Presentation. December 2014 http://www.reviewboard.ca/upload/project_document/EA1314-01_02_-_DAR_-_REGULATOR_MEETING_-_Engineering_Project_Description_2014_Dec4.PDF

Golder (Golder Associates Ltd.) 2014. Jay Project Geotechnical and Hydrogeological Factual Investigation Factual Report Vol. 1: Proposed Dikes. Report prepared for Dominion Diamond Corporation. Dated July 23, 2014. Golder Doc. No. 1313280041-E4041a-R-Rev0-2010. Available at: http://www.reviewboard.ca/upload/project_document/EA1314-01_Jay_Dike_Factual_Report_Volume_1_Part_A.PDF

DOMINION DIAMOND

Information Request Number: DAR-GNWT-IR-15

Source: Government of Northwest Territories – Lands: Paul Mercredi

Subject: Dike Construction Activities: Mitigation and Monitoring

DAR Section(s): 10.4

Preamble (GNWT):

The proposed mitigation and monitoring items for dike construction activities included: erosion control measures (Section 10.4.1), prevention of permafrost degradation or growth encouragement (Section 10.4.2), monitoring of geotechnical stability waste rock storage areas (Section 10.4.3), dams and dikes, and adaptive management (Section 10.4.4). Specific to geotechnical monitoring, Section 10.4.3 stated the following: "Monitoring activities will be an extension of existing programs in place at the Ekati Mine as required under the Water Licence. The Jay WRSA will be constructed as designed, which provides for long-term physical stability. Ground temperature cables will be installed in Jay WRSA and will be used to monitor permafrost. Seepage water quality will be monitored twice per year (spring and fall) as part of the annual seepage surveys. Geotechnical instrumentation will be installed within the Jay dike structure and foundation to monitor the performance of the dike during dewatering and operation. The instrumentation will monitor the physical performance of the dike to confirm that the structure is operating according to the design intent. Monitoring with the instrumentation will be continued into back-flooding and closure until the dike is breached at closure." Limited details appear to have been included regarding the typical geotechnical instrumentation that is proposed to monitor various site infrastructure. It is important to include the type of geotechnical information needed to make decisions on the performance and stability of the structures.

Request (GNWT):

GNWT requests that DDEC provide additional information on the types of geotechnical instrumentation and data collection proposed for the Project and how it would be used to determine the performance and stability of structures.

Response:

The Jay Project (Project) waste rock storage area (WRSA) does not need to be frozen to maintain physical stability or for geochemical management; however, a frozen condition within the WRSA is beneficial and will be promoted.

As with the other WRSA at the Ekati Mine, thermistors will be installed in the Jay WRSA after completion of the pile to monitor temperatures in the pile and foundation.

Following the existing Ekati Mine Waste Rock and Ore Storage Management Plan [WROMP] Ver. 4.1, provided to the Wek'èezhìi Land and Water Board (WLWB) as part of the Water Licence requirements for the Pigeon WRSA Design (Dominion Diamond 2014), seepage surveys of all WRSAs and ore stockpiles at the Ekati Mine are conducted twice a year (during spring freshet, and again in late summer or fall before freeze-up). The sampling of seepage and associated geochemical testing is designed to detect

changes that may affect the receiving environment. The Jay WRSA will be added to the Ekati Mine WROMP and will be included in these seepage surveys.

The pre-feasibility design for the Jay Dike describes the types of geotechnical instrumentation proposed, typical design details, and outlines how data from these instruments would be used to assess dike performance (Appendix E). The types of instrumentation proposed are as follows:

- vibrating wire piezometers;
- thermistor strings;
- inclinometers;
- survey monuments; and,
- weirs or other suitable devices to measure seepage.

In addition, blast vibration monitoring at select locations would also be conducted.

Vibrating wire piezometers will be used to measure pore pressures and temperatures at select elevations within the embankment, foundation, and shallow bedrock. These instruments will be located upstream and downstream of the low permeability element within the dike.

Thermistor strings will be installed within the low-permeability element and shallow bedrock and will measure the thermal profile variation.

Inclinometers may be installed within the low permeability element of the dike and would be used to monitor lateral deformation.

Survey monuments may be installed to measure surficial movement.

Weirs or other suitable devices would be installed following dewatering, at select locations, to measure the rate of seepage.

An Operation Maintenance and Surveillance manual will be developed as part of the detailed design for the Jay Dike and would be implemented prior to the initiation of dewatering. This document will provide further details regarding the recommended monitoring frequency for the instrumentation. A preliminary instrumentation plan and profile will be provided as part of the detailed design. Finalization of the exact instrument installation locations and depths would be made, by the engineer, following construction and grouting works to target specific areas base on conditions encountered in the field.

References:

Dominion Diamond (Dominion Diamond Ekati Corporation). 2014. Ekati Diamond Mine Waste Rock and Ore Storage Management Plan. Version 4.1, May 2014.

DOMINION DIAMOND

Information Request Number:	DAR-GNWT-IR-16
Source:	Government of Northwest Territories – Lands: Paul Mercredi
Subject:	Dike Monitoring
DAR Section(s):	3

Preamble (GNWT):

The nearby Diavik site is frequently cited within the DAR to support various design approaches/decisions. The Rio Tinto Diavik diamond mine conducts dike monitoring programs for existing dikes and is also required to monitor dike related effects for the newest dike (A21).

Request (GNWT):

GNWT requests that DDEC provide an outline of the intended dike monitoring program for the proposed Jay Pipe dike during and following construction. Note the two programs will be designed for different purposes.

Response:

The requirement for monitoring programs during and following construction of the Jay Dike were identified in the pre-feasibility design of the Jay Dike (Appendix E). A quality assurance and quality control (QA/QC) plan is an integral part of the construction process to confirm the construction is to the specified quality, and that the owner has an assurance the structure has been constructed in accordance with the design intent. The QA/QC plan will be outlined in the technical specifications, completed as part of the detailed design, and will be implemented by the contractor and engineer's representative.

An Operation Maintenance and Surveillance (OMS) manual will be prepared as part of the detailed design, and will be updated and implemented prior to the initiation of dewatering (Golder 2014). An OMS manual defines the appropriate levels of monitoring and visual inspections during different phases of operation (e.g., dewatering, operations, closure) (CDA 2014).

References:

CDA (Canadian Dam Association). 2014. Application of Dam Safety Guidelines to Mining Dams.

DOMINION DIAMOND

Information Request Number:	DAR-GNWT-IR-17
Source:	Government of Northwest Territories – Lands: Paul Mercredi
Subject:	Jay-Pipe Pit Geometry
DAR Section(s):	3, 3.5, 3.5.4.1 (Map 3.5-4 and 3.5-2)

Preamble (GNWT):

Section 3 of the DAR outlined the conceptual design of the various components specific to the Jay Project. In Section 3.5, discussion was presented that details the conceptual design of the various components specific to the Jay Project during the construction phase (Map 3.5-1) and operations phase (Map 3.5-2). The Pit geometry and preliminary stable slope configurations are outlined in Section 3.5.4.1. The information presented provides limited discussion pertaining to the following: - Whether freeze-thaw effects were taken into consideration in the stability assessment of the Pit walls. Based on a preliminary review of the data, it appears the freezing and thawing index may be on the order of 5,000 deg-days and 2,000 deg-days, respectively; however these indices are not presented in the DAR. - The stability and shape of the overburden (lake sediments) located between the excavated Jay Pit and the toe of the dike.

Request (GNWT):

GNWT requests that DDEC provide the following:

a) Describe how freeze-thaw of the pit walls was taken into consideration in the stability assessment of the excavated Jay Pit walls. Provide further discussion regarding freeze-thaw effects as well as the effects of a frozen face on the rock permeability and Pit infiltration rate/volume.

b) Provide an estimate of the freeze-thaw depths during operation of the Jay Pit.

c) With regards to Section 10.4 of the DAR (mitigation and monitoring), provide a description of the proposed actions, mitigations and monitoring associated with the effects of freeze-thaw on the stability of the of the Jay Pit walls.

d) Provide additional information on the slopes and stability of the overburden (lake sediments) located between Jay Pit and the toe of the dike once the area has been dewatered and describe how the lake sediments will be shaped.

Response:

a) Describe how freeze-thaw of the pit walls was taken into consideration in the stability assessment of the excavated Jay Pit walls. Provide further discussion regarding freeze-thaw effects as well as the effects of a frozen face on the rock permeability and Pit infiltration rate/volume.

During mine operation, freeze-thaw cycles are expected to have a minimal impact on the pit wall stability and will be limited to the surficial portion of the rock walls. At a later stage in the design process, a ground control management plan will be developed and implemented to monitor and maintain pit wall stability to an acceptable risk level associated with various forms of ground instability that may develop during operations. In addition, thermistors will be installed to supplement the monitoring program, if deemed necessary.

Ice walls do develop in some pits during mining; however, the development of such structures, their extent, their stability and any potential impact to safety, are site specific. Infiltration rate into pits is one factor that determines if an ice wall may form. If infiltration rates are relatively low, seasonal freezing is more likely to occur, in comparison to if infiltration rates are high. It is standard practice that mining operations continually evaluate pit wall conditions and mitigations or modifications are implemented, as necessary, as part of the ground control management plan.

b) Provide an estimate of the freeze-thaw depths during operation of the Jay Pit.

The Permafrost Baseline Report (Annex XIV of the Developer's Assessment Report [DAR]) for the Jay Project presents historical data for the area; the locations of thermistor installations are summarized on Table 4.2-1 and are presented on Map 4.2-1, and Appendix A contains graphical presentations of the thermistor data. In the Misery Pit area, the active layer varies between 1 metre (m) and 2.7 m (Section 3 of Annex XIV). Active layer refers to the upper soil and/or bedrock that annually thaws and refreezes. It is anticipated that the active layer on the islands and shore of Lac du Sauvage will be similar to that measured near the Misery Pit. Several thermistors were installed as part of the 2014 geotechnical investigation program. Initial data obtained from these thermistor locations are presented in the Jay Project Geotechnical and Hydrogeologic Field Investigation Factual Report (Volume 1: Proposed Dikes; Golder [2014]). In Volume 1, Figure 3 presents the location of the thermistor installations and Appendix D contains the initial data. Additional thermistors are planned to be installed as part of the ongoing investigations. The depths of the freeze-thaw layer in the proposed Jay Pit are expected to be of the same order of magnitude as those measured on the shore and on islands in Lac du Sauvage. However, these depths will locally vary depending on the pit wall exposure, structural geology, and hydrogeologic conditions.

c) With regards to Section 10.4 of the DAR (mitigation and monitoring), provide a description of the proposed actions, mitigations and monitoring associated with the effects of freeze-thaw on the stability of the of the Jay Pit walls.

A ground control management plan will be developed and implemented to monitor and maintain pit wall stability to an acceptable risk level associated with various forms of ground instability that may develop during operation of the Jay Pit, including potential rock falls induced by free-thaw cycles. In addition, thermistors will be installed to supplement the monitoring program, if deemed necessary.

d) Provide additional information on the slopes and stability of the overburden (lake sediments) located between Jay Pit and the toe of the dike once the area has been dewatered and describe how the lake sediments will be shaped.

The overburden thicknesses encountered in the Jay Pit diamond and sonic boreholes during the 2014 field investigation are summarized in Table 17-1.

Table 17-1 Summary of Jay Pit Overburden Thickness

Borehole ID	Overburden Thickness[a] (mah)	Borehole Inclination[b] (°)	Overburden Thickness[a] (vmbgs)
JGT-01[c]	4.7	80	4.6
JGT-02[c]	3.2	70	3.0
JGT-03[c]	4.5	70	4.2
JGT-04[c]	19.6	70	18.4
JGT-05[c]	3.9	70	3.6
JGT-06[d]	5.9	80	5.8
JGT-07[c]	6.4	90	6.4
JSD-01[d]	16.0	90	16.0
JSD-02[d]	8.9	90	8.9

a) Overburden thickness is the difference between the top of sediments and the top of bedrock.

b) Inclination is the angle below the horizontal; i.e., 90° = a vertical hole.

c) Overburden thickness calculated from data collected by Golder personnel.

d) Overburden thickness calculated from data provided by Dominion Diamond.

ID = identification; mah = metres along hole, relative to ground (or ice) surface; ° = degree; vmbgs = vertical metres below ground surface.

An additional geotechnical investigation is being carried out in 2015; these data will be used to supplement the information presented above and used in preparing the detailed design. Overburden materials consist of varying thicknesses and distributions of: lakebed sediment, glacial lacustrine, glacial fluvial and glacial till.

The overburden materials excavated above the Jay Pit, near the crest are planned to be sloped at an angle of 33°. In areas where the overburden thickness exceeds 10 m, the following bench configuration will be implemented, based on the pre-feasibility pit design:

- bench height: 10 m;
- catch berm width: 9.5 m;
- bench face angle: 60°; and,
- inter-ramp angle: 33°.

Additional information regarding overburden materials will be collected as part of the 2015 investigation program. This information will be incorporated into the detailed design for the pit. A ground control management plan will be developed and implemented to monitor and maintain pit wall stability. This will include stability of the overburden materials. Modifications to the proposed overburden slopes will be implemented, if required to maintain stability, based on conditions encountered during mining operations.

References:

Golder (Golder Associates Ltd.) 2014. Jay Project Geotechnical and Hydrogeological Field Investigation Factual Report Vol 1: Proposed Dikes, Part A. Submitted to Dominion Diamond Ekati Corporation. July 23, 2014. http://www.reviewboard.ca/upload/project_document/EA1314-01_Jay_Dike_Factual_Report_Volume_1_Part_A.PDF

DOMINION DIAMOND

Information Request Number: DAR-GNWT-IR-18

Source: Government of Northwest Territories – Lands: Paul Mercredi

Subject: Geotechnical Stability and Climate Change

DAR Section(s): 10.3.1, Annex IV, Annex X (Appendix B)

Preamble (GNWT):

Section 10.3.1 presented a comprehensive analysis of climate data, namely temperature and precipitation based on database records. Reference is given to Annex X – Appendix B (Derived Climate Data) and Annex IV (Permafrost Baseline Report). Projected climate changes with respect to the rate of predicted temperature increase for the future are discussed. A 100-year climate warming scenario was integrated into the modelling to help predict long-term thermal effects. Soil thermal properties were determined indirectly from correlations based on published soil index properties. Permafrost regime changes, on-land thermistors data, and estimates of permafrost thickness below the bottom of the lake as well as islands in the lake (Lac du Sauvage) are presented. The proposed dike alignment crosses these islands. The effects of permafrost degradation beneath the proposed dike and predictions for the active layer at the proposed waste rock pile using thermal analysis modeling are also discussed. No data for freezing/ thawing indices are presented or discussed within the DAR. The freezing/thawing indices provide useful information to predict permafrost distribution, thaw depth in frozen ground and aid in the engineering design.

Request (GNWT):

GNWT requests that DDEC provide the freezing/thawing indices data for the following periods: historical, current, and future “predicted” in response to climate change.

Response:

The historical, current, and predicted freezing and thawing indices were calculated and are summarized in Table 18-1, below.

Table 18-1 Calculated Freezing and Thawing Indices

Period	Annual Freezing Index (degrees Celsius days)	Annual Thawing Index (degrees Celsius days)
Average from derived historical daily air temperature data between 1959 and 2013 (refer to Annex X, Hydrology Baseline Report of the Developer’s Assessment Report [DAR])	4,628	1,108
Year 2013	4,698	1,324
After a climate change condition which considers a 5.6 degrees Celsius air temperature increase over 100 years (refer to Annex IV, Permafrost Baseline Report of the DAR).	3,108	1,762

DOMINION DIAMOND

Information Request Number: DAR-GNWT-IR-19

Source: Government of Northwest Territories – Lands: Paul Mercredi

Subject: Permafrost Baseline

DAR Section(s): Annex IV

Preamble (GNWT):

The Permafrost Baseline Report (Annex IV) described the existing permafrost conditions at the Project site. It intends to characterize the permafrost and active layer conditions at the site (including thermal conditions and ground ice/moisture contents of underlying material) and describe the relationship between the permafrost, active layer conditions and the groundwater regimes. Theoretical modeling of the critical depth to permafrost and formation of open taliks under Lakes are presented; however a comparison of the theoretical results to measured data in the vicinity of the Jay Pit is not provided. Reference to thermistors temperature profile data (Appendix A) are given for the Misery Pit zone but this data does not represent temperature profiles below the bottom of a lake. There is no reference to temperature profile data (thermistors profiles) in the zone of the proposed Jay Pit. It is reported in Section 3.3.3 that "a geotechnical and hydrogeological field investigation was carried out in the Jay pipe area from February to May 2014 (Golder 2104b,c,d)" during which deep thermistors were installed to collect ground temperature data with depth and time. In July 2014, Golder Associates submitted to Dominion Diamond Ekati Corporation a factual geotechnical and hydrological field investigation report. In volume 1, titled "Proposed Dikes", it is stated that seven thermistors cables were installed (on one of the islands along the proposed dike trajectory) to record the ground temperature over depth and time. Initial readings were taken in the months of installation (March and April 2014). DDEC has likely continued the collection of the thermistor data. No thermistor cable installations are mentioned in volume 2 of the factual geotechnical and hydrological field investigation report, titled "Proposed Jay Pit area"; It is unclear if thermistors were installed in the in-lake geotechnical holes drilled at the Jay Pipe area.

Request (GNWT):

GNWT requests that DDEC confirm if any thermistor cables were installed within the in-lake geotechnical holes drilled at the Jay Pipe area. If so, DDEC should provide a comparison of the theoretical temperature profile data for the Jay Pipe area to the measured temperature profile data.

Response:

No thermistor cables were installed within the in-lake geotechnical holes drilled in the Jay Pipe area during the 2014 investigation program. Long-term maintenance of any in-lake thermistor cables in the Arctic, to provide annual thermal data, is challenging due to ice formation and ice movement.

Seven thermistor cables were installed on land during the 2014 geotechnical investigation program. These thermistor cables were installed within diamond drill holes on abutments for the proposed dikes as summarized in Section 3.3 of the dike factual report (Golder 2014). The 2014 geotechnical drilling program was initiated to investigate the foundation conditions for the proposed dikes associated with the

Jay-Cardinal Project. However, during the investigation program, the project was switched to focus only on the Jay kimberlite pipe (Jay Project). This resulted in additional holes being drilled proximal to the Jay kimberlite pipe. Only two of the thermistors installed during the 2014 program are located near the Jay Dike. They are both located on the largest of the islands that the Jay Dike is proposed to cross, near the Westbay Well which was installed in borehole JGT-06 (Golder 2014). One thermistor cable was installed to measure thermal conditions in the upper 23 metres (m) of the soil/bedrock (JGT-07). The second thermistor cable was installed to measure the deeper thermal conditions, within bedrock between 26 m and 247 m below the ground surface. Based on the initial data obtained from these thermistors, in April and May 2014, the depth of the permafrost was interpreted to be about 140 m below ground surface. Unfortunately, the deep thermistor installed JGT-01 has stopped functioning; therefore, no additional data have been gathered for this location (Golder 2014). Graphs of the initial thermal data collected are contained in Appendix D of Golder (2014).

The depth of the active layer on this island is less than 2.4 m; based on 2014 data, the warmest temperature recorded at the first thermistor bead (at a depth of 2.4 m below ground surface) was -1.03 degrees Celsius (°C) on December 13, 2014. The coldest temperature recorded, following installation (April 11, 2014) and instrument stabilization, was -7.7°C, and the average temperature was -1.7°C. As expected, at a depth of approximately 23 m below ground surface, the temperature was more consistent with the warmest temperature being -2.8°C and the coldest being -3.4°C, and an average temperature of -3.3°C. A complete annual cycle of thermal data has not yet been gathered. Thermistors installed near the Misery Pit area indicate the active layer varies between 1 and 2.7 m (Permafrost Baseline; Annex IV of the Developer's Assessment Report). Thermal conditions in the Jay Pit area are anticipated to be similar to those in the Misery Pit area.

Additional thermistor cables are planned to be installed as part of the ongoing 2015 geotechnical investigation program that commenced on February 18, 2015 and is expected to continue until April 15, 2015, depending on ice conditions.

References:

Golder (Golder Associates Ltd.) 2014. Jay Project Geotechnical and Hydrogeological Factual Investigation Factual Report Vol. 1: Proposed Dikes. Report prepared for Dominion Diamond Corporation. Dated July 23, 2014. Golder Doc. No. 1313280041-E4041a-R-Rev0-2010.

DOMINION DIAMOND

Information Request Number:	DAR-GNWT-IR-20
Source:	Government of Northwest Territories – Lands: Paul Mercredi
Subject:	Jay Project Geotechnical and Hydrogeological Field Investigation Factual Report.Volume 1: Proposed Dikes
DAR Section(s):	Not Applicable

Preamble (GNWT):

The 2014 field geotechnical investigation program for the proposed dikes, completed between February and April 2014 by Golder Associates, included a total of 26 sonic and 22 diamond drilled boreholes along the proposed dike alignments. Eight of the boreholes were drilled on land and 40 from the frozen surface of Lac du Sauvage. Lake sediments/lakebed till was sampled during drilling with the Sonic equipment, while diamond drilling was used to drill and sample bedrock. Geotechnical laboratory tests were performed by Golder on selected reconstituted soil samples obtained from the soil cores retrieved from the sonic drilling. In addition, typical soil classification laboratory testing was completed, but limited to hydraulic conductivity, grain size analysis, Atterberg limits, consolidation, and triaxial tests. No unit weights were reported. Water contents were only done on the samples tested for Atterberg limits; no other water contents are reported in the text or borehole logs. Some grain size distributions were done on samples “combined” from different depths. It appears that no in-situ standard shear resistance testing was performed for the lakebed sediments/till during the Jay Dike 2014 site geotechnical investigation (e.g. split spoons, cone penetration, in-situ vane testing). Further to in-situ soil properties that may be obtained, these in-situ tests will provide information on the presence and extent of permafrost near the shorelines of the islands (where the lake depth is of the order of one to two meters) that are on the proposed trajectory of the Jay Dike. Such information will be critical to contractors who will excavate the lake bottom sediments and/or install the cut-off wall for reducing permeability of the dikes using grouting techniques.

Request (GNWT):

GNWT requests that DDEC provide the following:

a) Provide Figure 4 titled “Bedrock Geology” which was not found in the document.

b) On the borehole log JP5-SD-09, the soil layer represented by samples 04 and 05 is interpreted as sandy gravel with trace of silt. However, Figure 19 shows the grain size distribution for a combined sample 04 and 05 of borehole JP5-SD-09. The analysis indicates that the sample consists of 90% fines (silt and clay). Provide confirmation of these results.

c) In Sections 4.1.2 (for the lake sediments) 4.1.3 (for the competent soil), triaxial testing carried out on composite samples from different boreholes and depths is discussed. Consolidation tests were carried on both soil types (lake sediments and competent soil) and on samples reconstituted to some initial density. Provide the reason why triaxial testing was completed on composite samples, and describe the reliability of the triaxial and consolidation test results for design.

Response:

The following responses are provided:

a) Figure 4 from Golder (2014) was inadvertently omitted from the PDF version of the document that was submitted to the Mackenzie Valley Environmental Impact Review Board website. The file has been updated on the website and included in Attachment A for reference.

b) The record of borehole for JP5-SD-09 indicates soil sample 4 (8.6 – 8.9 metres [m] below ice surface) and soil sample 5 (10 – 10.3 m below ice surface) were combined for testing. Both samples were collected from a unit that was interpreted to be continuous and was described as:

- (GW) sandy GRAVEL, trace silt, well graded, presence of some cobbles, moist, and dense.

Figure 19 from Golder (2014) depicts particle size distribution results for a variety of samples, including JP5-SD-09 (combined sample 4 and sample 5) as green triangles. This particle size distribution is consistent with the description provided on the record of borehole log. Table 6 and Table E1 from Golder (2014) indicate the sample contained 62 percent (%) gravel, 32.6% sand, and 5.4% fines, by mass.

The sample on Figure 19 with approximately 86% fines (silt and clay) is from borehole JP5-SD-08 combined samples 4 and samples 5.

c) Collection of undisturbed samples of both soft sediments and granular type materials from boreholes drilled below a lake is challenging and generally not possible without specialized equipment and at a significant expense. The decision was made to collect disturbed samples utilizing a sonic drill rig for the purpose of the geotechnical investigation and laboratory testing program. Samples were collected during the investigation program and shipped to the laboratory in bulk containers which were subject to freeze/thaw during transport. Upon receipt of the samples at the laboratory, individual sample gradations were verified and triaxial testing was carried out on combined samples with similar characteristics. Combined samples were used to provide a sufficient volume of material to a conduct the testing. A range of effective stresses consistent with the anticipated design loadings were selected for conducting the tests.

Triaxial testing was carried out on a composited sample of the material interpreted to be lakebed sediment which was obtained from the following boreholes:

- JP5-SD-01 (sample 1, 6.2 – 6.4 m below ice surface): (CL-ML) SILTY CLAY – CLAYEY SILT, some sand, grey, cohesive, water content >plastic limit, very soft;
- JP5-SD-05 (sample 1, 10 – 10.2 m below ice surface): (CL-ML) SILTY CLAY – CLAYEY SILT, some sand, grey, cohesive, water content >plastic limit, soft; and,
- JP5-SD-07 (sample 1, 10 – 10.2 m below ice surface): (CL-ML) SILTY CLAY – CLAYEY SILT, some sand, grey, cohesive, water content >plastic limit, soft.

The description from each of these samples as recorded on the record of boreholes (Golder 2014, Appendix A) and provided above, is very similar. Prior to selecting samples for testing, they were visually reviewed in the laboratory. Material composited is considered to be representative of lakebed sediments. Densities obtained in the laboratory are not considered to be representative of site conditions, and thus, the resulting triaxial friction angles are considered to represent an upper limit of material strength for the samples tested.

One consolidation test was carried out on a sample of lakebed sediment material obtained from borehole JP1-SD-01 (sample 2). Results are considered to be reliable.

As summarized in Section 7.2 of Appendix E (Jay Pre-feasibility Dike Design), two cases for the lakebed sediment properties were assessed within the pre-feasibility design stability analysis for the dike. One case, the expected scenario, assumed the lakebed sediments will be displaced by the rockfill, or incorporated into the rockfill and therefore were not modelled. The second, conservative case, assumed that 1 m of lakebed sediment may exist at the base of the rockfill. For this case, the lakebed sediments were assigned a friction angle of 28 degrees and no cohesion.

Two sets of triaxial tests were carried out on competent soil samples obtained from the 2014 investigation program. The first set of triaxial tests was conducted on material interpreted to be glacial till and described as gravelly clayey sand. Material for testing was obtained from the borehole JP5-SD-02, sample 2 (7 to 7.3 m below ice surface) and sample 3 (8.6 – 8.8 m below ice surface). Sample 2 and sample 3 were obtained from a continuous unit. Prior to selecting samples for testing, they were visually reviewed in the laboratory. Material composited is considered to be similar and representative of the glacial till.

The second set of triaxial tests was conducted on material interpreted to be a glacial lacustrine deposit and described as silty clay. Material for testing was obtained from the borehole JP5-SD-08, sample 4 (16.3 to 16.5 m below ice surface) and sample 5 (17.6 to 17.8 m below ice surface). Sample 4 and sample 5 were obtained from a continuous unit. Prior to selecting samples for testing, they were visually reviewed in the laboratory. Material composited is considered to be similar and representative of the material interpreted to be a glacial lacustrine deposit.

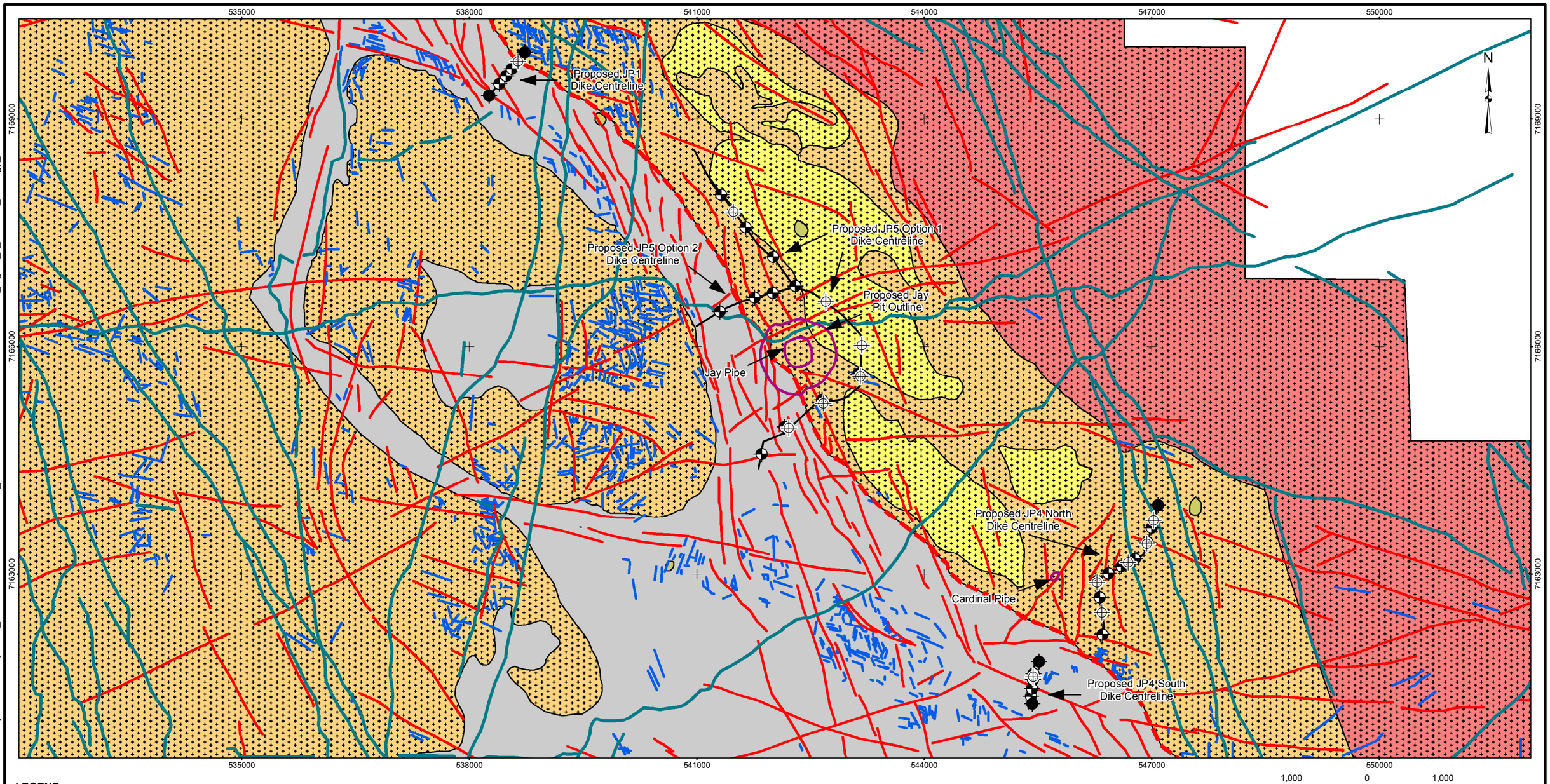
Results from the first set of triaxial tests conducted on the competent material, interpreted to be glacial till, are considered to be reasonable representative of this material.

Results from the second set of triaxial tests conducted on the competent material, interpreted to be from a glacial lacustrine deposit, are considered to be reasonably representative of this material.

One consolidation test was carried out on a competent soil sample obtained from borehole JP5-SD-08 (sample 6) interpreted to be from a glacial lacustrine deposit. Results are considered reliable.

References:

Golder (Golder Associates Ltd.) 2014. Jay Project Geotechnical and Hydrogeological Field Investigation Factual Report Vol 1: Proposed Dikes, Part A. Submitted to Dominion Diamond Ekati Corporation. July 23, 2014. http://www.reviewboard.ca/upload/project_document/EA1314-01_Jay_Dike_Factual_Report_Volume_1_Part_A.PDF



LEGEND

- SONIC BOREHOLE LOCATION
- DIAMOND BOREHOLE LOCATION
- DIAMOND BOREHOLE LOCATION WITH THERMISTOR
- DIKES
- FAULTS
- STRUCTURALLY CONTROLLED CONTACT
- JOINTS
- DIKE CENTRELINE

INTERPRETED GEOLOGY

- GREYWACKE
- PORPHYRITIC BIOTITE GRANITE
- TONALITE
- TWO MICA GRANITE
- UNDEFINED

1,000 0 1,000
SCALE 1:50,000 METRES

REFERENCE

1. BEDROCK GEOLOGY INTERPRETED BY GOLDER BASED ON DATA FROM MINERAL SERVICES CANADA INC. (2002) AND AURORA GEOSCIENCES LTD. (2013).
2. BOREHOLE AS-BUILT SURVEY PROVIDED BY AURORA GEOSCIENCES LTD., DATE RECEIVED: JUNE 04, 2014.
3. DATUM: NAD83 PROJECTION: UTM ZONE 12N

REV	DATE	REVISION DESCRIPTION	DES	GIS	CHK	RVW
1	2014-07-10	ISSUED FOR FINAL	FA	KI	GJ	FE

PROJECT
DOMINION DIAMOND
JAY PROJECT
NORTHWEST TERRITORIES, CANADA

TITLE
BEDROCK GEOLOGY

Golder Associates

PROJECT		13-1328-0041	FILE No. 13-1328-0041_2010_70
DESIGN	LS	2014-06-04	SCALE AS SHOWN
GIS	KI	2014-07-15	FIGURE
CHECK	FA	2014-06-10	4
REVIEW	FE	2014-07-10	

\\golder.gds\gal\Burnaby\CAD-GIS\Client\Dominion Diamond\Jay-Cardinal Project\99_PROJECTS\13-1328-0041\02_PRODUCTION\2010\70\MXD\1313280041_Figure_4_Bedrock_Geology_20140606.mxd

DOMINION DIAMOND

Information Request Number:	DAR-GNWT-IR-21
Source:	Government of Northwest Territories – Lands: Paul Mercredi
Subject:	Jay Project Geotechnical and Hydrogeological Field Investigation Factual Report. Volume 1 Proposed Jay Pit Area
DAR Section(s):	3

Preamble (GNWT):

The 2014 field geotechnical and hydrogeological investigation program at the proposed Jay Pit area was carried out between February 11 and April 29, 2014, by Golder Associates and included seven HQ3 diamond drilling holes and two Sonic drilling boreholes. On-site tasks included collection of geotechnical data from oriented rock core (with field estimates of rock strength and discontinuity data), downhole hydrogeological testing, and collection of rock core samples for laboratory testing. Hydrogeological testing consisted of twenty-eight successful single-packer tests carried out at selected overlapping intervals to provide a continuous hydraulic conductivity profile along the saturated section of each borehole.
Less than 1% of the total core logged was logged as either faults, kimberlite or lost core. Laboratory testing included point load tests, uniaxial compressive strength, triaxial compressive strength, Brazilian tensile strength, and direct shear on selected rock samples. Results from the uniaxial compressive strength, triaxial compressive strength, Brazilian tensile strength, and direct shear tests were not presented in the 2014 factual report.

Request (GNWT):

GNWT recommends that DDEC provide the following:

a) Additional information on the borehole relative to the bedrock texture and fractures (e.g. principal jointing, faulting and bedding, etc.).

b) The results from the uniaxial compressive strength, triaxial compressive strength, Brazilian tensile strength, and direct shear tests which were done on rock cores collected during this geotechnical investigation campaign which were not presented in the 2014 factual report.

c) The orientation of the boreholes drilled in the Jay Pit area on Figure 2 to further understand the locations sub-surface characterization.

d) Packer tests were run in the boreholes for determination of bedrock permeability. Approximately 90% of the packer test intervals vary between about 50 m and 100 m. Provide further discussion on the selection of the intervals for testing and the large range in the testing interval.

Response:

a) Lakebed soils overlay fresh, strong to very strong, predominantly good quality rock masses comprising granitoid rocks, metasediments, migmatites, pegmatite, and diabase dykes, and altered, very weak to moderately strong, poor to fair quality kimberlite. Within the bedrock, there are also fault zones that are distinctly identified and that tend to locally reduce the rock mass quality to fair or poor.

The structural model developed for the proposed Jay Pit indicates the occurrence of northwest-southeast and east–west trending faults. The borehole data indicate that the fault zones are infilled with material consisting mainly of clay and gouge and exhibit a joint condition rating of 0 or 6.

The rock mass fabric orientation data collected during the Jay Pit field investigation indicate the following:

- The granitoid, pegmatite, and diabase rocks have minimal foliation, and the joint orientations are fairly consistent between the different geotechnical holes.
- The dominant joint set observed in the granitoid, pegmatite, and diabase rocks dips at 25 degrees (°), on average, towards the southwest.
- The intrinsic foliation in the metasediments dips at 61°, on average, towards the southwest.
- The main joint sets in the metasediments are either sub-parallel or orthogonal to the foliation.

b) The results of the uniaxial compressive strength testing are summarized in Table 21-1.

Table 21-1 Summary of Uniaxial Compressive Strength Test Results

Rock Type	Number of Tests	UCS (MPa)		
		Minimum	Maximum	Average
Diabase	10	131	387	274
Granitoid	43	69	201	141
Metasediments	11	30	149	91

UCS = uniaxial compressive strength; MPa = megaPascal.

The results of the triaxial compressive strength testing are summarized in Table 21-2.

Table 21-2 Summary of Triaxial Compressive Strength Test Results

Hole ID	Depth From (mah)	Depth To (mah)	Rock Type	Sigma 3 (MPa)	Sigma 1 (MPa)
JGT-02	215.67	215.94	Granitoid	4	200
JGT-03	96.95	97.11	Granitoid	2	180

Table 21-2 Summary of Triaxial Compressive Strength Test Results

Hole ID	Depth From (mah)	Depth To (mah)	Rock Type	Sigma 3 (MPa)	Sigma 1 (MPa)
JGT-03	283.10	283.33	Granitoid	8	287
JGT-04	163.94	164.19	Metasediments	2	57
JGT-04	182.34	182.57	Metasediments	4	79
JGT-04	259.24	259.44	Metasediments	8	55
JGT-04	318.13	318.30	Granitoid	16	375
JGT-05	303.03	303.18	Metasediments	16	220

mah = metres along hole, relative to ground (or ice) surface; MPa = megaPascal.

The results of the Brazilian indirect tensile strength testing are summarized in Table 21-3.

Table 21-3 Summary of Brazilian Indirect Tensile Strength Test Results

Rock Type	Number of Tests	Tensile Strength (MPa)		
		Minimum	Maximum	Average
Granitoid	2	11.2	13.1	12.1
Metasediments	3	3.0	11.0	7.1

MPa = megaPascal.

The interpreted peak and residual Mohr-Coulomb strength parameters for the joint and foliation surfaces, based on the results of the direct shear testing, are summarized in Table 21-4.

Table 21-4 Summary of Discontinuity Peak and Residual Shear Strength Test Results

Rock Type	Feature Type	Peak Shear Strength		Residual Shear Strength	
		Cohesion (kPa)	Friction Angle (°)	Cohesion (kPa)	Friction Angle (°)
Diabase	Joint	0	37	0	25
Granitoid	Joint and Foliation	44	38	0	37
Metasediments	Joint	0	38	0	29
	Foliation	0	31	0	27

kPa = kiloPascal; ° = degree.

c) Downhole orientation surveys were carried out with a Reflex E-Z Shot tool in boreholes JGT-01 to JGT-06, and with a Maxibor tool in boreholes JGT-02 to JGT-06. Downhole orientation surveys were not carried out in vertical boreholes JGT-07, JSD-01, and JSD-02. The downhole surveys were compared and averaged over similar intervals. A summary of the averaged downhole orientation data is presented in Table 21-5.

d) Prior to conducting packer tests, the core recovered from the boreholes was reviewed in detail to assess the borehole stability, and to identify suitable locations for placement of the testing equipment. The test intervals varied in length from 16.7 to 106.7 metres (m), and were selected to provide a continuous hydraulic conductivity profile along the saturated portion of each borehole. The variable testing interval lengths reflect the variability in the ground conditions encountered.

References:

Golder (Golder Associates Ltd.) 2014. Jay Project Geotechnical and Hydrogeological Factual Investigation Factual Report Vol. 1: Proposed Dikes. Report prepared for Dominion Diamond Resources Corporation. Dated July 23, 2014. Golder Doc. No. 1313280041-E4041a-R-Rev0-2010.

Table 21-5 Jay Pit Geotechnical Borehole Orientation Surveys by Borehole

JGT-01[a]			JGT-02[b]			JGT-03[b]			JGT-04[b]			JGT-05[b][e]			JGT-06[b]		
Depth Range (mah)	Azimuth (deg)[c]	Inclination (deg)[d]	Depth Range (mah)	Azimuth (deg)[c]	Inclination (deg)[d]	Depth Range (mah)	Azimuth (deg)[c]	Inclination (deg)[d]	Depth Range (mah)	Azimuth (deg)[c]	Inclination (deg)[d]	Depth Range (mah)	Azimuth (deg)[c]	Inclination (deg)[d]	Depth Range (mah)	Azimuth (deg)[c]	Inclination (deg)[d]
0-30	199.3	80.0	0-100	29.0	71.6	0-150	309.5	71.8	0-258	69.2	70.9	0-78	111.3	71.2	0-111	205.9	77.0
30-50	205.5	80.2	100-250	31.5	71.0	150-200	313.4	70.8	258-309	72.8	70.1	78-246	114.6	71.1	111-183	208.7	76.9
50-105	201.5	80.5	250-333	35.0	70.6	200-250	316.2	69.3	309-351	74.7	70.0	246-400	117.0	71.3	183-273	211.7	76.9
105-130	206.8	80.3	333-390	38.1	70.5	250-300	319.3	67.7				400-453	119.0	71.3	273-327	214.8	76.8
130-160	203.0	80.3	390-450	40.6	70.5	300-369	322.5	65.7							327-400	217.8	76.6
160-205	206.8	80.4				369-449	325.6	63.8							400-461	220.3	76.4
205-225	210.0	80.5															
225-251	206.2	80.5															

Notes: mah = metres along hole, relative to ground (or ice) surface; deg = degree.

a) The average azimuth and inclination for borehole JGT-01 were calculated from Reflex survey data.

b) The average azimuth and inclination for boreholes JGT-02 to JGT-06 were calculated from Maxibor survey data.

c) All azimuths are with respect to true north. All angles are in degrees.

d) Inclination is the angle below the horizontal; i.e., 90 degrees = a vertical hole.

e) The azimuth information for borehole JGT-05 was revised following issue of document “Jay Project Geotechnical and Hydrogeological Field Investigation Factual Report Vol. 2: Proposed Jay Pit Area” (Golder 2014). Table 21-5 contains the revised data.

DOMINION DIAMOND

Information Request Number:	DAR-GNWT-IR-22
Source:	Government of Northwest Territories – Lands: Paul Mercredi
Subject:	Geotechnical and Hydrogeological Field Investigation
DAR Section(s):	Not Applicable

Preamble (GNWT):

At the request of GNWT during an introductory meeting on the Project (held on February 3, 2015 - minutes will be posted to the public registry) to potentially address items pertaining to baseline geotechnical and hydrogeological data, DDEC stated that additional characterization of the Jay Pipe area is proposed for 2015. This information was presented in the Ekati Exploration – 2015 Annual Work Plan, which was submitted to the Wek'èezhìi Land and Water Board as part of requirements to fulfill DDEC's Land Use Permit. The document summarizes the exploration activities (drilling operations, geochemical and geophysical surveys, winter road construction, use of vehicles and machines including earth-moving equipment within the permitted boundary, etc.), locations (Sable Pit, Lynx Pit and Jay Pit work areas) and type of drilling programs. The tasks to be performed from lake ice during the winter 2015 field investigation program are: - Large-Diameter Reverse Circulation drilling; - Air-track, rotary-percussive destructive drilling; (99 for the Jay Dike) - Sonic drilling; (64 for the Jay Dike) - Cone Penetration Testing (CPT); (12 in Lac du Sauvage) - Diamond drilling; - Thermistor installation. (6 in Lac du Sauvage) The Lac Sauvage overburden soils (sediments and lakebed till) will be investigated for their geotechnical properties by using Sonic drilling (sample collection and analysis) and Cone Penetration Testing (measure resistance to cone penetration).

Request (GNWT):

GNWT requests that DDEC provide the following:

a. For the proposed Jay Pipe area and dike, standard in-situ shear resistance testing and sampling for the lakebed sediments/till is not mentioned (such as split spoons, in-situ vane testing). Provide rationale for why these in-situ geotechnical investigation testing methods are not incorporated in the 2015 program. If not, will they be completed prior to construction?

b. Locations for Sonic and Diamond drilling are shown for the 2014 winter drilling program. Locations of Cone Penetrating Tests (CPT) are not shown. Provide further information regarding the locations where Cone Penetration Testing will be completed.

Response:

a. The 2015 geotechnical investigation program, being carried out to provide additional information to support the detailed design for the Jay Dike, includes vane shear testing in select boreholes. This in-situ testing will be carried out in conjunction with the Cone Penetration Testing (CPT) within the lakebed sediments and any glacial lacustrine (silty clay/clayey silt deposit) if encountered at depth. Split spoon testing/sampling is not included in this field program. Shelby tubes may be pushed to collect undisturbed samples, if glacial lacustrine material is encountered. The investigation is

appropriate for detailed design, taking into account: the type of structure proposed, the geologic history of the area, and experience from the construction of other similar structures in this region.

b. A summary of the proposed borehole locations where CPT is planned to be conducted as part of the 2015 investigation program are summarized in Table 22-1. Hole identification numbers correspond to those shown on the 2015 Jay site investigation plan (Dominion Diamond 2014).

Table 22-1 Summary of Boreholes with Cone Penetration Testing Planned in 2015 Program

Borehole ID	Northing (m)	Easting (m)
4	541,276	7,166,513
5	541,340	7,166,412
6	541,542	7,166,573
12	542,031	7,166,715
19	542,521	7,166,714
22	542,674	7,166,602
23	542,794	7,166,511
27	541,546	7,166,301
29	541,600	7,166,252
35	541,862	7,166,365
37	542,213	7,166,434
40	542,562	7,166,439
42	542,711	7,166,422
43	543,018	7,166,313
45	542,640	7,165,262
47	542,055	7,164,818
63	541,854	7,164,615

m = metres.

References:

Dominion Diamond (Dominion Diamond Ekati Corporation). 2014. 2015 Annual Work Plan for Land Use Permit W2013C0005 (Updated December 16, 2014). December 19, 2014. Submitted to the Wek'èezhìi Land and Water Board. http://www.reviewboard.ca/upload/project_document/EA1314-01_2015_Annual_Work_Plan_.PDF.

DOMINION DIAMOND

Information Request Number:	DAR-GNWT-IR-23
Source:	Government of Northwest Territories – Lands: Paul Mercredi
Subject:	Waste Rock Storage Area
DAR Section(s):	Appendix 3B

Preamble (GNWT):

The Project Description or Conceptual Closure and Reclamation Plan (CCRP) does not indicate that topsoil, till or lake sediments excavated during stripping of development areas will be stockpiled for future reclamation.

Request (GNWT):

GNWT recommends that the mine development plan include storing these materials in areas segregated within the WRSA or another suitable area. These materials may be required for future reclamation to provide a vegetation substrate on disturbed areas.

Response:

Lakebed sediments are fine-grained materials, such as, silt, clay, and sand, that accumulates on lake bottoms, often with thicker accumulations in deeper areas of a lake. During the development of open pits at the Ekati Mine in the past, lakebed sediments were put aside for possible future use in reclamation. These materials freeze and become difficult to use for reclamation. Lakebed sediments will be encountered during pit stripping and during dike construction associated with the Jay Project. For the Jay Project segregation and separate storage of this material is not planned, as site-specific reclamation research at the Ekati Mine has shown that lakebed sediment is not a suitable reclamation material. If stockpiled separately, this material would expand the amount of land disturbed by the Project, create a reclamation liability, requiring reclamation of itself. The specific research findings as published in various technical reports are as follows:

- As part of the rock pad research program established in 2008, lake sediment materials were evaluated for their suitability as a top dressing material. Monitoring results to date indicate that lake sediment did not provide favorable conditions for plant growth. Specifically mixing of lake sediment with topsoil, has reduced performance of planted stock and seeded grasses and legumes (Martens 2014; EcoSense 2014).
- Lake sediments were tested for their ability to support plant growth in a field experiment at the Fox Portal starting in 1996, then later tested in greenhouse experiments in 1998. Field and greenhouse studies on lake sediments in 1996 and 1999 found that lake sediments have low organic content, low moisture holding capacity and low cation exchange capacity, and appeared to be the main factors responsible for poor growth at the Fox Portal Pilot Study (Kidd and Max 2002; Martens 2013).

- Vegetation monitoring on a seeded test area within the lake sediment stock pile area sediment was established in 2002. Initial growth monitoring results were poor and the test area was rototilled and a light application of native grass cultivars and fertilizer was re-applied. Overall rate of native colonization of the lake sediments was deduced to be slow due to persistent crusted surface that persists on the lake sediments (Martens 2009).

As part of the construction pre-works, the Jay Road will be built to connect the Misery Road to the Jay Dike. Approximately 65,100 cubic metres (m^3) of material will be excavated (cut) to form the esker crossing. This material will be locally stockpiled and saved for use during closure and reclamation of the esker. A location for this stockpile will be identified as part of detailed design.

Glacial till will be excavated incidentally with lakebed sediment in some cases and separately during pre-stripping of the Jay open pit. Similar to lakebed sediment, glacial till has low value for widespread use for reclamation, and therefore, will not be segregated. Possible incidental needs for glacial till during reclamation can be fulfilled from the glacial till stockpile at the Misery waste rock storage area (WRSA).

Organic topsoil is scarce and extremely difficult to salvage for future use because it occurs as a thin veneer overlying glacial till. Topsoil is of benefit for reclamation, and therefore, opportunities for salvage will be pursued according to current practice at the Ekati Mine. For example topsoil was salvaged from the area of the (future) Pigeon WRSA following a field assessment of the area to identify practicable areas for salvage. This approach will also be applied to the area of the Jay WRSA during the construction period and with respect for the requirements for protection of migratory birds.

References:

EcoSense (EcoSense Environmental Inc.). 2014. Ekati Diamond Mine: 2014 Vegetation Annual Report. Prepared for Dominion Diamond Ekati Corporation by EcoSense Environmental Inc. Lethbridge, Alberta.

Kidd JG, Max KN. 2000. EKATI™ Diamond Mine reclamation research program, 1999, NT, Canada. Final report prepared for BHP Diamonds, Inc., Yellowknife, NWT, Canada, by ABR, Inc., Fairbanks, AK, USA.

Martens HE. 2009. EKATI Diamond Mine revegetation research projects, 2008. Final report prepared for BHP Billiton Diamonds Inc., Yellowknife, NWT, Canada by Harvey Martens and Associates, Calgary, AB, Canada.

Martens HE. 2013. Ekati Diamond Mine Revegetation Research Projects – 2012. Prepared for BHP Billiton Diamonds, Inc., Yellowknife, NWT, Canada by Harvey Martens & Associates Inc. Calgary AB.

Martens HE. 2014. Ekati Diamond Mine Revegetation Research Projects – 2013. Prepared for Dominion Diamond Ekati Corporation, Yellowknife, NWT, Canada by Harvey Martens & Associates Inc. Calgary AB.

DOMINION DIAMOND

Information Request Number:	DAR-GNWT-IR-24
Source:	Government of Northwest Territories – Lands: Paul Mercredi
Subject:	Waste Rock Storage Area
DAR Section(s):	3, Appendix 3B

Preamble (GNWT):

It is unclear how run-off water from the WRSA will be handled.

Request (GNWT):

GNWT requests additional information on the handling of run-off water from the WRSA.

Response:

Precipitation over the Jay waste rock storage area (WRSA) is generally anticipated to infiltrate into the pile and freeze resulting in a low proportion of surface minewater runoff. This assumption is consistent with observations at the existing WRSAs at the Ekati Mine. Runoff from the Jay WRSA will contribute to watershed yield in sub-basins Ac, B, and C.

The volume and timing of this runoff, and its chemistry profile, were accounted for in the Site Water Quality Model (Appendix 8E), which is an input into the Lac du Sauvage hydrodynamic water quality model (Appendix 8F). During construction and operations and early closure, runoff from the entire Jay WRSA is conservatively assumed to report to the diked area in Lac du Sauvage. In fact, seepage in the area of the WRSA that naturally flows to sub-basin C (a relatively small portion of the total seepage) would only be collected and pumped to the Jay diked area as an operational contingency measure. In late closure, when the diked area is reconnected to Lac du Sauvage, runoff will enter the lake environment.

The inputs from the Jay WRSA to the Site Water Quality Model were conservative. The chemistry profile of runoff from the Jay WRSA was assigned concentrations from WRSA seepage flow monitoring data collected from the Misery operations at the Ekati Mine (Section 8E3.4, Appendix 8E). Use of these data is considered conservative since the Misery WRSA contains a higher proportion of potentially acid generation (PAG) material compared to what will be placed in the Jay WRSA. The rock types stored in the existing Ekati Mine WRSAs are the same as what will be stored in the Jay WRSA; however, there is variability in their composition ratios and placement methods. Additionally, the quantity of WRSA runoff/seepage was conservatively estimated; the modelling assumed permafrost would not develop in the WRSA, leading to higher than anticipated seepage quantities. Runoff from the Jay WRSA was not projected to present any potential risk to the receiving environment.

Despite the conservatism in the modelling, the mine plan has supplemental considerations associated with the design and construction of the Jay WRSA. These considerations contribute to the mitigation of potential constituent loading in runoff and seepage to the receiving environment from the Jay WRSA, through minimizing the potential for waste rock oxidation:

- Initial placement of a basal layer of granite prior to waste rock deposition.
- Operational mixing of granite (non-potentially acid generating [non-PAG] rock) and metasediment (PAG rock) waste rock material to mitigate the acid generation potential of PAG rock in the Jay WRSA.
- Co-deposition of PAG and non-PAG rock during waste rock deposition minimizes the potential for formation of zones of PAG rock with a greater susceptibility for acid generation.
- Co-deposition of waste rock from the Jay Pit on an “as-mined” basis during operations is possible because of the simultaneous production of both metasediment and granite waste rock, with a predominance of granite, throughout the mine life. Due to the geometry of the Jay pipe, granite and metasediment will be produced simultaneously between 2020 and 2027. Little to no metasediment is anticipated in the last two years of operation, with granite accounting for more than 90 percent (%) of the waste rock being generated between 2026 and 2029.
- Reducing infiltration from snowmelt and the insulating effect of snow cover during closure by maintaining a generally even surface on the top of the pile so that snow blows away.

Dominion Diamond Ekati Corporation plans to extend the existing Ekati Mine Waste Rock and Ore Storage Management Plan (WROMP) Vers. 4.1 to include the Jay Project waste rock storage infrastructure (e.g., Jay WRSA). Under the Ekati Mine WROMP, seepage/runoff surveys of all WRSAs and ore stockpiles at the Ekati Mine are conducted twice a year (during spring freshet, and again in late summer or fall before freeze-up), in accordance with the requirement of the Water Licence. The testing of seepage chemistry is designed to detect changes that may affect the receiving environment. The Jay WRSA will be included in these seepage surveys. Seepage monitoring will continue through the operation stage of the project, and for 10 years following the completion of mining, until closure objectives are met.

During the monitoring period, adaptive seepage management strategies will be implemented at the Jay WRSA if necessary to remedy undesirable water quality trends. The adaptive management strategy outlined in the Ekati Mine WROMP (Section 7.7) includes the following components:

- Identification of issue, verification of trigger and development of a response plan.
- Additional studies to determine the extent of the impact of seepage (if any), and modification of the WROMP and seepage management program.
- Implementation of modified programs, and design / construction of mitigation structures and facilities for seepage collection (if required).

References:

Dominion Diamond (Dominion Diamond Ekati Corporation). 2014. Ekati Diamond Mine Waste Rock and Ore Storage Management Plan. Version 4.1, May 2014.

Information Request Number: DAR-GNWT-IR-25

Source: Government of Northwest Territories – Lands: Paul Mercredi

Subject: Waste Rock Storage Area

DAR Section(s): 3, Appendix 3B

Preamble (GNWT):

It is unclear if sufficient quantities of non-PAG waste rock can be segregated within the WRSA for final cover of PAG waste rock. This would be important in the event of premature closure or should the final closure cover require increased quantities of non-PAG rock than projected, as it would be far more costly to source non-PAG cover materials from elsewhere.

Request (GNWT):

GNWT requests that sufficient quantities of non-PAG waste rock be segregated within the WRSA for final cover of PAG waste rock. Any additional details that DDEC can provide at this time with respect to the quantities of non-PAG rock would be appreciated.

Response:

Table 3.5-4 of the Project Description (Section 3 of the Developer's Assessment Report), and included below as Table 25-1 for reference, presents the estimated annual schedule of waste rock production from the Jay Pit. Due to the geometry of the Jay pipe, granite (non-potentially acid generating [non-PAG] rock) and metasediment (potentially acid generating rock) will be produced simultaneously between 2020 and 2027. Little to no metasediment is anticipated in the last two years of operation (Table 25-1), with granite accounting for more than 90 percent (%) of the waste rock being generated between 2026 and 2029.

Table 25-1 Jay Annual Schedule of Waste Rock Production

By End of Year	Mass Overburden (tonnes)	Mass Granite (tonnes)	Mass Metasediment (tonnes)	Percentage of Metasediments to Granite (%)
2020	12,831,000	21,158,532	7,888,476	37
2021	-	20,609,209	11,057,541	54
2022	-	22,113,574	10,063,454	46
2023	-	18,640,257	7,170,387	39
2024	-	12,808,764	4,150,368	32
2025	-	10,959,372	2,441,854	22
2026	-	9,300,616	572,299	6
2027	-	6,037,945	27,018	0.4
2028	-	3,425,750	-	0
2029	-	804,986	-	0
Total	**12,831,000**	**125,859,005**	**43,371,397**	**34**

- = not applicable;% = percent.

The 5 metre (m) non-PAG rock cover around the perimeter of the pile will be progressively placed, as will the top cover as portions of the pile reach the final geometry. As 90% of the waste rock produced in the last four years of mining will be non-PAG rock, portions of the pile are anticipated to have more than 5 m of non-PAG cover.

The last column of Table 25-1 shows the percentage of metasediments to granite waste rock produced per year. The proportion of metasediments is greater during the first few years of production. During the first six years of mining (2020 to 2025), the percentage of metasediments ranges from 54% to 22%. If additional non-PAG waste rock was required to place a cover due to premature closure during this time, non-PAG material could be sourced from the pit.

Segregation and stockpiling of non-PAG waste rock during operations is not planned.

DOMINION DIAMOND

Information Request Number: DAR-GNWT-IR-26

Source: Government of Northwest Territories – Lands: Paul Mercredi

Subject: Waste Rock Storage Area

DAR Section(s): 3, Appendix 3B

Preamble (GNWT):

The present method for disposal of waste rock is to co-dispose granite and meta-sediments in layers within the WRSA with a 5m final cap of granite, similar to the Misery WRSA. This method is intended to encapsulate PAG rock within permafrost. However, results of thermal monitoring of Fox WRSA and Misery WRSA (2013 Waste Rock and Waste Rock Storage Area Seepage Survey Report, DDEC, 2014) indicate that: "Large portions of the Fox WRSA continued to remain unfrozen with temperatures at depth up to 5.3°C. An active layer displayed seasonal thawing with temperatures up to 4.4°C. The surface active layer thickness ranged from 4.8 to 6.0 m...This is likely a function of placing warm (above-freezing) waste rock and/or placing waste rock in above-freezing temperatures." "The Misery WRSA below the active layer was in a permafrost state, with temperatures predominantly at 0 to -10°C. The thickness of the active layer is however, quite variable, ranging from 2.5 m to 14 m with temperatures up to 14°C... The large active layer thicknesses in the Misery WRSA are likely a function of the proximity of some cables to the side slopes and the accumulation of snow, which acts as a thermal blanket reducing heat transfer from the waste rock at some locations." As suggested, the concern for unfrozen conditions or a large active layer may apply to only parts of a rock pile (such as southern exposure, or insulation caused by snow accumulation on lee faces) or aspects of the rock pile (such as darker rock or zones of coarse rock which can re-warm each year). However, the implications for closure are that the granite cap may need to be greater than 5m to prevent the active layer from extending into PAG waste rock, or that the proposed encapsulation by permafrost may not provide reliable long-term management of ARD and ML. It is understood that a "Special Study" to further investigate temperatures within the WRSA's will be completed by DDEC as per the Board's directives (March 13, 2014 and May 13, 2014). Further, Appendix 3B describes the conceptual closure plan for the Project. Section 4.2 of Appendix 3B informs on the management of waste rock within the waste rock storage areas at the Ekati Mine, as follows: "Waste rock storage areas (WRSAs) at the Ekati Mine are constructed to minimize runoff and to encourage permafrost formation. Potentially acid generating (PAG) materials are encapsulated within a thermally protective cover that avoids seasonal active layer thaw into the reactive material. The thermally protective cover will comprise 5 m of granite at the Misery WRSA and 3 m of glacial till plus a nominal 1 m of granite at the Pigeon WRSA. These measures will limit the potential for acid generation or metal leaching from the WRSAs. The cover for the Jay WRSA will comprise 5 m of granite." The discussion within Appendix 3B is limited as to the basis for the selection of a 5 m cover for the Jay-Pipe waste rock storage area is limited in discussion.

Request (GNWT):

GNWT requests that DDEC provide the following: a. Any thermal analysis to support the 5 m cover thickness proposed for the Jay Pit waste rock storage area that will incorporate the anticipated active layer within the rock pile. b. Descriptions of further work and research needed to re-evaluate the closure

design (i.e. thickness of the non-PAG cover) for all WRSA's at the Ekati mine. c. A preliminary discussion of closure options for WRSAs in the event that research determines that long term encapsulation by permafrost will not be achieved (e.g. underwater disposal of PAG, etc.).

Response:

The closure design concept for the Jay waste rock storage area (WRSA) includes a 5-metre (m)-thick granite cover, which has been deemed sufficient to maintain the active layer within the closure cover. However, the Jay WRSA does not need to be frozen to maintain physical stability or for geochemical management. Frozen conditions in the WRSA pile are beneficial and will be promoted. The WRSA will be reclaimed according to the methods described in the Ekati Mine Interim Closure and Reclamation Plan and will focus on providing a relatively flat upper surface that discourages snow accumulation. Wildlife safety through egress ramps for caribou or other wildlife will be in place. In addition, the WRSA will be designed and operated to achieve overall 3 horizontal to 1 vertical slopes to maintain geotechnical stability.

Recent (2014) thermal modelling for the design of the Pigeon WRSA at the Ekati Mine (Waste Rock and Ore Storage Management Plan [WROMP] Vers. 4.1) was provided to the Wek'èezhìi Land and Water Board (WLWB) as part of the Water Licence requirements for the Pigeon WRSA Design (Dominion Diamond 2014). This thermal modelling is also relevant for the design of the Jay WRSA. The thermal modelling validated that frozen conditions can be maintained within the pile below the 5 m granite cover under a 100-year climate change scenario. The climate change scenario was described as follows (excerpted from Section 4.5 of Tetra Tech EBA 2014):

> *Global warming was integrated into the model to help predict long-term thermal effects. Environment Canada's 2009 report from Adaptation and Impacts Research Section (AIRS) (Environment Canada 2009) reviewed the most recent modelling assessment for the Arctic. An ensemble approach (multi-model means/medians) was adopted by AIRS reduce the uncertainty associated with any individual model. Model validation over the historical period from 1971 to 2000 was first used to identify those models which best reproduced the mean annual temperature of this period against the National Centre for Environmental Prediction global gridded dataset. Subsequently, only the four best-agreement models were used to produce the final ensemble projections. The four best-ranking models within each sector were then used as an ensemble to produce projections of temperature changes in the 2020s, 2050s, and 2080s for both the A1B (balanced emission emphasis), and A2 (high emission) scenarios. CSA (2010) adopted the climate change projections from Environment Canada (Environment Canada, 2009). A moderate A1B greenhouse gas emission scenario was adopted in the thermal analyses, which represents a reasonably conservative case.*
>
> *Ekati (64°43`N 110°37`W) is located in Arctic Sector C1 as classified in Environment Canada (Environment Canada, 2009) and CSA (CSA, 2010). The predicted mean temperature changes from 1971 to 2000 baseline under the moderate greenhouse gas emission scenario at the Arctic Sector C1 (CSA, 2010) are presented in Table 4. These rates of the predicted temperature change were applied in the thermal analyses.*

Table 4 Predicted Seasonal Air Temperature Changes in Arctic Sector C1 (CSA 2010)

Period	Predicted Seasonal Air Temperature Changes from 1971-2000 Baseline under the Moderate (A1B) Green-house Gas Emission Scenario (°C)			
	Winter	Spring	Summer	Autumn
2011 to 2040	1.9	1	0.8	1.3
2041 to 2070	4.2	2.1	1.8	2.7
2070 to 2100	6.2	2.8	2.4	3.4

Note: Table 4 from Tetra Tech EBA 2014.

Even with an increased active layer thickness, there remains a very low likelihood of long term seepage from the WRSA, with a water quality that requires active management. Therefore, no additional thermal modelling is required.

Thermistors will be installed in the Jay WRSA to monitor temperatures in the pile foundation and within the pile itself. In addition, there are thermistors installed in existing WRSAs at the Ekati Mine that will continue to provide data regarding thermal conditions in these WRSAs.

Dominion Diamond plans to extend the existing Ekati Mine Waste Rock and Ore Storage Management Plan (WROMP) Vers. 4.1 to include the Jay Project waste rock storage infrastructure (e.g., Jay WRSA). Under the Ekati Mine WROMP, seepage/runoff surveys of all WRSAs and ore stockpiles at the Ekati Mine are conducted twice a year (during spring freshet, and again in late summer or fall before freeze-up), in accordance with the requirement of the Water Licence. The testing of seepage chemistry is designed to detect changes that may affect the receiving environment. The Jay WRSA will be included in these seepage surveys. Seepage monitoring will continue through the operation stage of the project, and for 10 years following the completion of mining, until closure objectives are met.

If thermal monitoring of the Jay WRSA indicates that the active layer cannot be maintained in the 5 m cover layer, consideration may be given to increasing the closure cover layer thickness. This decision will also depend on Jay WRSA seepage water quality monitoring trends. If seepage water quality trends do not show indications of changes that may affect the receiving environment, modifications to the closure cover may not be required.

References:

Dominion Diamond (Dominion Diamond Ekati Corporation). 2014. Ekati Diamond Mine Waste Rock and Ore Storage Management Plan. Version 4.1, May 2014.

CSA (Canadian Standards Association). 2010. Technical Guide – Infrastructure in Permafrost: A Guideline for Climate Change Adaptation. CSA Reference Number: Plus 4011-10.

Environment Canada, 2009. Arctic Ensemble Scenarios, 2009. Prepared by Adaptation and Impacts Research Section (AIRS) Climate Research Division, Environment Canada, 2009, 26 p.

Tetra Tech EBA Inc. 2014. Pigeon Pit Waste Rock Storage Area Design – Revision 1, Ekati Diamond Mine, NT. April 2014.

DOMINION DIAMOND

Information Request Number: DAR-GNWT-IR-28

Source: Government of Northwest Territories – Lands: Paul Mercredi

Subject: Hydrological Modelling

DAR Section(s): 8

Preamble (GNWT):

Much of the characterization of baseline hydrologic conditions, and all of the predicted hydrologic effects of the project, are derived from watershed modeling, rather than empirical measurements. The watershed model is detailed and complex, some model parameter values appear unrealistic or subject to large errors. Further, the data available for model calibration are very limited. No estimates of accuracy or error limits appear to have been made. No allowance appears to have been made for model result uncertainties in design of the project water management plan or facilities.

Request (GNWT):

GNWT requests DDEC provide additional information on how uncertainties are addressed in the hydrological modeling based on DDEC's assumptions noted in the comments section.

Response:

A description of uncertainty identification and reduction for hydrological modelling, including input data, model parameters, model calibration and project water management, is provided in Section 8.6.2.2 of the Developer's Assessment Report (DAR).

The hydrology baseline (Annex X of the DAR) expands on an existing body of work for the Lac de Gras and Lac du Sauvage watersheds. The baseline hydrologic conditions for the Lac de Gras watershed were originally characterized for the Diavik Environmental Impact Assessment (Golder 1997) and updated through review of monitoring data (Golder 2008).

The hydrology baseline has been updated and expanded to include the following information, which are presented in detail in Appendices A through F of Annex X:

- Literature review of hydrological and metereologic studies in Northern Tundra Environments;
- Derived meterological data record from 1959 to 2013;
- Historic hydrometric data for the Lac de Gras watershed including Lac de Gras, Lac de Gras tributaries, and Lac du Sauvage tributaries;
- Detailed characterization of the Lac du Sauvage watershed using light detection and ranging (LiDAR) data;
- 2013 hydrological field data collected in the Lac du Sauvage and Lac de Gras watersheds; and,
- Regional water balance modelling of the entire Lac de Gras watershed using GoldSim.

The hydrology baseline data analysis and regional water balance modelling were developed to assess mean characteristics and natural variability of discharge and water levels of lake outlets in the baseline area. This was done to allow potential effects to be evaluated for waterbodies with minimal historical site-specific data.

A key result and calibration point from the hydrological baseline is the mean annual water yield for the Lac de Gras basin of 150 millimetres (mm). This was determined from long-term hydrological monitoring data from Point Lake (Station 10PB001) and Desteffany Lake (10PA001) stations of the Coppermine River (Environment Canada 2014). The determination of a mean water yield and a long term climate data set allows hydrological modelling to capture natural variability for lakes in the Lac du Sauvage watershed and Lac de Gras.

The historical data (i.e., prior to 2013 field data collection) available for model calibration in the Lac du Sauvage watershed is limited to several tributary lakes. The model was calibrated using historic discharge data for the timing of lake outlet opening and closing. The comparison of historical hydrographs to modelled discharge data has validated model predictions with respect to amount and timing of lake outlet discharge for Lake E10 (Ursula Lake) and Lake D3 (Counts Lake).

The regional water balance model was also validated with Lac de Gras measured water level and discharge. The variation and timing of Lac de Gras water levels, when considered with the mean annual water yield, provide validation of the Lac de Gras water balance and for the model inputs.

The preamble comment of unrealistic watershed parameters was addressed for runoff coefficients in the response to DAR-GNWT-IR-40. The water yields calculated are consistent with the previous studies and runoff coefficients are consistent with current water balance modelling at the Ekati Mine when sublimation is considered (ERM Rescan 2014).

The design of key water management structures, such the Jay runoff sump and the mine inflows sump (Section 4.6 of Appendix 3A; Mine Water Management Plan of the DAR) located within the diked area, account for model result uncertainties. Refer to the response to DAR-GNWT-IR-30 for a description of the contingencies and DAR-EC-IR-15 for possible adaptive management strategies that may be used if hydrologic conditions encountered are significantly different than predicted.

The uncertainties in hydrological modelling have been addressed through the calibration of long term hydrological monitoring data on the Coppermine River, review of regional study results, and validation of the model using historical hydrological monitoring data. Additional hydrometric monitoring within the Lac de Gras and Lac du Sauvage watershed as part of the Jay Project was completed in 2014 (Dominion Diamond 2015), and it is expected that continuing hydrometric data collected as part of the Jay Project will be incorporated into the final design of the water management plan and facilities.

References:

Dominion Diamond (Dominion Diamond Ekati Corporation). 2015. 2014 Hydrology Supplemental Baseline Report for the Jay Project. Prepared by Golder Associates Ltd., April 2015. Yellowknife, NWT, Canada.

Environment Canada. 2014. Water Survey of Canada. Retrieved from Hydrometric Data – Coppermine River at Outlet of Point Lake: Available at http://www.wsc.ec.gc.ca/applications/H2O/HydromatD-eng.cfm. Accessed on March 3, 2014.

Golder (Golder Associates Ltd.). 1997. Baseline Data of Climate and Surface Water Hydrology for the Diavik Diamond Mine EIA.

Golder. 2008. 2007 Review of Baseline Climate and Surface Water Hydrology for the Diavik Diamond Mine. Burnaby, British Columbia, Canada. Golder Associates Ltd.

ERM Rescan (ERM Rescan Environmental Services Ltd.). 2014. Updated Koala Watershed Water Quality Model Report.

DOMINION DIAMOND

Information Request Number: DAR-GNWT-IR-29

Source: Government of Northwest Territories – Lands: Paul Mercredi

Subject: Hydrology Baseline

DAR Section(s): 8

Preamble (GNWT):

All of the baseline characterization and the presentation of project effects involve use of an annual calendar year period. Use of the calendar year period would underestimate the extremes of true annual variability of wet and dry years.

Request (GNWT):

GNWT recommends that annual values used in the impact assessment should be based on the hydrologic year which extends from the onset of freezing temperatures in October through to the following September. For certain types of analysis of annual water yield and runoff coefficients, the runoff of streams which extends past the end of the hydrologic year (September) should be assigned to that runoff year, since such runoff is the result of that year's precipitation. For streams that discharge through the entire winter season, all of the runoff through into May (or whenever the new spring runoff begins) should be assigned to the preceding runoff year. Please provide a rationale for not using the above approach in the baseline hydrology work and any impacts to the assessment in the DAR.

Response:

We understand that in northern watersheds, the hydrologic year commencing at the onset of snow accumulation is often used to characterize flow and water level regimes, rather than the calendar year commencing January 1. However, use of the calendar year in this assessment was selected to provide results for the following reasons:

- Working with and presenting the results as a calendar year was the most efficient and consistent method to provide data and assessments to other disciplines (i.e., Water Quality, Engineering, etc.) for their modelling and assessments.
- Some of the inputs required for the water balance model (e.g., back-flooding and operational water transfers) were available on a calendar year basis.
- Ultimately, the parameters used as a proxy to compare the effects metrics are not influenced by either the calendar year or hydrologic year, as discussed below.

The baseline characterization and presentation of Jay Project (Project) effects on flows and water levels were compared primarily through monthly average values or by frequency analyses conducted on the annual maximum peaks or minimum lows for specified events (e.g., the 7-day peak or the 30-day low flow). For all of these baseline and assessment results, calendar year periods or water year periods provide the same results because these events do not span over two hydrologic years. Peak events

consistently occur during open-water season, and low-flow events occur either in October (prior to freeze-up) or during late winter months at streams that discharge year-round.

The 100-year and 2-year peak flows and water levels were assessed as one annual maximum flow or water level per calendar year for 50 years of analysis (1964-2013). Similarly, the 7-day and 14-day peak, and the 30-day, 60-day, and 90-day averaged low flows were assessed as one annual minimum flow or water level per calendar year over the 1964-2013 time period. Determining the annual maximum (or minimum) flow or water level based on the calendar year will yield the same 50 year dataset as the annual maximum based on the hydrologic year, and therefore, would make no change in the results presented in the Developer's Assessment Report (DAR). It should also be noted that the maximum flows and water levels typically occurred during the summer months (June to September) and the minimum flows and water levels typically occurred during the spring months prior to the freshet (March to May) for the streams that discharge year-round.

The monthly estimates are based on frequency analyses of the daily flows averaged over each month every year from 1964 to 2013 to produce one estimate for each month per year. Use of the hydrologic year would have no influence on the monthly estimates as the flows do not carry over from December to January and would make no change to the results presented in the DAR.

Use of a hydrologic year may have an effect on the calculated annual water yield time series, as the water yields are a function of the total volume averaged over the total watershed area per key area (e.g., Lac du Sauvage, Lac de Gras, and Desteffany Lake). Using a hydrologic year from October to September may produce a different total runoff volume than the annual calendar year (January to December). For baseline modelling, water yields were used primarily for calibration, and therefore, the same period was used to calibrate modelled annual water yields to observed annual water yields. An example of a comparison of the effects to water yields, using both the calendar year and the hydrologic year during Closure Year 3 (the period with the greatest effects to Lac du Sauvage and downstream waterbodies), is provided below in Table 29-1 and the following discussion. The results using a calendar year are presented in Table 8D5-300 of Appendix 8D of the DAR, with the percent change from baseline provided below in Table 29-1. These results are compared in Table 29-1 (below) to the percent change from baseline during Closure Year 3, using an annual period of the hydrologic year. The hydrologic year is estimated to start October 15th (ERM Rescan 2014).

Table 29-1 Derived Percent Change in Water Yield for Calendar Versus Hydrologic Year at Lac du Sauvage, Lac de Gras, and Desteffany Lake Outlets – Closure Year 3

Condition	Return Period (years)	Percent Change in Annual Water Yield from Baseline During Closure Year 3					
		Percent Change in Annual Water Yield Using a Calendar Year Period			Percent Change in Annual Water Yield Using a Hydrologic Year Period		
		Lac du Sauvage	Lac de Gras	Desteffany Lake	Lac du Sauvage	Lac de Gras	Desteffany Lake
Wet	100	-8.1%	-3.4%	-2.0%	-8.8%	-3.4%	-2.1%
	50	-8.7%	-3.6%	-2.1%	-9.1%	-3.2%	-2.2%
	20	-10.0%	-3.9%	-2.3%	-10.0%	-3.9%	-2.4%
	10	-11.0%	-3.7%	-3.0%	-11.0%	-3.7%	-2.5%
	5	-12.2%	-4.6%	-2.7%	-12.2%	-4.6%	-3.3%

Table 29-1 Derived Percent Change in Water Yield for Calendar Versus Hydrologic Year at Lac du Sauvage, Lac de Gras, and Desteffany Lake Outlets – Closure Year 3

Condition	Return Period (years)	Percent Change in Annual Water Yield from Baseline During Closure Year 3					
		Percent Change in Annual Water Yield Using a Calendar Year Period			Percent Change in Annual Water Yield Using a Hydrologic Year Period		
		Lac du Sauvage	Lac de Gras	Desteffany Lake	Lac du Sauvage	Lac de Gras	Desteffany Lake
Median	2	-14.2%	-5.4%	-3.2%	-14.2%	-5.4%	-3.2%
Dry	5	-17.2%	-6.3%	-3.7%	-17.1%	-5.5%	-3.7%
	10	-18.1%	-5.9%	-4.0%	-17.8%	-5.9%	-4.0%
	20	-20.4%	-7.1%	-3.4%	-19.1%	-7.1%	-4.2%
	50	-21.2%	-6.6%	-4.5%	-20.6%	-7.6%	-4.5%
	100	-21.5%	-6.9%	-3.8%	-21.6%	-7.0%	-4.7%

Note: Annual water yield using a Calendar Year period is based on a 50 year period of record. The Hydrologic year period is based on 49 years, because 2013 has an incomplete hydrologic year. This may have an influence on the differences between calendar year and hydrologic year when considering the frequency analysis of both datasets.

% = percent.

The assessment of the results in the Hydrology Baseline (Annex X) and Section 8.5.3 of the DAR using the calendar year is valid as the primary parameters used as a proxy for comparison (e.g., 100-year peak, 2-year peak, 7-day peak, 14-day peak, 30-day low, 60-day low, 90-day low, and mean monthly) are not influenced by the hydrologic year, as discussed earlier.

The annual water yield is the parameter potentially most affected by the use of calendar year versus hydrologic year, as it is a function of the total runoff volume. Changing the start date may yield more/less total runoff volume than using the calendar year. However, based on the sample results presented in Table 29-1, comparing the percent differences between the baseline annual water yields and the year 3 closure annual water yields, calculated for both the calendar year and the hydrologic year, shows very little difference between the two. On average, the difference between calendar year and hydrologic year is near zero, with the largest difference occurring for the dry 20 year Desteffany Lake water yield (calendar year is -3.8 percent (%), hydrologic year is -4.7% for a difference of 0.9%). The effects to annual parameters, such as water yields, from baseline values due to Project activities, are therefore, valid with negligible changes due to the use of a calendar year or hydrologic year. Therefore, the conclusions in the DAR remain valid.

References:

ERM Rescan (ERM Rescan Environmental Ltd.). 2014. Ekati Diamond Mine 2013 Aquatic Effects Monitoring Program Annual Report. Prepared for Dominion Diamond Ekati Corporation. Yellowknife, NWT, Canada.

DOMINION DIAMOND

Information Request Number: DAR-GNWT-IR-30

Source: Government of Northwest Territories – Lands: Paul Mercredi

Subject: Water Management Facilities

DAR Section(s): 3, Appendix 3A

Preamble (GNWT):

The mine water management plan and design and sizing of all of the water management facilities (except the B diversion channel) are based on average climate and runoff conditions, applied over the entire life of the project. No evaluations appear to have been made to estimate the effects of sequences of wet or dry years, and how the mine water management plan and design and sizing of water management facilities would accommodate a reasonable range of conditions.

Request (GNWT):

GNWT requests that DDEC provide information respecting the potential effects of sequences of wet or dry years as noted in the comments section.

Response:

The groundwater inflows to the Jay Pit represent approximately 65 percent (%) of the total amount of minewater to be managed over the operations period (under average climate conditions). Groundwater inflows are minimally influenced by sequences of wet or dry years. Thus, the minewater management system is less sensitive to annual climate variations.

The design of key water management structures, such the Jay runoff sump and the mine inflows sump (Section 4.6 of Appendix 3A; Mine Water Management Plan of the Developer's Assessment Report [DAR]) located within the diked area, accounts for potential upset conditions generated by extreme events, such as extreme storms or sequences of wet periods. In addition, the pumping systems in these sumps are sized to provide excess capacity, which will reduce the risk of overflow from the sumps in the event of sequences of wet periods. The pumping systems within the sump will be managed to keep water levels low, thereby providing one area for contingency storage. The Jay runoff sump has been designed for the 1 in 10-year, 24-hour rainfall event (39.3 millimetres) in excess of the normal operating capacity, defined based on the results of the water balance model run for average year climate conditions. This contingency storage is estimated to be 220,000 cubic metres (m^3). The mine inflow sump will be sized to provide a contingency storage equivalent to a minimum of three days of open pit minewater inflow. This contingency storage is estimated to be 63,000 m^3. Additional operational sumps will be developed within the pit as development progresses and will provide short term capacity for water management. If necessary, the capacity of the mine inflow sump and runoff sump can be increased by construction of small containment berms around the sumps (Section 4.6 of Appendix 3A of the DAR).

In the unlikely event of overflow, water from the sumps will be contained within the downstream area of the dike, within the dewatered lakebed, and could report to the Jay Pit. As such, water is not anticipated to be released to the environment and would, therefore, have no effects to the environment.

In the event of sequences of dry periods, the sumps will receive less water than predicted (mainly the Jay runoff sump, as the mine inflows sump will be regulated by groundwater from the Jay pit), which ultimately results in less water pumped to the Misery Pit.

Sequences of wet or dry years could have an effect on the overall volume of water within the Misery Pit. This could influence the commencement and rate of discharge from Misery Pit to Lac du Sauvage. For example, if a sequence of 1:10 year annual wet conditions were to occur, discharge from the Misery Pit would begin approximately 3.5 months sooner than predicted; in the event of a sequence of 1:10 year annual dry conditions the discharge may commence 1 year later than predicted. Note that even with a sequence of wet years, discharge from the Misery Pit would still not occur for close to 5 years following the start of operations.

As a contingency, pumping to Lac du Sauvage from Misery Pit was set to commence when the water elevation reaches 430 metres above sea level (10 metres below the pit rim). This provides a contingency of 3.3 million m^3, equivalent to 6 months of the estimated inflows pumped to the Misery Pit. Additional adaptive management strategies for the minewater management plan are discussed in Section 8.3 of Appendix 3A in the DAR.

The water management structures have been designed to accommodate a range of conditions and to provide for contingency.

DOMINION DIAMOND

Information Request Number: DAR-GNWT-IR-31

Source: Government of Northwest Territories – Lands: Paul Mercredi

Subject: Baseline Water Balance Model

DAR Section(s): Annex X

Preamble (GNWT):

A 4-hour time step was used to develop the model, apparently using daily data, however it is unclear why a 4-hour time step was used and how 4-hour values were obtained from the daily data.

Request (GNWT):

GNWT requests DDEC provide rationale on the utilization of a 4-hour time step and provide information on how 4 hour values were obtained from the daily data.

Response:

The regional water balance model, including the Desteffany Lake, Lac de Gras, and Lac du Sauvage watersheds, use a 4-hour time step to allow a higher frequency of lake outlet discharge calculations.

The regional water balance model has approximately 500 lake outlets modelled in parallel and in series. At each lake outlet, the volume of water and corresponding water depth (stage) of the lake reservoir during the computation time step, is applied to the lake outlet stage-discharge rating curve and discharged accordingly.

Based on manual optimization runs of the model, using a 1-day (24 hour) time step artificially attenuated water within the system of lake reservoirs, especially at smaller modelled lake outlets. A 4-hour time step was observed to improve the lake outlet discharge hydrographs, in particular the peak freshet flows at inlets to Lac du Sauvage. A further reduction to a 1-hour time step did not noticeably improve the results and greatly increased the model run time.

GoldSim is a dynamic simulator, which means it models time-varying behavior of a system. In GoldSim, time is a built-in variable which is explicitly associated with all model variables, including input time series data.

GoldSim can use daily input data for model runs with a shorter time step. Examples of how the hydrological model uses daily data at a 4-hour time step length are as follows:

1. Constant daily data, such as mean daily temperature, are the same for each 4 hour time step in the calendar day.
2. Daily data with a rate (i.e., rainfall, snowfall, evaporation, etc.) are distributed over the shorter time steps. In Equation 1, 6 millimetres (mm) of rainfall in a day (24-hour time step) would result in 1 mm per 4-hour time step. The total amount of rainfall over the day is unchanged.

Equation 1:
$$6\ \frac{mm}{day} \div 6\ \frac{timesteps}{day} = 1\ \frac{mm}{timestep}$$

DOMINION DIAMOND

Information Request Number:	DAR-GNWT-IR-32
Source:	Government of Northwest Territories – Lands: Paul Mercredi
Subject:	Baseline Water Balance Model
DAR Section(s):	Annex X

Preamble (GNWT):

Within Pages F-2 to F-9 of Annex X, the overall model structure is not clearly described. Apparently there are three sub-models: one for the watershed of Lac du Sauvage (LDS), one for that of Paul Lake (PL), and one for that of Lac de Gras (LDG). The LDS and PL sub-models are detailed models, with all watershed lakes having a surface area greater than 4 ha included in the model. The LDG model is less detailed, consisting of nine tributary sub-watersheds treated as lumped systems. The LDS (and PL) sub-models are complex (the LDS model has 476 lakes) and involve a large number of model parameter values, each having some uncertainty. This degree of complexity could be counterproductive in terms of the skill of the model in simulating hydrologic effects.

Request (GNWT):

GNWT requests that DDEC outline results that would be obtained if the LDS and PL sub-models were simplified using the lumped tributary sub-watershed approach as was used for the LDG sub-model, and describe how those results would compare with available observed data as well as with the results obtained for the detailed models.

Response:

The regional water balance model includes the entire watershed upstream of the Coppermine River at Desteffany Lake outlet, including the Lac de Gras and Lac du Sauvage watersheds. Within the regional water balance model, the Lac du Sauvage watershed and Paul Lake basin use a more detailed approach to routing of water through lake reservoirs. This was done so that baseline hydrology and potential Jay Project effects could be evaluated on lakes smaller than Lac du Sauvage and Lac de Gras, and because a more detailed understanding the hydrology of Lac du Sauvage and its tributary watersheds was required during development of Project alternatives and preliminary design. Without this detailed approach, baseline and potential Jay Project effects to lakes such as Christine Lake (Lake B1), Lake B0, and Lake C1 would not be possible within the regional water balance model.

The Paul Lake basin was also modelled with a more detailed approach because the previous Jay-Cardinal Project Description required prediction of baseline values and potential effects in the Paul Lake basin, Lake E1, and Duchess Lake. Calibration of the model was completed prior to a reduction in geographical extent of the Jay Project, so the detailed approach to routing of water through lake reservoirs in the specified watersheds was maintained in the model. Removal of the additional detail would be expected to reduce overall model predictive performance.

The use of the lumped tributary sub-basin approach is not expected to change the annual water yield or the calibration of key model parameter values. This is because model parameters values for climate data, sublimation and runoff coefficients are calibrated for the Lac de Gras basin.

Use of a lumped tributary sub-basin approach in the Lac du Sauvage watershed would not use hydrometric field data collected in the Lac du Sauvage basin during the 2013 field program or historical data collected at Counts Lake (Lake D3) and Ursula Lake (Lake E10) for validation. Model validation at smaller lakes is essential to providing confidence to the predicted Jay Project effects at smaller lakes. A lumped tributary sub-basin approach would also not be able to model the backwater effects of Lac de Gras on inflows at the Lac du Sauvage outlet, a situation that is not present at the other sub-basin inflows.

There is a high level of confidence in overall predicted changes to surface hydrology, especially at a watershed scale considering Lac du Sauvage, Lac de Gras, and the Coppermine River at Desteffany Lake. The lumped tributary sub-basin approach eliminates small lake hydrology outputs and the ability to validate these to hydrometric data and to predict effects due to Jay Project activities. For these reasons, new modelling results using only lumped tributaries and eliminating smaller lakes are not expected to improve the predictions of baseline hydrology or Jay Project effects, and are therefore, not produced or assessed.

DOMINION DIAMOND

Information Request Number:	DAR-GNWT-IR-33
Source:	Government of Northwest Territories – Lands: Paul Mercredi
Subject:	Baseline Water Balance Model
DAR Section(s):	Annex X

Preamble (GNWT):

On Page F-2 of Annex X, the model does not appear to allow for the routing time effects of flows as they move through the complex of lakes and channels to the points of interest.

Request (GNWT):

GNWT requests that DDEC clarify whether flow routing time effects are included in the model. If so, how is this done? If not, what are the potential implications of not including this aspect?

Response:

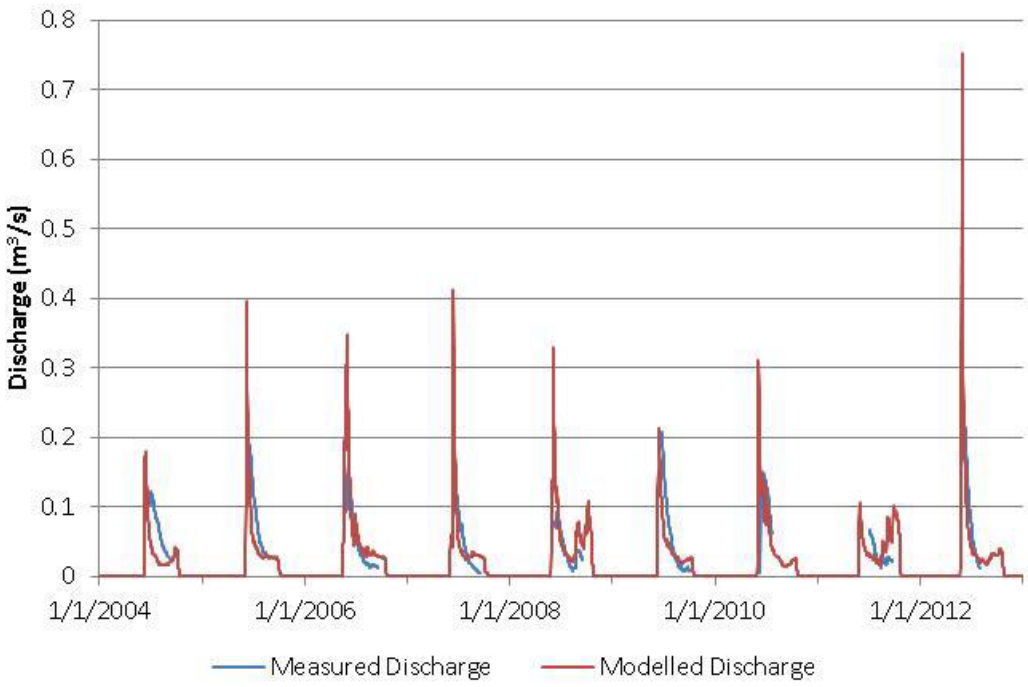
Channel routing was not included in the water balance model. This is generally consistent with the physical characteristics of the Lac du Sauvage watershed, where lakes are connected by relatively short channels and conveyance of flow depends on lake storage and timing of release through lake outlets.

Storage effects through the complex of lakes were included in the Lac du Sauvage watershed and Paul Lake basin. A network of approximately 500 lakes were modelled in series and in parallel. This attenuation of flows is controlled through storage in all modelled lakes and lake outlets throughout the watershed.

The potential implications of not including the time effects in channels would be to underestimate the time required for flows to be routed downstream in each basin. This has not been observed in the comparison of observed hydrographs to modelled hydrographs.

The timing of flows from the contributing watersheds match measured data as presented in the Developer's Assessment Report, Annex X, Section F3.1.2.3 and Section 8D3.1.5. An example of this is shown in Figure 33-1.

Figure 33-1 Counts Lake (D3) Measured vs Modelled Discharge



Based on the comparisons of Lac de Gras and Desteffany Lake hydrographs, there is no consistent lag as shown in Figure 33-2 and Figure 33-3 below. This indicates that modelling without consideration of channel routing provides an accurate estimate of flows and discharges in Lac de Gras and the Coppermine River downstream to Desteffany Lake.

Figure 33-2 Desteffany Lake Outlet Modelled and Measured Discharges

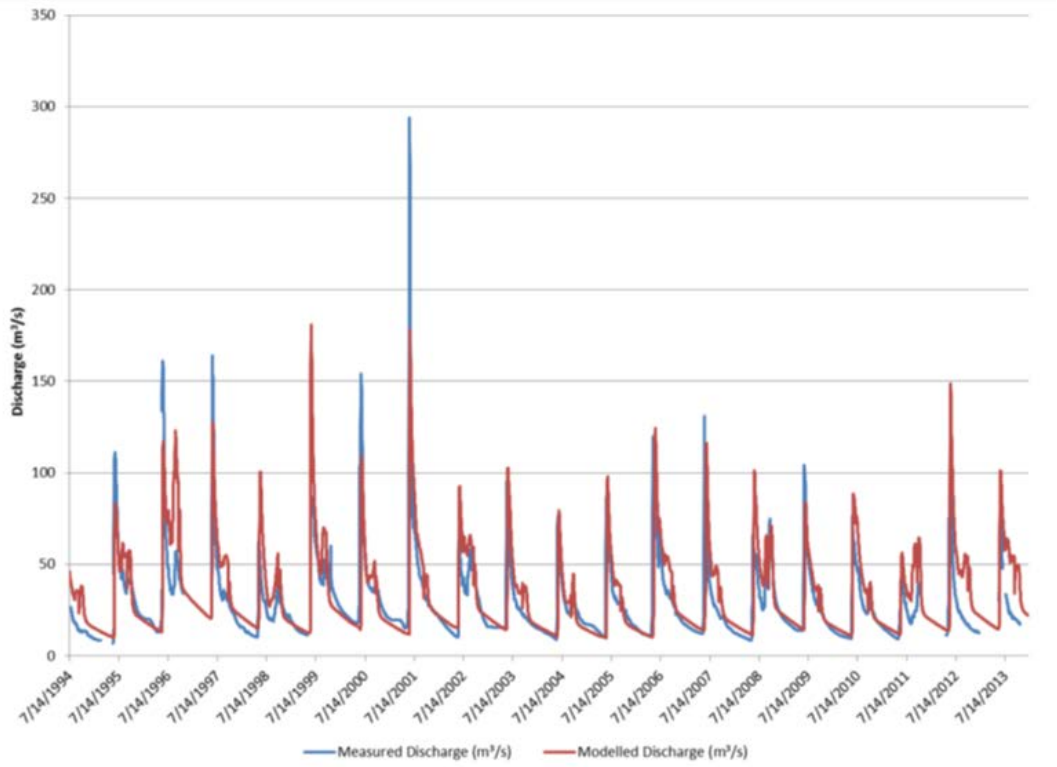
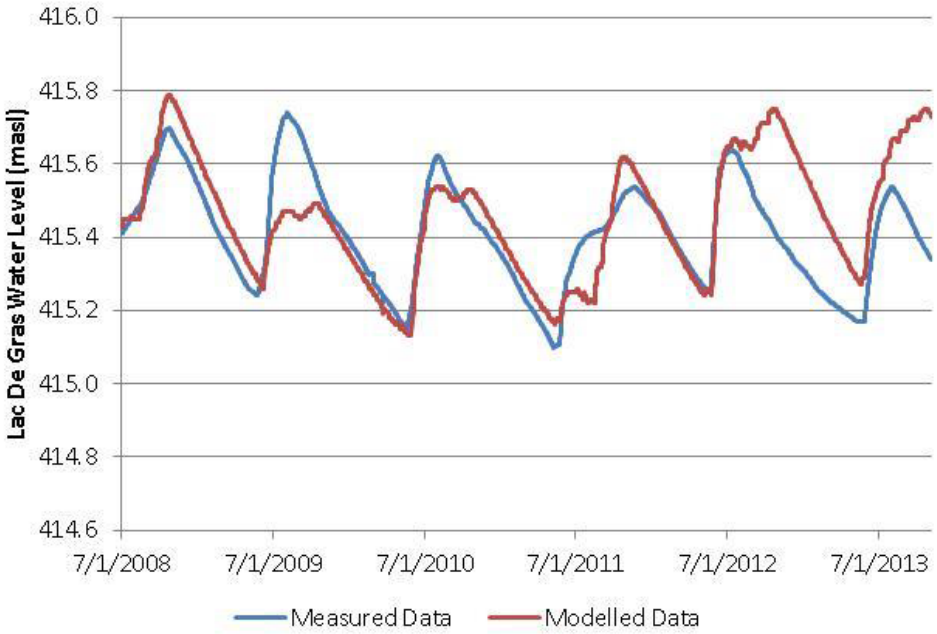


Figure 33-3 Lac de Gras Modelled vs Measured Water Level



DOMINION DIAMOND

Information Request Number:	DAR-GNWT-IR-34
Source:	Government of Northwest Territories – Lands: Paul Mercredi
Subject:	Baseline Water Balance Model
DAR Section(s):	Annex X

Preamble (GNWT):

On Page F-4 to F-6 of Appendix X, the method used for derivation of lake outlet discharge rating curves is based on a "regional" approach which appears subject to errors by a factor of 2 or 3.

Request (GNWT):

GNWT requests that DDEC outline whether any other approaches were attempted. Additionally, DDEC should outline whether the accuracy of the adopted approach was tested by using the derived rating curve at several outlets with measured rating curves which can be used for comparative purposes.

Response:

The general approach to deriving stage-discharge lake outlet rating curves at modelled lakes in the regional water balance model was to use the following three methods, listed in preferential order. This approach has been used in similar water balance studies for northern mine sites.

1) Using existing historical stage-discharge equations where available. These equations have been generated over several years during local hydrometric monitoring programs and were considered to be reliable;

2) Conducting hydrological surveys of key lake outlets and larger streams in the basin and generating relationships using HEC-RAS software, calibrated to the measured stage-discharge data. This method was considered to be reliable due to a high degree of control over quality during the field survey programs and analysis, and is subject to ongoing validation; and,

3) Using a broad-crested weir equation for lake outlets for which no detailed hydrology or hydrometric surveys were completed as part of the 2013 baseline hydrology field programs. This was generally applied to lakes with small upstream watershed areas, compared to those where the other methods were applied, and is discussed below.

Table F3-1 in Appendix F of Annex X (Hydrology Baseline of the Developer's Assessment Report [DAR]) provides the methods used for all lakes visited as part of the 2013 hydrology baseline field program. For all lakes not listed in Table F3-1, where detailed hydrology surveys were not completed, the method used for derivation of lake outlet discharge rating curves at modelled lake outlets was based on a broad-crested weir equation, with a coefficient "w", as shown in equation F34-1. Values for "*w*" were based on stage-discharge pairings at lake outlets visited as part of the 2013 hydrology baseline field program.

Equation F34-1: Broad-Crested Weir Equation

$$Q = w\, y^{1.5}$$

where:

Q = discharge (m^3/s);

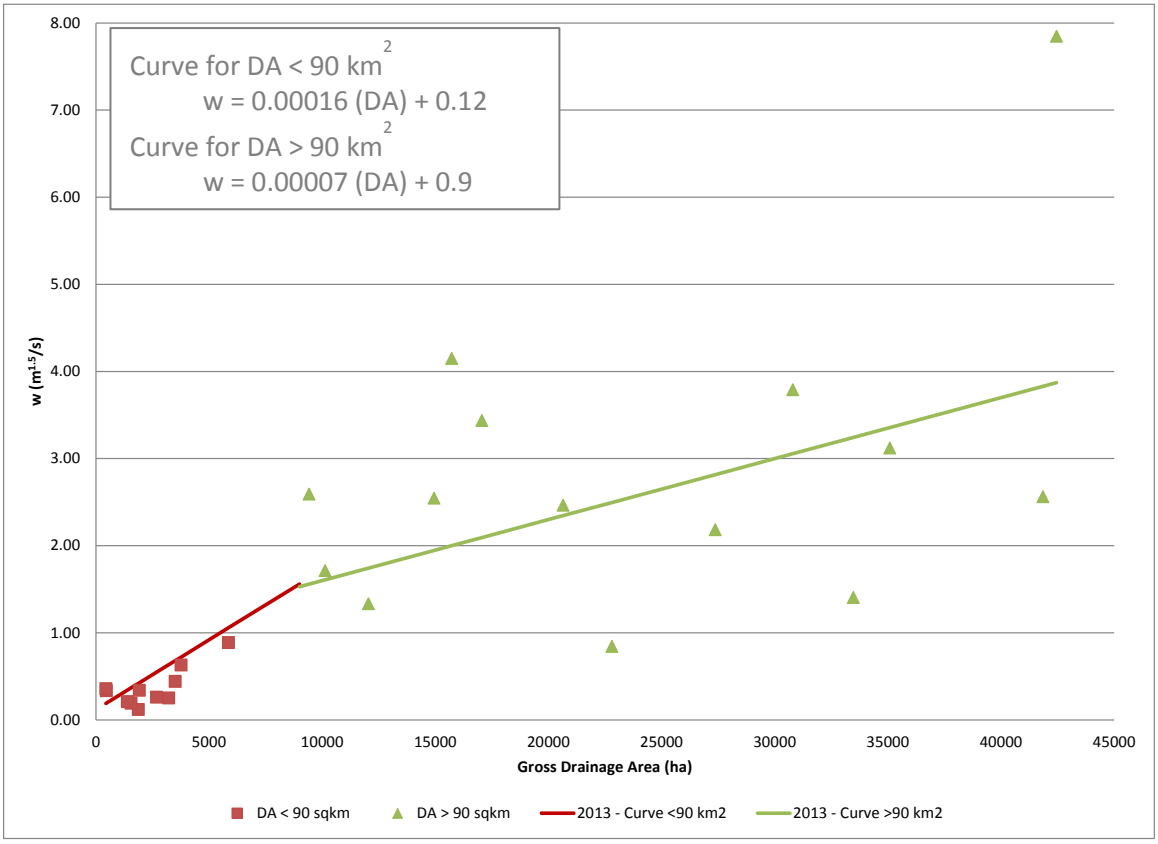
w = coefficient determined as a function of a physical basin or outlet characteristic (see below)

y = depth above zero-flow elevation (m); and,

DA = gross basin drainage area (km^2).

This method was used to provide an estimate of lake outlet rating curves to account for lake storage where only limited Geographic Information System (GIS) data (Light Detection and Ranging [LiDAR] and Orthophotos) were available to estimate channel widths, drainage area, and outlet type. Relationships between “w” and surveyed bankfull widths and drainage areas were investigated at sites with detailed hydrology surveys, including separate analysis of outlet types (entrenched outlets versus boulder garden outlets). Relationships between “w” and depth or width:depth ratios were not investigated because depths could not be determined from GIS data (LiDAR and Orthophotos). Based on all the above, the relationship with the greatest correlation was “w” values to drainage areas. A bi-modal curve was created for “w” as a function of drainage area (DA), as shown in Figure 34-1 (curve equations shown on figure).

Figure 34-1 Rating Curve Value "w" and Gross Drainage Area Relationship



$m^{1.5}/s$ = weir equation coefficient; km^2 = square kilometres; < = less than; > = greater than; ha = hectare; DA = drainage area (ha).

It is expected that individual surveyed sites will vary from a best-fit curve (or curves) due to natural variability in the outlet slope, shape, and bed and bank materials. However, this method was intended to provide an estimate of average rating curves for non-key lake sites, where water level accuracy at a specific lake is not required. The accuracy of the adopted approach was tested during the model calibration to observed hydrometric data primarily at Lac de Gras, Desteffany Lake, and small basin stations with long-term hydrometric data (i.e., Ursula Lake [Lake E10] and Counts Lake [Lake D3]).

The rating curve derived from the regional approach (not used in the regional water balance model) is compared to the derived rating curve at two sites that used the derived rating curves in the regional water balance model. The outlet stage-discharge rating curves are shown for Lake J76 (Figure 34-2), with a drainage area of 37.7 square kilometres (km^2), and Lake G4 (Figure 34-3) with a drainage area of 308 km^2. Figures 34-2 and 34-3 include additional baseline data collected as part of the 2014 hydrology baseline report (Dominion Diamond 2015). These stations represent a range of drainage areas, and while they do not reflect the accuracy of each individual rating curve estimated using the regional approach, they provide a subset for comparison. For both sites, there is general agreement between the regional approach and the derived rating curves, with better agreement at the low end of the rating curves. The model is not necessarily intended to accurately model the discharges at un-measured, small upper

watershed lakes where the regional approach is used. These discrepancies do not appear to have large adverse effects on the model results at the lower watershed (larger drainage area) lakes due to the degree of flow attenuation in the watershed. Furthermore, long-term calibration of the baseline water balance model was completed on a watershed scale at Lac de Gras and Desteffany Lake, indicating that the regional approach is valid overall on a watershed scale.

Figure 34-2 Lake J76 Outlet Stage-Discharge Rating Curve

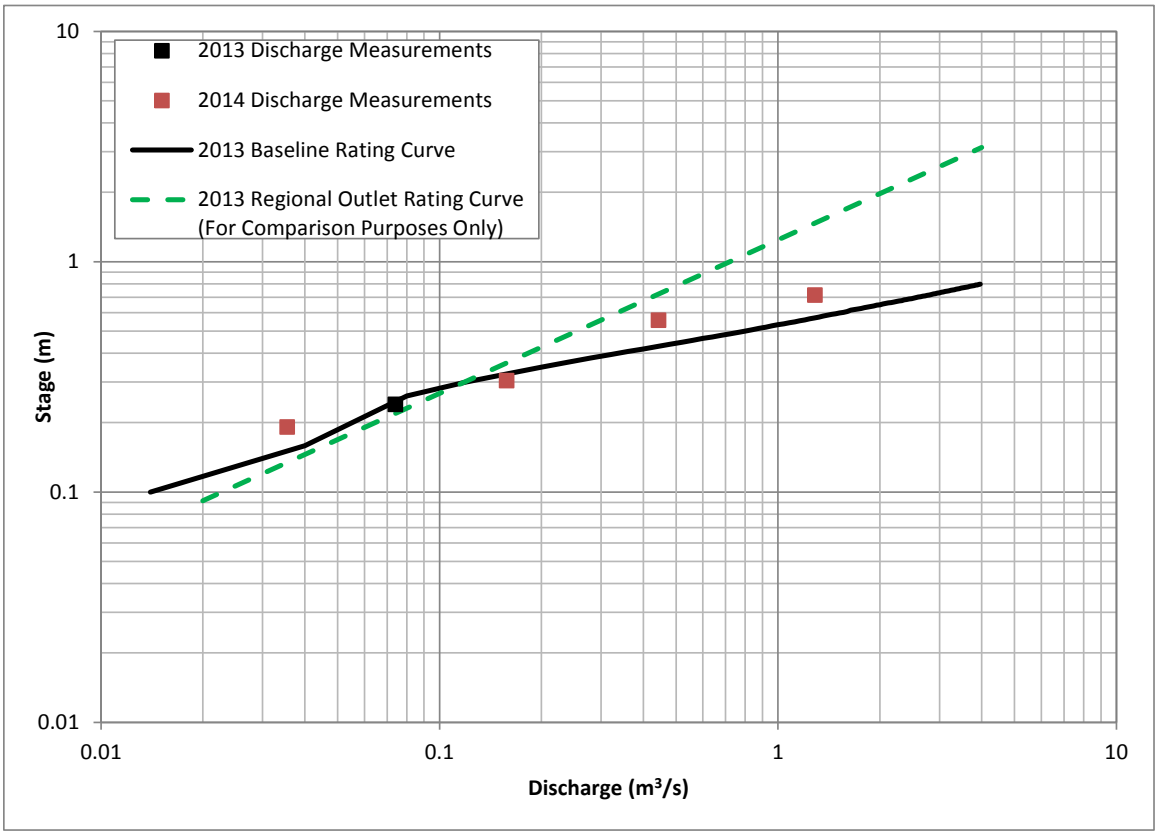
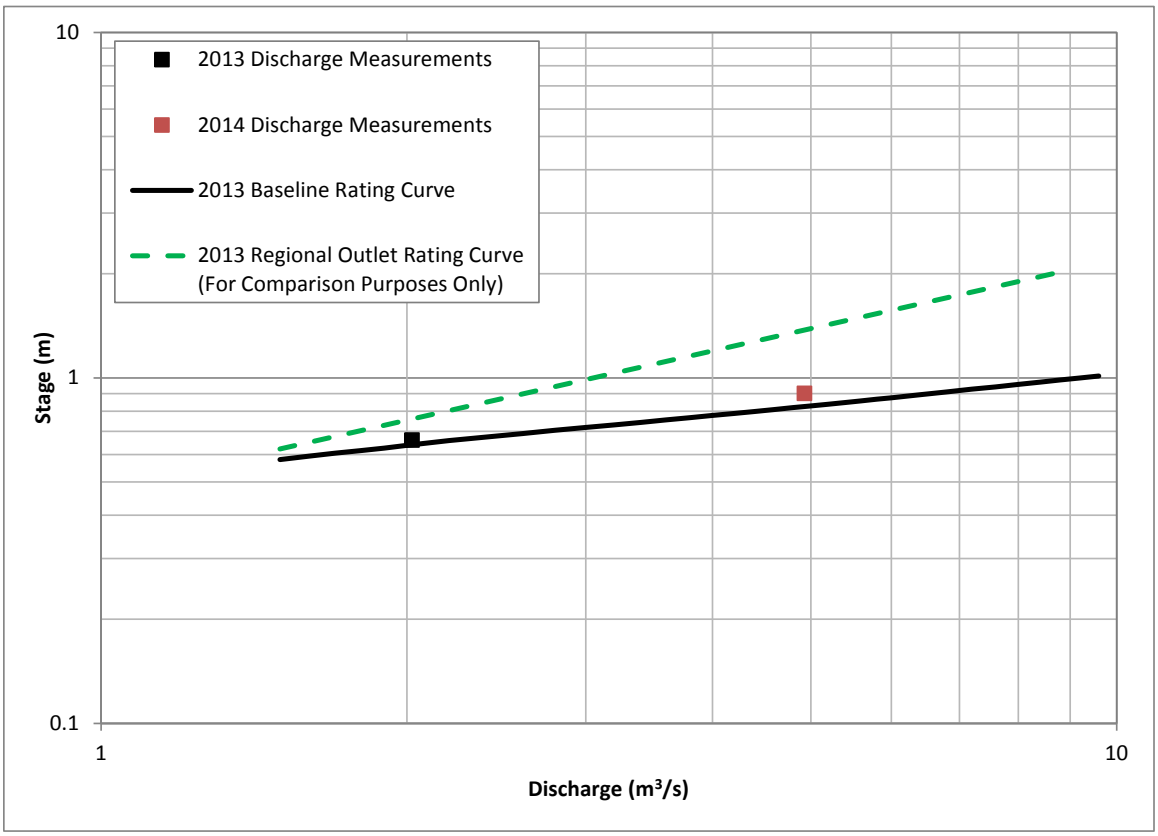


Figure 34-3 Lake G4 Outlet Stage-Discharge Rating Curve



References:

Dominion Diamond (Dominion Diamond Ekati Corporation). 2015. 2014 Surface Water and Hydrology Supplemental Baseline Report for the Jay Project. Prepared by Golder Associates Ltd., April 2015. Yellowknife, NWT, Canada.

DOMINION DIAMOND

Information Request Number: DAR-GNWT-IR-35

Source: Government of Northwest Territories – Lands: Paul Mercredi

Subject: Baseline Water Balance Model

DAR Section(s): Annex X

Preamble (GNWT):

Pages F-4 to F-6 of Annex X, the description of the methodology for application of lake outlet discharge rating curves based on a "regional" approach appears incomplete.

Request (GNWT):

GNWT requests clarification on the methods used for the determination of the zero flow depth "y" in the weir equation for each lake.

Response:

The regional hydrology water balance model included all lakes within the Lac du Sauvage watershed with a surface area greater than 4 hectares. As part of the 2013 baseline data collection program within the Lac du Sauvage and Lac de Gras watersheds, detailed aerial reconnaissance was completed at 72 lake outlets, detailed aerial reconnaissance and hydrometric ground surveys (collection of water levels, discharge and cross-sections) were completed at 39 lake outlets, and additional continuous hydrometric modelling was completed at 6 of the above 39 lake outlets (including Lac du Sauvage). Collected baseline data is summarized in Appendix E of the Hydrology Baseline Report (Annex X) of the Developer's Assessment Report (DAR). In addition, historical hydrometric data was used to derive lake outlet stage-discharge rating curves at additional lake outlets including Lac de Gras, Christine Lake (Lake B1), Ursula Lake (Lake E10), and others as summarized in Appendix C of the Hydrology Baseline Report (Annex X) of the DAR. Detailed hydrometric surveys were prioritized for larger lakes with greater storage potential, terminal sub-basin lakes, lakes within potentially altered watersheds or representative lakes.

Three methods were used to derive stage-discharge rating curves at modelled lake outlets, and the selection of the method was a function of available site specific information. The three methods, including the broad-crested weir equation, are described in Section F3.1.2.1.2 in Appendix F of the Hydrology Baseline Report (Annex X) of the DAR. The broad-crested weir equation is provided as Equation F3.1-1 in Appendix F of the Hydrology Baseline Report (Annex X) of the DAR, and was used for lake outlets where detailed ground surveys were not completed (typically smaller, non-terminal sub-basin lakes).

The following describes the methodology used to determine the variable "y" which is defined as the depth above zero-flow elevation (m) in the regional broad-crested weir rating curve equation.

For all water surface elevations less than or equal to the zero-flow elevation, no water will be discharged at the lake outlet, and conversely, for all water surface elevations greater than the zero-flow elevation (when the outlet is not frozen), water will be discharged at the lake outlet. Also referred to as the lake sill

elevation, it is a physical component of all lake outlets, which controls the lake outlet discharge. The lake outlet discharge rate for lake water surface elevations above the zero-flow elevation can be calculated using a lake outlet stage discharge rating curve.

Each modelled lake using the regional rating curve approach was assigned:

- An initial volume sufficient to maintain a lake volume (i.e., not go dry) throughout the baseline period. The assumption that the modelled larger lakes have sufficient volume to not go dry was supported by field observations in 2013 and 2014. The initial volume is associated with the zero-flow condition, where no water is discharging from the reservoir.
- An initial depth above the zero-flow elevation (either of zero or the long-term modelled average to reduce model spin-up time). No geodetic elevations were applied to water levels in these modelled reservoirs.
- A constant lake area (i.e., a vertical wall) boundary, which was assumed, as detailed bathymetry and storage-elevation curves were not available for the over 400 modelled lakes. In addition, it is expected that the change in lake water surface area due to natural water level fluctuations for the larger modelled lakes is a small fraction of the mean water surface area.

The lake inflows and outflows, as depicted in Figure F3-1 of Appendix F, Annex X, were calculated at each reservoir element according to the Water Balance Model Flowchart (Figure F3-2, Annex X, Appendix F) and methods described in Appendix F of Annex X. For each time-step, the volume greater than the initial lake volume divided by the lake water surface area, or depth of water “y”, is applied to the lake outlet rating curve as described in Section F3.1.2.1.2 (Annex X, Appendix F) to derive a discharge. Outflows from a reservoir are transferred into the downstream reservoir as inputs.

DOMINION DIAMOND

Information Request Number:	DAR-GNWT-IR-36
Source:	Government of Northwest Territories – Lands: Paul Mercredi
Subject:	Baseline Water Balance Model
DAR Section(s):	Annex X

Preamble (GNWT):

GNWT notes that there is no information on lake stage-storage curves, or how lake storage was taken into account.

Request (GNWT):

GNWT requests that DDEC provide information on lake stage-storage curves as well as information on how lake storage was taken into account.

Response:

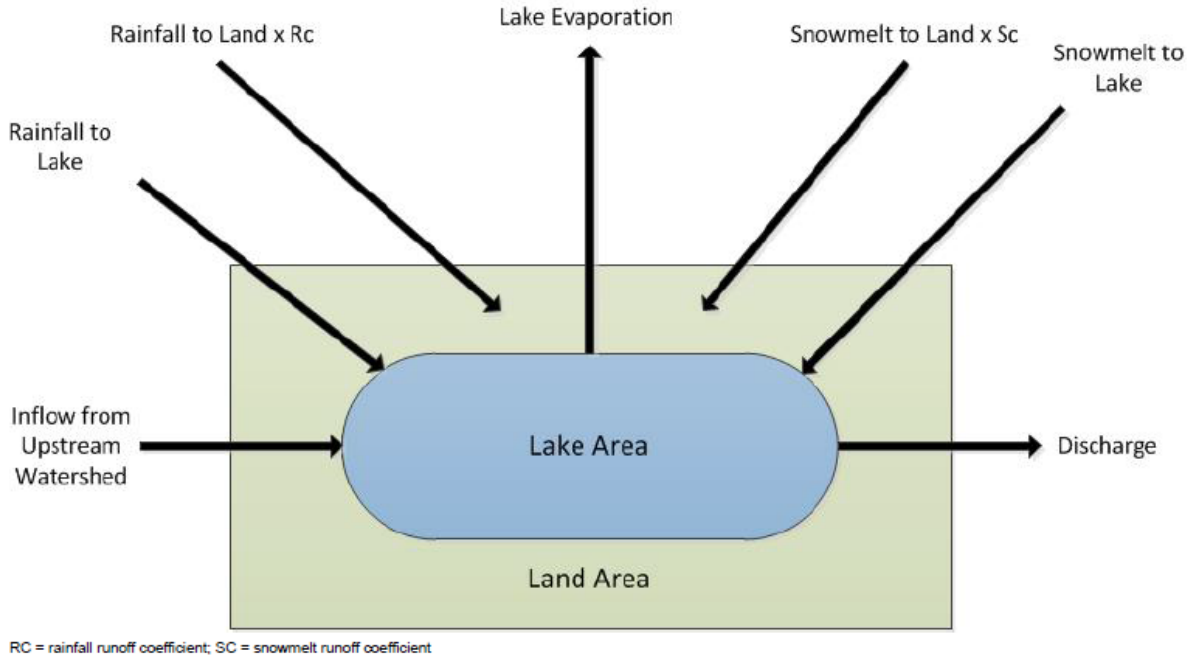
In the water blance model, each modelled lake uses a “vertical wall” assumption that the lake surface area is constant and does not change with variations in lake water level. This assumption was used as there was no available bathymetry for almost all modelled lakes. Lakes with available bathymetry (including Lac du Sauvage, Lac de Gras, Lake B1, Lake C1, Lake D3) do not have resolution to support varying lake surface area for relatively small changes in depth. For the purposes of this water balance model, the change in overall evaporation and runoff rates due to changing lake surface areas is assumed to be minimal.

These assumptions are supported by the fact that lakes in the study area typically have very small (e.g., often on the order of 0.5 metres) variations in water surface elevation between normal high and low water stages. Stage-storage characteristics below the lake low water level (i.e., dead storage) are not required inputs to the model.

Lake storage curves, at 1 metre depth resolution, are provided in the Developer’s Assessment Report (Annex X, Hydrology Baseline Report) for each Lac du Sauvage sub-basin (Section 5.2.1) and for Lac de Gras (Section 5.3).

Lake storage is tracked in each modelled reservoir as an accumulation (or loss) of water based on the inflow and outflow rates, as depicted in Figure 36-1 below. The lake storage is proportional to the lake water level, which in turn, affects the lake outlet discharge rate. If the lake water level is below the zero-discharge elevation, evaporative losses are still accounted for.

Figure 36-1 Schematic of Lake Reservoir Model



RC = rainfall runoff coefficient; SC = snowmelt runoff coefficient

DOMINION DIAMOND

Information Request Number: DAR-GNWT-IR-37

Source: Government of Northwest Territories – Lands: Paul Mercredi

Subject: Baseline Water Balance Model

DAR Section(s): Annex X

Preamble (GNWT):

On page F-11 of Annex X, the use of the Slipper Lake discharge hydrograph to adjust rating curves for the LDG Tributary Watershed 9 discharge is unclear and appears incomplete. Additionally, the methodology used for the other 8 Tributary Watersheds is unclear.

Request (GNWT):

GNWT requests that DDEC provide a complete description of the use of the Slipper Lake discharge hydrograph to adjust rating curves for the LDG Tributary Watershed 9 discharge. GNWT also requests that DDEC provide information on methods related to the other 8 Tributary Watersheds.

Response:

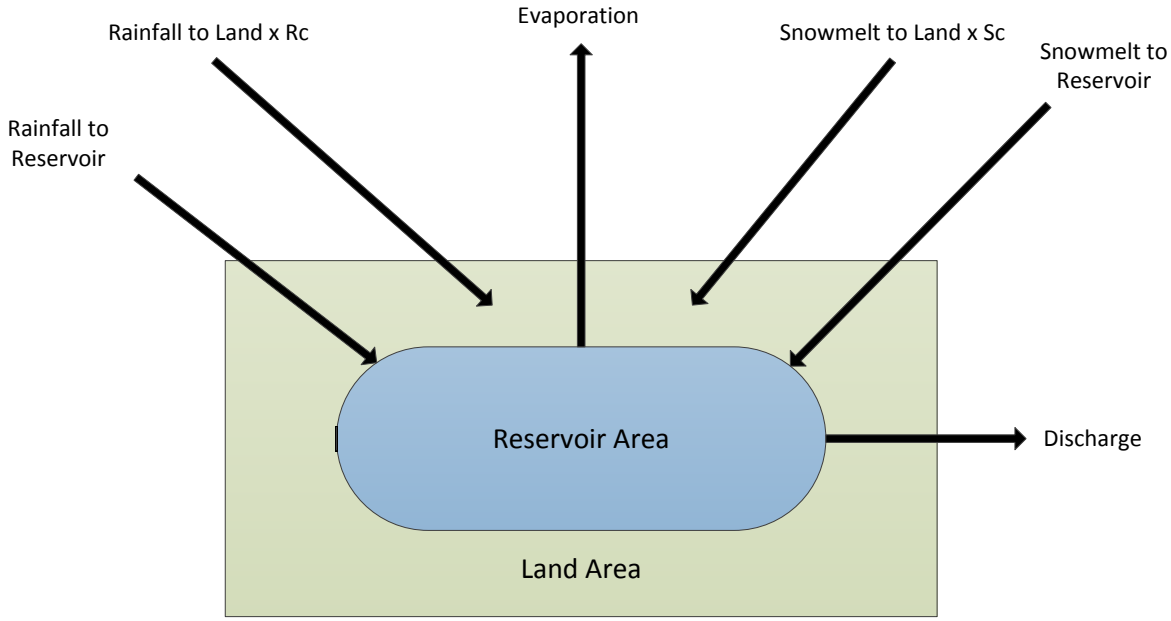
The discharge from the Lac de Gras tributary basins, in addition to direct precipitation on Lac de Gras, and discharges from the Paul Lake basin and the Lac du Sauvage watershed, are the inputs into Lac de Gras. The regional water balance model was primarily calibrated to water yields, flows, and water levels in Lac de Gras and Desteffany Lake, and therefore, overall inputs into Lac de Gras are calibrated. The nine Lac de Gras tributary basins, with the exception of Tributary Basin 4, were modelled as discrete reservoirs using the structure in Figure 37-1 below. The tributary basin areas were broken down into the total land and total lake areas to determine to total annual discharge volume.

The modelling approach for tributary basins described above (in Figure 37-1) does not apply to the Paul Lake basin and the Lac du Sauvage watershed, which were modelled as a network of lake reservoirs in series and parallel. The difference in model structure between watersheds is further described in the response to DAR-GNWT-IR-32.

Basin 4 is the direct contributing area to Lac de Gras and is not modelled as a discrete reservoir. The gross drainage of Basin Areas 5 and 7 were combined and modelled as one reservoir due to their small size.

There are very limited hydrometric data for the nine contributing tributary basins to Lac de Gras apart from hydrometric data collected as a part of the Ekati Mine Aquatic Effects Monitoring Program (AEMP) within the Slipper Lake basin (ERM Rescan 2014). These data include flows and water levels from the terminal basin lake, Slipper Lake. The typical hydrograph for basins of this size are to have peak flows in freshet, low sustained flows through the summer, and potentially increased fall flows due to precipitation. The outlet openings are assumed to freeze completely over the winter as described in Section F3.1.3 in Appendix F of Annex X, and confirmed in the Ekati Mine AEMP (ERM Rescan 2014) and 2014 Hydrology Supplemental Baseline Report (Dominion Diamond 2015).

Figure 37-1 Diagram for Lac de Gras Tributary Basin Model



The approach to model the Lac de Gras tributary basins was to:

1) Determine total annual discharge from each tributary basin determined from total land and lake areas.
2) Use a broad-crested weir equation with coefficients calculated from the regional analyses described in Section F3.1.2.1.2 of Appendix F in Annex X.
3) Calibrate the overall shape of the tributary basin hydrograph to match the overall hydrograph shape of the Slipper Lake hydrograph by adjusting the water level factor, *l,* described below.

A broad-crested weir equation was used to model the terminal discharge from each tributary basin to Lac de Gras. The broad-crested weir equation is defined as:

$$Q = w\,(l\,y)^{1.5}$$

where:

Q = discharge (m³/s);

w = 0.007*DA +0.90 (from regional analysis);

l = 2.5 (water level correction factor)

y = depth above zero-flow elevation (m); and,

DA = gross basin drainage area (km^2)

The water level correction factor was to improve modelling of reservoirs while integrating the broad-crested weir equation and the regional relationship described in Section F3.1.2 in Appendix F of Annex

10. Direct application of the broad crested equation to the reservoir model is not appropriate, as water level rise is spread across all lake and stream surface areas and resulting discharge is insufficient. The described method determines the expected quantity and seasonal variation for discharge into Lac de Gras from tributary basins.

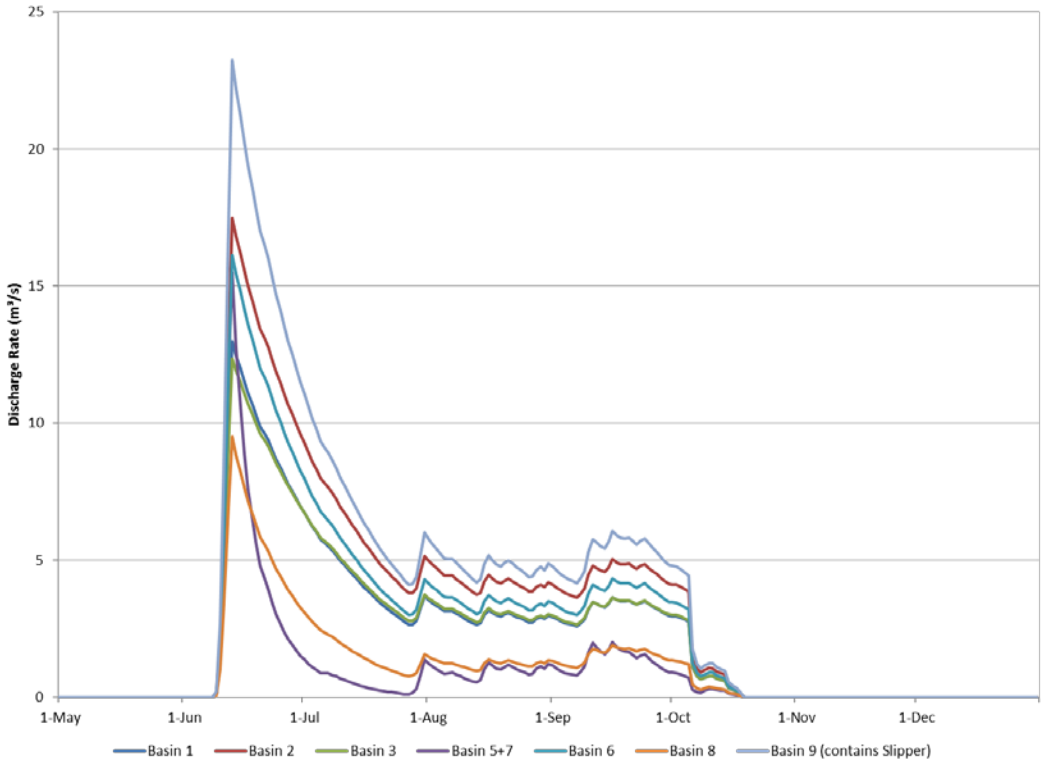
The gross basin drainage area and w factors are presented in Table 37-1.

Table 37-1 Basin Drainage and 'w' Factor

Basin	Gross Basin Drainage Area (km^2)	w factor
1	26,261	2.74
2	36,008	3.42
3	26,742	4.40
4	63,752	5.36
5+7	15,629	1.99
6	30,421	3.03
8	12,202	1.75
9	41,605	3.81

A hydrograph result for the modelled year 2012 is shown for each tributary basin in Figure 37-2.

Figure 37-2 Modelled 2012 Tributary Basin Hydrographs



While there are very limited hydrometric data for the tributary basins, the method described provides an appropriate annual discharge with a temporal distribution that is consistent with observed data. Lac de Gras stages and discharges, which are the result of this method and ultimately used for the assessment of the Jay Project effects, are calibrated to the observed historical hydrological data.

References:

Dominion Diamond (Dominion Diamond Ekati Corporation). 2015. 2014 Hydrology Supplemental Baseline Report for the Jay Project. Prepared by Golder Associates Ltd., April 2015. Yellowknife, NWT, Canada.

ERM Rescan (ERM Rescan Environmental Services Ltd.). 2014. Ekati Diamond Mine 2013 Aquatic Effects Monitoring Program Annual Report. Prepared for Dominion Diamond Ekati Corporation. Yellowknife, NWT, Canada.

DOMINION DIAMOND

Information Request Number: DAR-GNWT-IR-38

Source: Government of Northwest Territories – Lands: Paul Mercredi

Subject: Baseline Water Balance Model

DAR Section(s): Annex X

Preamble (GNWT):

On Page F-13 of Annex X related to ice-affected discharges, all estimates of ice effects on discharges appear to be derived by modeling based on still water and air temperatures. GNWT notes ice formation at lake outlets are also influenced by water temperature and water velocity and that lake outlet ice cover dates differ from general lake ice cover dates. Some lake outlets are known to remain open all winter.

Request (GNWT):

GNWT requests clarification on the amount of actual data available which could be used to predict ice-affected discharges.

Response:

The precise timing and extent of ice effects on lake outlets will depend on a wide variety of factors, including, but not limited to, lake outlet geometry, channel bed material, air temperature, water temperature, solar radiation, formation and melting of snow and ice blockages. The opening and freeze-up dates will vary for each outlet and for each year. It would not be possible to have site-specific freshet and freeze-up data for all lake outlets, but the degree-day method used in the model is physically based and appears to provide reasonable results as per the overall model calibration and validation.

The degree-day method provides a natural variation in the timing and rate of change of lake outlet ice effects based on ambient temperature, that can be applied at a watershed scale. Degree days are calculated as the product of “degrees variation from a base temperature” and “time in days” using daily mean temperatures. The degree-day method has been used for similar projects within the Lac de Gras watershed (Golder 1997; ERM Rescan 2014).

The degree-days are not used in this model for a direct calculation of the rate of ice formation which would, as mentioned in the preamble, require additional data, such as, water temperature and estimation of the thermal resistance above the growing ice layer. The degree-day method provides an estimate of date of initiation and rate of outlet opening during freshet. In the fall, it provides an estimate of the initiation and rate of outlet closing. The modelled outlet opening and freeze-up dates are provided in Table 38-1.

Table 38-1 Modelled Dates for Lake Outlet Break-Up and Freeze-Up (Period 1964 to 2013)

Model Date	Lake Outlet Break-Up	Lake Outlet Freeze-Up
Earliest Modelled Date	May 21	October 8
Mean Modelled Date	June 3	October 12
Latest Modelled Date	June 23	November 4

The sensitivity of model results to outlet freeze-up timing is low, due to small or zero flow rates for small watersheds. The sensitivity of model results to outlet opening timing during freshet is somewhat greater, but is limited due to upstream flow attenuation (in snowpack and lake storage) prior to full outlet opening. The modelled dates bracket the measured hydrometric data in the Lac de Gras watershed and are consistent with experience monitoring freshet at various locations in the Northwest Territories. Modelled outlet freeze-up and break-up dates for the Jay Project baseline report are consistent with those reported in the Ekati 2012 Aquatic Effects Monitoring Program (AEMP) (ERM Rescan 2013).

Large outlets that are not expected or not observed to freeze-up, based on Traditional Knowledge (Weledeh Yellowknives Dene 1997) and observation (Dominion Diamond 2015), include Lac du Sauvage, Duchess Lake, Lac de Gras and Desteffany Lake. These were modelled with reduced flow rates due to ice-effects rather than complete freeze-up of outlets. The methods for modelling reduced ice-affected flow rates are discussed in Section F3.1.3.2 of Appendix F in Annex X (Hydrology Baseline of the Developers' Assessment Report [DAR]) and in the response to DAR-GNWT-IR-39.

Field surveys during April 25 to 29, 2014 were completed to assess lake outlet conditions during an ice-affected season (Dominion Diamond 2015). The assumption that lake outlets other than Lac du Sauvage, Duchess Lake, Lac de Gras, and Desteffany Lake freeze solid during winter was generally validated. The following points provide a summary of the survey observations:

- Lakes Af1, B0, C1, D3 (Counts Lake), E1, F1, G1, H1, J1, and L1 were all observed to have outlets frozen to the stream bed with no flow;
- Paul Lake, a medium-sized lake within the Lac de Gras watershed, was observed to not have an ice covered outlet channel, and therefore, was not completely frozen to the channel bed approximately 20 metres upstream of the Misery Haul Road bridge crossing, during this site visit; and,
- The Lac du Sauvage Narrows had portions of open-water with observed flow and ice-cover extending into the Narrows from both Lac du Sauvage and Lac de Gras.

The degree-day method used is considered to provide an appropriate approximation of conditions at lake outlets in the region, and provides acceptable results consistent with Traditional Knowledge, historical observations, and data collected as part of the Jay Project baseline program. In addition, it is also validated as an appropriate method to describe baseline conditions and assess the effects to flows and water levels due to the Project activities.

References:

Dominion Diamond (Dominion Diamond Ekati Corporation). 2015. 2014 Hydrology Supplemental Baseline Report for the Jay Project. Prepared by Golder Associates Ltd., April 2015. Yellowknife, NWT, Canada.

ERM Rescan (ERM Rescan Environmental Services Ltd.). 2013. Ekati Diamond Mine 2012 Aquatic Effects Monitoring Program Annual Report. Prepared for BHP Billiton Canada Inc. Yellowknife, NWT, Canada.

ERM Rescan. 2014. Ekati Diamond Mine 2013 Aquatic Effects Monitoring Program Annual Report. Prepared for Dominion Diamond Ekati Corporation. Yellowknife, NWT, Canada.

Golder (Golder Associates Ltd.). 1997. Baseline Data of Climate and Surface Water Hydrology for the Diavik Diamond Mine EIA.

DOMINION DIAMOND

Information Request Number: DAR-GNWT-IR-39

Source: Government of Northwest Territories – Lands: Paul Mercredi

Subject: Baseline Water Balance Model

DAR Section(s): Annex X

Preamble (GNWT):

On Page F-14 of Annex X, LDS and LDG discharges are stated to be reduced due to blocking of the outlet channel by ice, yet the method presented to compute reduced discharges is based only on ice cover roughness, not flow area reduction. It is not apparent if other factors such as ice thickness growth and smoothing of the under-ice surface over the winter season were considered. These factors could also potentially affect the discharge regime.

Request (GNWT):

GNWT requests that DDEC confirm whether or not these additional factors were considered, and if not, please provide a rationale for the exclusion of these factors in this analysis.

Response:

The discharge regime at the Lac du Sauvage and Lac de Gras outlets were calibrated to historical Lac de Gras water levels and downstream Desteffany Lake discharges for both open-water season and lake ice-cover season, in addition to annual water yields. This calibration provides a high level of confidence in overall model performance.

The method used to estimate winter ice-affected discharges from the Lac du Sauvage and Lac de Gras outlets is intended to provide a combined effect (a reduction) to the discharge regime from ice effects. The effects due to ice thickness growth or smoothing of the under-ice surface were not considered individually, but rather within the combined winter flow reduction factor. This approach was used due to limited available calibration data for ice-affected discharges specific to the Lac du Sauvage and Lac de Gras outlets, and is consistent with previous modelling completed at the Lac de Gras outlet (Golder 1997).

It is expected that additional data from the 2014 hydrology field program (Dominion Diamond 2015), surveys completed by Ekati Environmental Staff (see the response to DAR-MVEIRB-IR-64), and future operational monitoring at the Lac du Sauvage and/or Lac de Gras outlets, will provide additional site-specific calibration data for winter conditions. These calibration data will support future analyses contributing to the Jay Project Closure Plan and related evaluation of effects to the Lac du Sauvage and Lac de Gras discharge regimes.

References:

Dominion Diamond (Dominion Diamond Ekati Corporation). 2015. 2014 Hydrology Supplemental Baseline Report for the Jay Project. Prepared by Golder Associates Ltd., April 2015. Yellowknife, NWT, Canada.

Golder (Golder Associates Ltd.). 1997. Baseline Data of Climate and Surface Water Hydrology for the Diavik Diamond Mine EIA.

DOMINION DIAMOND

Information Request Number: DAR-GNWT-IR-40

Source: Government of Northwest Territories – Lands: Paul Mercredi

Subject: Baseline Water Balance Model

DAR Section(s): Annex X

Preamble (GNWT):

On Page F-22 of Annex X, the calibration results show that unrealistic values of runoff coefficients were required for calibration - i.e. RC for rainfall land runoff = 0.57 and SC for snowpack runoff from land = 1.00. No explanation for this result is provided, and no justification for accepting this result is made.

Request (GNWT):

GNWT requests the DDEC provide an explanation of the result noted above as well as provide justification for the acceptance of this result.

Response:

The runoff coefficients derived in the water balance model and presented in Table F3-9 of Annex X, Appendix F of the Developer's Assessment Report (DAR) were calibrated to the mean annual water yield of the Lac de Gras basin. The runoff coefficients for rainfall and snowfall runoff on land are 0.2 to 0.3 units higher than those found in the literature review in the Annotated Bibliography (DAR Annex X, Appendix A).

It is expected that runoff coefficients vary in hydrological studies, as they are calibrated to measured data and may include inconsistent treatments of factors including sublimation, evapotranspiration, and infiltration losses. In particular, the 30 percent reduction in snow water equivalent that was applied in the model to account for sublimation is likely to account for much of this apparent discrepancy.

The runoff coefficients are consistent with previous calculations of land water losses in the Lac de Gras basin (Golder 2008), current runoff coefficients used at the Ekati Mine (ERM Rescan 2014), and with hydrological experience at other mine sites in the Northwest Territories.

The runoff coefficients are considered realistic and appropriate based on the historic water yields, study methodology, and comparison to recent regional studies.

References:

ERM Rescan (ERM Rescan Environmental Ltd.). 2014. Water Balance and Water Quality Modelling related to the Jay Project. Yellowknife, NT, Canada: ERM Rescan.

Golder (Golder Associates Ltd.). 2008. 2007 Review of Baseline Climate and Surface Hydrology for the Diavik Diamond Mine. Burnaby, BC, Canada: Golder Associates Ltd.

DOMINION DIAMOND

Information Request Number:	DAR-GNWT-IR-41
Source:	Government of Northwest Territories – Lands: Paul Mercredi
Subject:	Baseline Water Balance Model
DAR Section(s):	Annex X

Preamble (GNWT):

On Page F-24 of Annex X, the rainfall and snowfall data used for inputs to the model were developed using “undercatch” correction factors. Corrections for undercatch are appropriate, and indeed are required for accurate inputs, especially in the north. Research has shown that such factors depend on whether precipitation occurs as rainfall or snowfall and the type of instrumentation used, as well as other aspects, and that the value of the correction factor can vary considerably from month to month and year to year. The method used in the DAR was to use one constant long term average annual correction factor for rain and one for snow, and then apply those two factors to each and every day of the selected recorded data.

Request (GNWT):

GNWT requests the DDEC provide an explanation of the result and a justification of their approach.

Response:

The water balance model considers physical characteristics of the basins and derived long-term meteorology for the hydrology baseline study area. The baseline meteorology is intended to represent the long-term mean and variability at the Jay Project, but is not intended to represent conditions at specific locations on specific dates. For example, a rainstorm that may have occurred in the Lac du Sauvage basin in the summer of a specific year may not be present in the baseline meteorology series. However, over the long term, mean and extreme rainfall characteristics at that location should be represented.

The Climate Research Division of Environment Canada has developed a database of long-term homogenous precipitation data. The Adjusted Historical Canadian Climate Data (AHCCD) database includes 495 stations where archived rainfall and snowfall data have been adjusted for rain and snow separately (Environment Canada 2013). The adjustments account for many factors regarding undercatch for rain and snow gauges including wind, evaporation, sublimation and gauge specific wetting losses.

An analysis conducted by Golder Associates Ltd. (Golder) in 2007 for the Diavik Diamond Mine (Golder 2008) using historical time series of rainfall and snowfall (1959-2006) was constructed for use at the Diavik Mine as a combination of historical precipitation reported at the Environment Canada Meteorological Climate Stations: Contwoyto Lake (ID 2200850), Lupin (ID 22026HN), Diavik Mine AWS, and Ekati Mine.

The Golder (2008) analysis estimated the monthly and annual rainfall and snowfall correction factors per year based on the adjusted monthly rainfall and snowfall records archived in the AHCCD database. The Golder (2008) analysis indicated that a comparison of adjusted and archived monthly rainfall data

suggests an average (i.e., annual) rainfall correction factor of about 1.12 and a similar correction factor of 1.32 for snowfall.

The Golder (2008) analysis also indicated that:

- The recorded rainfall and snowfall series at the Lupin Extended station from 1959 to 2001 were increased by a factor of 1.03 and 1.05, respectively, to account for aerial variation;
- The monthly rainfall data series from 1959 to 2006 was adjusted by a consistent factor of 1.12 to account for rainfall undercatch (the average annual undercatch factor is 1.12; although specific monthly factors range from 1.11 to 1.28 for the main rainfall months of June to October); and,
- The monthly snowfall data series from 1959 to 2006 was adjusted by a consistent factor of 1.32 to account for snowfall undercatch (the average annual undercatch factor is 1.32, although monthly undercatch factors range from 1.30 to 1.66 over the main snowfall months of October to May).

The range of the monthly undercatch factors is calculated from average undercatch factors for each individual month (e.g., the average of all the January factors). The range of rainfall undercatch factors for the entire dataset from 1959 to 2002 is 1.04 to 5.00 and the snowfall undercatch factors range from 1.00 to 6.67.

There are instances when the monthly average undercatch factors are influenced by outliers; this is presented for illustrative purposes for the June rainfall data and February snowfall data in Figure 41-1 and Figure 41-2, respectively.

The undercatch factors derived from average annual data reduce the potential for monthly outliers to influence the overall undercatch factor for both the rainfall and snowfall data. This allows for the development of a meteorological series that is representative of the long term mean and variability of the Project instead of representing specific, potentially anomalous events.

Figure 41-1 Rainfall Undercatch Factors for the Month of June

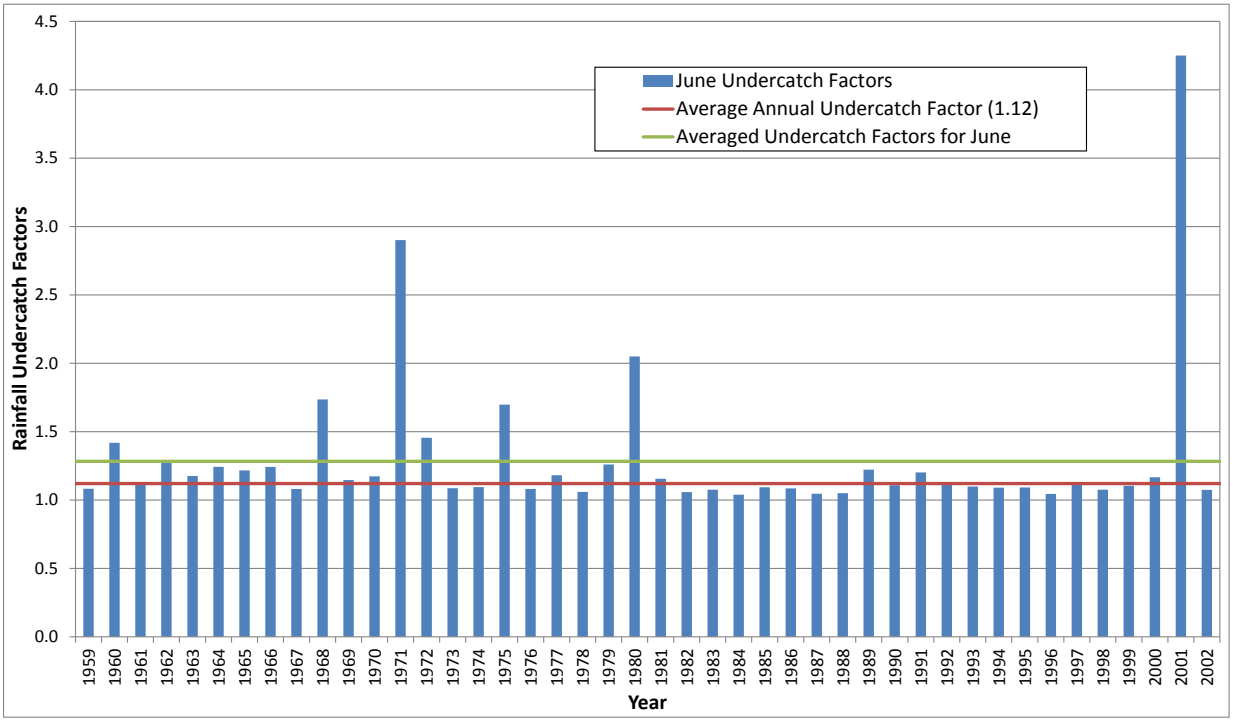
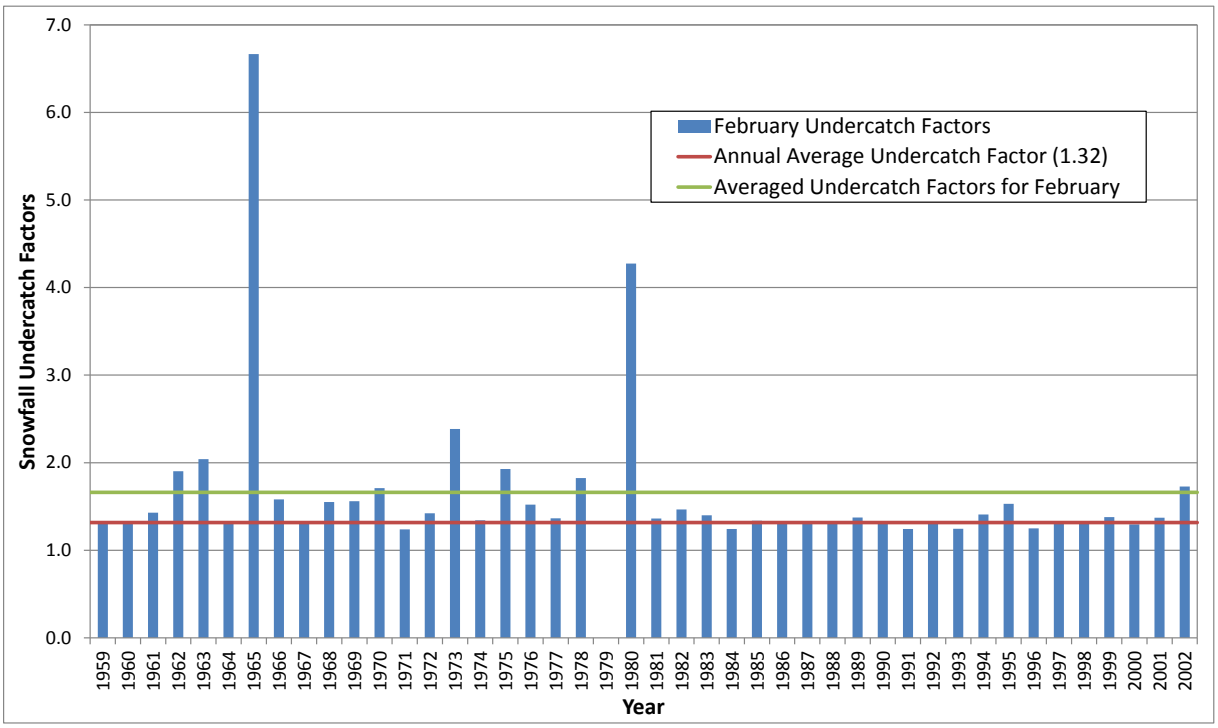
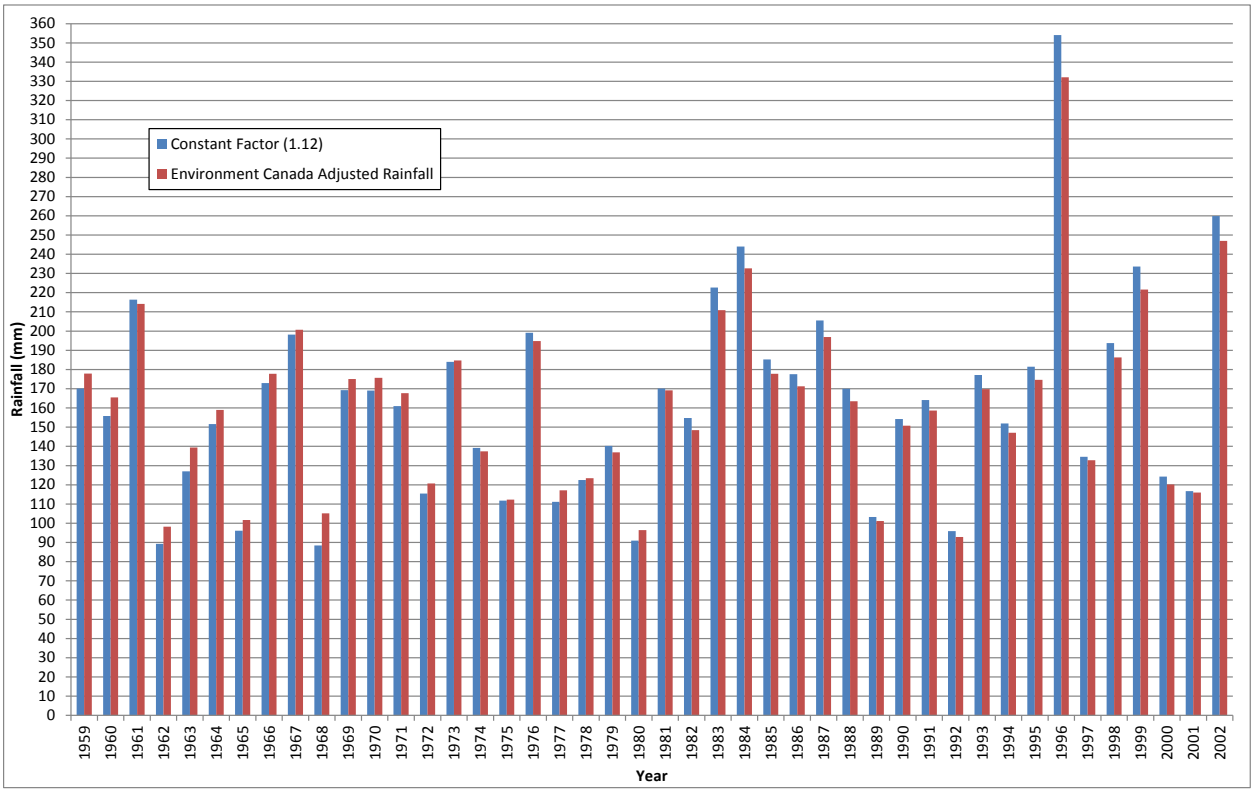


Figure 41-2 Snowfall Undercatch Factors for the Month of February



A comparison of the daily rainfall amounts at the Lupin Extended station, adjusted using a constant undercatch factor (1.12) to the monthly rainfall amounts adjusted by Environment Canada, and not corrected for location, is shown in Figure 41-3. The rainfall data shown in Figure 41-3 are the total annual (calendar year) rainfall amounts for each year in the time series.

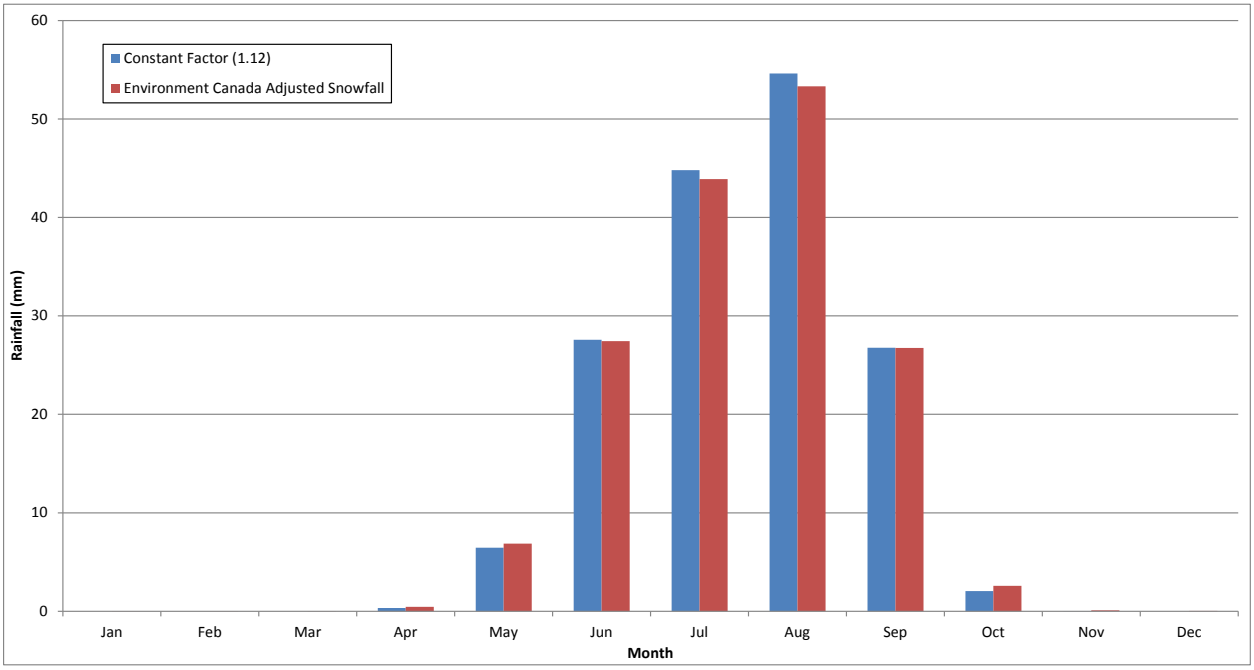
Figure 41-3 Lupin Extended Station Annual Rainfall Adjusted for Undercatch



For the years up to 1973, the annual rainfall amounts adjusted with a constant factor of 1.12 are similar to the Environment Canada adjusted amounts (within 5 percent [%]), with some years showing amounts under-predicting the Environment Canada dataset. The years after 1973 show a trend where the rainfall amounts adjusted with a constant factor over-predict the Environment Canada dataset (within 5%). Across the entire time series, the rainfall amounts adjusted by a constant factor are within ± 5% of the Environment Canada amounts. The average annual rainfall (calendar year) of both the adjusted datasets (one constant undercatch factor and Environment Canada) are 162.6 millimetres (mm) and 161.4 mm, respectively.

A comparison of the total monthly rainfall amounts averaged over the entire time series at the Lupin Extended station adjusted using a constant undercatch factor (1.12) to the monthly rainfall amounts adjusted by Environment Canada, not corrected for location, are shown in Figure 41-4.

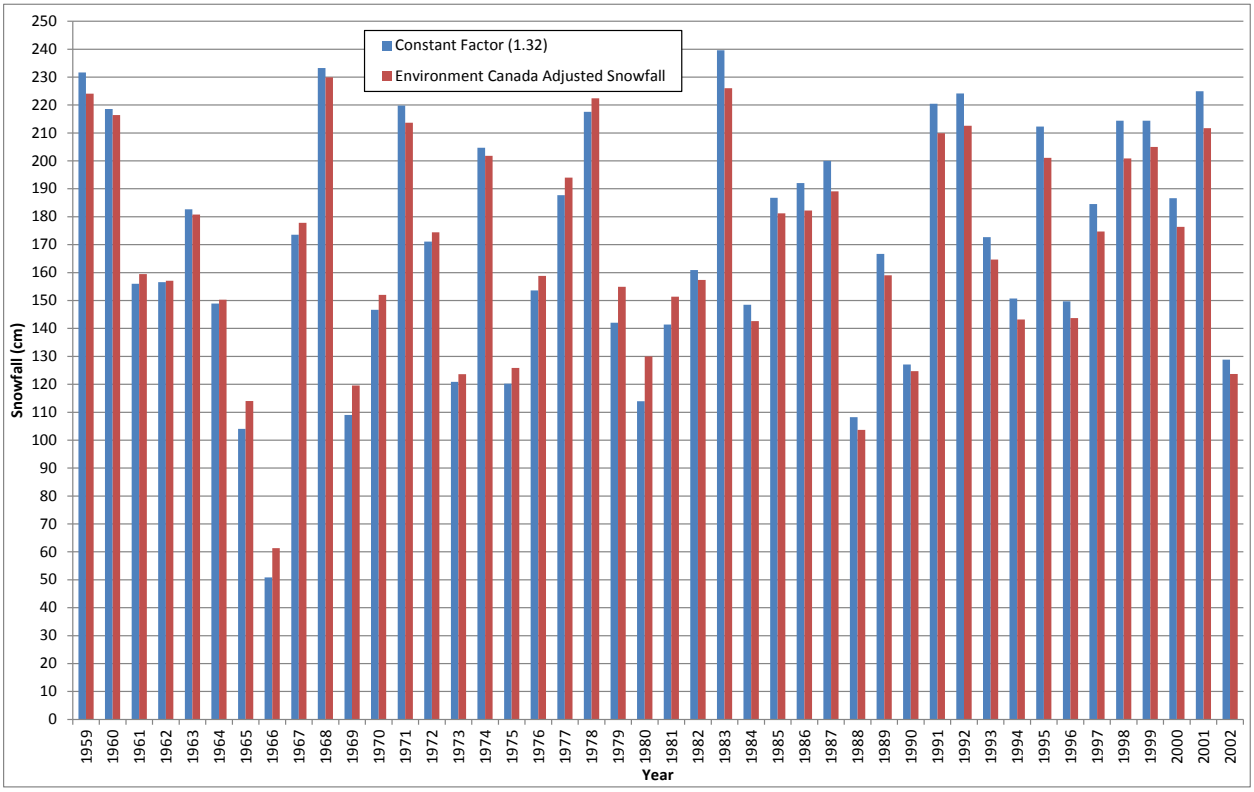
Figure 41-4 Lupin Extended Station Monthly Averaged Rainfall Adjusted for Undercatch



Similar to the annual rainfall amounts, the average monthly rainfall amounts developed using a constant factor of 1.12 compare reasonably well with the Environment Canada adjusted rainfall amounts (± 5%). In the baseline climate data set, undercatch values for rainfall of 1.12 were applied to Diavik rainfall measurements collected from 2002 to 2008 and Ekati rainfall measurements collected from 2009 to 2013.

A comparison of the annual snowfall amounts at the Lupin Extended station adjusted using a constant undercatch factor (1.32) to the annual snowfall amounts adjusted by Environment Canada, not correcting for location, is shown in Figure 41-5. The snowfall data shown in Figure 41-5 are the total annual (calendar year) snowfall amounts summated for each year in the time series.

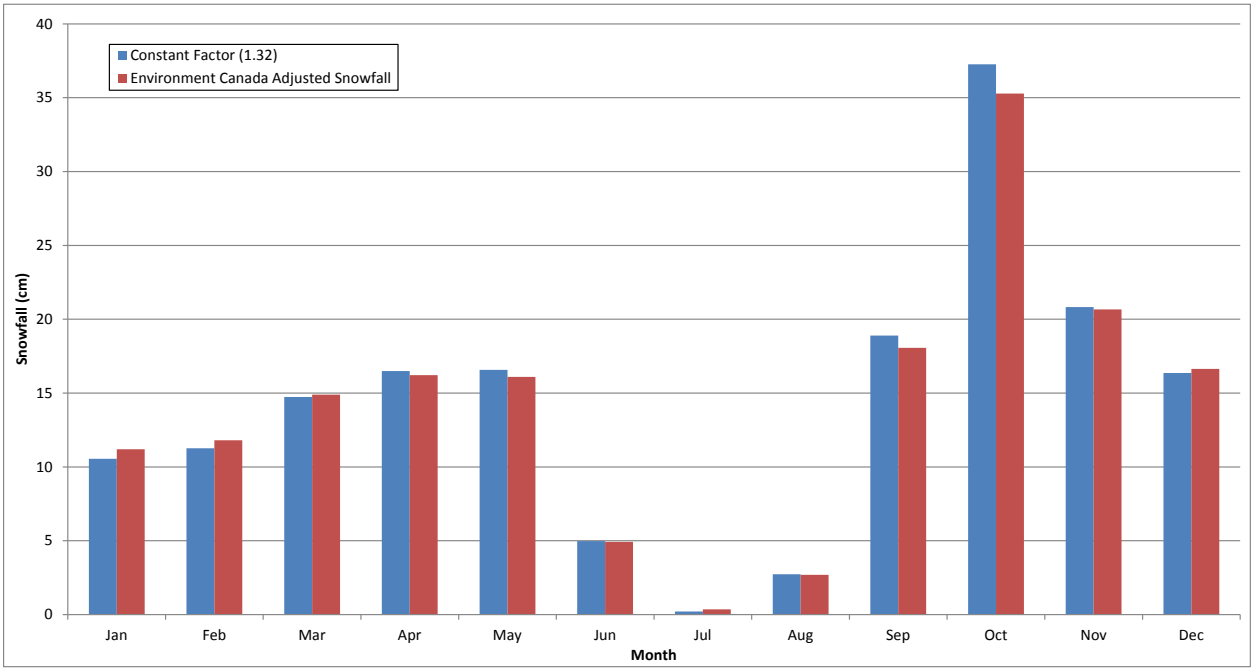
Figure 41-5 Lupin Extended Station Annual Snowfall Adjusted for Undercatch



For the years up to 1981, the daily snowfall amounts adjusted with a constant factor of 1.32 are similar to the Environment Canada adjusted amounts (within 5%), with some years showing amounts under-predicting the Environment Canada dataset. The years after 1981 show a trend where the snowfall amounts adjusted with a constant factor over-predict the Environment Canada dataset (within 5%). Across the entire time series, the snowfall amounts adjusted by a constant factor are within ± 5% of the Environment Canada amounts. The average annual snowfall (calendar year) of both the adjusted snowfall datasets (one constant undercatch factor and Environment Canada) are 170.9 centimetres (cm) and 168.8 cm.

A comparison of the total monthly snowfall amounts averaged over the entire time series at the Lupin Extended station adjusted using a constant undercatch factor (1.32) to the monthly snowfall amounts adjusted by Environment Canada, not correcting for location, are shown in Figure 41-6.

Figure 41-6 Lupin Extended Station Monthly Averaged Snowfall Adjusted for Undercatch



Similar to the annual snowfall amounts, the average monthly snowfall amounts developed using a constant factor of 1.32 compare reasonably well with the Environment Canada adjusted snowfall amounts (± 5%). No undercatch factor was applied to Diavik manual snowfall measurements collected from 2002 to 2013, following comparison to same year corrected Lupin snowfall and Ekati measured snowfall.

Application of consistent undercatch factors for rainfall and snowfall allow baseline meteorology to represent the long-term mean and variability at the Jay Project. The application of consistent undercatch factors is considered appropriate in comparison to adjusted data with annual and monthly undercatch factors.

References:

Golder (Golder Associates Ltd.). 2008. 2007 Review of Baseline Climate and Surface Water Hydrology for the Diavik Diamond Mine. Prepared for Diavik Diamond Mines Inc., Yellowknife, NWT, Canada. Document RPT-602, Ver. 0. November 2008. 110 pp.

Environment Canada. 2013. Adjusted and Homogenized Canadian Climate Data (AHCCD).Available at: http://www.ec.gc.ca/dccha-ahccd/. Accessed: January 20, 2014.

DOMINION DIAMOND

Information Request Number:	DAR-GNWT-IR-42
Source:	Government of Northwest Territories – Lands: Paul Mercredi
Subject:	Baseline Water Balance Model
DAR Section(s):	Annex X

Preamble (GNWT):

On Page F-25 of Annex X, it is noted that the comparison of modeled and observed discharges was possible for only three locations. The modeled discharge peaks are much higher - up to 3 to 6 times greater - than observed peaks.

Request (GNWT):

GNWT recommends that DDEC provide clarification on the relationship between modeled and observed discharges as noted above and their implications for the model.

Response:

The freshet peak discharges of Northern streams are often missed by hydrological monitoring programs due to the logistical and safety concerns of field work during spring break up. For many of the observed discharges, the highest recorded discharge is the first measurement of the year, indicating that the hydrograph peak likely had already occurred and was not captured in the observed data.

The relationship between modelled and observed discharges apart from the freshet peak appear to match well for timing and magnitude of discharge rates. Additional qualifiers for comparison of model results and measured data are included on Page F-27 of Annex X (Hydrology Baseline) of the Developer's Assessment Report (DAR). Furthermore, a comparison of observed values with the modelled water levels and flows at Lac de Gras (Page F-26 of Annex X [Hydrology Baseline] of the DAR) and the modelled flows at Desteffany Lake (Figure 8D3.1-3 of Appendix 8D of the DAR), appear to be well matched for timing and magnitude.

Additional hydrometric data was collected as part of the 2014 hydrology field program (Dominion Diamond 2015), and will be used for continuing model validation. An initial model validation report, based on 2014 hydrometric data, is expected to be completed late spring or early summer 2015.

References:

Dominion Diamond (Dominion Diamond Ekati Corporation). 2015. 2014 Hydrology Supplemental Baseline Report for the Jay Project. Prepared by Golder Associates Ltd., April 2015. Yellowknife, NWT, Canada.

DOMINION DIAMOND

Information Request Number:	DAR-GNWT-IR-43
Source:	Government of Northwest Territories – Lands: Paul Mercredi
Subject:	Mine Water Management
DAR Section(s):	3, Appendix 3A

Preamble (GNWT):

On Page 15 of the Mine Water Management Plan, regarding flow to the diked area for dewatering, the land areas contributing inflow to the diked area are neither shown on the Figures nor quantified in the text. It also appears that part of the WRSA would drain into the diked area.

Request (GNWT):

GNWT requests that DDEC provide the information noted in the comment section, in order for GNWT to be able to assess water balance.

Response:

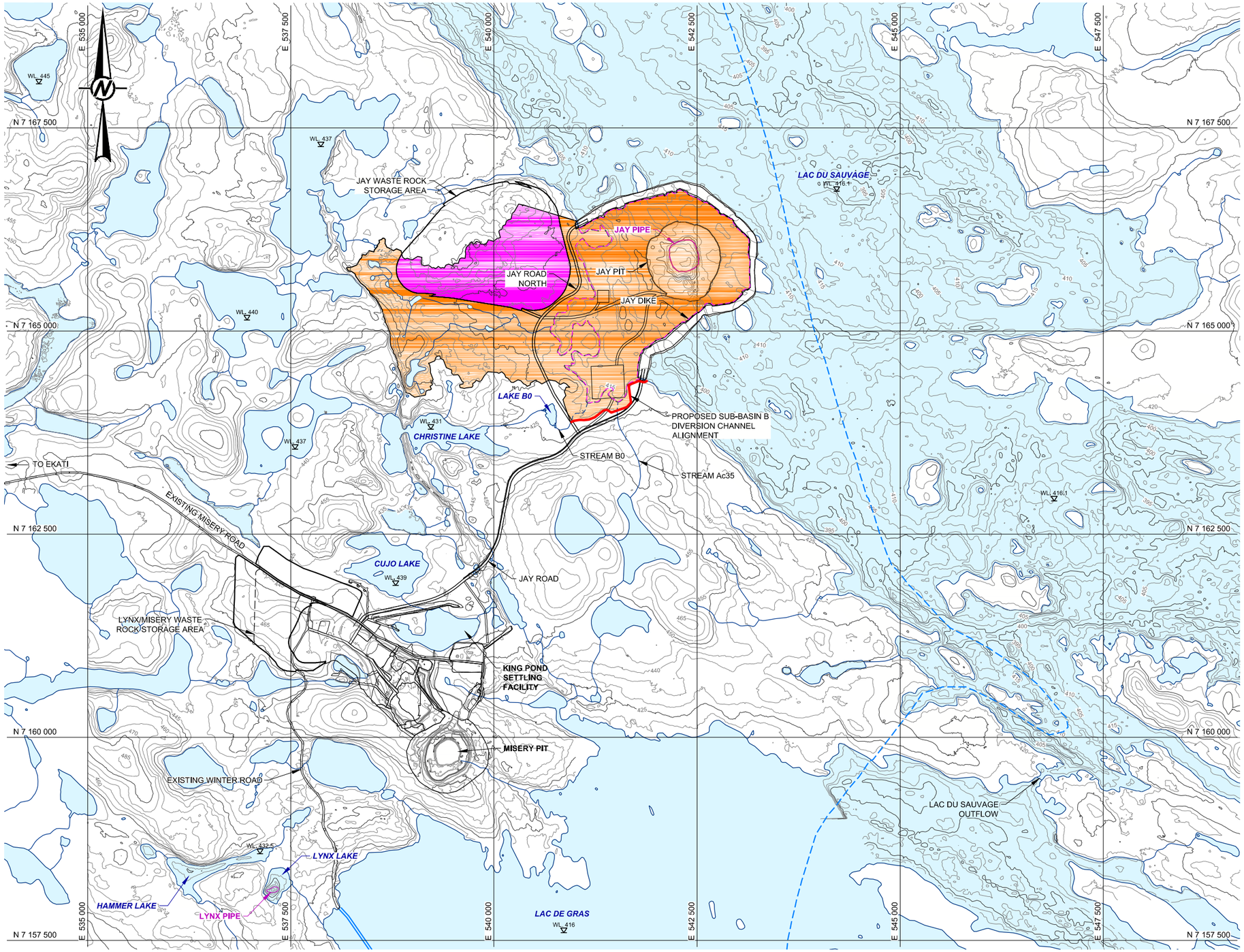
Figure 43-1 shows the watershed areas contributing inflows to the diked area. These areas are referred to as:

- Jay Runoff Sump Contributing Area (shown in orange); and,
- Waste Rock Area contributing to the Jay Sump (shown in pink).

Runoff volumes from these areas were incorporated into the water balance model within the Mine Water Management Plan, which is included in Appendix 3A of the Developer's Assessment Report (DAR). Table 43-1 below, presents the watershed areas used in the water balance model to calculate flows that enter the diked area. These areas have been subdivided according to the runoff coefficient term used in the model. Appendix B of the Mine Water Management Plan (Appendix 3A) provides additional details, along with the runoff coefficient values assigned for each area.

The areas have been provided for the following two snapshots to represent the dewatering period;

- Start of dewatering - the diked area is filled with water; and,
- End of Dewatering - the diked area is empty, with the exception of the sumps.



LEGEND

- WATERBODY
- WATERCOURSE
- ROAD
- SUB-BASIN B DIVERSION CHANNEL
- WINTER ROAD - YEARLY CONSTRUCTION
- WINTER ROAD - ON DEMAND CONSTRUCTION
- PIPE LOCATION
- WATER LEVEL ELEVATION
- DISCONTINUED STREAM PORTION

SUB-BASIN LEGEND

- JAY RUNOFF SUMP CONTRIBUTING AREA
- WASTE ROCK AREA CONTRIBUTING TO JAY RUNOFF SUMP
- JAY RUNOFF SUMP LAKEBED AREA

NOTES

1. ALL UNITS ARE IN METRES UNLESS OTHERWISE NOTED.
2. GROUND SURFACE AND BATHYMETRY CONTOURS ARE SHOWN AT 5 m INTERVALS.
3. COORDINATES ARE SHOWN IN DATUM: NAD 83, PROJECTION: UTM ZONE 12.
4. DIKE LAYOUT UPDATED TO FINAL PFS DIKE DESIGN.

REFERENCES

1. CONTOUR AND BATHYMETRY DATA PROVIDED BY AURORA GEOSCIENCES LTD., FILE: Final 1m Contours - Priority Area.dxf, DATE RECEIVED: OCTOBER 29, 2013.
2. WATER OBTAINED FROM CANVEC NATURAL RESOURCES CANADA, 2012.
3. JAY PIT MODEL: GOLDER ASSOCIATES LTD., 2014. DOMINION DIAMOND PRE-FEASIBILITY MINE DESIGN STUDY. SUBMITTED TO DOMINON DIAMOND EKATI CORPORATION, DATED OCTOBER 7, 2014. REFERENCE NO: 1313280041-E14065-R-Rev0-2020. (FILE NAME: pit_v6_OL.dxf).
4. JAY PIPE LOCATION RECEIVED FROM DOMINION DIAMOND CORPORATION, FILE: jay_kimberlite_pipe_OL.dxf, DATED: JULY 19, 2013.
5. LYNX PIPE LOCATION RECEIVED FROM DOMINION DIAMOND CORPORATION, FILE: lynx_polyline.dxf, DATED: JUNE 25, 2013.

0 1,000 2,000 3,000

SCALE METRES

REV	DATE	REVISION DESCRIPTION	DES	CADD	CHK	RVW
2	2015-04-02	ISSUED FOR FINAL	MP	JD	FE	FD

PROJECT

DOMINION DIAMOND™

JAY PROJECT
NORTHWEST TERRITORIES, CANADA

TITLE

WATER BALANCE MODEL CATCHMENT BOUNDARIES

Golder Associates

PROJECT No.		1419751.3200.35	FILE No.		1419751-3200-35_1
DESIGN	MP	2015-03-10	SCALE		AS SHOWN
CADD	JD	2015-03-10	FIGURE		
CHECK	FE	2015-04-02			43-1
REVIEW	FD	2015-04-02			

N:\Client\Dominion Diamond\Jay-Cardinal Project\99_PROJECTS\1419751\02_PRODUCTION\3200\35\1419751-3200-35_1.dwg | Layout: 1 | Modified: jkownacki 03/25/2015 4:39 PM | Plotted: jdeol 04/02/2015

Table 43-1 Watershed Areas Used in the GoldSim Water Balance Model

Mine Phase	Land Type [a]		Diked Area Catchment Area (m^2)
Start of Dewatering	Natural	Undisturbed (includes WRSA)	5,360,917
		Dewatered Lakebed	0
	WRSA		0
	Road		96,200
	Lake Surface (within the dike)		3,601,068
	Total Area		9,058,185
End of Dewatering	Natural	Undisturbed (includes WRSA)	3,685,917
		Dewatered Lakebed	3,586,426
	WRSA[b,c]		0
	Road		96,200
	Lake Surface (sumps within the dike)		14,642
	Total Area		9,058,185

a) Land Type, refers to the runoff coefficient used in the water balance modelling (refer to Appendix B of the Mine Water Management Plan for additional discussion).

b) The ultimate footprint of the WRSA is conservatively considered in the model throughout the entire operations phase, to account for surface preparation activities prior to depositing waste rock material.

c) A portion of the WRSA is located outside of the natural catchment draining to the diked area. The contingency adaptive management plan includes collecting and managing the WRSA seepage. In the water balance model, this area is conservatively assumed to drain to the Jay runoff sump.

WRSA = waste rock storage area; m^2 = cubic metres.

DOMINION DIAMOND

Information Request Number: DAR-GNWT-IR-44

Source: Government of Northwest Territories – Lands: Paul Mercredi

Subject: Mine Water Management

DAR Section(s): 3, Appendix 3A

Preamble (GNWT):

On page 18 of the Mine Water Management Plan regarding the diversion channel, no information is provided on the watershed area or derivation of the design discharge. The figures also show a stream entering the diversion channel near its downstream end. It is unclear if this stream is included in the computations.

Request (GNWT):

GNWT requests additional information of the watershed area or derivation of the design discharge for the discharge channel. GNWT requests clarification from DDEC regarding the inclusion of a stream near the downstream end of the Sub-Basin B Diversion Channel in the computations regarding discharge.

Response:

The Sub-Basin B Diversion Channel is described in Section 3.5.3.2 of the Developer's Assessment Report (DAR). The diversion channel will divert flow from the drainage area to the west of the Lac du Sauvage comprising the Lake B1 (Christine Lake) and Lake B0 watershed (stream B0 watershed), and the Stream Ac35 wastershed (small stream that flows from Lake Ac35). Stream Ac35 will enter the diversion channel near the downstream end. The watershed area reporting to the diversion channel is shown in green in Map 44-1.

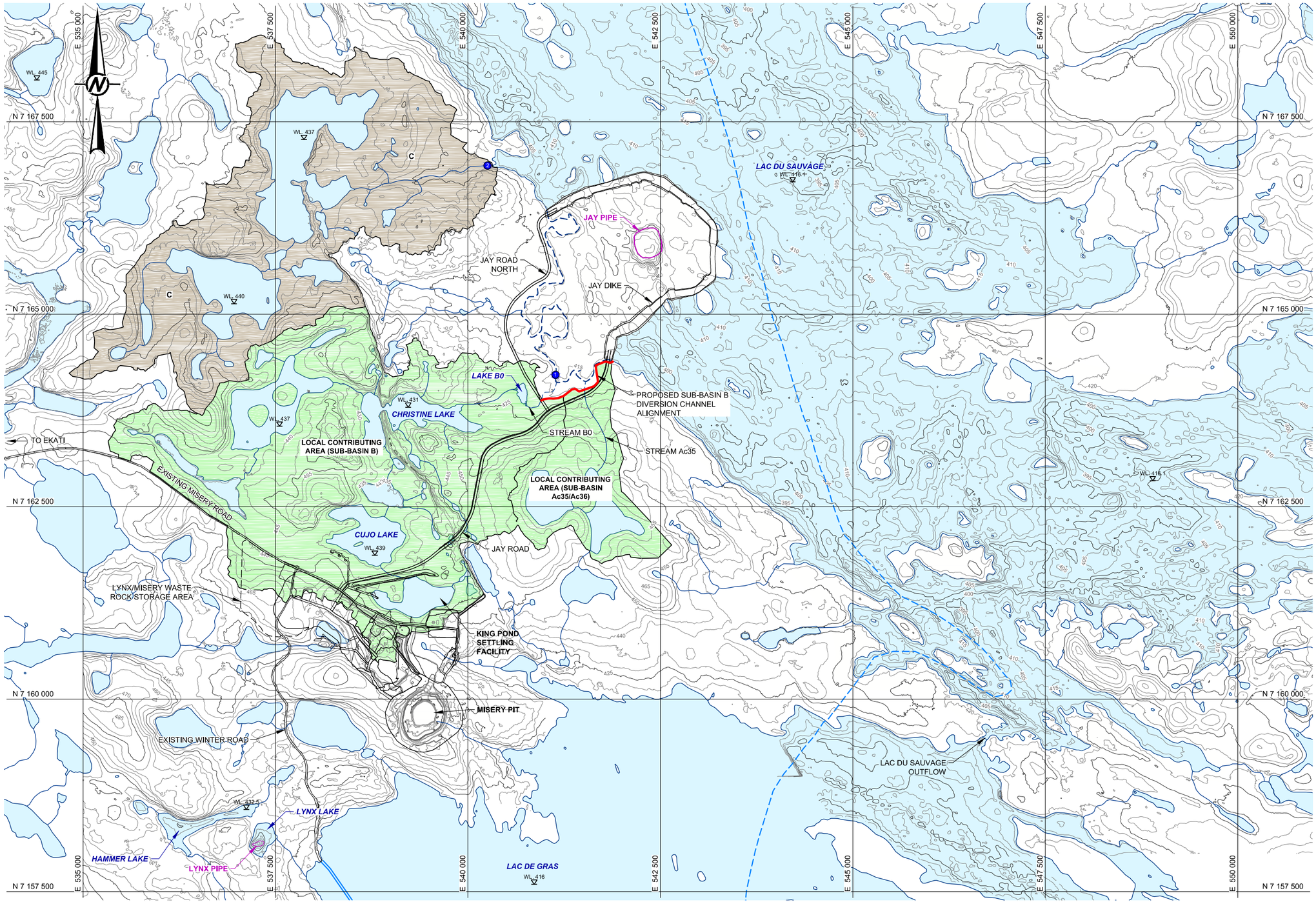
The diversion channel is designed to convey the peak flow generated from the reporting watershed areas during the 1-in-100 year return period storm.

Estimated extreme daily rainfall plus snowfall depths at the Project (Hydrology Baseline; Annex X of the DAR) were applied to the regional water balance developed for the Project and were used to derive design hydrographs and peak flows for the diversion channel.

The watershed areas reporting to the diversion channel as well as the estimated 1-in-100 year design flows are provided in Table 44-1.

Table 44-1 Drainage Areas and Design Flows for Sub-basin B and Sub-basin Ac35/Ac36

Catchment	Drainage Area (km^2)	Design Flows (m^3/s)
Sub-basin B	15.5	2.53
Ac35/Ac36	2.5	0.65
Total (channel design flow)	18.0	3.18



LEGEND

- SUB-BASIN OUTFLOW
- WATER BODY
- WATER COURSE
- ROAD
- SUB-BASIN B DIVERSION CHANNEL
- EXISTING SHORELINE IN DRAWDOWN AREA
- WINTER ROAD - YEARLY CONSTRUCTION
- WINTER ROAD - ON DEMAND CONSTRUCTION
- PIPE LOCATION
- WATER LEVEL ELEVATION
- DISCONTINUED STREAM PORTION

SUB-BASIN LEGEND

- SUB-BASIN C
- DIVERSION CHANNEL CONTRIBUTING AREA

NOTES

1. ALL UNITS ARE IN METRES UNLESS OTHERWISE NOTED.
2. GROUND SURFACE AND BATHYMETRY CONTOURS ARE SHOWN AT 5 m INTERVALS.
3. COORDINATES ARE SHOWN IN DATUM: NAD 83, PROJECTION: UTM ZONE 12.
4. DRAWING TO BE READ IN CONJUNCTION WITH TECHNICAL MEMORANDUM E14034-TM-REV.0.

REFERENCES

1. CONTOUR AND BATHYMETRY DATA PROVIDED BY AURORA GEOSCIENCES LTD., FILE: Final 1m Contours - Priority Area.dxf, DATE RECEIVED: OCTOBER 29, 2013.
2. WATER OBTAINED FROM CANVEC NATURAL RESOURCES CANADA, 2012.
3. JAY PIPE LOCATION RECEIVED FROM DOMINION DIAMOND CORPORATION, FILE: jay_kimberlite_pipe_OL.dxf, DATED: JULY 19, 2013.
4. LYNX PIPE LOCATION RECEIVED FROM DOMINION DIAMOND CORPORATION, FILE: lynx_polyline.dxf, DATED: JUNE 25, 2013.

0 1,000 2,000 3,000
SCALE METRES

REV	DATE	DESCRIPTION	DRW	DES	CHK	RVW
0	2014-08-29	ISSUED FOR PFS DESIGN	JD	JR	RM	JCC
B	2014-08-08	DRAFT - ISSUED FOR REVIEW	JD	JR	RM	JCC

SEAL / PERMIT

NOT FOR CONSTRUCTION

CLIENT: DOMINION DIAMOND

CONSULTANT: Golder Associates

PROJECT: 13-1328-0041.2020.25
JAY PROJECT
NORTHWEST TERRITORIES, CANADA

TITLE: SUB-BASIN B DIVERSION CHANNEL SITE PLAN

DRAWING No.: MAP 44-1

SHEET No.: 1 OF 1

SHEET SIZE ANSI D 25 mm 0

Drawing File: N:\Client\dominion diamond\Ujr_coding project\99_projects\13-1328-0041\02_PRODUCTION\2020\25\JAY DIVERSION CHANNEL\13132820041-2020-25_400-1.dwg Layout1 Friday, September 05, 2014 9:22:40 AM By: THossen

DOMINION DIAMOND

Information Request Number: DAR-GNWT-IR-45

Source: Government of Northwest Territories – Lands: Paul Mercredi

Subject: Mine Water Management

DAR Section(s): Appendix 3A

Preamble (GNWT):

On page 25 of the Mine Water Management Plan, the proposed use of the Lynx and Misery Pits for water storage is based on average runoff conditions. The effects of wet years on the water management approach and capacity requirements are unclear. As well, it is not specified how the discharge from Lynx Pit to LDG is to be controlled/managed.Request (GNWT):

Request (GNWT):

GNWT requests additional information on the effects of wet years on the water management approach and capacity and volume requirements, as well as how the discharge from Lynx Pit to LDG is to be controlled to prevent erosion or flooding.

Response:

The Mine Water Management Plan (Appendix 3A of the Developer's Assessment Report [DAR]) includes the use of the Lynx Pit for storage of water with elevated concentrations of total suspended solids (TSS) from dewatering of the diked area. The volume of water that will have elevated concentrations of TSS is an empirical estimate (50 percent [%] of the dewatered volume) for the purposes of water management planning and design. The actual volume will be dependent on various factors, for example: ice cover, wind, topography of the diked area, sediment thickness and gradation, and location of intake pumping systems. As dewatering will occur only over a 6 month period, any seasonal wet or dry variation will have limited effect on the overall volume of water to be dewatered, and potentially managed for TSS.

The Lynx Pit has an estimated maximum storage capacity of approximately 5.2 million cubic metres (m^3). The Lynx Pit will be filled with approximately 4.9 million m^3 of water pumped from the diked area, which provides approximately 3 metres of freeboard, or 300,000 m^3 storage allowance. It is estimated that under average climatic conditions, it will take 2.5 years for the Lynx Pit to become completely filled (i.e., reach storage capacity) with natural runoff that enters the pit and precipitation. This time is expected to be more than adequate to allow the suspended sediment to settle within the Lynx Pit Lake. A 1:10 year annual wet or dry year during the natural filling of this 300,000 m^3 could shorten or lengthen the filling period by approximately 6 months, which would not be expected to significantly affect the water quality in the Lynx Pit. Water quality monitoring will occur in the Lynx Pit during the natural flooding period to assess the suitability for the Lynx Pit Lake to naturally discharge to Lac du Gras.

Once the storage capacity of the pit lake is filled, water in Lynx Pit Lake will discharge through the existing natural Lynx Lake outlet to Lac de Gras, by gravity. The flooded Lynx Pit will have the same reporting catchment area as the current Lynx Lake. As such, it not anticipated that natural outflows from the flooded Lynx Pit will differ significantly from current discharge from Lynx Lake.

The final design of the Lynx Pit Lake outlet will include erosion protection features within the natural outlet channel to Lac de Gras, if required.

The Misery Pit will be used to store the remaining portion of the dewatering volume that contains elevated concentration of TSS (i.e., not stored in the Lynx Pit). Thereafter, the Misery Pit will continue to be used for minewater management.

A description of the effects of wet and dry years on storage requirements in the Misery Pit is provided in the response to DAR-GNWT-IR-30.

DOMINION DIAMOND

Information Request Number: DAR-GNWT-IR-46

Source: Government of Northwest Territories – Lands: Paul Mercredi

Subject: Mine Water Management

DAR Section(s): Appendix 3A

Preamble (GNWT):

On page 28 of the Mine Water Management Plan, it is noted that changes in hydrologic conditions due to climate change should be of little concern, compared to what is known about historical dry and wet year cycles. It is not apparent that climate change impacts were considered in the design. A related but potentially significant issue is the uncertainty in the results of the hydrologic modelling, which has not been assessed in the DAR.

Request (GNWT):

GNWT requests that DDEC discuss the need for a capacity safety factor to allow for or mitigate modelling uncertainty.

Response:

Refer to the response to DAR-GNWT-IR-30 for a description of the effects of wet or dry cycles on water management facilities. The groundwater inflows to the Jay Pit represent approximately 65 percent (%) of the total amount of minewater to be managed over the operations period (under average climate conditions). Groundwater inflows are minimally influenced by sequences of wet or dry years. Thus, the minewater management system is less sensitive to annual climate variations, than a system dominated by precipitation and surface runoff.

Due to the relatively short duration of the Project (i.e., less than 20 years, including construction, operation, and closure), climate change impacts to the water management facilities were considered to be less than the range of possible variations of wet or dry years, and therefore, no additional variations were considered.

The primary source of water that is pumped to the Misery Pit, during operations, is groundwater. Estimates of groundwater inflow volumes to the Jay Pit were obtained from the hydrogeological model that was developed in support of the Developer's Assessment Report (DAR) (Appendix 8A). Conservative assumptions were made for the hydrogeological model parameters resulting in conservatively high predictions of inflows to the Jay Pit (i.e., the Environmental Assessment Conservative Scenario) and in turn pumped to the Misery Pit. Groundwater inflows into the Jay Pit will be monitored throughout mining, as will the remaining storage capacity in the Misery Pit. This will allow time to react if adaptive management planning becomes necessary.

Appendix 8A presents results for two scenarios: the Reference Case (Section 8A3.6) which represents the expected hydrogeological conditions, and the Environmental Assessment Conservative Scenario (Section 8A4) which represents an upper bound estimate of groundwater inflow quantity and quality to the pit. To provide a sufficient level of conservatism that the effects on the environment have not been

underestimated, the Environmental Assessment Conservative Scenario has been presented and evaluated throughout the DAR. The water management structures have been designed based on the Environmental Assessment Conservative Scenario, and therefore, can accommodate a range of conditions and provide for contingency.

For comparison, Dominion Diamond has provided a ‘reasonable case’ water quality prediction (Compendium of Supplemental Water Quality Modelling, Appendix B). Although this case is also considered to be conservative, it better represents Dominion Diamond’s expectations for water quality for the Jay Project. Results of the water quality modelling for the reasonable case further demonstrate that the predictions used in the DAR are conservative.

DOMINION DIAMOND

Information Request Number: DAR-GNWT-IR-47

Source: Government of Northwest Territories – Lands: Paul Mercredi

Subject: Sub-basin B Diversion

DAR Section(s): 3, Section 3.5.3.2

Preamble (GNWT):

DDEC has proposed a Sub-basin B Diversion that will divert a small drainage area on the southwest shore of Lac du Sauvage to direct the Christine Lake outflow south around the dike into the main basin of Lac du Sauvage and will be approximately 1.3 km in length with a base width and depth of 1.5 m. While Section 3.5.2.2 of the DAR states that a design flow of 1:100 year return period, plus a minimum 0.3 m freeboard, was implemented, the flow and velocities of water moving through this area is unclear. Additionally, while it is stated that mitigation measures will be implemented to prevent erosion within the channel and at the discharge location, specifics do not appear to have been provided.

Request (GNWT):

GNWT recommends that DDEC provide flows and velocities anticipated within the Sub-basin B Diversion that would prevent adverse effects from erosion and sedimentation from the channel or at the outlet to Lac du Sauvage. DDEC should outline proposed mitigations that will be implemented to prevent water with high TSS from entering or being created in Lac du Sauvage.

Response:

Please see the response to DAR-GNWT-IR-44 for information on the drainage areas and design flows for the Sub-Basin B Diversion Channel. The diversion channel is proposed to have a trapezoidal section, with a bottom width of 1.5 metres (m), a depth of 1.5 m, 2H:1V side slopes, and a 0.1 percent (%) minimum longitudinal gradient. Based on the current understanding of overburden thickness in the Project area, it is assumed that the diversion channel will be mainly excavated in soil. Thus, it is proposed that the channel be lined with rip-rap, underlain by a 0.15 m thick drainage layer and non-woven geotextile, for erosion prevention. The rip-rap layer would have a diameter which 50% of the stones by weight (D_{50}) would be smaller than 150 millimetres (mm).

During average rainfall events (e.g., the 1 in 2-year event), the flow velocities in the diversion channel are estimated to range from 0.53 metres per second (m/s) along the portion of the channel with the minimum gradient (0.1%) up to 1.70 m/s along the portion of the channel with the steepest gradient (2.5%). Flow velocities in the diversion channel during the design event (1 in 100-year event) are estimated to range from 0.65 m/s to 1.8 m/s.

These velocities are low and compatible with the selected channel lining (rip-rap). Thus, it is expected that there is a low probability of erosion within the diversion channel. The assessment of potential effects on surface hydrology (including sediment and erosion) is in Section 8.4.2.4.2 of the Developer's Assessment Report under the secondary pathway of *The Sub Basin B Diversion Channel used to divert local drainage channels outside of the diked area of Lac du Sauvage may cause changes to water levels, flows, and channel/bank stability.* Due to the design and implementation of appropriate channel and

culverts, no increase in channel instability would be expected, and the design will reduce risks of erosion and sedimentation (Section 8.4.2.2.1), such that effects on Lac du Sauvage would not be expected.

The final design of the channel will include specific features to reduce the risk of erosion and sedimentation at the outflow into Lac du Sauvage, such as a rip-rap pad extending into Lac du Sauvage could be constructed at the discharge of the diversion channel to prevent erosion of the lakebed sediment.

DOMINION DIAMOND

Information Request Number: DAR-GNWT-IR-48

Source: Government of Northwest Territories – Lands: Paul Mercredi

Subject: Mine Water Management

DAR Section(s): 3, Appendix 3A, 8 (Table 8.1-1),8.2.2.2.3

Preamble (GNWT):

The mine water management plan describes the discharge of impounded water directly to Lac du Sauvage. Approximately 60% of this water is expected to be discharged to Lac du Sauvage with TSS as the sole discharge criterion. However other discharges (DAR, Table 8.1-1) discuss measurement indicators for the valued component water quality. These include specific analytes / measurements in sediment and water. The source of the granitic rock shell used in dike construction may be from the proposed Jay pipe waste rock storage area and /or the Lynx pit overburden. The proponent states that "the results of leachate testing indicated that granite could leach certain metals in neutral conditions" and "Kinetic testing of granite samples further identified that granite may have the potential for leaching several metals in neutral conditions" (DAR, s. 8.2.2.3).

Request (GNWT):

GNWT requests that DDEC provide quantitative assurance that the various rock sources used to create the rock shell will not result in increased concentrations of contaminants of potential concern (COPCs) within the impounded water or serve as a source of metals to Lac du Sauvage.

Response:

To access the Jay kimberlite pipe for open pit development and ore extraction, a localized portion of Lac du Sauvage will be isolated, through construction of a dike, so that the Jay Pit area can be dewatered. The dike will be constructed of non-potentially acid generating (non-PAG) granite sourced from the Lynx pit waste rock and/or the Jay quarry. The non-PAG granite rock that will be used for dike construction is not expected to have an influence on water quality in Lac du Sauvage or within the diked of area of the Jay open pit. Use of non-PAG granite waste rock in dike construction has been successfully completed at other mine sites in northern Canada (e.g., Diavik and Meadowbank mines). The granitic materials used in the dike construction at these mines did not have an influence on affecting the potential for water to be discharged, or to water quality in the immediate receiving environment during the dewatering period (e.g., Diavik Mine, DDMI [2011]). Additionally, monitoring studies conducted during the construction and operation of two dikes at the Diavik Mine (i.e., dikes A154 and A418) determined that effects to water quality, sediment quality, and benthic invertebrate communities in the near vicinity of the dikes, due to leaching of material, were not discernible (DDMI 2011).

As the isolated area containing the Jay Pit is dewatered, lakebed sediments will eventually be re-suspended, increasing total suspended solids (TSS) concentrations in the water to be discharged. As with other dewatering activities carried out at the Ekati, Diavik, and Meadowbank Mines, it is anticipated that TSS concentrations will be the limiting factor governing direct discharge to Lac du Sauvage. TSS will be monitored at the discharge point from the diked area during the dewatering

period. When concentrations of TSS increase to the pre-defined threshold, water from the diked area will no longer be pumped to Lac du Sauvage, and be redirected by pipeline to the mined out Misery or Lynx pits for settling of TSS.

To support the assessment of potential effects to Lac du Sauvage from the Jay Dike construction, several supporting processes were completed: geochemical testing of available granite considered for use as dike material, evaluation of monitoring data from existing site conditions at the Ekati Mine site, and incorporation of the geochemical source term data into a site water quality model.

As presented in the Geochemistry Baseline Report for the Jay Project (Annex VIII of the Developer's Assessment Report), a robust geochemical characterization program was completed to assess the metal leaching and acid rock drainage potential of waste rock to be mined from the Jay Project (Project). The program included several laboratory-scale geochemical tests to evaluate the metal leaching potential of mine waste materials, including humidity cell testing of select granite samples. A humidity cell test (HCT) is an accelerated weathering chamber designed to provide control over air, temperature, and moisture, while allowing for the removal of weathering products (principally oxidation products) in solution. Humidity cell tests operate on a seven-day cycle consisting of three days of dry air and three days of water-saturated air pumped through the sample cell (ASTM 2007: D5744-07). On the seventh day, the sample is leached with a known quantity of water and the leachate is analyzed for dissolved constituents.

The main purpose of the HCT is to determine chemical weathering rates of a solid-phase sample; however, it is standard practice to compare leachate constituent concentrations to relevant environmental criteria. This approach is only intended to qualitatively screen parameters that require further evaluation in the context of the Project water and waste management plans, as the conditions simulated in the humidity cell test do not necessarily represent ambient, site conditions (Kempton 2012). Therefore, the identification of a constituent that has the potential to leach from granitic waste rock in laboratory test conditions is not indicative of metal leaching potential at concentrations that will result in adverse effects to surface water receptors under site conditions. The results of laboratory geochemical analysis were compared to site monitoring data from the existing waste rock storage areas (WRSAs) to confirm the geochemical characteristics of granite at the Ekati Mine. Many constituents had similar ranges of concentration in WRSA seepage compared with that measured from the granite HCTs.

References:

ASTM (American Society for Testing and Materials) 2007. D5744-07 Standard Method for Laboratory Weathering of Solid Materials Using a Humidity Cell.

DDMI (Diavik Diamond Mines Inc.). 2011. Lakebed Sediment, Water Quality and Benthic Invertebrate Study, A154 Dike – Year 4 Results, A418 Dike – Year 2 Results. Submitted to Wek'èezhìı Land and Water Board. Yellowknife, NWT, Canada. August 2011.

Kempton H. 2012. A Review of Scale Factors for Estimating Waste Rock Weathering from Laboratory Tests. Presented at the 9th International Conference on Acid Rock Drainage. Ottawa, Canada.

DOMINION DIAMOND

Information Request Number: DAR-GNWT-IR-49

Source: Government of Northwest Territories – Lands: Paul Mercredi

Subject: Habitat Loss

DAR Section(s): 9, 9.4.3.1.1

Preamble (GNWT):

The proposed Misery discharge location (Mine water Management Plan, Map 3-5; DDEC 2014, Map 9.4.2) appears to be approximately 1 km from the single shoal (S8) in Lac du Sauvage. Shoal S8 is identified as "good" spawning habitat for Lake Trout and Cisco (Golder 2014, Jay Project Fish and Baseline Report, Map 2.2-1 and Map 2.2-3; respectively). It is also one of two "fair" shoaling areas in Lac du Sauvage for Round Whitefish (Golder 2014, Jay Project Fish and Baseline Report, Map 2.2-2). Shoal S4 which appears to be proximal to the dike, but "upstream" is also one of four "poor" spawning areas for Round Whitefish (Golder 2014, Jay Project Fish and Baseline Report, Map 2.2-2). No "good" spawning habitat was identified for Round Whitefish. DDEC (DAR, s. 9.4.3.1.1) concludes that "The amount of cumulative change to spawning shoal habitat for the Application Case is expected to result in no measurable effect to population abundance and distribution for fish VCs." This conclusion is based on the total habitat available in the experimental study area which includes Lac de Gras. It is not clear if evidence is available that confirms Lake Trout move from Lac du Sauvage to Lac de Gras to spawn. Further, it is not clear that habitat loss for the Jay Pipe development should be contextualized at the scale of the experimental study area. Note, the scale of habitat loss should also apply to Round Whitefish and Cisco.

Request (GNWT):

Given that the prevailing currents will carry any suspended sediments and associated contaminants of potential concern toward shoal S4 and that this shoal may also be affected by the dike, GNWT recommends DDEC discuss the implications on fish populations using only Lac du Sauvage in the denominator of any habit loss percentages. GNWT requests that DDEC also superimpose the proposed dike and effluent plume on Maps 2.2-1, 2.2-2 and 2.2-3 (Golder 2014, Jay Project Fish and Baseline Report) and the effluent plume on Map 9.4-2 (DDEC, 2014).

Response:

Dominion Diamond is confident that the assessment approach, described in Section 9.1.4.2 (and see Section 6.3.1 for the rationale for the boundary of the effects study area) in the Developer's Assessment Report (DAR), provides a reliable assessment of effects to the fish Valued Components (VCs). Key properties of the VCs, such as ongoing fisheries productivity and self-sustaining and ecologically effective populations, were assessed within an effects study area (ESA). The approach, including the selection of the boundary for the ESA is consistent with the scientific literature on environmental assessments of a commercial, recreational, or aboriginal fishery (Randall et al. 2013).

As described in Section 9.1.4.2 of the DAR, the selection of the boundary for the ESA was based on the physical and biological properties of VCs. Most relevant to a fish VC (such as Arctic Grayling, Lake Trout,

and Lake Whitefish) was the spatial scale of the population or fisheries unit under examination (Randall et al. 2013). Spatial scales of estimates of the effects, including cumulative effects, on assessment endpoints aligned to the scales of the changes in habitat relative to the full area contributing to the fishery (or self-sustaining population). By this design, effects assessment areas captured the maximum spatial extent of potential effects from the Project and other previous, existing, and reasonably foreseeable future developments.

Within the ESA, population and fishery units for the VCs were determined to operate on spatial scales beyond the area to be enclosed by the dike and extended beyond Lac du Sauvage (Map 9.1-3 in the DAR). Effects to Arctic Grayling, Lake Trout, and Lake Whitefish were examined at the spatial scale of the combined Lac du Sauvage and Lac de Gras waterbodies since the fish VCs occur in both lakes, both lakes are relatively large and deep and have similar habitat characteristics, and the lakes are connected by a short channel that, according to Traditional Knowledge, provides connectivity year-round (Weledeh Yellowknives Dene 1997). For additional information on the year-round flow and open water conditions of the Narrows, see the response to DAR-MVEIRB-IR-64. Historical records also show traditional subsistence fishing of Lake Trout and Lake Whitefish in Lac de Gras and Lac du Sauvage, which can be considered as the same fishery. There are no physical barriers to prevent fish from moving between Lac du Sauvage and Lac de Gras, with evidence of Lake Trout movements from Lac de Gras to the Lac du Sauvage Narrows and likely into the waters of Lac du Sauvage (Dillon 2002), and therefore, including Lac de Gras as part of the ESA to assess fish populations and fish habitat changes is appropriate.

In addition to the two lakes, the scale of the ESA included tributaries that may be used for other life history stages (e.g., spawning, rearing, or feeding) by VC species, and tributaries that may support forage fish for VC species in Lac du Sauvage and Lac de Gras (Map 9.1 3 in the DAR). This spatial extent is identified as ESA-1 in Table 9.1-5 of the DAR, and was chosen to best evaluate effects, including cumulative effects, from the Jay Project to ongoing fisheries productivity and self-sustaining and ecologically effective populations for the VCs. Consideration of an ESA using only Lac du Sauvage for fish that may be affected by the Jay Pit and diked area would certainly fail to capture cumulative effects from existing and reasonably foreseeable developments in the Lac de Gras watershed, but would also fall short in reliably predicting impacts at the scale of the population.

Regardless of what value is in the denominator of an equation, the assessment of magnitude included the ability of the VC to absorb or otherwise accommodate disturbance, and the assessment of magnitude was combined with an assessment of other criteria in the classification of residual impacts (i.e., magnitude, geographic extent, duration, frequency, reversibility, and likelihood as described in Section 9.6.1.1). The goal is to provide an ecologically relevant classification of impacts based on changes in measurement indicators for fish VCs, and Dominion Diamond is confident that this goal was met for the fish and fish habitat assessment in the DAR.

Dominion Diamond would also like to clarify that the DAR quantifies effects within Lac du Sauvage. The lake footprint results are summarized at the scale of Lac du Sauvage in Section 9.4.3.1.1 (see Tables 9.4-3 and 9.4-4), and the text from Section 9.4.3.1.1 includes the following statistics for habitat types in Lac du Sauvage, including potential spawning shoal habitat (characterized by coarse substrate types at moderate lake depths in Section 9.4.2.1.1):

- The total in-lake footprint of the Project in Lac du Sauvage during operations is estimated to be 54.3 hectares (ha) from the dike and 335.7 ha from the dewatering of the diked area, resulting in a total loss of 390.0 ha, or 4.5% of the aquatic habitat in Lac du Sauvage;
- Of the four depth categories (0 to 2 metres [m], 2 to 6 m, 6 to 10 m, and greater than 10 m), most of the affected habitat will be within the 2 to 6 m stratum, representing a 5.2% incremental change (135.0 ha loss) in Lac du Sauvage;
- The coarse substrate habitat losses will be primarily at shallow (0 to 2 m) and moderate depths (2 to 6 m) resulting in a relative overall loss of 5.9% of the coarse substrate areas in Lac du Sauvage;
- Losses of shallow and moderate depth (i.e., less than 5 m water depth) habitat types delineated using orthophotos will include boulder/cobble (43.2 ha), resulting in a relative loss of 6.2% of the boulder/cobble substrate in the shallow and moderate depth habitats of Lac du Sauvage

Also in Section 9.4.3.1.1., effects to potential spawning shoals for Lake Trout and Lake Whitefish, and forage species, such as Cisco and Round Whitefish, were assessed by comparing known shoal locations relative to the location of the dike and dewatered area (Fish and Fish Habitat Baseline Annex XIV; Map 9.4-2). Up to 21 shoals were previously identified in Lac du Sauvage as potential habitat for spawning. All but one of the 21 previously identified shoals (S2) in Lac du Sauvage fall outside of the proposed diked area. S2 is located adjacent to the dike; however, S2 is classified as an unsuitable shoal for spawning (Annex XIV). The next closest spawning shoal in proximity to the dike is S4 (315 m northeast of the edge of the dike). S4 may be a fair-quality shoal for spawning Lake Trout, Lake Whitefish, and forage species. Other spawning shoals are well over 1,500 m from the edge of the dike location. Dominion Diamond agrees the relative change would be larger for an 8,651 ha lake, rather than an ESA area of 65,758 ha; however, the ESA was used for the classification of impacts for the reasons discussed above. The DAR concluded that the amount of cumulative change to spawning shoal habitat for the Application Case is expected to result in no measurable effect to population abundance and distribution for fish VCs. Effects at the scale of Lac du Sauvage would be limited to a minor distribution of fish VCs and similar to what is reported in the DAR for the ESA.

As requested, new maps (Maps 49-1A to 49-1D) are provided to illustrate the proposed dike and anticipated plume from the minewater discharge to Lac du Sauvage in proximity to the shoal information provided on Maps 2.2-1, 2.2-2, and 2.2-3 in the Fish and Fish Habitat Baseline Report (Annex XIV) and on Map 9.4-2 in the DAR. For purposes of this information request response, chloride was used as a proxy to delineate the mixing of the minewater discharge plume in the lake. The maps provide predicted maximum depth average concentrations of chloride in all grid cells across the lake under different snapshots: the model calibration period (Map 49-1a), end of the early operations phase (Map 49-1b), end of late operations phase (Map 49-1c), and the post-closure period (Map 49-1d). On all maps, the same chloride scale is provided; the scale ranges from zero (less than the detection limit of 0.5 mg/L) to 120 mg/L (the aquatic life guideline for protection of aquatic life; CCME 1999).

The assessment node identified as LDS-P1 on the maps is the grid cell within Lac du Sauvage that contains the diffuser (Section 8.5.4.1.2); predictions at this location are representative of the expected water quality at the edge of the far-field mixing zone (Section 8.5.4.2.2). Based on the results of the hydrodynamic model, and as illustrated in Map 49-1c, effluent will mix through the lake, but concentrations will remain well below the aquatic life guidelines. Concentrations will continue to decrease

through post-closure and will return to conditions similar to before the Project (i.e., Map 49-1a). The modelling used in the DAR was developed under conservative assumptions for source term inputs (e.g., nitrogen source terms, geochemistry inputs, groundwater flows), so it is expected that the modelled results are overestimated.

The extent of the mixing zone will be determined during the permitting phase of the Project (see response to DAR-MVEIRB-IR-43). Monitoring during the construction, operations, and closure phases of the Project will be conducted to track water quality throughout the mine site, within the water containment areas, and within the receiving environment through the Surveillance Network Program (SNP) and the Aquatic Effects Monitoring Program (AEMP). Adaptive management measures associated with the monitoring of water quality under an AEMP are expected to be consistent with those currently applied by the Ekati Mine.

535000
540000
545000
550000
555000
7175000
7170000
7165000
7160000
N
E-S2-1
Af-10
F-S1
Lake Af1
Lake E1
E-L1-1
E-L1-2
Af-7
G-S1
G-L2
Af-1
Af-2
Duchess Lake
Af-4
D-S1
Counts Outflow (Reference)
Ae-2
Cisco: Unsuitable
Lake Trout: Unsuitable
Round Whitefish: Unsuitable
S1
Ae-1
I-S1
H-L1
Ad-2
Ad-1
S3
LDS9
S6
S5
Cisco: Unsuitable
Lake Trout: Unsuitable
Round Whitefish: Unsuitable
Cisco: Unsuitable
Lake Trout: Unsuitable
Round Whitefish: Unsuitable
S12
Lake C1
C-L1
C-S1
LDS6
S4
Cisco: Fair
Lake Trout: Fair
Round Whitefish: Poor
LDS10
J-S1
Cisco: Unsuitable
Lake Trout: Unsuitable
Round Whitefish: Unsuitable
S2
LDS4
LDS3
LDS5
LDS7
S7
Cisco: Fair
Lake Trout: Fair
Round Whitefish: Fair
S13
Cisco: Fair
Lake Trout: Fair
Round Whitefish: Poor
Aa-2
Ac-8
Ac-1
Ac-2
LDS-P1
Ac-7
LDS8
Cisco: Good
Lake Trout: Good
Round Whitefish: Fair
S8
LDS1
LDS2
Cisco: Fair
Lake Trout: Fair
Round Whitefish: Poor
S14
Aa-1
Lake B1 (Christine Lake)
LDS11
S10
S9
Cisco: Unsuitable
Lake Trout: Unsuitable
Round Whitefish: Unsuitable
S16
Cisco: Fair
Lake Trout: Fair
Round Whitefish: Poor
S11
S17
S15
Cisco: Unsuitable
Lake Trout: Unsuitable
Round Whitefish: Unsuitable
Ac-5
LDS-P2
Ac-4
Cisco: Unsuitable
Lake Trout: Unsuitable
Round Whitefish: Unsuitable
Lac du Sauvage
Cisco: Fair
Lake Trout: Fair
Round Whitefish: Poor
S18
Ab-1
Cisco: Unsuitable
Lake Trout: Unsuitable
Round Whitefish: Unsuitable
S19
S20
Cisco: Unsuitable
Lake Trout: Unsuitable
Round Whitefish: Unsuitable
K-S1
Cujo
Ab-2
Cisco: Fair
Lake Trout: Fair
Round Whitefish: Poor
S21
LDS12
LDS-P3
Ab-S1
L-S1
Misery Operation
FF2-1
FF2-3
FF2-4
FF2-5
LDG-P1
FF2-2
Lac de Gras
The Narrows

LEGEND

- EKATI MINE FOOTPRINT
- PROPOSED JAY FOOTPRINT
- ELEVATION CONTOUR (20 m INTERVAL)
- WATERCOURSE
- WATERBODY
- BASELINE STATION
- ASSESSMENT LOCATION
- SPAWNING HABITAT

SPAWNING SHOALS (S)

- *CISCO: SUITABILITY*
- *LAKE TROUT: SUITABILITY*
- *ROUND WHITEFISH: SUITABILITY*
- HYDRODYNAMIC MODEL GRID

CONCENTRATION (mg/L)

0 - 2.5	60 - 62.5
2.5 - 5	62.5- 65
5 - 7.5	65 - 67.5
7.5 - 10	67.5 - 70
10 - 12.5	70 - 72.5
12.5 - 15	72.5 - 75
15 - 17.5	75 - 77.5
17.5 - 20	77.5 - 80
20 - 22.5	80 - 82.5
22.5 - 25	82.5 - 85
25 - 27.5	85 - 87.5
27.5 - 30	87.5 - 90
30 -32.5	90 - 92.5
32.5 - 35	92.5 - 95
35 - 37.5	95 - 97.5
37.5 - 40	97.5 - 100
40 - 42.5	100 - 102.5
42.5 - 45	102.5 - 105
45 - 47.5	105 - 107.5
47.5 - 50	107.5 - 110
50 - 52.5	110 - 112.5
52.5 - 55	112.5 - 115
55 - 57.5	115 - 117.5
57.5 - 60	117.5 - 120

NOTES

1. AA, AB, AC, AD, AE, AND AF NODES WERE USED AS CALIBRATION LOCATIONS IN LAC DU SAUVAGE; LDS-P1, LDS-P2, AND LDS-P3 ARE THE PRIMARY LOCATIONS USED IN THE WATER QUALITY ASSESSMENT
2. WATER QUALITY MODELING WITHIN A BASIN WAS ALSO SUMMARIZED USING PREDICTED CONCENTRATIONS FROM REPRESENTATIVE NODES FOR EACH BASIN OF LAC DU SAUVAGE (I.E., AA-1, AB-1, AC-1, AD-1, AE-1, AND AF-1)
3. AA-1, AB-1, AC-1, AD-1, AE-1, AND AF-1 REPRESENT WATER QUALITY NODES USED IN TIME SERIES PREDICTIONS OF CHLOROPHYLL A AND TOTAL PHOSPHORUS CONCENTRATIONS IN LAC DU SAUVAGE (SEE FIGURE 8.5-1 OF THE DAR),
4. SEE SECTION 8.5.4.1.2 OF THE DAR FOR SPECIFICS ON METHODOLOGY OF WATER QUALITY MODELING.
5. PREDICTED CHLORIDE CONCENTRATIONS WERE USED AS A PROXY TO MAP THE PREDICTED EFFLUENT PLUME, AND CONSIDERED THE CCME GUIDELINE (1999) OF 120 MG/L.

REFERENCE

CCME (CANADIAN COUNCIL OF MINISTERS OF THE ENVIRONMENT). 1999. CANADIAN ENVIRONMENTAL QUALITY GUIDELINES. (LAST UPDATED 2011).
GOLDER. 1997. TECHNICAL MEMORANDUM #12-2, SHOAL HABITAT SURVEY, LAC DE GRAS AND LAC DU SAUVAGE, SUMMER 1996. ENVIRONMENTAL BASELINE PROGRAM. SUBMITTED TO DIAVIK DIAMOND MINES INC. YELLOWKNIFE, NWT, CANADA. DOC NO. TM12-2.
NATIONAL TOPOGRAPHIC BASE DATA (NTDB) 1:250,000
CANVEC © NATURAL RESOURCES CANADA, 2012
NATURAL RESOURCES CANADA, CENTRE FOR TOPOGRAPHIC INFORMATION, 2012
DATUM: NAD83 PROJECTION: UTM ZONE 12N

DOCUMENT

DAR-GNWT-IR-49

1.5 0 1.5
SCALE 1:75,000 KILOMETRES

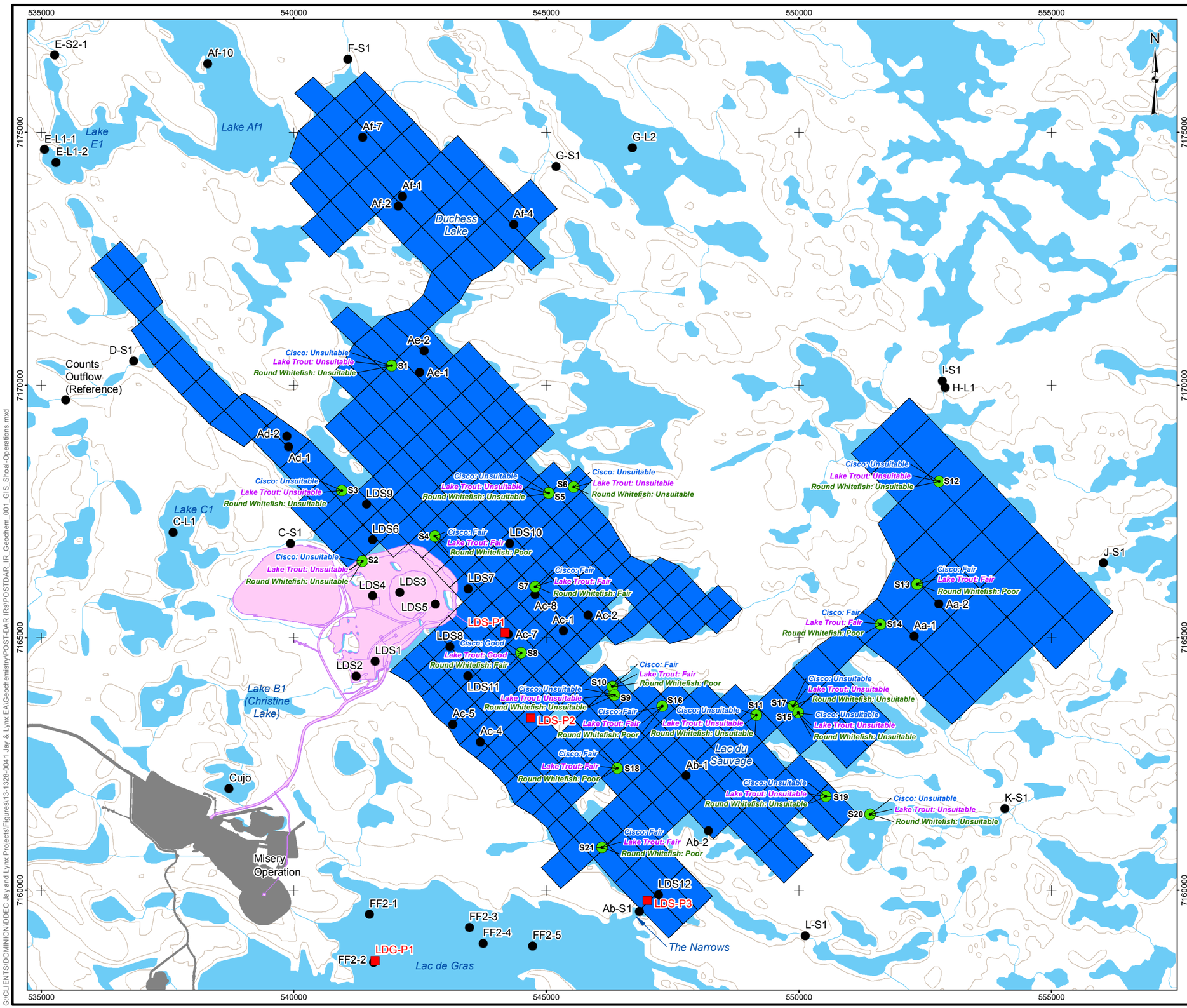
PROJECT
DOMINION DIAMOND
JAY PROJECT
NORTHWEST TERRITORIES, CANADA

TITLE
MAP OF SPAWNING SHOALS, WATER QUALITY NODES AND PREDICTED DEPTH AVERAGE CHLORIDE CONCENTRATIONS IN 2012

Golder Associates

PROJECT		1419751	FILE No. POSTDAR_IR_Geochem_001_GIS	
DESIGN	CS	31/03/15	SCALE AS SHOWN	REV 0
GIS	LMS	02/04/15		
CHECK	CS	02/04/15	MAP 49-1A	
REVIEW	KM	02/04/15		

G:\CLIENTS\DOMINION\DDEC_Jay and Lynx Projects\Figures\13-1328-0041 Jay & Lynx EA\Geochemistry\POST-DAR IRs\POSTDAR_IR_Geochem_001_GIS_Shoal-Operations.mxd



LEGEND

- EKATI MINE FOOTPRINT
- PROPOSED JAY FOOTPRINT
- ELEVATION CONTOUR (20 m INTERVAL)
- WATERCOURSE
- WATERBODY
- BASELINE STATION
- ASSESSMENT LOCATION
- SPAWNING HABITAT

SPAWNING SHOALS (S)

- *CISCO: SUITABILITY*
- *LAKE TROUT: SUITABILITY*
- *ROUND WHITEFISH: SUITABILITY*
- HYDRODYNAMIC MODEL GRID

CONCENTRATION (mg/L)

0 - 2.5	60 - 62.5
2.5 - 5	62.5- 65
5 - 7.5	65 - 67.5
7.5 - 10	67.5 - 70
10 - 12.5	70 - 72.5
12.5 - 15	72.5 - 75
15 - 17.5	75 - 77.5
17.5 - 20	77.5 - 80
20 - 22.5	80 - 82.5
22.5 - 25	82.5 - 85
25 - 27.5	85 - 87.5
27.5 - 30	87.5 - 90
30 -32.5	90 - 92.5
32.5 - 35	92.5 - 95
35 - 37.5	95 - 97.5
37.5 - 40	97.5 - 100
40 - 42.5	100 - 102.5
42.5 - 45	102.5 - 105
45 - 47.5	105 - 107.5
47.5 - 50	107.5 - 110
50 - 52.5	110 - 112.5
52.5 - 55	112.5 - 115
55 - 57.5	115 - 117.5
57.5 - 60	117.5 - 120

NOTES

1. AA, AB, AC, AD, AE, AND AF NODES WERE USED AS CALIBRATION LOCATIONS IN LAC DU SAUVAGE; LDS-P1, LDS-P2, AND LDS-P3 ARE THE PRIMARY LOCATIONS USED IN THE WATER QUALITY ASSESSMENT
2. WATER QUALITY MODELING WITHIN A BASIN WAS ALSO SUMMARIZED USING PREDICTED CONCENTRATIONS FROM REPRESENTATIVE NODES FOR EACH BASIN OF LAC DU SAUVAGE (I.E., AA-1, AB-1, AC-1, AD-1, AE-1, AND AF-1)
3. AA-1, AB-1, AC-1, AD-1, AE-1, AND AF-1 REPRESENT WATER QUALITY NODES USED IN TIME SERIES PREDICTIONS OF CHLOROPHYLL A AND TOTAL PHOSPHORUS CONCENTRATIONS IN LAC DU SAUVAGE (SEE FIGURE 8.5-1 OF THE DAR),
4. SEE SECTION 8.5.4.1.2 OF THE DAR FOR SPECIFICS ON METHODOLOGY OF WATER QUALITY MODELING.
5. PREDICTED CHLORIDE CONCENTRATIONS WERE USED AS A PROXY TO MAP THE PREDICTED EFFLUENT PLUME, AND CONSIDERED THE CCME GUIDELINE (1999) OF 120 MG/L.

REFERENCE

CCME (CANADIAN COUNCIL OF MINISTERS OF THE ENVIRONMENT). 1999. CANADIAN ENVIRONMENTAL QUALITY GUIDELINES. (LAST UPDATED 2011).
GOLDER. 1997. TECHNICAL MEMORANDUM #12-2, SHOAL HABITAT SURVEY, LAC DE GRAS AND LAC DU SAUVAGE, SUMMER 1996. ENVIRONMENTAL BASELINE PROGRAM. SUBMITTED TO DIAVIK DIAMOND MINES INC. YELLOWKNIFE, NWT, CANADA. DOC NO. TM12-2.
NATIONAL TOPOGRAPHIC BASE DATA (NTDB) 1:250,000
CANVEC © NATURAL RESOURCES CANADA, 2012
NATURAL RESOURCES CANADA, CENTRE FOR TOPOGRAPHIC INFORMATION, 2012

DATUM: NAD83 PROJECTION: UTM ZONE 12N

DOCUMENT

DAR-GNWT-IR-49

1.5 0 1.5
SCALE 1:75,000 KILOMETRES

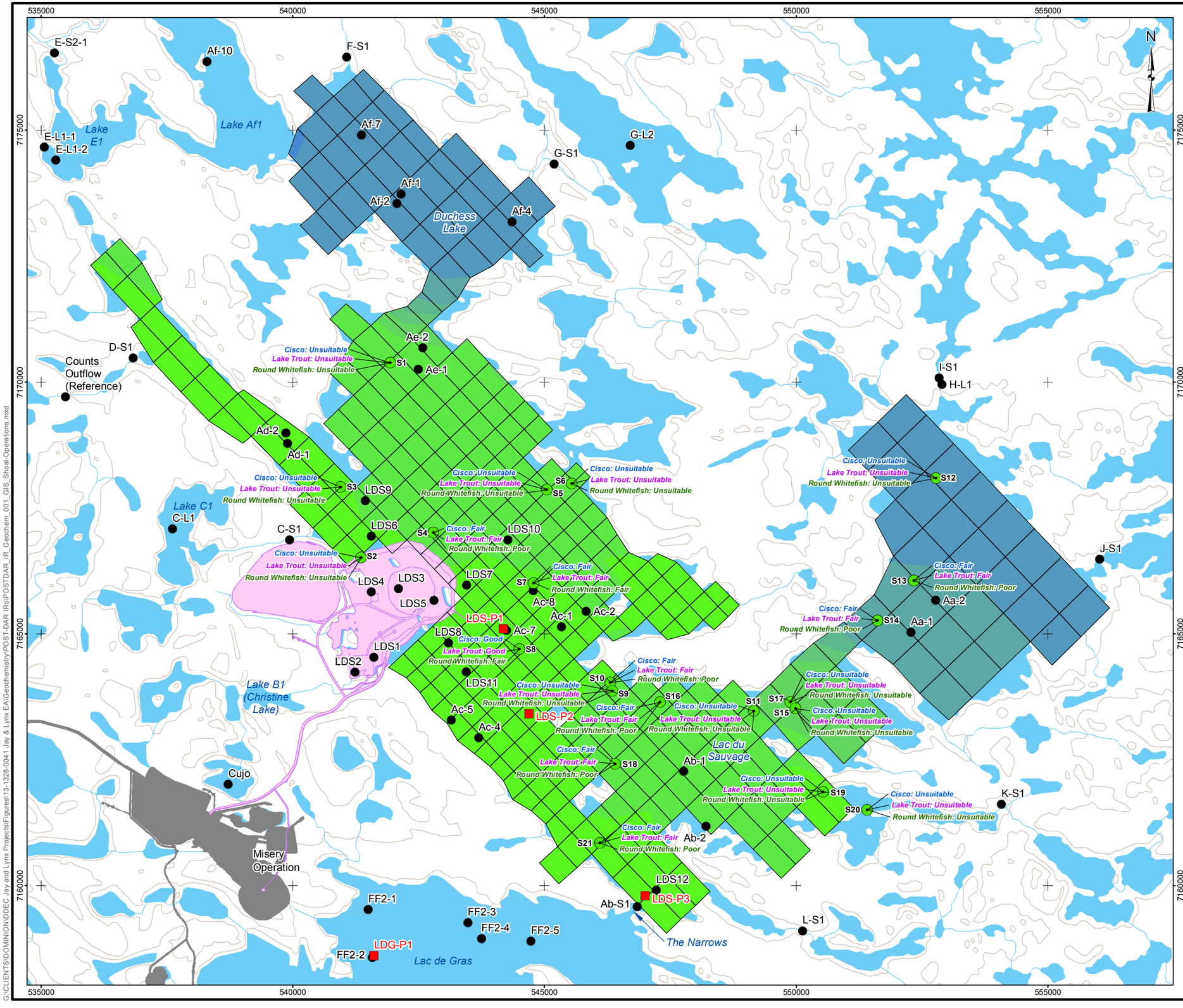
PROJECT
DOMINION DIAMOND
JAY PROJECT
NORTHWEST TERRITORIES, CANADA

TITLE
MAP OF SPAWNING SHOALS, WATER QUALITY NODES AND PREDICTED DEPTH AVERAGE CHLORIDE CONCENTRATIONS IN 2024

Golder Associates

PROJECT	1419751		FILE No. POSTDAR_IR_Geochem_001_GIS	
DESIGN	CS	31/03/15	SCALE AS SHOWN	REV 0
GIS	LMS	02/04/15		
CHECK	CS	02/04/15	MAP 49-1B	
REVIEW	KM	02/04/15		

G:\CLIENTS\DOMINION\DDEC_Jay and Lynx Projects\Figures\13-1328-0041_Jay & Lynx EA\Geochemistry\POST-DAR IRs\POSTDAR_IR_Geochem_001_GIS_Shoal-Operations.mxd



LEGEND

- EKATI MINE FOOTPRINT
- PROPOSED JAY FOOTPRINT
- ELEVATION CONTOUR (20 m INTERVAL)
- WATERCOURSE
- WATERBODY
- BASELINE STATION
- ASSESSMENT LOCATION
- SPAWNING HABITAT

SPAWNING SHOALS (S)

- *CISCO: SUITABILITY*
- *LAKE TROUT: SUITABILITY*
- *ROUND WHITEFISH: SUITABILITY*

- HYDRODYNAMIC MODEL GRID

CONCENTRATION (mg/L)

0 - 2.5	60 - 62.5
2.5 - 5	62.5- 65
5 - 7.5	65 - 67.5
7.5 - 10	67.5 - 70
10 - 12.5	70 - 72.5
12.5 - 15	72.5 - 75
15 - 17.5	75 - 77.5
17.5 - 20	77.5 - 80
20 - 22.5	80 - 82.5
22.5 - 25	82.5 - 85
25 - 27.5	85 - 87.5
27.5 - 30	87.5 - 90
30 -32.5	90 - 92.5
32.5 - 35	92.5 - 95
35 - 37.5	95 - 97.5
37.5 - 40	97.5 - 100
40 - 42.5	100 - 102.5
42.5 - 45	102.5 - 105
45 - 47.5	105 - 107.5
47.5 - 50	107.5 - 110
50 - 52.5	110 - 112.5
52.5 - 55	112.5 - 115
55 - 57.5	115 - 117.5
57.5 - 60	117.5 - 120

NOTES

1. AA, AB, AC, AD, AE, AND AF NODES WERE USED AS CALIBRATION LOCATIONS IN LAC DU SAUVAGE; LDS-P1, LDS-P2, AND LDS-P3 ARE THE PRIMARY LOCATIONS USED IN THE WATER QUALITY ASSESSMENT
2. WATER QUALITY MODELING WITHIN A BASIN WAS ALSO SUMMARIZED USING PREDICTED CONCENTRATIONS FROM REPRESENTATIVE NODES FOR EACH BASIN OF LAC DU SAUVAGE (I.E., AA-1, AB-1, AC-1, AD-1, AE-1, AND AF-1)
3. AA-1, AB-1, AC-1, AD-1, AE-1, AND AF-1 REPRESENT WATER QUALITY NODES USED IN TIME SERIES PREDICTIONS OF CHLOROPHYLL A AND TOTAL PHOSPHORUS CONCENTRATIONS IN LAC DU SAUVAGE (SEE FIGURE 8.5-1 OF THE DAR),
4. SEE SECTION 8.5.4.1.2 OF THE DAR FOR SPECIFICS ON METHODOLOGY OF WATER QUALITY MODELING.
5. PREDICTED CHLORIDE CONCENTRATIONS WERE USED AS A PROXY TO MAP THE PREDICTED EFFLUENT PLUME, AND CONSIDERED THE CCME GUIDELINE (1999) OF 120 MG/L.

REFERENCE

CCME (CANADIAN COUNCIL OF MINISTERS OF THE ENVIRONMENT). 1999. CANADIAN ENVIRONMENTAL QUALITY GUIDELINES. (LAST UPDATED 2011).
GOLDER. 1997. TECHNICAL MEMORANDUM #12-2, SHOAL HABITAT SURVEY, LAC DE GRAS AND LAC DU SAUVAGE, SUMMER 1996. ENVIRONMENTAL BASELINE PROGRAM. SUBMITTED TO DIAVIK DIAMOND MINES INC. YELLOWKNIFE, NWT, CANADA. DOC NO. TM12-2.

NATIONAL TOPOGRAPHIC BASE DATA (NTDB) 1:250,000
CANVEC © NATURAL RESOURCES CANADA, 2012
NATURAL RESOURCES CANADA, CENTRE FOR TOPOGRAPHIC INFORMATION, 2012
DATUM: NAD83 PROJECTION: UTM ZONE 12N

DOCUMENT

DAR-GNWT-IR-49

1.5 0 1.5
SCALE 1:75,000 KILOMETRES

PROJECT DOMINION DIAMOND TM

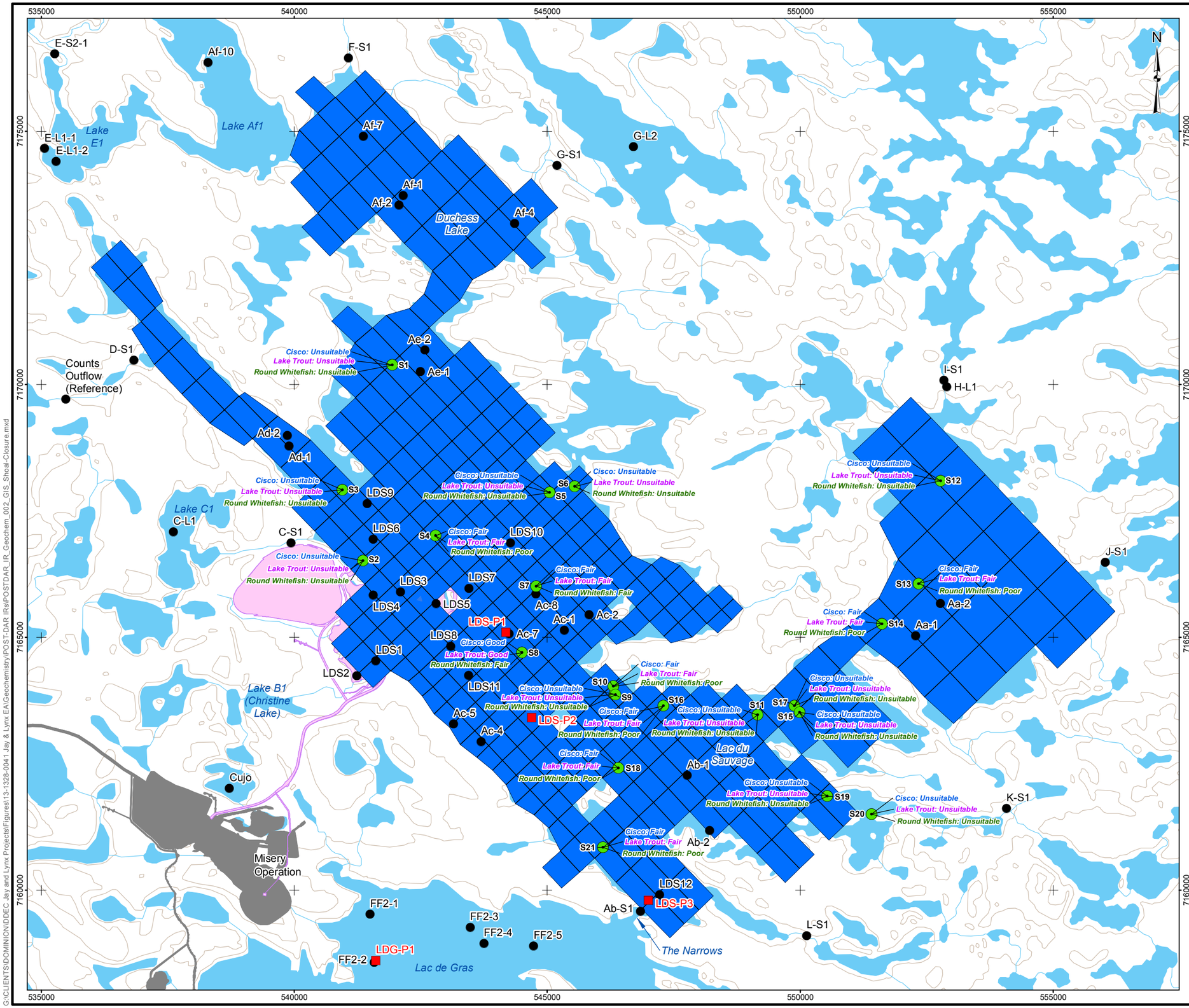
JAY PROJECT
NORTHWEST TERRITORIES, CANADA

MAP OF SPAWNING SHOALS, WATER QUALITY NODES AND PREDICTED DEPTH AVERAGE CHLORIDE CONCENTRATIONS IN 2030

Golder Associates

PROJECT		1419751	FILE No. POSTDAR_IR_Geochem_001_GIS	
DESIGN	CS	31/03/15	SCALE AS SHOWN	REV 0
GIS	LMS	02/04/15	MAP 49-1C	
CHECK	CS	02/04/15		
REVIEW	KM	02/04/15		

G:\CLIENTS\DOMINION\DDEC_Jay and Lynx Projects\Figures\13-1328-0041 Jay & Lynx EA\Geochemistry\POST-DAR IR\s\POSTDAR_IR_Geochem_001_GIS_Shoal-Operations.mxd



LEGEND

- EKATI MINE FOOTPRINT
- PROPOSED JAY FOOTPRINT
- ELEVATION CONTOUR (20 m INTERVAL)
- WATERCOURSE
- WATERBODY
- BASELINE STATION
- ASSESSMENT LOCATION
- SPAWNING HABITAT

SPAWNING SHOALS (S)

- *CISCO: SUITABILITY*
- *LAKE TROUT: SUITABILITY*
- *ROUND WHITEFISH: SUITABILITY*
- HYDRODYNAMIC MODEL GRID

CONCENTRATION (mg/L)

0 - 2.5	60 - 62.5
2.5 - 5	62.5- 65
5 - 7.5	65 - 67.5
7.5 - 10	67.5 - 70
10 - 12.5	70 - 72.5
12.5 - 15	72.5 - 75
15 - 17.5	75 - 77.5
17.5 - 20	77.5 - 80
20 - 22.5	80 - 82.5
22.5 - 25	82.5 - 85
25 - 27.5	85 - 87.5
27.5 - 30	87.5 - 90
30 -32.5	90 - 92.5
32.5 - 35	92.5 - 95
35 - 37.5	95 - 97.5
37.5 - 40	97.5 - 100
40 - 42.5	100 - 102.5
42.5 - 45	102.5 - 105
45 - 47.5	105 - 107.5
47.5 - 50	107.5 - 110
50 - 52.5	110 - 112.5
52.5 - 55	112.5 - 115
55 - 57.5	115 - 117.5
57.5 - 60	117.5 - 120

NOTES

1. AA, AB, AC, AD, AE, AND AF NODES WERE USED AS CALIBRATION LOCATIONS IN LAC DU SAUVAGE; LDS-P1, LDS-P2, AND LDS-P3 ARE THE PRIMARY LOCATIONS USED IN THE WATER QUALITY ASSESSMENT
2. WATER QUALITY MODELING WITHIN A BASIN WAS ALSO SUMMARIZED USING PREDICTED CONCENTRATIONS FROM REPRESENTATIVE NODES FOR EACH BASIN OF LAC DU SAUVAGE (I.E., AA-1, AB-1, AC-1, AD-1, AE-1, AND AF-1)
3. AA-1, AB-1, AC-1, AD-1, AE-1, AND AF-1 REPRESENT WATER QUALITY NODES USED IN TIME SERIES PREDICTIONS OF CHLOROPHYLL A AND TOTAL PHOSPHORUS CONCENTRATIONS IN LAC DU SAUVAGE (SEE FIGURE 8.5-1 OF THE DAR),
4. SEE SECTION 8.5.4.1.2 OF THE DAR FOR SPECIFICS ON METHODOLOGY OF WATER QUALITY MODELING.
5. PREDICTED CHLORIDE CONCENTRATIONS WERE USED AS A PROXY TO MAP THE PREDICTED EFFLUENT PLUME, AND CONSIDERED THE CCME GUIDELINE (1999) OF 120 MG/L.

REFERENCE

CCME (CANADIAN COUNCIL OF MINISTERS OF THE ENVIRONMENT). 1999. CANADIAN ENVIRONMENTAL QUALITY GUIDELINES. (LAST UPDATED 2011).
GOLDER. 1997. TECHNICAL MEMORANDUM #12-2, SHOAL HABITAT SURVEY, LAC DE GRAS AND LAC DU SAUVAGE, SUMMER 1996. ENVIRONMENTAL BASELINE PROGRAM. SUBMITTED TO DIAVIK DIAMOND MINES INC. YELLOWKNIFE, NWT, CANADA. DOC NO. TM12-2.
NATIONAL TOPOGRAPHIC BASE DATA (NTDB) 1:250,000
CANVEC © NATURAL RESOURCES CANADA, 2012
NATURAL RESOURCES CANADA, CENTRE FOR TOPOGRAPHIC INFORMATION, 2012
DATUM: NAD83 PROJECTION: UTM ZONE 12N

DOCUMENT

DAR-GNWT-IR-49

1.5 0 1.5
SCALE 1:75,000 KILOMETRES

PROJECT: DOMINION DIAMOND
JAY PROJECT
NORTHWEST TERRITORIES, CANADA

TITLE
MAP OF SPAWNING SHOALS, WATER QUALITY NODES AND PREDICTED DEPTH AVERAGE CHLORIDE CONCENTRATIONS IN 2050

Golder Associates

PROJECT	1419751		FILE No. POSTDAR_IR_Geochem_002_GIS	
DESIGN	CS	31/03/15	SCALE AS SHOWN	REV 0
GIS	LMS	02/04/15		
CHECK	CS	02/04/15	MAP 49-1D	
REVIEW	KM	02/04/15		

G:\CLIENTS\DOMINION\DDEC Jay and Lynx Projects\Figures\13-1328-0041 Jay & Lynx EA\Geochemistry\POST-DAR IRs\POSTDAR_IR_Geochem_002_GIS_Shoal-Closure.mxd

References:

CCME (Canadian Council of Ministers of the Environment). 1999. Canadian Environmental Quality Guidelines, with updates to 2014. Publication No. 1299. Winnipeg, MB, Canada. ISBN: 1-896997-34-1.

Dillon (Dillon Consulting Ltd.). 2002. Lake Trout Habitat Utilization Study, 2001. Technical Report – Final. Prepared for Diavik Diamond Mines Inc., Yellowknife, NWT, Canada.

Randall RG, Bradford MJ, Clarke KD, Rice JC. 2013. A science-based interpretation of ongoing productivity of commercial, recreational or Aboriginal fisheries. DFO Can Sci Advis Sec Res. Doc. 2012/112 iv + 26 p.

Weledeh Yellowknives Dene. 1997. Weledeh Yellowknives Dene: A Traditional Knowledge Study of Ek'ati. Yellowknives Dene First Nation Council, Dettah, NWT, Canada.

DOMINION DIAMOND

Information Request Number:	DAR-GNWT-IR-50
Source:	Government of Northwest Territories – Lands: Paul Mercredi
Subject:	Lynx Pit – Post-Closure
DAR Section(s):	3 (Appendix 3A), 4.4, 8.3

Preamble (GNWT):

It is stated throughout the DAR that the Lynx Pit will be used for a component of water management of the Jay project. Specifically, it is noted that high total suspended solids water during dewatering for solid settling and long-term storage. This activity will serve a dual function as during dewatering of the area of Lac du Sauvage to expose the Jay pipe, the water will be also used to backfill the Lynx Pit which is the identified closure option for Lynx. However, it is unclear if the addition of turbid water from Lac du Sauvage to Lynx Pit, as opposed to clean lake water as originally planned, will result in a different post-closure situation at Lynx. While GNWT understands that TSS is expected to settle out in Lynx over time, the specifics around this process and the long-term water quality that will result in Lynx is unclear. This is compounded if the Lynx Pit is to be used as contingency storage for mine water during operations.

Request (GNWT):

GNWT requests additional information and assessment of impacts regarding the post-closure scenario at Lynx Pit and any variance in this regard that may result from the incorporation of Lynx Pit into the water management of Jay Pit as opposed to the original closure scenario for Lynx.

Response:

The closure of Lynx Pit is described in Section 3.5.8.3 of the Developer's Assessment Report (DAR) and Section 5.4.2.1.3 of Appendix 3B. The post-closure scenario for the Lynx Pit is similar to that without the Jay Project in that the closure plan involves filling with freshwater. For the Jay Project, the Lynx Pit will be used for the storage and management of lake water containing elevated total suspended solids (TSS) pumped from Lac du Sauvage during the dewatering phase of the Project. Back-flooding of Lynx Pit with water that comes from the dewatering associated with the Jay Project will not affect the post-closure scenario for the Lynx Pit, in comparison with back-flooding Lynx Pit with water from Lac de Gras. No changes to the post-closure conditions for the Lynx Pit are expected from the incorporation of Lynx Pit into the water management plan for the Jay Project.

Back-flooding of Lynx Pit with water sourced from the dewatering of the diked area will stop three metres (m) below the crest of the Lynx Pit. Natural precipitation and surface water inflow from the area immediately surrounding the Lynx Pit will gradually back-flood the upper 3 m of the Lynx Pit, over an approximately three year period. This time will be suitable for the TSS contained in the back-flooded water to settle and deposit at the bottom of the Lynx Pit. It is expected that based on the size and shape of the pit and the presence of ice during the winters, wind-induced mixing will be minimized, allowing the TSS to settle. However, during this period, water quality in the Lynx Pit will be monitored. Once back-flooding of the Lynx Pit is complete, and providing water quality meets discharge criteria, then the Lynx pit lake will naturally discharge through the existing stream into Lac de Gras.

At closure, the estimated depth of Lynx Pit will be 120 m. As described in Section 8, if adaptive management strategies are identified for minewater management during operational monitoring, there is the potential that Lynx Pit may be considered as a potential alternative minewater storage location. This is currently not part of the water management plan for the Project; however, if this were determined to be required, the use of Lynx pit would be described in a specific adaptive management response plan, which would address the implications of using Lynx Pit for this purpose. This is envisioned to follow the process for adaptive management responses described in the Ekati Mine Aquatic Response Framework (currently under review by the Wek'èezhìı Land and Water Board).

DOMINION DIAMOND

Information Request Number:	DAR-GNWT-IR-51
Source:	Government of Northwest Territories – Lands: Paul Mercredi
Subject:	Post-Closure Re-Connected Portion of Lac du Sauvage
DAR Section(s):	3, 3.5, 3.5.4.1 (Map 3.5-1 and 3.5-2)

Preamble (GNWT):

3.5.8.7 of the DAR states that at closure the dike will be breached at several locations 2-3m below the water level. The approximate height of the dikes underwater, and the processes by which water will be circulated in this area, is unclear. Are there any differences in water quality anticipated inside and outside the dike as a result of this circulation? Will there be any behavioural constraints regarding aquatic species moving in and out of the diked area? Has consideration been given to keeping this area isolated post-closure?

Request (GNWT):

GNWT requests that DDEC provide additional information regarding the post-closure status of the re-connected portion of Lac du Sauvage including:

a) Height of the dikes underwater and potential constraints on re-establishment of aquatic species;

b) Water quality gradient between the diked area and the main basin of Lac du Sauvage;

c) Anticipated circulation patterns of water within the diked area;

d) Discussion on alternatives to re-connection.

Response:

The following provides responses to GNWT requests:

a) The dike will be constructed to an elevation approximately 2 metres (m) above the normal water level in Lac du Sauvage (416.1 metres above sea level [masl]). The height of the dike beneath the water will vary based on the bathymetry of the lakebed surface; along centreline of the proposed dike alignment, the maximum water depth is 12.5 m and average water depth is 5 m. Figure 3.5-1 in Section 3.5 of the Developer's Assessment Report (DAR), shows three typical design sections of the dike, based on the depth to bedrock, referred to as a shallow, intermediate, and deep section. By comparing the three sections, it is apparent that the amount of rockfill below the water level varies according to the lakebed bathymetry.

   The preliminary dike breach locations shown on Figure 5.1 of Appendix 3B of the DAR coincide with deeper water areas. Water depths are 6 m or more at the proposed breach locations; the depth of the dike breach will be determined during final closure design and will be established to ensure surface water circulation with Lac du Sauvage is achieved. Maintaining surface water circulation is expected to be sufficient to establish habitat connectivity and avoid habitat fragmentation as no physical or

chemical barrier would be present that would prevent colonization. No limitations to the re-establishment of aquatic species within the diked area after the dike has been breached is predicted.

b) Following completion of mining in the Jay kimberlite pipe, the top 50 m (13.7 million cubic metres [m^3]) of the minewater stored in Misery Pit, with high concentrations of total dissolved solids (TDS), will be pumped to the bottom of the Jay Pit. The high TDS water will remain in the lower portion of Jay Pit, and freshwater from Lac du Sauvage will be placed on top of the high TDS water within the Jay Pit and to back-flood the diked area. Water quality in the Jay diked area will be monitored, and once it has been demonstrated to meet acceptability criteria for mixing with the lake, the local breaches in the Jay Dike will be created. Breaches will be designed and constructed in a manner to provide connectivity between the diked area and Lac du Sauvage and to achieve surface water circulation between the diked area and the main basin of Lac du Sauvage (see Appendix 8F of the DAR). As described in the DAR (see Sections 8.5.4.2.2 and 8.5.4.2.3 of the DAR), long-term stable meromictic conditions will be established in the Jay Pit to isolate the high TDS water at the bottom of the pit and the surface low TDS water. The Jay Pit hydrodynamic modelling projected some small localized water quality inputs within the diked area at post-closure due to upward diffusion between the monimolimnion and mixolimnion; however, these inputs have been accounted for in the Lac du Sauvage hydrodynamic water quality modelling (Appendix 8F of the DAR). With the expected water circulation, there will not be a water quality gradient between the diked area and main basin of Lac du Sauvage that could affect re-establishment of aquatic species within the diked area.

c) The conceptual closure plan states that the diked area breaches will be designed and constructed in a manner such that connectivity and water circulation between the diked area and Lac du Sauvage would be established. This is supported by the current hydrodynamic modelling result. Consistent with other aspects of the Conceptual Closure Plan for the Ekati Mine with the Jay Project, design specifics that will achieve the closure objectives for the dike breaches (e.g., depth and final location of breaches) will be developed as part of the final closure plan.

d) Reconnection of the diked area to Lac du Sauvage is the preferred closure approach. This is consistent with the closure approach that has been accepted for other similar projects, such as the dikes associated with the A418, A154, and A21 pits at the Diavik Mine, and the Bay-Goose Dike at the Meadowbank Mine. Please see the response to DAR-MVEIRB-IR-19 for pros and cons of reconnecting the diked area to Lac du Sauvage. The advantages of reconnection of the diked area outweigh any potential advantages of not reconnecting the diked area with Lac du Sauvage and is considered the best closure option for the Jay Project.

DOMINION DIAMOND

Information Request Number:	DAR-GNWT-IR-52
Source:	Government of Northwest Territories – Lands: Paul Mercredi
Subject:	Estimation of Baseline Water Quality
DAR Section(s):	8, 8.2.5.2.1, Map 8.2-6, Table 8.2-45, Table 8.2-49

Preamble (GNWT):

The DAR (s. 8.2.5.2.1) states: “Based on the most recent AEMP studies (Rescan 2012f; ERM Rescan 2013a), concentrations in Lac du Sauvage did not show evidence of increasing temporal concentrations compared to baseline or reference conditions; therefore, there has been no measurable change in water or sediment quality parameters in Lac du Sauvage over time due to mine activities”. The citation refers to the 2012 AEMP. Section 2.1.1.4 of ERM Rescan (2014) reports on the 2013 AEMP and assesses trends in chloride concentrations relative to changes in background lakes, separately by months. Analyses at LDS 1 or 2 are only possible for one month (April) for LDS1 due to excessive censoring in reference lakes and possibly (further investigation not conducted) to lack sampling data for August. The single analysis conducted shows increasing trends in chloride at LDS1 for the month of April. Trends in other analytes were not examined at this time. The results suggest that some data potentially should have been excluded in the estimation of background concentrations in Lac du Sauvage. This may have implications with respect to the DAR where statements are made regarding natural background concentrations exceeding proposed SSWQOs. Also, despite the inclusion of Map 8.2-6 and Table 8.20-45 in the Developer's Assessment Report it is not clear what data are used to compile the results presented in Table 8.2-49. Of particular concern is the inclusion of samples that could reflect influence from the current discharge to Lac du Sauvage, particularly AEMP locations LDS2 and LDS1. The same argument applies to the use of “S” –series of sampling location data from 1998 forward given that DDEC (formerly BHP Billiton) began discharge as early as 1998. Note that many of the water samples collected during 1994-2000 by DDMI identified as replicates were in fact duplicate quality assurance samples and depth-specific samples. Zajdlik (2007) found that when correctly counting the baseline pH, conductivity and Ni measurements, the data sets were reduced in size by 83.6, 52 and 54.8%, respectively.

Request (GNWT): intermittent

As discharge from the Misery Pit to Lac du Sauvage has been episodic, GNWT requests that DDEC clarify what sample locations and years were used to create the Lac du Sauvage baseline dataset and whether discharge to Lac du Sauvage was occurring at the time of sampling. With respect to the S-series of stations used to create Table 8.2-50, GNWT requests that DDEC demonstrate that the data reflect baseline conditions within Lac de Gras. GNWT requests DDEC discuss the quality assurance steps taken in compiling the Lac de Gras data particularly with respect to the treatment of samples collected over depth and why data are not separated by open water and under ice seasons as was done for Lac du Sauvage data. GNWT requests that the water and sediment quality data collected within Lac du Sauvage in 2014 be made available. These data are necessary to corroborate the suitability of some sampling locations in the baseline dataset.

References: ERM Rescan. 2014. Ekati Diamond Mine: 2013 Aquatic Effects Monitoring Program Part 3 - Statistical Report. Prepared for Dominion Diamond Ekati Corporation by ERM Rescan: Yellowknife, Northwest Territories. Zajdlik, B. 2007. Review of DDMI Baseline Data Set. Prepared by Zajdlik & Associates Inc. Prepared for B. Blais and N. Richea, DIAND.

Response:

1. Lac du Sauvage Baseline Dataset and Discharge to Lac du Sauvage

As part of current Ekati Mine operations, effluent is discharged seasonally from the King Pond Settling Facility (KPSF) to Cujo Lake (King-Cujo watershed); water from the King-Cujo watershed drains to Lac du Sauvage (Dominion Diamond 2015a). Note that under current operating conditions at the Misery site, there is no discharge of effluent from the Misery Pit; as part of the Jay Project, minewater will be stored in the mined-out Misery Pit and discharged to Lac du Sauvage starting in Year 5 of operations.

Water quality data from 2004 (Rescan 2007), 2006 (Rescan 2007), 2010 (Rescan 2011), 2011 (Rescan 2012), 2012 (ERM Rescan 2013), and 2013 (Annex XI in the Developer's Assessment Report [DAR]) were combined and used to characterize spatial and temporal variability in Lac du Sauvage. The stations included in the dataset are provided on Map 8.2-6 in the DAR. The spatial and temporal coverage of the dataset was provided in Table 8.2-46 with the summary statistics in Table 8.2-49 in the DAR. To expand upon the information provided in Table 8.2-46, a new table that summarizes the sampling effort by station, month, and year of sample collection was developed (Table 52-1).

The timing of effluent discharge to the King-Cujo watershed is provided in Table 52-1. In 2004, discharge to Cujo Lake, from the KPSF, occurred from July to October, and water quality samples were collected in July, August, and September from Lac du Sauvage (station LDS3 only; included on Map 8.2-6); these samples were collected as part of a baseline study. In 2006, discharge occurred from July to September, and water quality samples were collected in February, March, April, and again in July, August, and September. From 2010 to 2012, water quality samples were collected in April and August, and discharge occurred from July to September in 2010 and 2011, and from June to July in 2012. In 2013, water quality samples were collected in July, August and September, and discharge occurred in July.

Table 52-1 Water Quality Sampling Effort in Lac du Sauvage (2004, 2006, and 2010 to 2013) and Timing of Effluent Discharge to the King-Cujo Watershed

Lac du Savage Sampling Station	Lac du Sauvage Water Quality Sampling Effort by Year and Month					
	2004	2006	2010	2011	2012	2013
LDS1	-	Feb,Mar,May,Jul,Aug,Sep	Apr, Aug	Apr, Aug	Apr, Aug	-
LDS2	-	Feb,Mar,May,Jul,Aug,Sep	Aug	Aug	Aug	-
LDS3	Jul, Aug,Sep	Feb,Mar,May,Jul,Aug,Sep	-	-	-	-
LDS4	-	Aug,Sep	-	-	-	-
LDS5	-	Feb,Mar,May,Jul,Aug,Sep	-	-	-	-
LDS6	-	Aug,Sep	-	-	-	-
LDS7	-	Aug,Sep	-	-	-	-
LDS8	-	Aug,Sep	-	-	-	-
LDS9	-	Feb,Mar,May,Jul,Aug,Sep	-	-	-	-
LDS10	-	Feb,Mar,May,Jul,Aug,Sep	-	-	-	-
LDS11	-	Feb,Mar,May,Jul,Aug,Sep	-	-	-	-
LDS12	-	Feb,Mar,May,Jul,Aug,Sep	-	-	-	-
Aa-1	-	-	-	-	-	Jul Aug, Sep
Aa-2	-	-	-	-	-	Jul Aug, Sep

Table 52-1 Water Quality Sampling Effort in Lac du Sauvage (2004, 2006, and 2010 to 2013) and Timing of Effluent Discharge to the King-Cujo Watershed

Lac du Savage Sampling Station	Lac du Sauvage Water Quality Sampling Effort by Year and Month					
	2004	2006	2010	2011	2012	2013
Ab-1	-	-	-	-	-	Jul Aug, Sep
Ab-2	-	-	-	-	-	Jul, Aug
Ac-1	-	-	-	-	-	Jul Aug, Sep
Ac-2	-	-	-	-	-	Jul, Aug
Ac-4	-	-	-	-	-	Jul Aug, Sep
Ac-5	-	-	-	-	-	Jul, Aug
Ac-7	-	-	-	-	-	Jul Aug, Sep
Ac-8	-	-	-	-	-	Jul, Aug
Ad-1	-	-	-	-	-	Jul Aug, Sep
Ad-2	-	-	-	-	-	Jul, Aug
Ae-1	-	-	-	-	-	Jul Aug, Sep
Ae-2	-	-	-	-	-	Jul Aug, Sep
Ab-S1	-	-	-	-	-	Aug, Sep
Effluent discharge to King-Cujo Watershed						
Timing of Discharge	Jul to Oct	Jul to Sep	Jul to Sep	Aug and Sep	Jun and Jul	Jul

Source: Rescan (2007, 2011, 2012), ERM Rescan (2013); DAR, Annex XI; Dominion Diamond (2015a).
Note: Stations are shown on Map 8.2-6 in the DAR.
DAR=Developer's Assessment Report; Feb=February; Mar=March; Apr=April; Jul=July; Aug=August; Sep=September; Oct=October

2. Baseline (Reference Condition) Dataset for Lac de Gras

Effluent discharge from the Long Lake Containment Facility (LLCF) at the Ekati Mine to the Koala watershed began in 1999 (Dominion Diamond 2015a) (Table 52-2). Water quality sampling at “S” stations, in Slipper Bay of Lac de Gras, began in 1998 under the Ekati Mine AEMP. In 1999, discharge from the LLCF to the Koala watershed occurred from January to November and water quality samples were collected in Lac de Gras (Slipper Bay) in July, August, and September. In 2000, discharge occurred from June to December and water quality samples were collected in July, August, and September. Water quality samples from Slipper Bay were only collected during the open-water period. In this dataset, samples were collected 1 m below the surface and mid-way through the water column. All data, as presented in the Ekati AEMP reports (Rescan 1998, 1999, 2000) were included to characterize Reference Conditions.

Table 52-2 Water Quality Sampling Effort in Lac de Gras (1998 to 2000) and Timing of Effluent Discharge to the Koala Watershed

Lac de Gras Sampling Station	Lac de Gras Water Quality Sampling Effort by Year and Month		
	1998	1999	2000
BHP-S1	Jul, Aug, Sep	Jul, Aug, Sep	-
BHP-S2	Jul, Aug, Sep	Jul, Aug, Sep	Jul, Aug, Sep
BHP-S3	Jul, Aug, Sep	Jul, Aug, Sep	Jul, Aug, Sep
Effluent discharge to Koala Watershed			
Timing of Discharge	-	Jan to Nov	Jun to Dec

Source for water quality samples (DDMI 2001); source for effluent discharge (Dominion Diamond 2015a).

Note:

BHP-S1= also known as S1; this station is no longer sampled as part of the Ekati Aquatic Effects Monitoring Program.

BHP-S2= also known as S2; this station is sampled regularly as part of the Ekati Aquatic Effects Monitoring Program; shown on Map 8.2-6 in the DAR.

BHP-S3= also known as S3; this station is sampled regularly as part of the Ekati Aquatic Effects Monitoring Program; shown on Map 8.2-6 in the DAR.

BHP=Broken Hill Proprietary Company; DAR=Developer's Assessment Report; Feb=February; Mar=March; Apr=April; Jul=July; Aug=August; Sep=September; Nov=November; Dec=December; -=no discharge or sample collected.

The Reference Condition in Lac de Gras was characterized in the DAR by data collected up to the year 2000; the summary statistics for the Reference Condition were provided in Table 8.2-50 in the DAR. These data were collected across the lake, but in the DAR, all data were grouped together.

Reference Condition water quality data in Lac de Gras (1994 to 2000) is summarized by individual stations from across Lac de Gras and by grouped results for the BHP-S stations (i.e., stations within Slipper Bay of Lac de Gras) (Table 52-3). The stations represented in this table are illustrated on Map 8.2-6 in the DAR.

The purpose of Table 52-3 is to illustrate the measured range of baseline data from across the lake to the data collected in Slipper Bay. Since discharge to the Koala watershed (and into Slipper Bay of Lac de Gras) started in 1999, and samples were collected in 1998 to 2000 from Slipper Bay, there was concern by the reviewer that data from Slipper Bay, or those from 1999 and 2000, should not have been used to characterize the Reference Condition in Lac de Gras.

Overall, data collected from the BHP-S stations (i.e., stations within Slipper Bay of Lac de Gras) in 1998 to 2000 were below relevant water quality guidelines with the exception of slight exceedances in pH and chromium; these exceedances were consistent with the other Lac de Gras stations. Conventional parameters of pH, total suspended solids (TSS), and turbidity at the BHP-S stations were within range of all Lac de Gras stations. Nutrient concentrations at the BHP-S stations were also with range of Lac de Gras stations with a few exceptions. Maximum ammonia at the BHP-S stations was higher than maximum ammonia at all Lac de Gras stations except LDG44. Maximum total phosphorus concentration was higher at the BHP-S stations as compared to LDG40, LDG41, LDG42, LDG43, and LDG45; at the other Lac de Gras stations, maximum ammonia was higher as compared to the BHP-S stations. Nitrite was lower at the BHP-S stations as compared to the Lac de Gras stations.

Total metal concentrations varied between stations, but generally results from the BHP-S stations were within range of the Lac de Gras stations. Maximum concentrations were higher at the BHP-S stations as compared to some, but not all, Lac de Gras stations. For example, maximum aluminium was higher at the

BHP-S stations as compared to LDG40, LDG41, LDG45, and LDG46, but maximum aluminium was higher at LDG42, LDG43, LDG49, and LDG48 as compared to the BHP-S stations. This type of trend was evident for all metals.

Overall, there are minor differences in water quality results at the BHP-S stations as compared to the other stations in Lac de Gras, and where there are differences, the absolute difference is very small (i.e., on the order of a fraction of a microgram).

Therefore, for purposes of the Jay Project environmental assessment, combining all data from pre-2000 to describe the Reference Condition was appropriate.

Table 52-3 Baseline Water Quality Data in Lac de Gras (1994 to 2000) by Stations

Parameters	Units	Guidelines			Lac de Gras-Mid Field Stations														Lac de Gras-Far Field Stations					
		Aquatic Life		Drinking Water (Health Canada 2012)	LDG40		LDG41		LDG42		LDG43		LDG44		LDG45		LDG49		LDG46		LDG48		BHP-S (Slipper Bay)	
		Acute (CCME 1999)	Chronic (CCME 1999)		(n)	Range	(n)	Range	(n)	Range	(n)	Range	(n)	Range	(n)	Range	(n)	Range	(n)	Range	(n)	Range	(n)	Range
Conventional Parameters																								
pH [a]	-	-	6.5 - 9.0	6.5 - 8.5	25	**6.21** to 6.80	127	**6.41** to 6.82	187	**6.33** to 6.71	2.65	**6.31** to 6.80	87	**6.24** to 6.80	124	6.50 to 6.70	109	**6.21** to 6.78	58	6.66 to 6.94	60	**6.45** to 6.81	168	**6.44** to 6.60
TSS	mg/L	-	-	-	8	<0.4 to 4.0	9	<0.4 to 12.0	19	<0.4 to 10.0	19	<0.4 to 4.0	11	<0.40 to 3.00	111	<2.0 to 10.0	18	<0.4 to 4.0	4	<0.4 to 4.0	15	<0.4 to 14.0	168	<2.0 to 8.0
Turbidity [a]	NTU	-	-	-	21	0.2 to 5.3	55	0.1 to 4.7	93	0.1 to 2.8	110	0.1 to 4.4	43	0.1 to 0.2	126	0.2 to 0.3	45	0.1 to 0.9	6	0.1 to 8.5	33	0.1 to 1.0	168	0.2 to 0.4
Nutrients																								
Ammonia	mg/L	-	45-72	-	8	<0.005 to 0.010	8	<0.006 to 0.012	23	<0.005 to 0.010	23	<0.005 to 0.011	10	0.010 to 0.040	111	<0.005 to 0.020	18	<0.010 to 0.010	5	<0.010 to 0.011	21	<0.005 to 0.030	168	<0.003 to 0.033
Nitrite	mg/L	-	0.06	1	6	<0.200 to **0.200**	2	0.004 to 0.004	10	<0.003 to **0.200**	10	<0.003 to **0.200**	6	<0.003 to **0.200**	12	<0.002 to <0.002	14	<0.003 to **0.200**	-	-	7	<0.003 to **0.200**	24	<0.002 to <0.002
Total Phosphorus	mg/L	-	-	-	8	0.0032 to 0.0090	9	<0.0010 to 0.0061	24	<0.0010 to 0.0080	24	<0.0010 to 0.0077	10	0.0022 to 0.0140	111	<0.0010 to 0.0090	22	0.0030 to 0.0390	5	0.0028 to 0.0180	19	<0.0010 to 0.0850	168	<0.0010 to 0.012
Total Metals																								
Aluminum	µg/L	-	5.0 or 100	100	8	3.10 to 30.00	11	<1.00 to 34.00	25	<1.00 to 93.00	25	<1.00 to 40.00	12	<1.00 to 44.00	111	0.17 to 8.80	20	4.00 to **420.00**	5	1.00 to 14.00	21	2.00 to **330.00**	168	1.10 to 40.80
Arsenic	µg/L	-	5	10	5	<0.20 to 0.26	11	<0.20 to 0.30	18	<0.20 to 2.10	18	<0.20 to 0.30	9	<0.20 to 0.30	111	0.14 to 1.80	12	<0.20 to 0.60	5	<0.20 to 0.22	19	<0.20 to 2.00	168	<0.03 to 0.83
Cadmium [b]	µg/L	0.11	0.04	5	8	**<0.05** to **3.00**	11	**<0.05** to **0.20**	26	**<0.04 to 3.00**	26	**<0.04** to **4.00**	12	**<0.05** to **3.00**	111	<0.02 to **<0.05**	21	**<0.04** to **3.00**	5	**<0.05** to **0.20**	22	**<0.05** to **7.00**	168	<0.02 to **<0.05**
Chromium	µg/L	-	1	50	8	<0.06 to **8.00**	11	<0.06 to **9.00**	25	<0.06 to **16.00**	25	<0.06 to **7.00**	12	<0.20 to **7.00**	111	<0.06 to **1.44**	20	<0.20 to **10.00**	5	<0.06 to **4.00**	22	<0.06 to **5.00**	168	<0.06 to **1.41**
Copper	µg/L	-	2	1000	8	<0.6 to **5.00**	11	<0.20 to **6.00**	25	<0.20 to **8.50**	25	<0.20 to **7.20**	12	<0.20 to **2.60**	111	<0.60 to 1.90	20	<0.20 to **7.10**	5	<0.20 to 0.60	22	<0.20 to **10.00**	168	<0.60 to 1.10
Lead	µg/L	-	1	10	2	<0.05 to 0.05	11	<0.05 to **2.40**	17	<0.05 to **1.30**	17	<0.05 to **2.00**	8	<0.05 to **5.40**	111	<0.05 to 0.20	8	<0.20 to **8.00**	5	<0.05 to 0.30	20	<0.05 to **5.90**	168	<0.05 to 0.20
Nickel	µg/L	-	25	-	8	0.62 to 7.00	11	<0.50 to 4.80	25	<0.50 to 20.00	25	<0.50 to 17.60	12	<0.50 to 11.00	111	0.26 to 0.90	20	<0.50 to 19.00	5	<0.05 to 0.54	22	<0.50 to 7.00	168	<0.05 to 1.33
Zinc	µg/L	-	30	5,000	8	<0.80 to **150.00**	11	<0.80 to **44.00**	25	<0.60 to **107.00**	25	<0.80 to **47.80**	12	<0.60 to 17.00	75	<0.80 to 1.70	20	<0.60 to **109.00**	5	<0.80 to 3.00	22	<0.60 to 28.00	114	<0.80 to 2.20

Source: DDMI (2001).
Note:
BHP-S Stations includes: BHP-S1, BHP-S2 and BHP-S3.
BHP-S1= also known as S1; this station is no longer sampled as part of the Ekati Aquatic Effects Monitoring Program.
BHP-S2= also known as S2; this station is sampled regularly as part of the Ekati Aquatic Effects Monitoring Program; shown on Map 8.2-6 in the DAR.
BHP-S3= also known as S3; this station is sampled regularly as part of the Ekati Aquatic Effects Monitoring Program; shown on Map 8.2-6 in the DAR.
See DDMI (2001) for station locations within Lac de Gras.
Range calculated using raw data.
Bolded concentrations are higher than relevant water quality guidelines.
Guidelines calculated using median values of hardness, pH and temperature.
a) Range is 25th to 75th percentile as presented in Table 1-5 in DDMI (2001).
b) analytical detection limit was higher than the relevant chronic aquatic life guideline.
n =-count; BHP = Broken Hill Proprietary Company; CCME = Canadian Council of Ministers of the Environment; LDG = Lac de Gras; mg/L = milligrams per litre; NTU = Nephelometric Turbidity Units; µg/L = micrograms per litre; TSS = total suspended solids; - = no guideline or no data; < = less than

3. Provide 2014 Data for Lac du Sauvage

The 2014 baseline supplemental report (Dominion Diamond 2015b) has been submitted to the Mackenzie Valley Environmental Impact Review Board with the Information Request submission.

References:

DDMI (Diavik Diamond Mines Inc.). 2001. Diavik Diamond Mine 2000 Aquatic Effects Monitoring Program, Technical Report, March 2001.

Dominion Diamond (Dominion Diamond Ekati Corporation). 2015a. Misery Pumped Flows and Long Lake Containment Facility Discharge. Provided via email from Eric Denholm (Dominion Diamond) to Steve Strawson (Golder Associates Ltd.). Fw: data request. Friday, March 20, 2015 9:30 AM

Dominion Diamond 2015b. 2014 Water and Sediment Quality Supplemental Baseline Report for the Jay Project. Prepared by Golder Associates Ltd for Dominion Diamond Ekati Corporation, Yellowknife NT. 102 pp + Appendices.

ERM Rescan (ERM Rescan Environmental Services Ltd.). 2013. Ekati Diamond Mine 2012 Aquatic Effects Monitoring Program Annual Report. Prepared for BHP Billiton Canada Inc. Yellowknife, NWT, Canada.

Rescan (Rescan Environmental Services Ltd.). 1998. 1998 Aquatic Effects Monitoring Program (AEMP) Technical Report. Prepared for BHP Billiton Canada Inc. Yellowknife, NWT, Canada.

Rescan. 1999. 1999 Aquatic Effects Monitoring Program (AEMP) Technical Report. Prepared for BHP Billiton Canada Inc. Yellowknife, NWT, Canada.

Rescan. 2000. 2000 Aquatic Effects Monitoring Program (AEMP) Technical Report. Prepared for BHP Billiton Canada Inc. Yellowknife, NWT, Canada.

Rescan. 2007. Ekati Diamond Mine 2006 Jay Pipe Aquatic Baseline. Prepared for BHP Billiton Canada Inc. Yellowknife, NWT, Canada.

Rescan. 2011. Ekati Diamond Mine 2010 Aquatic Effects Monitoring Program Annual Report. Prepared for BHP Billiton Canada Inc. Yellowknife, NWT, Canada.

Rescan. 2012. Ekati Diamond Mine 2011 Aquatic Effects Monitoring Program Annual Report. Prepared for BHP Billiton Canada Inc. Yellowknife, NWT, Canada.

DOMINION DIAMOND

Information Request Number:	DAR-GNWT-IR-53
Source:	Government of Northwest Territories – Lands: Paul Mercredi
Subject:	Water Quality
DAR Section(s):	8

Preamble (GNWT):

Due to density effects, the effluent plume is expected to settle on the bottom quite quickly proximally to GEMSS modeling cell LDS1. This condition is most extreme during the winter months.

Request (GNWT):

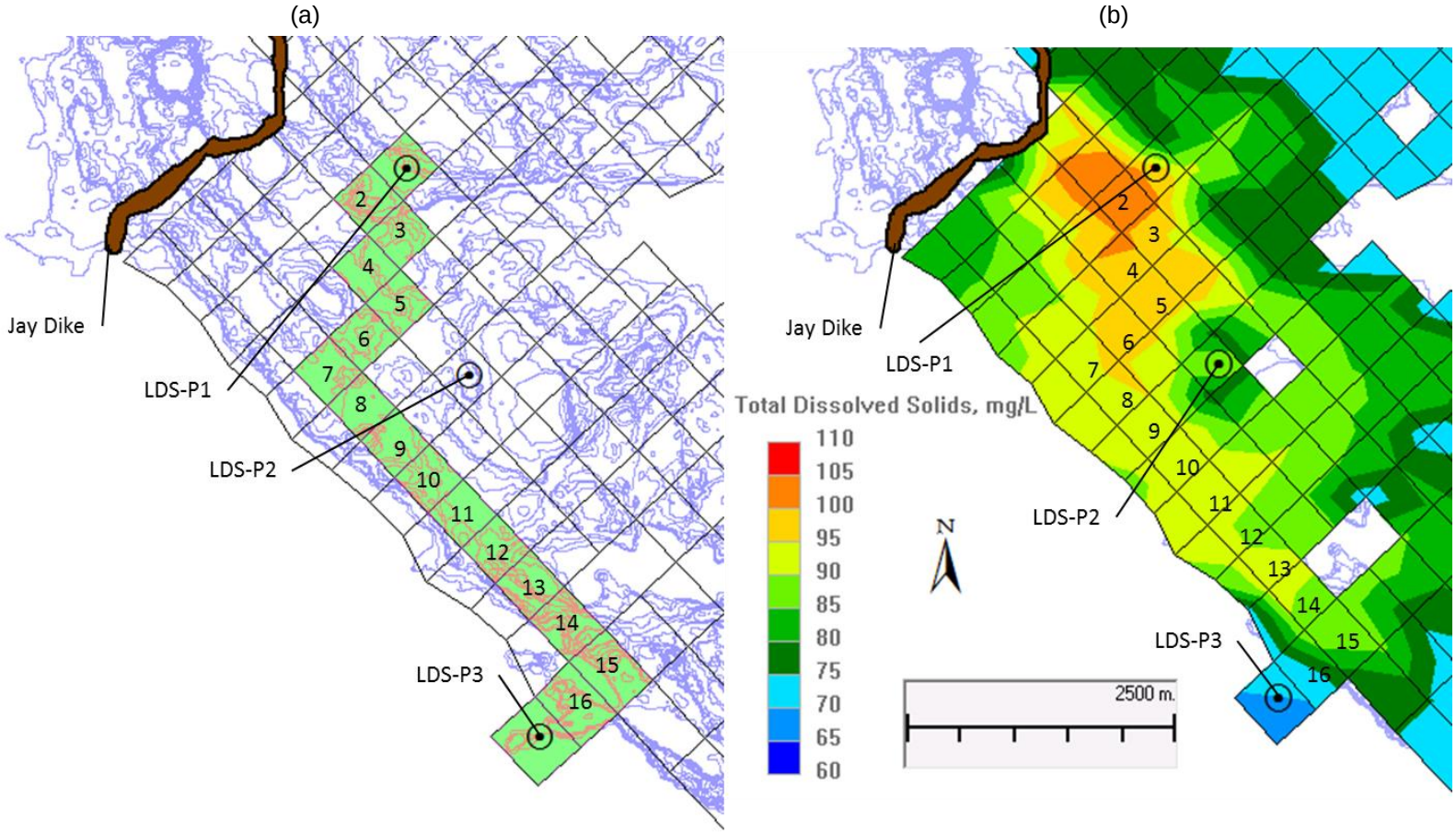
GNWT recommends that DDEC provide the existing conservative case predictions for the deepest GEMSS cells between LDS1 and the Lac du Sauvage narrows.

Response:

The deepest grid cells between assessment nodes LDS-P1 and LDS-P3, with under-ice depths ranging from 4 metres (m) to 12 m, are shown in Figure 53-1a. The maximum predicted concentrations of total dissolved solids (TDS) at the bottom of the lake in the Lac du Sauvage hydrodynamic model, during the late operations phase (i.e., 2024 to 2030), are illustrated in Figure 53-1b. Maximum modelled concentrations of all constituents in the deepest grid cells between assessment nodes LDS-P1 and LDS-P3, and during the late operations phase (i.e., 2024 and 2030), are provided in Table 53-1. The predicted concentrations provided in Figure 53-1b and Table 53-1 represent independently calculated maximums at the bottom of each cell based on model predictions between 2024 and 2030; these concentrations do not necessarily occur simultaneously.

The predicted concentrations in these areas of Lac du Sauvage are less than guidelines; the predicted concentrations do not pose a risk to aquatic life or continued traditional use of water, and thus do not change the outcome of the assessment.

Figure 53-1 (a) Deepest Lac du Sauvage Grid Cells Between LDS-P1 and LDS-P3 and (b) Maximum Predicted Total Dissolved Solids Concentrations at the Bottom of the Lake during the Operations Period



m = metre; mg/L = milligrams per litre; N = North.

Table 53-1 Environmental Assessment Case for Lac du Sauvage – Maximum Predicted Bottom Concentrations in the Deepest Grid Cells between LDS-P1 and LDS-P3

Parameter	Units	Assessment Node	Grid Cell															Assessment Node
		LDS-P1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	LDS-P3
Modelled Under Ice Depth	m	10	10	8	8	10	8	10	12	12	12	12	12	10	8	8	4	4
Field Measured																		
Water temperature	°C	17	16	16	16	16	16	16	17	17	17	17	17	17	16	16	17	17
Dissolved oxygen	mg/L	16	15	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16
Conventional Parameters																		
Hardness	mg/L	53	54	54	52	51	49	48	49	49	48	48	48	48	47	46	35	36
Total dissolved solids	mg/L	100	101	101	98	95	92	90	92	92	91	91	90	90	89	88	68	68
Major Ions																		
Calcium	mg/L	19	19	19	18	18	17	17	17	17	17	17	17	17	16	16	12	12
Chloride	mg/L	51	51	51	49	48	46	45	46	46	45	45	45	45	45	44	32	32
Fluoride	mg/L	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.014	0.014
Magnesium	mg/L	1.7	1.7	1.7	1.7	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.5	1.3	1.3
Potassium	mg/L	0.84	0.84	0.84	0.83	0.83	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.81	0.76	0.76
Sodium	mg/L	12	12	12	12	11	11	11	11	11	11	11	11	11	11	10	7.8	7.8
Sulphate	mg/L	2.1	2.1	2.1	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	1.9	1.9
Nutrients																		
Total nitrogen (calculated)	mg-N/L	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	0.9	0.78	0.77
Total ammonia	mg-N/L	0.19	0.19	0.19	0.18	0.18	0.17	0.17	0.18	0.18	0.18	0.17	0.17	0.17	0.17	0.17	0.13	0.13
Nitrate	mg-N/L	0.69	0.69	0.69	0.66	0.65	0.64	0.64	0.64	0.64	0.64	0.64	0.64	0.64	0.64	0.62	0.48	0.48
Total phosphorus	mg-P/L	0.013	0.013	0.013	0.013	0.013	0.013	0.013	0.013	0.013	0.013	0.013	0.013	0.013	0.013	0.012	0.011	0.011
Dissolved orthophosphate	mg/L	0.0069	0.0069	0.0069	0.0068	0.0067	0.0067	0.0067	0.0067	0.0067	0.0067	0.0067	0.0067	0.0067	0.0067	0.0065	0.005	0.005
Silica, reactive	mg/L	0.27	0.27	0.27	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.25	0.23	0.23
Total Metals																		
Aluminum	µg/L	65	66	65	64	63	63	63	63	63	63	63	63	63	63	61	52	52
Arsenic	µg/L	0.42	0.42	0.42	0.42	0.42	0.42	0.42	0.42	0.42	0.42	0.42	0.42	0.42	0.42	0.41	0.4	0.4
Barium	µg/L	4.6	4.7	4.6	4.6	4.6	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.4	3.9	3.9
Beryllium	µg/L	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Bismuth	µg/L	0.012	0.012	0.012	0.012	0.012	0.012	0.012	0.012	0.012	0.012	0.012	0.012	0.012	0.012	0.012	0.011	0.01
Cadmium	µg/L	0.033	0.033	0.033	0.033	0.033	0.033	0.033	0.033	0.033	0.033	0.033	0.033	0.033	0.033	0.032	0.031	0.031
Chromium	µg/L	0.26	0.27	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.24	0.24
Cobalt	µg/L	0.26	0.26	0.26	0.26	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.22	0.21
Copper	µg/L	0.85	0.85	0.85	0.85	0.85	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.81	0.81
Iron	µg/L	39	40	39	39	38	38	38	38	38	38	38	38	38	38	37	32	32
Lead	µg/L	0.055	0.056	0.055	0.055	0.054	0.054	0.054	0.054	0.054	0.054	0.054	0.054	0.054	0.054	0.053	0.049	0.049
Manganese	µg/L	10	10	10	9.7	10	10	10	10	9.6	10	9.6	9.6	9.6	9.6	9.4	8.1	8.1
Mercury	µg/L	0.0061	0.0062	0.0061	0.006	0.006	0.0059	0.0059	0.006	0.006	0.006	0.0059	0.0059	0.0059	0.0059	0.0058	0.005	0.005
Molybdenum	µg/L	0.66	0.67	0.66	0.65	0.64	0.63	0.63	0.64	0.64	0.64	0.64	0.64	0.64	0.63	0.62	0.52	0.52
Nickel	µg/L	0.7	0.71	0.7	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.68	0.68	0.62	0.61
Selenium	µg/L	0.064	0.064	0.064	0.064	0.064	0.064	0.064	0.064	0.064	0.064	0.064	0.064	0.064	0.064	0.063	0.061	0.061
Silver	µg/L	0.052	0.052	0.052	0.052	0.052	0.052	0.052	0.052	0.052	0.052	0.052	0.052	0.052	0.052	0.052	0.051	0.051
Strontium	µg/L	549	561	549	542	538	531	531	533	533	533	532	532	532	530	517	437	434
Uranium	µg/L	0.64	0.66	0.64	0.64	0.63	0.62	0.62	0.63	0.63	0.63	0.62	0.62	0.62	0.62	0.61	0.52	0.51
Vanadium	µg/L	0.082	0.083	0.082	0.081	0.081	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.079	0.07	0.07
Zinc	µg/L	0.97	0.98	0.97	0.96	0.96	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.94	0.87	0.87
Dissolved Metals																		
Aluminum	µg/L	8.9	9.0	8.9	8.9	8.8	8.8	8.8	8.8	8.8	8.8	8.8	8.8	8.8	8.8	8.7	8.0	8.0
Arsenic	µg/L	0.41	0.41	0.41	0.41	0.41	0.41	0.41	0.41	0.41	0.41	0.41	0.41	0.41	0.41	0.41	0.4	0.4
Barium	µg/L	4.2	4.3	4.2	4.2	4.2	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1	3.6	3.6
Beryllium	µg/L	0.0078	0.0078	0.0078	0.0077	0.0077	0.0077	0.0077	0.0077	0.0077	0.0077	0.0077	0.0077	0.0077	0.0077	0.0076	0.0072	0.0072

Table 53-1 Environmental Assessment Case for Lac du Sauvage – Maximum Predicted Bottom Concentrations in the Deepest Grid Cells between LDS-P1 and LDS-P3

Parameter	Units	Assessment Node	Grid Cell															Assessment Node
		LDS-P1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	LDS-P3
Modelled Under Ice Depth	m	10	10	8	8	10	8	10	12	12	12	12	12	10	8	8	4	4
Bismuth	µg/L	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.01	0.01
Cadmium	µg/L	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.0086	0.0085
Chromium	µg/L	0.079	0.08	0.079	0.079	0.079	0.079	0.079	0.079	0.079	0.079	0.079	0.079	0.079	0.079	0.079	0.076	0.076
Cobalt	µg/L	0.21	0.21	0.21	0.21	0.21	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.17	0.17
Copper	µg/L	0.83	0.83	0.83	0.83	0.83	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.8	0.8
Iron	µg/L	19	19	19	18	18	18	18	18	18	18	18	18	18	18	18	15	15
Lead	µg/L	0.023	0.023	0.023	0.023	0.022	0.022	0.022	0.022	0.022	0.022	0.022	0.022	0.022	0.022	0.022	0.019	0.019
Manganese	µg/L	9.5	10	9.5	9.4	9.4	9.3	9.3	9.3	9.3	9.3	9.3	9.3	9.3	9.3	9.1	7.9	7.8
Mercury	µg/L	0.0014	0.0014	0.0014	0.0014	0.0014	0.0013	0.0013	0.0014	0.0014	0.0014	0.0014	0.0014	0.0014	0.0013	0.0013	0.0012	0.0011
Molybdenum	µg/L	0.65	0.67	0.65	0.65	0.64	0.63	0.63	0.64	0.64	0.64	0.63	0.63	0.63	0.63	0.62	0.52	0.52
Nickel	µg/L	0.67	0.67	0.67	0.66	0.66	0.65	0.65	0.66	0.66	0.66	0.66	0.66	0.66	0.65	0.65	0.59	0.59
Selenium	µg/L	0.034	0.034	0.034	0.034	0.034	0.033	0.033	0.034	0.034	0.034	0.034	0.034	0.034	0.033	0.033	0.031	0.031
Silver	µg/L	0.0041	0.0041	0.0041	0.0041	0.0041	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.0038	0.0038
Strontium	µg/L	549	561	549	542	537	531	531	533	533	533	532	531	531	530	517	436	434
Uranium	µg/L	0.63	0.64	0.63	0.62	0.62	0.61	0.61	0.61	0.61	0.61	0.61	0.61	0.61	0.61	0.6	0.5	0.5
Vanadium	µg/L	0.041	0.041	0.041	0.041	0.041	0.041	0.041	0.041	0.041	0.041	0.041	0.041	0.041	0.041	0.04	0.038	0.038
Zinc	µg/L	0.92	0.93	0.92	0.91	0.91	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.89	0.83	0.83

m = metre; °C = degrees Celsius; mg/L = milligrams per litre; mg-N/L = milligrams nitrogen per litre; mg-P/L = milligrams phosphorus per litre; µg/L = micrograms per litre.

DOMINION DIAMOND

Information Request Number: DAR-GNWT-IR-54

Source: Government of Northwest Territories – Lands: Paul Mercredi

Subject: SSWQOs

DAR Section(s): 8

Preamble (GNWT):

The SSWQOs presented appear to be relevant to the larger Ekati project and specific to the receiving waterbodies approved under that Water Licence, Leslie Lake and Cujo Lake, and their applicability to Lac du Sauvage is unclear.

Request (GNWT):

GNWT recommends that DDEC provide additional information on the specific derivation of SSWQOS noted to be implemented at Lac du Sauvage, which has different characteristics than other Ekati receiving bodies.

Response:

The Ekati Mine Site-Specific Water Quality Objectives (SSWQOs) were initially developed for use in the Koala watershed (including Slipper Bay of Lac de Gras), King-Cujo watershed (including Lac du Sauvage), Nanuq Lake watershed, and Counts Lake watershed; however, these SSWQOs also apply generally to other freshwater bodies in the Northwest Territories. For instance, the Ekati Mine SSWQO for nitrate, following site-specific toxicity testing, was found to be suitable for Snap Lake, which is in an entirely different watershed, the Lockhart Watershed. This suitability was endorsed by Ecometrix, the independent consultant to the Mackenzie Valley Environmental Impact Review Board for the Snap Lake Mine's recent Water Licence Amendment (EA1314-02[1]). Similarly, the Ekati Mine SSWQO for chloride was endorsed by Ecometrix Incorporated as suitable for Snap Lake (Ecometrix 2014, 2105).

The Ekati Mine SSWQOs for chloride, potassium, sulphate, nitrate, molybdenum, and vanadium were developed following the Canadian Council of Ministers of the Environment (CCME; 2007) procedure and the use of short-term and long-term toxicity data (Elphick et al. 2011; Rescan 2012a,b,c,d,e). The Ekati Mine SSWQOs for chloride, sulphate, and nitrate also take into account the relationship between the constituent and hardness, and as such, the SSWQO equations can be applied to waters with hardness between 10 to 160 milligrams calcium carbonate per litre (mg $CaCO_3$/L). Water hardness of Lac du Sauvage and Lac de Gras are predicted to range up to 52 and up to 11 mg $CaCO_3$/L, respectively, during the Jay Project. Since the SSWQOs were developed following industry standard practice, and they have been accepted for use at the Ekati and Snap Lake mines, and the downstream waterbodies associated with those mines, it was determined that it was appropriate to use them as benchmarks to assess predicted water quality in the Developer's Assessment Report.

[1] File number for the Snap Lake Water Licence Amendment on the Mackenzie Valley Review Board.

References:

CCME (Canadian Council of Ministers of the Environment). 2007. A Protocol for the Derivation of Water Quality Guidelines for the Protection of Aquatic Life. Canadian Council of Ministers of the Environment. Winnipeg, MB, Canada.

EcoMetrix (EcoMetrix Incorporated). 2014. Review of Amendment Application Submitted December, 2013 for the Snap Lake Mine. Submitted to the Mackenzie Valley Land and Water Board. Yellowknife, NWT, Canada. May 2014.

EcoMetrix. 2015. Review of Updated Application for Water License Limits for the Snap Lake Mine. Submitted to the Mackenzie Valley Land and Water Board. Yellowknife, NWT, Canada. February 2015.

Elphick JRF, Bergh KD, Bailey HC. 2011. Chronic toxicity of chloride to freshwater species: effects of hardness and implications for water quality guidelines. Environ Toxicol Chem 30: 230-246.

Rescan (Rescan Environmental Services Ltd.). 2012a. EKATI Diamond Mine: Site-Specific Water Quality Objective for Potassium. Prepared for BHP Billiton Canada Inc. Yellowknife, NWT, Canada.

Rescan. 2012b. EKATI Diamond Mine: Site-specific Water Quality Objective for Sulphate. Prepared for BHP Billiton Canada Inc. Yellowknife, NWT, Canada.

Rescan. 2012c. EKATI Diamond Mine: Site-Specific Water Quality Objective for Nitrate, 2012. Prepared for BHP Billiton Canada Inc. Yellowknife, NWT, Canada.

Rescan. 2012d. EKATI Diamond Mine: Site Specific Water Quality Objective for Molybdenum, 2011. Prepared for BHP Billiton Canada Inc. Yellowknife, NWT, Canada.

Rescan. 2012e. EKATI Diamond Mine: Site-specific Water Quality Objective for Vanadium. Prepared for BHP Billiton Canada Inc. Yellowknife, NWT, Canada.

DOMINION DIAMOND

Information Request Number: DAR-GNWT-IR-55

Source: Government of Northwest Territories – Lands: Paul Mercredi

Subject: Dewatering

DAR Section(s): 8.4.2.4.1

Preamble (GNWT):

Page 8-172 notes that 15 million m^3 will be dewatered from the isolated area of Lac du Sauvage during the initial de-watering phase. Water will be pumped from the diked area to the main basin through three open pipe outfalls at 6500 m^3/hr. The velocities associated with this discharge are unclear. As well, it is uncertain if the 6500 m^3/hr represents the total pumping volume or the volume associated with each outfall.

Request (GNWT):

GNWT recommends clarification on the total volumes and velocities of discharge water entering Lac du Sauvage from the diked area during initial dewatering.

Response:

The following provides clarification related to pumping from the diked area of Lac du Sauvage during the initial phase of dewatering (direct discharge to Lac du Sauvage) :

- Three pump stations will operate during the dewatering stage – PS1, PS2, and PS3 (Section 3.5.1.4 of the Developer's Assessment Report [DAR]).
  - PS1 is designed for a flow rate of 1,350 cubic metres per hour (m^3/h)
  - PS2 is designed for a flow rate of 1,600 m^3/h
  - PS3 is designed for a flow rate of 3,550 m^3/h
- These three pump stations will operate simultaneously for combined flow rate of 6,500 m^3/h.
- During the initial phase of dewatering, discharge occurs to two locations in Lac du Sauvage, with PS1 and PS3 discharging into the same area, for a combined flow rate of 4,900 m^3/h, and PS2 discharging in a different area (see Figure 3-4 in Appendix 3A of the DAR; Mine Water Management Plan).
- The diameter of the last 10 metres of each pipeline will be increased, to reduce the discharge velocity, to 1 metre per second.

DOMINION DIAMOND

Information Request Number:	DAR-GNWT-IR-56
Source:	Government of Northwest Territories – Lands: Paul Mercredi
Subject:	Re-filling of Pits
DAR Section(s):	8

Preamble (GNWT):

It is stated that re-filling of Misery and Jay Pits will occur from June to October. Has DDEC considered re-filling during winter to reduce the closure period or is this not feasible due to operational and temperature constraints?

Request (GNWT):

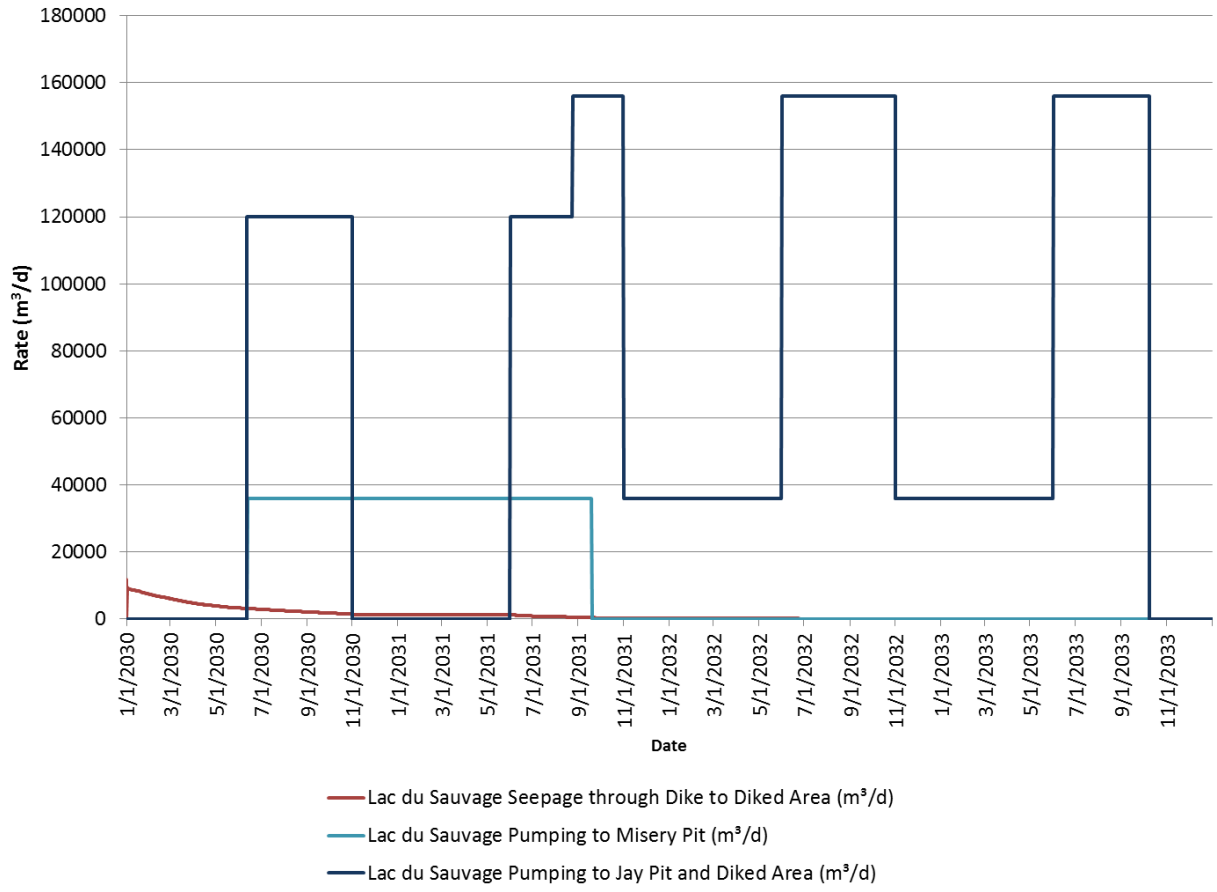
GNWT requests that DDEC provide rationale on the proposed seasonal refilling of Misery and Jay Pits and provide information as whether winter filling has at all been assessed for the project.

Response:

The proposed closure back-flooding plan for Misery and Jay pits accounts for back-flooding occurring year-round; seasonal back-flooding rates from Lac du Sauvage were set to mitigate effects to water levels and discharges in Lac du Sauvage and downstream waterbodies.

Section 8.5.3.2.4 of the Developer's Assessment Report (DAR) includes the water withdrawals from Lac du Sauvage for the back-flooding of the Misery Pit, Jay Pit, and the diked area, and an assessment of the associated effects to water levels and discharges during the year of back-flooding with the greatest effects (2032). Figure 8.5-54 of the DAR, reproduced below as Figure 56-1, shows the daily water withdrawal rates from Lac du Sauvage for back-flooding of the Misery and Jay pits and the diked area.

Figure 56-1 Back-flooding Flow Rates for the Jay and Misery Pits



m^3/d = cubic metres per day.

The hydrology assessment considers the year-round back-flooding of the Misery and Jay pits. The planned pumping rate during November to May is 36,000 cubic metres per day (m^3/d) (1,500 cubic metres per hour [m^3/h]), when natural outflows from Lac du Sauvage are low, and 156,000 m^3/d (6,500 m^3/h) during June to October, as shown on Figure 56-1. The back-flooding of the Misery Pit is expected to occur at a constant rate of 36,000 m^3/d. Pumping rates for the back-flooding of the Jay Pit and diked area will be reduced during concurrent Misery Pit re-filling, to confirm that seasonal rates described above are not exceeded. Year-round back-flooding, with the two pumping rates noted above, was used in the assessment of effects to water levels and discharges within Lac du Sauvage and downstream waterbodies in DAR Section 8.5.3.2.4.

DOMINION DIAMOND

Information Request Number: DAR-GNWT-IR-57

Source: Government of Northwest Territories – Lands: Paul Mercredi

Subject: Narrows

DAR Section(s): 8.5.6.1.2

Preamble (GNWT):

Section 8.5.6.1.2 of the DAR states that reduced flows may cause ice blockage at the narrows between Lac du Sauvage and Lac de Gras, therefore during refilling of areas during closure, pumping rates from Lac du Sauvage may be reduced. Flow rates at the narrows should be maintained within natural range during winter, as suggested, and monitoring and trigger levels will have to be linked to operational actions. There is a mention of mitigation for adaptive management during low periods, however little clarification was given.

Request (GNWT):

GNWT requests additional information on proposed mitigations to ensure that ice blockage at the Narrows is avoided.

Response:

Specific trigger levels for reducing pumping rates during low-flow periods or winter conditions have not yet been identified. A Jay Pit and diked area back-flooding pumping plan will be developed prior to closure. It is expected that this plan will be submitted for approval under the water licence process and will be required prior to back-flooding (currently scheduled to commence in 2030). As part of the back-flooding pumping plan, Dominion Diamond will implement mitigation, as required, through an adaptive management plan. The adaptive management plan will include monitoring and the establishment of trigger levels that will be linked to operational actions (i.e., temporary reduction or cessation of pumping rates) to protect fish habitat in the Lac du Sauvage Narrows and to maintain flow rates within the natural range.

Additional information will be collected during operations as part of the Aquatic Effects Monitoring Program, prior to commencement of pumping for the Jay Pit and Misery Pit back-flooding, to further characterize baseline conditions including flow rates, water levels, and ice cover at the Lac du Sauvage Narrows under winter low-flow conditions. The current understanding of the Lac du Sauvage Narrows is that flowing water and partial open-water can be expected during the winter months, as described in the response to DAR-MVEIRB-IR-64. The adaptive management plan will be developed as part of the back-flooding pumping plan.

DOMINION DIAMOND

Information Request Number:	DAR-GNWT-IR-58
Source:	Government of Northwest Territories – Lands: Paul Mercredi
Subject:	Mine Water Management
DAR Section(s):	3, Appendix 3A, 8.4.2.4.1

Preamble (GNWT):

Based on predicted water flows, the Mine water Management Plan states that discharge from the Misery Pit directly to Lac du Sauvage will occur during the last 5 years of operation. This "effluent water will be monitored for compliance against the effluent quality criteria defined in the Water Licence". DDEC (DAR, s 8.4.2.4.1) also states that "the diked area will remain isolated from Lac du Sauvage until water quality in the back-flooded area meets acceptability (criteria) for mixing with the lake".

Request (GNWT):

GNWT requests DDEC outline how water from the Misery and/or Lynx pits or the impounded water will be treated in the event that effluent does not meet effluent quality criteria. GNWT requests, as an alternative, that DDEC consider the implications of discharging from Misery Pit earlier than 5 years when water quality is projected to be better and curtail discharge in year 9 when water quality would be poorest. Note the water at the end of operations (year 10) will be moved to the bottom of Jay Pit and is intended to be isolated from Lac du Sauvage surficial waters post-closure.

Response:

Throughout all the phases of the Jay Project (Project), water quality within the Misery Pit will be monitored at the surface and at depth to allow an ongoing assessment against modelled projections. If water quality is identified as tracking outside of Developer's Assessment Report (DAR) projections and represents a risk to the receiving environment, adaptive management strategies would be implemented. These strategies (Section 8.3, Appendix 3A of the DAR) may involve improvement or modifications to the mine water management plan, or temporary use of the contingency allowances included in the design of the water management structures. Planned risk mitigation measures and possible adaptive management strategies that would be considered include the following:

- maintaining a storage contingency allowance in the existing King Pond throughout the construction and operations stage for use as an additional total suspended solids management facility during construction and operations phase, or for short-term emergency minewater storage;
- maintaining the contingency storage in the Misery Pit (approximately 3 million cubic metres) throughout the operations stage for use as emergency minewater storage (upper 10 metres of the pit);
- maintaining pumping capacity and a pipeline between the Misery and Lynx pits throughout the operations stage to allow for lowering of the Lynx Pit water level to generate additional contingency minewater storage, if required;

- increasing storage capacity in the Jay runoff sump and mine inflows sump (e.g., constructing containment berms around the sumps) to augment temporary minewater storage capacity within the diked area;
- consideration of direct discharge to the environment from the Jay runoff sump, if water is found to meet established discharge criteria (the discharge locations used during the initial stages of dewatering would be used);
- use of storage capacity available at the Ekati site (e.g., construction of pumping and pipeline system from the Misery site to the Ekati site); and,
- treatment of parameters of concern prior to discharge to Lac du Sauvage.

These strategies, together with others that would be developed at that time based on the circumstances at hand, would allow for adjustments to the water management plan, if necessary, to maintain compliance with the Water Licence. In the unlikely event of water quantity and quality trends differing from expectations, these strategies would also allow sufficient time to develop and implement additional adaptive management strategies, without significantly affecting mine operations.

All influences on the Misery Pit discharge water quality, and downstream in Lac du Sauvage and Lac de Gras, were considered when the water management plan was developed, including discharge earlier than presented in the water management plan. Consideration of an alternative water management strategy for discharging from Misery Pit to Lac du Sauvage prior to Year 5 (i.e., 2024) of operations was not, however, determined to be favourable for the Project for the following reasons:

- discharging prior to Year 5 would result in Dominion Diamond and Diavik mines having overlapping discharges, increasing the cumulative constituent load reporting to Lac de Gras;
- not discharging for a minimum of five years provides Dominion Diamond with the opportunity to monitor minewater stored in the Misery Pit, develop an understanding of the key controls on pit water quality, and implement appropriate adaptive management strategies in a proactive manner, if required;
- discharging earlier in the mine life from Misery Pit would result in a longer filling time of the pit, increasing the surface area of exposed wall rock and the chemical load produced from weathering of the pit walls (see expanded rationale below); and,
- not all constituent concentrations increase throughout the mine life and peak concentrations of these constituents are not observed at the end of the mine life (see expanded rationale below).

As stated in Section 8E3.5 of the DAR, the exposed wall rock in the Misery Pit is estimated to be approximately 52 percent (%) metasediment and 48% granite at the end of mining (ERM Rescan 2013). Metasediment has been documented (see Geochemistry Baseline, Annex VIII of the DAR) to contain higher sulphide concentrations than the granite and, as a result, has a higher potential for acid generation in comparison to other waste rock units (mainly granite). Therefore, discharging from the Misery Pit earlier in the mine life would increase the surface area of metasediment available to oxidize in the pit wall and the extent to which a greater surface area would be exposed to potential oxidation. Submerging the pit walls as soon as possible with water pumped from the Jay Pit substantially reduces potential for oxidation

of metasediment, acid production, and flushing of chemical weathering products stored in the pit walls to the pit water.

A review of the projected constituents in the pit water concentrations indicates that constituents specifically related to groundwater inflow (e.g., total dissolved solids and chloride) increase as the composition of the Misery Pit becomes increasingly composed of water pumped from the Jay Pit towards the end of the mine life. Conversely, several constituents are projected to decrease (e.g., sulphate and iron) during operations (see Attachment 8E-1 of DAR Appendix 8E). Concentrations of these constituents are related to oxidation products stored in the pit wall and therefore decrease as the volume of water stored in Misery Pit increases and the exposed wall rock surface area decreases. While the projected concentrations of these constituents early in the mine life are not considered to pose a potential risk to the downstream environment, their concentrations could increase if the pit walls are exposed for longer periods of time, resulting in greater than predicted concentrations of these constituents.

References:

ERM Rescan (Rescan Environmental Services Ltd.) 2013. Ekati Diamond Mine. Modelling Predictions of Water Quality for Pit Lakes. November 2013.

DOMINION DIAMOND

Information Request Number: DAR-GNWT-IR-59

Source: Government of Northwest Territories – Lands: Paul Mercredi

Subject: Diffuser

DAR Section(s): 8.4.2.4.2, 3 (Appendix 3A)

Preamble (GNWT):

The diffuser port will be situated in 8m of water and is designed to prevent scouring of the bottom and suspension of the lakebed by virtue of upward facing discharge ports. However, DDEC (DAR s8.4.2.4.2) states that “ports (are) directed at such an angle as to minimize the potential influence on surface ice. This angle is 45 degrees from the horizontal” (Mine water Management Plan, s 4.8). Using the number of ports, port diameter (8.4 cm), diffuser position and depth it is not clear that the port exit velocity will not affect ice formation. This may have an effect on safety for persons sampling this area or for animals crossing this waterbody.

Request (GNWT):

GNWT recommends that DDEC provide additional certainty regarding the statement that the proposed diffuser does not pose any concerns in these regards.

Response:

The operational discharge of water from the Misery Pit to Lac du Sauvage may cause a change (reduction) to ice development near the outfall in the receiving waterbody was assessed as a secondary pathway for hydrology in Section 8.4.2.4.2 of the Developer’s Assessment Report (DAR; page 8-193). As described in this section, minewater discharge through the diffuser could potentially cause a minor localized, reduction in ice development, but the use of an appropriately designed diffuser, along with appropriate discharge rates, will limit any potential for localized reduction in ice development.

There are three factors that can affect ice formation: the temperature of the effluent, the design of the diffuser, and the mechanical effect of the plume. Currents can affect the affect the thermal heat flux at the ice-water interface and subsequently the ice growth mainly in two ways: introducing frictional heat (Marsh 1990); and, redistributing heat through circulation (Marsh and Prowse 1987; Beltaos 1996).

The diffuser will be designed to minimize the effects of minewater discharge from Misery Pit into Lac du Sauvage on the development of surface ice through the use of the following mitigations:

- No to minimal temperature differential is expected between the ambient water temperature in Lac du Sauvage and the minewater being discharged into Lac du Sauvage, as the diffuser will be decanting water from the nearby Misery Pit. Therefore, ice formation is not expected to be affected by temperature.
- The discharge will occur through an engineered diffuser.

- The diffuser will be located in a sufficient depth of water (currently anticipated to be approximately 8 metre [m] depth) with the ports directed upwards at an angle (45 degrees) as to minimize the potential influence on surface ice. Near-field modelling (using CORMIX, described in Attachment 8F1 of the DAR) of the discharge from the diffuser configuration, indicates that the plume of minewater discharge would interact with the surface ice approximately 45 m from the discharge. The plume is not expected to interact with the surface ice immediately above the diffuser.
- Discharge flow rates from the diffuser have been designed to reduce influence on surface ice. Based on the cross-sectional area of the expected plume under the ice and the diffuser configuration, the velocity of the plume when it interacts with the bottom of the ice is estimated to be similar to the assumed under-ice ambient velocity used in the CORMIX model (0.0005 metres per second [m/s]), and well below the open-water lake velocities used (0.083 m/s and 0.53 m/s based on 3 percent of measured wind speeds). These values are based on the maximum pumping rate discharge (2,000 cubic metres per hour). As the velocity of the minewater discharge plume when it interacts with the surface ice in Lac du Sauvage is not above ambient velocities, it is not expected to affect ice formation in terms of introducing friction heat or circulation.

Based on the diffuser design described above and temperature of the minewater discharged into Lac du Sauvage, limited potential to interfere with ice formation is anticipated. However, monitoring of ice formation and thickness near the location of the diffuser will be conducted to confirm model predictions and ensure safety of field sampling crews and wildlife. If ice formation is affected, measures would be implemented to limit/control access to affected areas and adaptive mitigation plans established.

References:

Beltaos S. 1996. River Ice James. Water Resources Publications. Feb. 1996.

Marsh P, Prowse TD. 1987. Water Temperature and Heat Flux at the base of River Ice Covers. Cold Reg Sci Technol. 14: 33-50.

Marsh P. 1990. Modelling Water Temperature Beneath River Ice Covers. Can. J. Civ. Eng. 17: 36-44.

DOMINION DIAMOND

Information Request Number: DAR-GNWT-IR-60

Source: Government of Northwest Territories – Lands: Paul Mercredi

Subject: Sediment Quality

DAR Section(s): 8.2.5.3.1

Preamble (GNWT):

Section 8.2.5.3.1 of the DAR states that "there has been no measurable change in sediment quality parameters in Lac du Sauvage over time due to mine activities (Rescan 2012f; ERM Rescan 2013a)". The latter document does not report on sediment quality and the statistical appendix (Rescan, 2012a) from the first citation (Rescan 2012f) appears to shows significant trends in arsenic and total nitrogen at LDS1. Rescan (2012b) states that the statistically significant "temporal patterns (in nitrogen) at site LdS1 and Cujo Lake (Rescan, 2012a, pg. 810) are (visually) similar to those observed in reference lakes" and on this basis conclude that there are no mine related effects. With respect to As, a statistically significant trend is detected that is different from the reference lakes. That is As concentrations at LDS1 are changing at a rate different than the reference lakes. Because As concentrations in 2011 are similar to baseline concentrations the conclusion is made that there is no mine effect. Finally, a trend in Cu at LDS1 appears to be only marginally insignificant. The results show that significant changes are occurring at LDS1.

Request (GNWT):

GNWT requests that DDEC provide either the analyses using the latest sampling results or the raw data in order to determine whether changes in sediment quality are occurring in Lac du Sauvage. If changes are occurring, this may have implications on the sediment quality summary presented in Table 8.2-57 and longer term EA predictions.

Response:

As based on interpretation of sediment data collected from Lac du Sauvage, as part of the Ekati Mine Aquatic Effects Monitoring Program (AEMP), no mine effects have been detected (Rescan 2012a,b). Based on this interpretation, all available sediment data were combined to characterize baseline sediment quality variability in the Developer's Assessment Report (DAR).

Samples for sediment quality analysis were collected from Lac du Sauvage in 2006 (Rescan 2007), 2013 (Water and Sediment Quality Baseline; Annex XI of the DAR), and 2014 (Dominion Diamond 2015) as part of baseline studies. Samples are also collected in Lac du Sauvage every three years as part of the Ekati Mine AEMP. To be consistent with the water quality assessment in the DAR, AEMP data from 2010 to 2012 were used to characterize existing conditions. The latest AEMP study with sediment data available for inclusion in the DAR was conducted in 2011 (Rescan 2012a,b,c). The AEMP study conducted in 2014 also included collection of sediment data (ERM 2015), but those data are not yet published; however, a summary of the AEMP data analysis and interpretation were available for inclusion in this response. As part of the AEMP, sediment samples are also collected from two reference lakes: Counts and Nanuq lakes.

To address this information request regarding the consideration that some sediment constituent concentrations in Lac du Sauvage may be increasing over time, box and whisker plots[1] were developed for total nitrogen, arsenic, and copper (Figures 60-1, 60-2, and 60-3). These plots included data for Lac du Sauvage since 2006 (i.e., 2006 [Rescan 2007], 2011 [Rescan 2012a,b,c], 2013 [Annex XI of the DAR], and 2014 [Dominion Diamond 2015]), and, for additional context, data for Counts Lake (2011; Rescan 2012a,b,c), Nanuq Lake (2011; Rescan 2012a,b,c), and Duchess Lake (2013).

For each year that data are available for Lac du Sauvage, the number of basins, sampling stations, and sampling depths targeted for sampling has differed. In 2006, samples were collected in the main central bay (i.e., basins Aa through Ae); in 2011, samples were collected at station LDS1; in 2013 and 2014, samples were collected throughout the lake. For the DAR, the Ekati Mine AEMP reports were reviewed to understand the range of constituent concentrations and to determine whether regions of Lac du Sauvage could be collated to provide a representation of existing condition. As it was concluded in Rescan (2012a,b) that there were no discernible mining influences, all sediment data from Lac du Sauvage were collated together. The data shows the variability within these basins (e.g., 2006, 2013, 2014) is similar to that at a single location (e.g., 2011). This is evident in the plots provided below.

- Total nitrogen concentrations are lower in Lac du Sauvage than in Counts and Nanuq lakes, and concentrations in Lac du Sauvage do not appear to show increasing trends over time as concentrations are lower in 2013 than in 2011 (Figure 60-1). As presented in the AEMP report (Rescan 2012b, Figure 4.3-3), mean concentration in 1999 is similar to mean concentration in 2011. The temporal pattern of total nitrogen in Lac du Sauvage is similar to trends in the reference lakes, and thus, no effects due to mining are discernible (Rescan 2012b).
- The median arsenic concentration in Counts Lake is higher than the median concentrations in Lac du Sauvage in 2006, 2011, and 2013; the range of median arsenic concentrations in Lac du Sauvage is higher than the median concentrations in Nanuq and Duchess lakes (Figure 60-2). The 2013 and 2014 within-lake variability of arsenic concentrations in Lac du Sauvage is relatively constant compared to the within-lake variability measured in 2006. Comparison to reference condition data (i.e., 1999 data) is limited to graphical representation in Rescan (2012b, Figure 4.3-5); based on Figure 4.3-5 (Rescan 2012b), mean arsenic concentration in 1999 was higher than mean concentration in 2011.

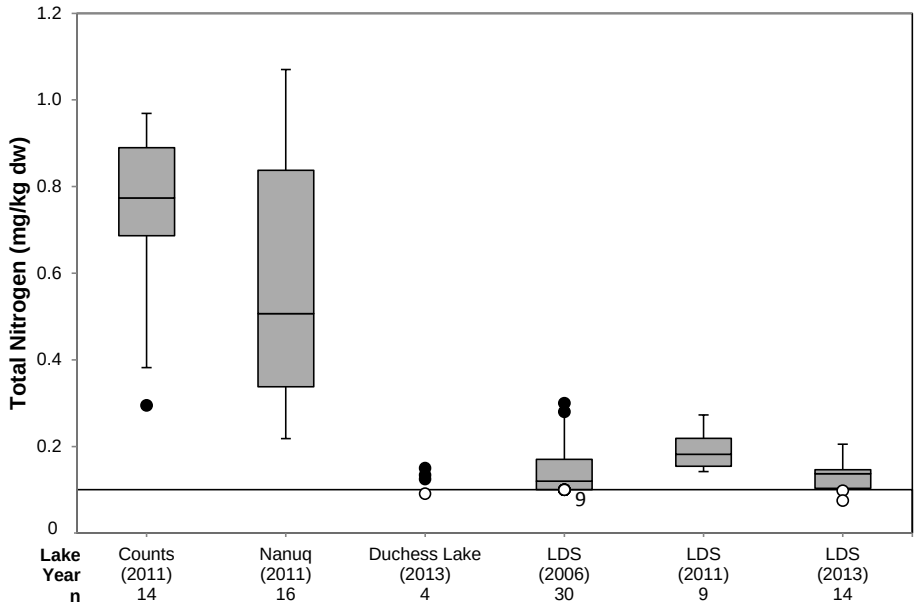
  The range of arsenic concentrations in 2013 (i.e., Ae-2, Ae-1, Ac-4, Ac-7, Ac-1, and Ab-1; Annex XI) and 2014 (i.e., Ab-1, Ac-7, Ad-1, Ae-1; Dominion Diamond 2015) are similar to concentrations in 2011 at station LDS1. From these results, arsenic concentrations in Lac du Sauvage do not appear to be showing increasing trends over time. In addition, the AEMP concluded that arsenic has changed in mid-depth sediments at LDS1, but statistical and graphical analysis suggest that concentrations at LDS1 are similar to baseline conditions and reference lakes, and thus, no effects are attributable to mining (Rescan 2012b). The 2014 AEMP study concluded, based on statistical and graphical analyses, that arsenic concentrations have remained consistent over time at all monitored sites, and that there is no effect due to mine operations (ERM 2015).

[1] Features of the box and whiskers plot - box boundaries = 25th and 75th percentiles (inter-quartile range, IQR); horizontal line in box = median; whiskers = 1.5 x height of box (IQR); circles (dots) when box is present = values outside range of whiskers; circles with no box = values when total count of data was less than 8; open circle = value less than detection limit; number next to circle = count of data with same value.

- Results of the copper concentrations between 2006 and 2014 do not suggest changes such as increasing trends over time (Figure 60-3). In addition, the within-lake variability (2006, 2013, and 2014) of copper in Lac du Sauvage is higher than the within station variability (LDS1). The 2014 AEMP study concluded, based on statistical and graphical analyses, that copper concentrations have remained consistent over time at all monitored sites, and that there is no effect due to mine operations (ERM 2015).

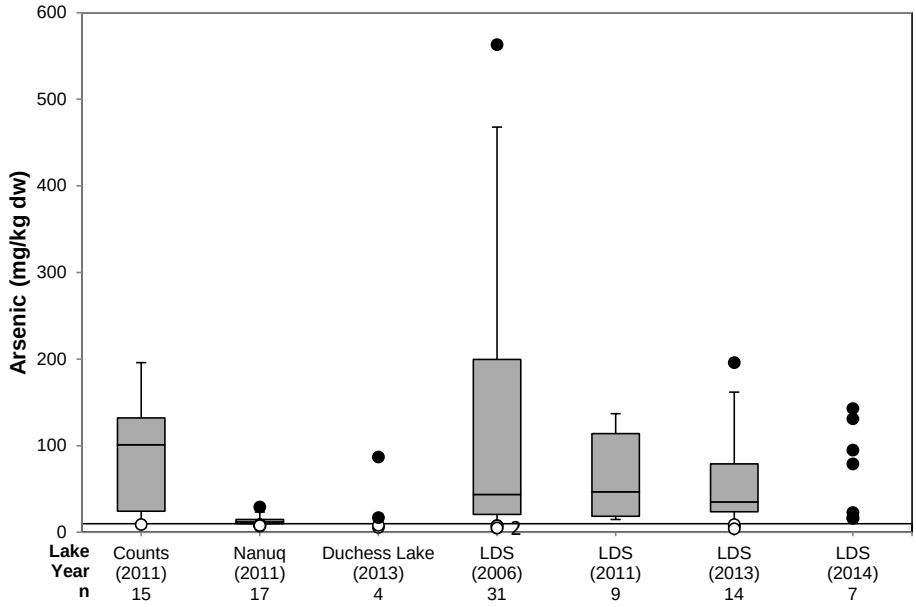
A review of the available data collected in Lac du Sauvage up to 2014 characterizes the existing sediment quality in Lac du Sauvage sufficiently for the purposes of the environmental assessment of the Jay Project. Thus, data presented in Table 8.2-57 of the DAR and the conclusion that there are no discernible mining-related changes to sediment quality in Lac du Sauvage are appropriate. As a result, the data provide a useful starting point for baseline data to use in AEMP monitoring to compare to construction and operation sediment quality data to identify Jay Project effects.

Figure 60-1 Sediment Total Organic Nitrogen Concentration in Counts Lake, Nanuq Lake, Duchess Lake, and Lac du Sauvage



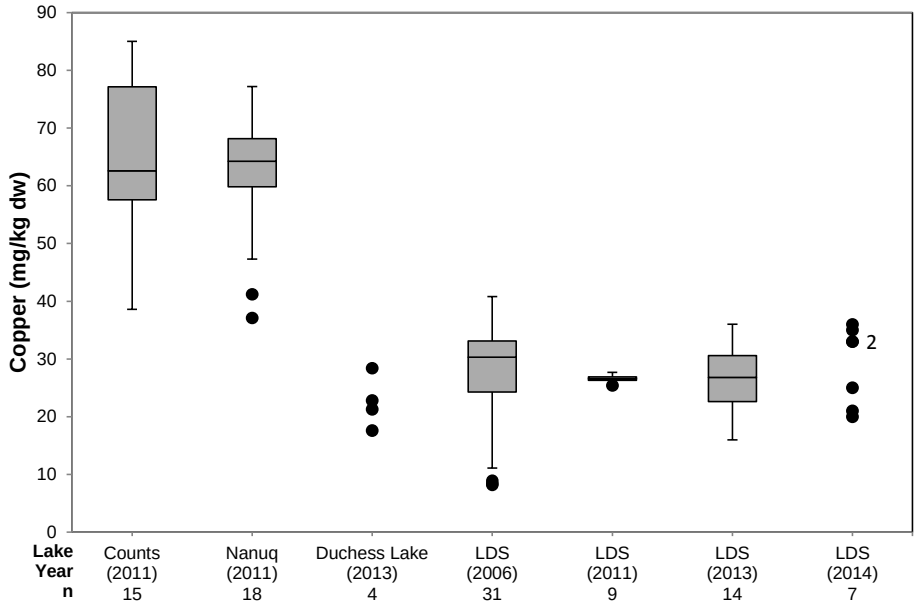
mg/kg/dw = milligrams per kilogram dry weight; LDS = Lac du Sauvage Gras; n = number.

Figure 60-2 Sediment Arsenic Concentration in Counts Lake, Nanuq Lake, Duchess Lake, and Lac du Sauvage



mg/kg/dw = milligrams per kilogram dry weight; LDS = Lac du Sauvage Gras; n = number.

Figure 60-3 Sediment Copper Concentration in Counts Lake, Nanuq Lake, Duchess Lake, and Lac du Sauvage



mg/kg/dw = milligrams per kilogram dry weight; LDS = Lac du Sauvage; n = number.

References:

Dominion Diamond (Dominion Diamond Ekati Corporation). 2015. 2014 Water and Sediment Quality Supplemental Baseline Report for the Jay Project. Prepared by Golder Associates Ltd., April 2015. Yellowknife, NWT, Canada.

ERM Rescan (ERM Rescan Environmental Services Ltd.). 2015. Ekati Diamond Mine: 2014 Aquatic Effects Monitoring Program Part 1 – Evaluation of Effects. Prepared for Dominion Diamond Ekati Corporation. Yellowknife, NWT, Canada.

Rescan (Rescan Environmental Services Ltd.). 2007. Ekati Diamond Mine 2006 Jay Pipe Aquatic Baseline. Prepared for BHP Billiton Canada Inc. Yellowknife, NWT, Canada.

Rescan. 2012a. Ekati Diamond Mine 2011 Aquatic Effects Monitoring Program Annual Report. Prepared for BHP Billiton Canada Inc. Yellowknife, NWT, Canada.

Rescan. 2012b. Ekati Diamond Mine 2011 Aquatic Effects Monitoring Program, Part 1 – Evaluation of Effects. Prepared for BHP Billiton Canada Inc. Yellowknife, NWT, Canada.

Rescan. 2012c. Ekati Diamond Mine 2011 Aquatic Effects Monitoring Program, Part 2 – Data Report. Prepared for BHP Billiton Canada Inc. Yellowknife, NWT, Canada.

DOMINION DIAMOND

Information Request Number: DAR-GNWT-IR-61

Source: Government of Northwest Territories – Lands: Paul Mercredi

Subject: Closure

DAR Section(s): 8.5.3.1.9

Preamble (GNWT):

In Section 8.5.3.1.9 of the DAR, DDEC states that Project effects for the Closure period were modeled using the historical record (1964 to 2013). However, GNWT notes that predicted water quality at closure will be different than the historical record and this could lead to inaccuracies in model results. Closure modeling should be run over the end of operations and be reflective of conditions anticipated at closure (i.e. 10+ years into the future).

Request (GNWT):

GNWT recommends that closure modeling be run using predicted water quality at closure rather than the historical record to provide a more accurate assessment of potential impacts to water quality at closure. If DDEC believes another method is more applicable, rationale should be provided.

Response:

Section 8.5.3.1.9 of the Developer's Assessment Report (DAR) referenced in the Preamble relates to the water balance modelling that was completed as part of the surface hydrology assessment of flows and water levels. In this assessment, the historical record was used to account for climate variability in the model in the surface hydrology assessment. The historical climate record was also used to generate average monthly conditions that were subsequently used in the lake water quality model predictions (see DAR, Appendix 8F). The modelled average monthly climate conditions were repeated annually in water quality predictions of Lac du Sauvage and Lac de Gras until 2060.

A detailed water quality model for the Jay Project (Project) was developed to evaluate changes to site discharge and downstream lake water quality in Lac du Sauvage and Lac de Gras during operations, closure, and post-closure phases of the Project. The model is continuous over these three periods. Therefore, projected water quality model results included in the DAR already rely on predicted Lac du Sauvage and Lac de Gras water quality at closure, accounting for incremental changes in the receiving environment over the life of the Project (including cumulative effects).

The reader is referred to the following appendices, which provide additional details of the water quality model, including timeframes model and boundary conditions:

- Appendix 8E – Site Discharge Water Quality Modelling Report
- Appendix 8F – Hydrodynamic and Water Quality Models of Lac du Sauvage and Lac de Gras
- Appendix 8G – Hydrodynamic Modelling of Jay and Misery Pits

DOMINION DIAMOND

Information Request Number: DAR-GNWT-IR-62

Source: Government of Northwest Territories – Lands: Paul Mercredi

Subject: Closure Section

DAR Section(s): 8.3.4

Preamble (GNWT):

It is stated throughout the DAR that freshwater caps will be applied to both Misery Pit and Jay Pit to establish meromixis, or chemocline, where freshwater caps would be a layer above the higher TDS water. While GNWT is aware of other closure proposals similar in nature, it is unclear as to the similarities between concentrations and depths in Jay Pit and Misery Pit to any proposed pit lakes in the NWT or successful pit lakes in similar climatic regimes. The viability of the mine water management plan is contingent upon stratification in several pits. The Jay Pit mine water management plan uses modelling and also cites Boehrer and Schultze 2006; Castendyk and Webster-Brown 2007; Castendyk and Eary 2009 as evidence of "isolating poor quality water (e.g., acidic water, high TDS water) under meromictic conditions in a pit lake (that) has been successfully applied at other mine sites".

Request (GNWT):

GNWT requests a short description of the congruence between these cited studies and the Misery, Jay and Lynx pits where perpetual stratification is predicted. References: Boehrer B, Schultze M. 2006. On the relevance of meromixis in mine pit lakes. 7th International Conference on Acid Rock Drainage (ICARD), March 26-30, 2006, St. Louis, Missouri, R.I. Barnhisel (ed.) American Society of Mining and Reclamation (ASMR), Lexington. Castendyk DN, Webster-Brown JG. 2007. Sensitivity analyses in pit lake prediction, Martha Mine, New Zealand: Relationship between turnover and input water density. Chem Geol 244: 42-55. Castendyk DN, Eary LE (eds). 2009. Mine Pit Lakes: Characteristics, predictive modelling and sustainability, Vol. 3. Management Technologies for Metal Mining Influenced Waters. Society for Mining, Metallurgy and Exploration Inc. (SME). Littleton, CO, USA

Response:

Before discussing each case study, it is important to note the key drivers of meromixis. Meromixis is the process whereby lakes become vertically stratified because the wind-driven mixing does not produce enough turbulent mixing to overcome the vertical density gradient. Meromixis is strengthened in waterbodies by deep depths (and corresponding small surface areas), high salinity gradients, long periods of thick ice cover, and constant temperature. Meromixis is weakened by low salinity and large fetches (long surfaces; high surface area to depth ratios), especially if the fetch is along the prevailing wind direction, and by high wind speeds. Meromixis is a natural phenomenon in lakes that exhibit these characteristics, including Arctic lakes (Oullet and Pagé 1988). Therefore, a deep, saline (or high total dissolved solids [TDS] content) lake with a freshwater cap and a small surface area in a northern environment is conceptually expected to develop strong and lasting meromixis.

Castendyk and Webster-Brown (2007) referred to the Martha Pit Lake, New Zealand. At the time of publication, the mine closure plan entailed filling the pit lake in 2007. However, the mine plan was

subsequently changed to expand mining and the pit has not yet been filled. The remainder of this Information Request response cites case studies of post-filling pit lakes.

Lake Goitsche in Germany is described in Boehrer et al. (2003). It is a former lignite coal mine pit with a depth of 50 metres (m). It has a TDS of about 450 milligrams per litre (mg/L) in the mixolimnion (upper layer with lower salinity) and about 1,500 mg/L in the monimolimnion (bottom layer with higher salinity). Therefore, this example would have a density gradient roughly similar to that of the Jay Project pit lakes. The lake has a narrow pycnocline at a depth of about 27 m.

Copper Island Pit Lake, on Vancouver Island, British Columbia (BC), is described in Castendyk and Eary (2009) in a chapter by Pelletier et al. (2009). Copper Island Pit Lake is a 350 m deep pit lake that was flooded with seawater up to a depth of 16 m and capped with freshwater. The density gradient in this pit lake would be much higher than those in the Project pit lakes. It was flooded to induce meromixis to mitigate acid mine drainage; the lake became meromictic as predicted.

The climate of the two previously mentioned pit lakes would be moderate compared to the northern climate of Project pit lakes. Case studies of pit lakes that are located within a similar climate are described below in more detail:

Gunnar Pit Lake in Northern Saskatchewan, near Lake Athabasca, was first described by Tones (1982), and later by Muldoon and Schramm (2009). Gunnar Pit Lake is located at a former uranium mine that closed in 1964. After closure, a trench was blasted to connect the pit lake to Lake Athabasca, and the entire pit was flooded, but with no induced stratification. The trench was later closed by backfilling with about 2.7 million cubic metres of waste rock. Over time, the lake established a meromictic density gradient and pycnocline (zone of vertically changing densities). The lake stratifies seasonally at a depth of about 10 m and has a pycnocline over a gradient from 75 to 90 m deep. The specific conductivity is reported as 300 micromhos per centimetre (µmho/cm; equivalent to microsiemens per centimetre) in the mixolimnion and 1,900 µmho/cm in the monimolimnion.

Pieters and Lawrence (2014) describe six meromictic pit lakes in Northern BC, the Yukon Territories, and the Northwest Territories (NWT). They also discuss factors that affect meromixis in northern mine pit lakes, such as high depth, steep walls, and brackish water.

- Faro Pit at the Faro Mine in the Yukon is at least 90 m deep with a pycnocline at 20 m due to a salinity difference of about 200 mg/L (approximately 1,020 mg/L in mixolimnion and 1,250 mg/L in monimolimnion).
- Grum Pit Lake, also at the Faro Mine, is at least 50 m deep and is strongly stratified at 7 m. It has a uniform salinity of almost 900 mg/L in the monimolimnion and a variable salinity of about 700 to 770 mg/L (during the four surveys completed in 2011) in the mixolimnion.
- Vangorda Pit Lake is also at the Faro Mine. It is at least 50 m deep and was stratified at 5 m depth. The TDS concentration in the monimolimnion is approximately 2,000 mg/L, and 1,050 to 1,450 mg/L in the monimolimnion (the maximum concentration in the monimolimnion was measured under ice, when salt exclusion from ice is high).
- Zone 2 pit lake at the former Colomac Mine, NWT and Waterline pit lake at the Equity Silver Mine, BC, are 110 and 40 m deep, respectively, and have pycnoclines at less than 20 m. The physical

limnology of these lakes is altered by deep inflows, which are also changing the overall salinity of the lakes with time. The range of mixolimnion to monimolimnion TDS concentrations for these pit lakes are approximately 600 to 770 mg/L and approximately 1,000 to 2,000 mg/L, respectively. As described in the response to DAR-IEMA-IR-17, deep inflows are not expected to be an issue in either Jay or Misery pit lake.

- Main Zone pit lake at the Equity Silver Mine in BC is mechanically stirred by the disposal of acid mine drainage sludge into the water column. Little congruence would be expected to this pit lake since sludge will not be pumped through the water column of either Jay or Misery pit lakes.

With the possible exception of lakes that are being influenced by ongoing mining activities (e.g., Main Zone pit), all of the above-mentioned case studies involve meromictic lakes. This empirical evidence supports the prediction that Dominion Diamond's pit lakes (i.e., Misery and Jay) will be permanently stratified, and possibly at shallower depths than predicted in the Developer's Assessment Report (DAR; Section 8.5.4.2.3; Appendix 8G). A shallower pycnocline would mean that the downward movement of the pycnocline predicted in the DAR, and concomitant upward advection of saline water, would have been over-predicted (i.e., would conservatively over-predict the load of TDS and other constituents delivered to receiving waterbodies at closure). Put another way, the observations at the referenced pit lakes in the literature indicate that the DAR predictions regarding pit lake limnology are conservative.

References:

Boehrer B, Schultze M, Liefold S, Behlau G, Rahn K, Frimel S, Kiwel U, Kuehn B, Brookland I, Büttner O. 2003. Stratification of mining Lake Goitsche during flooding with river water. p. 223-231. In: Tailings and Mine Waste '03. Swets and Zeitlinger, Lisse

Castendyk DN, Eary LE. (Eds). 2009. Mine Pit Lakes: Characteristics, predictive modelling and sustainability, Vol. 3. Management Technologies for Metal Mining Influenced Waters. Society for Mining, Metallurgy and Exploration Inc. (SME). Littleton, CO, USA

Castendyk DN, Webster-Brown JG. 2007. Sensitivity analyses in pit lake prediction, Martha Mine, New Zealand: Relationship between turnover and input water density. Chem Geol 244: 42-55.

Muldoon J, Schramm LL. 2009. Gunnar Uranium Mine Environmental Remediation: Northern Saskatchewan. In ASME 2009 12th International Conference on Environmental Remediation and Radioactive Waste Management (pp. 621-632). American Society of Mechanical Engineers.

Oullet M, Pagé P. 1988. Canada's most fascinating lake. GEOS 1988/4. 1-7.

Pelletier, C.A., Wen, M.E., Poling, G.W., 2009, Flooding pit lakes with surface water, in Castendyk, D.N. and Eary, L.E., eds., Mine Pit Lakes: Characteristics, Predictive Modelling, and Sustainability: Society for Mining, Metallurgy, and Exploration, Inc., Littleton, CO, USA. p. 187-202.

Pieters R, Lawrence GA. 2014. Physical processes and meromixis in pit lakes subject to ice cover. Can J Civil Eng. 41(6), 569-578.

Tones PI. 1982. Limnological and fisheries investigation of the flooded open pit at the Gunnar uranium mine. Saskatchewan Research Council, Saskatoon (Canada).

DOMINION DIAMOND

Information Request Number:	DAR-GNWT-IR-63
Source:	Government of Northwest Territories – Lands: Paul Mercredi
Subject:	Ekati Diamond Mine -2013 Wildlife Effects Monitoring Program Caribou
DAR Section(s):	12, 12.3.2.1, 12.3.2.2.2, 13, 13.3.2.1, 13.3.2.2.2

Preamble (GNWT):

The new Wildlife Act (NWT) came into force in 2014 making the completion of wildlife management and monitoring plans a requirement for operators of industrial projects likely to: 1) result in a significant disturbance to big game or other prescribed wildlife; 2) substantially alter, damage or destroy habitat; 3) pose a threat of serious harm to wildlife or habitat; or 4) significantly contribute to cumulative impacts on a large number of big game or other prescribed wildlife, or on habitat. The Act requires that a wildlife management and monitoring plan must include a) a description of potential disturbance and harm to wildlife and habitat, b) a description of the required measures for the mitigation of potential impacts, c) the process for monitoring impacts and assessing whether mitigation measures are effective and d) other prescribed requirements. ENR has issued draft guidelines for the development of Wildlife and Wildlife Habitat Protection Plans (WWHPP) and Wildlife Effects Monitoring Plans (WEMPs) to assist operators in developing plans that meet the requirements under the Act. GNWT acknowledges that DDEC annually provides a Wildlife Effects Monitoring Program (WEMP) document which reports on wildlife monitoring activities and provides some general information on mitigation. GNWT notes that the eight main objectives listed in DDEC's most recent 2013 WEMP (p.1-5) all refer exclusively to monitoring and that the report makes but general reference to mitigation and little reference to the process by which adaptive management is used to review and improve mitigation and monitoring. As far as GNWT is aware, there is no up-to-date, comprehensive plan that outlines mitigations, policies and procedures that are undertaken to mitigate impacts to wildlife at the Ekati mine. GNWT defines contents of a Wildlife and Wildlife Habitat Protection Plan (WWHPP) as the steps necessary to protect personnel, wildlife, and wildlife habitat within the project footprints with day-to-day standard operating procedures (SOPs) including mitigations (i.e. road closures triggers), staff reporting procedures (i.e. wildlife sightings/incidents), and best practices. The WWHPP is meant to complement the WEMP and may be a stand-alone document that is specific to minimizing impacts to wildlife and wildlife habitat along with addressing public concerns.

Request (GNWT):

It is recommended that DDEC provide a detailed Wildlife and Wildlife Habitat Protection Plan, including standard operating procedures that outline preventative measures, monitoring practices, training and reporting procedures for wildlife staff on site to ensure that there is timely and effective reporting procedures to environmental staff and ENR if an emergency occurs. This document should also identify/reference the process for applying adaptive management to mitigating impacts to wildlife and highlight areas that have specifically been modified to accommodate the Jay Project.

Response:

As with other environmental monitoring and management plans, Dominion Diamond Ekati Corporation expects to provide a Wildlife and Wildlife Habitat Protection Plan (WWHPP) and a Wildlife Effects Monitoring Program (WEMP) for the Ekati Mine and Jay Project during the permitting phase of the Project. The documents will be based on the conceptual plans described in the Developer's Assessment Report, and this approach provides confidence that the detailed mitigation plans and monitoring programs are designed specifically for the Project as it continues through the Environmental Assessment process. The WWHPP will contain details on mitigation policies, practices, and procedures, and the results from adaptive management that has been implemented during the operation of the Ekati Mine, and how mitigations will be specifically modified for the Jay Project. The WEMP will provide details on the study designs and sampling methods used to test effects predictions and the effectiveness of mitigation.

DOMINION DIAMOND

Information Request Number: DAR-GNWT-IR-65

Source: Government of Northwest Territories – Lands: Paul Mercredi

Subject: Terms of Reference

DAR Section(s): 4.0, 12.1.3

Preamble (GNWT):

The DAR states, "Measurement indicators represent properties of the environment and the VC that when changed could result in or contribute to an effect on the assessment endpoint" (DAR s. 12.1.3 p. 12-4). Thus, measurement indicators are used to evaluate development impacts on valued components and are often quantitative in nature. The measurement indicators used for assessing cumulative impacts to caribou were: • habitat quantity • habitat arrangement and connectivity • habitat quality • survival and reproduction • abundance and distribution. In all cases, a quantitative analysis was presented in the DAR which in turn led to a quantitative change in the indicator. However, when impact significance was determined, a qualitative interpretation was provided. The Terms of Reference request on p. 14 paragraph 3 that the Developer identify …"what, in its opinion, the threshold for significance would be".

Request (GNWT):

For each measurement indicator used to determine cumulative impacts to caribou, provide rationale for a quantitative threshold of significance and discussion on how the quantitative change in measurement indicator either falls within or exceeds the quantitative thresholds (including the results of the recently submitted Population Viability Analysis).

Response:

Quantitative thresholds, critical values, or screening values that relate the changes in measurement indicators to effects on assessment endpoints are not available for barren-ground caribou and other wildlife valued components (VCs) considered in the Developer's Assessment Report (DAR). Because thresholds and critical values are not available, the DAR provided a reasoned qualitative narrative founded on ecological principles supported by science, and when possible by Traditional Knowledge, to describe what would constitute significant effects to barren-ground caribou and other wildlife VCs. This approach is consistent with the requirements of the Terms of Reference (TOR; MVEIRB 2014). Section 4.2 (pp. 17) of the TOR states:

"If a determination is made that significant adverse impacts are not likely, the developer will provide a narrative statement that identifies what, in its opinion, the threshold for significance would be. It is acknowledged that quantitative thresholds for all components may not be feasible."

The DAR predicted that the cumulative direct disturbance from the Project and all previous, existing, and reasonably foreseeable future developments to be less than 0.6 percent (%) of the total area in each seasonal range. Analyses in the DAR were based on number of conservative assumptions to maximize predicted effects. Section 12.6 of the DAR provides a reasoned qualitative narrative of thresholds for significance from development disturbance for measurement indicators for caribou including:

- permanent removal of preferred habitat loss or highly productive areas important for survival and reproduction of caribou at the population level;
- an abrupt change in abundance from dividing a caribou herd could decrease the effectiveness of predator swamping or lead to inbreeding depression (all of which are termed Allee effects [Vors and Boyce 2009; Swift and Hannon 2010]); and,
- long-term or permanent depression in caribou abundance where the population is still self-sustaining but no longer supports ecosystem functions such as nutrient cycling through grazing and deposition of fecal nitrogen (see Vors and Boyce 2009), and stable wolf, grizzly bear, and wolverine populations.

There are studies that indicate bird and mammal populations begin to decline when 40% of the landscape is disturbed (Andrén 1994, 1999; Fahrig 1997; Mönkkönen and Reunanen 1999; Flather and Bevers 2002; Swift and Hannon 2010). However, ecological thresholds vary by species, landscape type, and spatial scale (Fahrig 1997; Swift and Hannon 2010). Because of these sources of variation, there is uncertainty about how generally applicable thresholds established elsewhere are to barren-ground caribou and other wildlife VCs affected by the Jay Project. Nonetheless, the reasoned narrative approach used in the DAR to meet the requirements of the TOR arrives at a similar conclusion; that the effect sizes (i.e., magnitude of changes to measurement indicators) predicted in the DAR are within the adaptive capacity and resilience of caribou and other wildlife VCs.

References:

Andrén H 1994. Effects of Habitat Fragmentation on Birds and Mammals in Landscapes with Different Proportions of Suitable Habitat: A Review. Oikos 71:355-366.

Andrén A 1999. Habitat Fragmentation, the Random Sample Hypothesis, and Critical Thresholds. Oikos 84:306-308.

Fahrig L 1997. Relative Effects of Habitat Loss and Fragmentation on Population Extinction. J Wild Manage 61:603-610.

Flather CH, Bevers M. 2002. Patchy Reaction-Diffusion and Population Abundance: The Relative Importance of Habitat Amount and Arrangement. Am Nat 159:40-56.

Mönkkönen M, Reunanen P. 1999. On Critical Thresholds In Landscape Connectivity: A Management Perspective. Oikos 84: 302-305.

MVEIRB (Mackenzie Valley Environmental Impact Review Board). 2014. Revised Terms of Reference (EA1314-01) Jay Project, Dominion Diamond Ekati Corporation. July 17, 2014. Yellowknife, NWT, Canada.

Swift TL, Hannon SJ. 2010. Critical Thresholds Associated with Habitat Loss: A Review of the Concepts, Evidence, and Applications. Biol Review 85: 35-53.

Vors LS, Boyce MS. 2009. Global Declines of Caribou and Reindeer. Glob Chan Biol. doi: 10.1111/j.1365-2486.2009.01974.x

Information Request Number: DAR-GNWT-IR-66

Source: Government of Northwest Territories – Lands: Paul Mercredi

Subject: Barren-ground Caribou

DAR Section(s): 12.2.2.1, 12.4.2.2

Preamble (GNWT):

DDEC has cited a number of references that provide estimates of the size of zones of influence from different types of development or disturbance that it has included in its analysis. Given that one of the more authoritative estimates of zone of influence for the Bathurst herd was developed based on Ekati-Diavik complex (Boulanger et al 2012), it seems reasonable to apply its findings as part of the modeling exercise; however it should be noted that zone of influence is considered a dynamic metric that can change depending on such things as size of operation, type of operation, season, herd status etc. DDEC has also included a number of assumptions and references to generate predictions about the magnitude of this effect (i.e. disturbance coefficients, energetic expenditures related to avoidance). Yet, DDEC has provided no discussion about the extent to which expansion of development activities at Ekati might cause changes in the zone of influence to caribou.

Request (GNWT):

Does DDEC expect a change in either the size or magnitude of the zone of influence to caribou surrounding the Ekati/Diavik complex as a result of the Jay Project? Please describe why or why not. If a change is predicted, please describe how this might be monitored and mitigated.

Response:

Dominion Diamond Ekati Corporation (Dominion Diamond) does not anticipate a change in the magnitude (disturbance coefficients) or size (spatial extent) of the assumed zone of influence (ZOI) used to predict changes in caribou habitat quality and energetics related to active mine sites such as Ekati and Diavik as a result of the Jay Project (Project). No changes are anticipated because the type of infrastructure, activities, and mitigation for the Project are similar with those existing at the Ekati and Diavik mines. Zone of influence estimates by Boulanger et al. (2012) were also generated during the decline phase of the Bathurst herd. However, the spatial extent associated with the existing zones of influence due to the Ekati and Diavik mines was predicted to increase from the Project, which decreased the amount of quality habitat for caribou, as described by the incremental changes reported in Section 12.4.2.2 of the Developer's Assessment Report (DAR).

The approach used throughout the assessment in the DAR was to apply conservative assumptions to predict maximum effects from changes in habitat quality and sensory disturbance (Sections 12.4.2.2 and 12.4.2.3). This was done to manage uncertainty, such as for the magnitude and temporal and spatial extent of effects, and provide confidence that the assessment would not underestimate effects levels (i.e., precautionary approach). For example, Boulanger et al. (2009, 2012) estimated the ZOI around the Ekati and Diavik mines was 4 kilometres (km) pre-operation and 14 km during operation phases, and 6.5 km for the Snap Lake Mine. The DAR assumed a larger 15 km ZOI with a magnitude consistent with Boulanger

et al. (2012) around all active mining developments including the Project, Ekati, Diavik and Snap Lake mines, and Gahcho Kué Project. The predicted magnitude and spatial extent of zones of influence for other development types are provided in Table 12.4-15 of the DAR, which were designed to be conservative, and are likely greater than might be expected or have been shown by monitoring. The maximum effects predicted in the DAR capture these differences. The DAR does include predictions about temporal changes in the magnitude and size of zones of influence in Section 12.4.3. For example, the 15 km ZOI around the Project and other active developments was assumed to remain constant through construction and operation and expected to be reversible 5 to 10 years following Project closure (Section 12.6.2). Throughout the DAR there is also discussion about uncertainty associated with zones of influence, which is related to temporal changes in the magnitude and spatial extent of ZOI, such as habituation to disturbance by caribou and the type, size and level of activity of different developments (Haskell and Ballard 2008; ERM Rescan 2014a,b; Johnson and Russell 2014), and Appendix D, Temporal vs Spatial Cumulative Effects and Underestimating Incremental Effects from the Jay Project.

Zone of influence monitoring at the Ekati Mine (inclusive of the Jay Project) will be guided by the recommendations of the ZOI Task Group, led by the Government of the Northwest Territories, Environment and Natural Resources. Dominion Diamond will also consider feedback from communities, monitoring agencies through on-going engagement activities and participation in wildlife monitoring workshops. Monitoring and mitigation will be described in a “Jay Update” of the Wildlife and Wildlife Habitat Protection Plan and a Wildlife Effects Monitoring Program for the Ekati Mine (inclusive of the Jay Project), which are anticipated to be developed during the permitting phase.

References:

Boulanger J, Poole KG, Gunn A, Wierzchowski J. 2009. The Zone of Influence for Migratory Tundra Caribou around Canada’s Arctic Diamond Mines: Estimation and Implications. Draft.

Boulanger J, Poole KG, Gunn A, Wierzchowski J. 2012. Estimating the Zone of Influence of Industrial Developments on Wildlife: a Migratory Caribou Rangifer tarandus groenlandicus and diamond mine case study. Wildlife Biol 18: 164-179.

Haskell SP, Ballard WB. 2008. Annual re-habituation of calving caribou to oilfields in northern Alaska: implications for expanding development. Can J Zoolog 86:627-637.

ERM Rescan (ERM Rescan Environmental Services Ltd.). 2014a. Ekati Diamond Mine: 2013 WEMP Addendum Wildlife Camera Monitoring Summary Report. Prepared for Dominion Diamond Ekati Corporation by ERM Rescan, Yellowknife, NWT.

ERM Rescan. 2014b. Ekati Diamond Mine: 2013 Wildlife Effects Monitoring Program. Prepared for Dominion Diamond Ekati Corporation. March 2014.

Johnson CJ, Russell DE. 2014. Long-term distribution responses of a migratory caribou herd to human disturbance. Biol Conserv 177:52-63.

DOMINION DIAMOND

Information Request Number:	DAR-GNWT-IR-67
Source:	Government of Northwest Territories – Lands: Paul Mercredi
Subject:	Barren-ground Caribou
DAR Section(s):	12.2.2.1, 12.4.2.2

Preamble (GNWT):

DDEC reports having employed at least two separate methods for looking at rates of deflection of caribou from crossing roads in the project. At least 10 years worth of snow track data alongside the Misery Road in April and May (2002-2011) appears to have produced an estimate of 56% of caribou deflected from crossing. DDEC reports deflection rates measured by motion sensor cameras in 2012 at around 8%, and in 2011- 2013 at 1% or 2%. There appears to be quite a margin of disparity between these estimates of road permeability (i.e. deflection rates), yet DDEC seems more inclined to treat the camera results (1% metric) as the more definitive results. DDEC does note shortcomings associated with each of these methods. For instance, they state that it cannot be determined from snow track data whether a caribou did not cross at all or whether it did not cross at that location (DAR p. 12-21), and therefore, this method may be over-reporting deflection rates. In regards to the camera study, the trigger range is only 25-30 m and DDEC states "the effective range of the cameras is likely limited to less than 500m, meaning that caribou reactions to the road beyond this distance would be difficult to discern from the data" (bottom of p 12-96). This suggest this method is under-reporting deflection rates. Given that these two datasets will likely provide the baseline against which further monitoring of impacts related to the road and associated distribution line, more explicit analysis of the benefits of these methods will have implications for future road monitoring.

Request (GNWT):

Please describe:

a) why the different methods for measuring crossing rates have provided such disparate results,

b) DDEC's rationale for apparently supporting caribou deflection rates listed in the 2013 camera report over those of previous years and methods, and

c) what the implications of this might be for the design of a road monitoring programs for testing the impacts associated with the primary pathway related to the road.

Response:

a) Snow track and camera monitoring will typically produce dissimilar results, primarily because the study design and methods sample different measurement variables, seasons, and duration. As well, the environmental conditions during the northern migration and post-calving periods are different, which influence caribou behaviour.

   The snow track survey method included observers recording the presence of snow tracks by truck from roads but did not include following deflected tracks to determine if they crossed elsewhere. The

results of snow track monitoring are derived from detection of caribou snow tracks along road surveys during the northern migration season (May 1 to 31) when lakes remain frozen and can be readily used by caribou (Rescan 2011). Detection of snow trails is subject to the frequency of surveys, observer skill, and weather events such as recent snowfall and high wind speed. Snow berms along roads are also present and increase the vertical profile of the road relative to summer and autumn. High snow berms may also inhibit detection of snow tracks.

In contrast, the results of camera monitoring rely on the presence of a caribou to trigger photos or when photos are pre-programed to be taken. The trigger distance of cameras is approximately 30 m. Cameras have been deployed as early as February 20 and as late as December 8 in 2011 to 2013 (ERM Rescan 2014), but mostly capture caribou during summer when lakes remain open and may deflect caribou movements. The percentage reported for the camera study represents the unmodelled frequency of deflection events observed at the road interface relative to the total number of caribou groups observed in photos (ERM Rescan 2014).

Seasonal variation in caribou behaviour is also likely to influence the results of these two monitoring programs. The northern migration is a period when caribou exhibit directional and high movement rates to reach the calving grounds by early to mid-June (Gunn et al. 2001). In contrast, post-calving movements are slower and meandering, as caribou spend more time feeding and avoiding predators and insects.

b) It is recognized by Dominion Diamond that the cameras recording caribou interaction along roads at the Ekati Mine do not reflect deflection rates that may be occurring before caribou reach the road. However, the results from camera monitoring and from the snow track surveys indicate that caribou do cross active roads. The Developer's Assessment Report (DAR) assumed that roads would be a complete barrier to movement (i.e., caribou would not cross active roads) and the results of these two monitoring programs support that this is a conservative assumption.

c) The continued use of cameras would be appropriate to evaluate the DAR assumption that caribou would not cross roads (complete barrier to movement). However, as has been the practice for the Ekati Mine, review of results with and feedback on monitoring programs from regulators, communities, and monitoring agencies will guide future monitoring programs in the Ekati Wildlife Effects Monitoring Program (WEMP).

References:

ERM Rescan (ERM Rescan Environmental Services Ltd.). 2014. Ekati Diamond Mine: 2013 WEMP Addendum — Wildlife Camera Monitoring Summary Report. Prepared for Dominion Diamond Ekati Corporation by ERM Rescan: Yellowknife, NWT.

Rescan (Rescan Environmental Services Ltd). 2011. EKATI Diamond Mine: 2010 Wildlife Effects Monitoring Program. Prepared for BHP Billiton Canada Inc. by Rescan Environmental Services Ltd.: Yellowknife, NWT.

Gunn A, Dragon J, Boulanger J. 2001. Seasonal movements of satellite-collared caribou from the Bathurst herd. Final Report to the West Kitikmeot Slave Study Society, Yellowknife, NWT.

DOMINION DIAMOND

Information Request Number: DAR-GNWT-IR-68

Source: Government of Northwest Territories – Lands: Paul Mercredi

Subject: Species at Risk

DAR Section(s): 13.1.3

Preamble (GNWT):

Short-eared owl and rusty blackbird are territorially-managed species that are listed in Schedule 1 of the federal Species at Risk Act. Subsection 79 (2) of SARA, states that during an assessment of a project, the adverse effects of the project on listed wildlife species and their critical habitat must be identified, that measures are taken to avoid or lessen those effects, and that the effects need to be monitored. Subsection 79 (2) of SARA applies regardless of the level of significance of effects.
The Proponent assessed the project effects on Peregrine Falcon and Short-eared Owl, both listed on Schedule 1 of SARA, through the raptor valued component (13.1.3). The raptor valued component assessment does not capture the unique requirements of the Short-eared Owl as the focus is on cliff-nesting raptors. Short-eared owls are ground nesters, nomadic and their abundance is linked to availability of small mammals. Short-eared owls have been detected in low abundance during monitoring activities on site, and the Proponent reports a Short-eared Owl mortality caused by a vehicle collision in the 2013 WEMP. The Proponent assessed the project effects on Rusty Blackbird through the upland bird valued component (13.1.3). Project effects on upland birds were determined to be non-significant and the valued component was removed from further assessment. Therefore it remains unclear what mitigation measures and effects monitoring were being proposed that were specific to Rusty Blackbirds.

Request (GNWT):

Please identify for Short-eared Owl and Rusty Blackbird: a. the adverse effects of the project on the species b. the measures that will be taken to avoid or lessen the effects on the species c. the effects monitoring proposed for each species

Response:

a) The status report by Committee on the Status of Endangered Species Wildlife in Canada (COSEWIC 2008) indicates that short-eared owl use unforested habitats, including Arctic tundra within the northern range of their Canadian distribution and more commonly breed in coastal tundra areas in the Northwest Territories and Nunavut. Arctic tundra generally describes a wide range of upland habitats found in the birds Effects Study Area (ESA) used in the Developer's Assessment Report (DAR). Since short-eared owl is an upland nesting and foraging species, then the effects pathways, mitigation, and residual effects assessment for upland birds would also apply to regional short-eared owl populations and are provided in Table 13.3-1 of the DAR. This is consistent with the assessment approach for rusty blackbird. The residual effects for upland birds were determined as either no linkage or secondary for all effects pathways. Discussion on the determination of pathway assessment results is provided in Sections 13.3.2.2.1 and 13.3.2.2.2 of the DAR.

Changes to habitat quality, movement, behaviour, and population connectivity were determined to be secondary for upland birds (DAR Section 13.3.2.2.2). The analysis predicts that previous and existing developments have directly removed 1.1 percent (%) of upland habitat in the birds ESA, relative to the reference condition. The Project will disturb an additional 0.2% of upland habitats relative to the 2014 Base Case. Cumulative direct change through the Reasonably Foreseeable Development (RFD) Case is predicted to be 1.3% (Dominion Diamond 2014).

To determine direct and indirect effects, a 300 metre (m) buffer was applied to development footprints to capture sensory disturbance and assumed to be unavailable to upland bird species, which would include short-eared owl. Cumulatively, the area within 300 m of previous and existing development footprints is 96.5 square kilometres within the birds ESA, which represents an adverse change of 2.5% relative to the reference condition. The sensory disturbance effects from the Project will alter an additional 0.3% of upland habitat. Cumulative direct and indirect changes to upland habitat are predicted to be 4.1% through the RFD Case (Dominion Diamond 2014). As such, incremental and cumulative changes to upland habitat from the Project and other developments are predicted to have negligible effects on self-sustaining and ecologically effective upland breeding bird populations including upland bird species at risk.

b) The Project mitigations for upland birds would also apply to upland bird species at risk, including rusty blackbird and short-eared owl and are provided in Table 13.3-1 of the DAR. Examples include:

- to the extent practicable, land and vegetation clearing will occur outside of the general nesting season, which is defined as occurring from May 20 to August 13 for the Project site (zone N9; EC 2015);
- continuing with surveys for active nests on mine infrastructure and open pits each spring;
- avoiding disturbance to active nest sites;
- preventing birds from nesting on mine infrastructure or in active open pits;
- continuing site worker environmental sensitivity training; and,
- identifying specific times and places where incidental take may occur, and proposing specific mitigation (such as nest sweeps, grubbing and use of bird deterrents).

c) Details on the mitigations and monitoring for species at risk will be included in the Wildlife and Wildlife Habitat Protection Plan and Wildlife Effects Monitoring Program, which will be submitted during the permitting phase (see response to DAR-GNWT-IR-63).

References:

COSEWIC (Committee on the Status of Endangered Wildlife in Canada). 2008. COSEWIC assessment and update status report on the Short-eared Owl *Asio flammeus* in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. vi + 24 pp. (www.sararegistry.gc.ca/status/status_e.cfm).

Dominion Diamond (Dominion Diamond Ekati Corporation). 2014. Jay Project Developer's Assessment Report Sable Addendum. Prepared by Golder Associates Ltd., December 2014.

EC (Environment Canada). 2015. Nesting Calendars in zone N (Map), technical information for planning purposes covering Arctic Plains and Mountains (BCR3). Environment Canada website: https://www.ec.gc.ca/paom-itmb/default.asp?lang=En&n=4F39A78F-1#_03. Accessed March 26, 2015.

DOMINION DIAMOND

Information Request Number: DAR-GNWT-IR-69

Source: Government of Northwest Territories – Lands: Paul Mercredi

Subject: Wildlife and Wildlife Habitat

DAR Section(s): 13.3.2.1.3, 2013 WEMP

Preamble (GNWT):

In its review of mitigation effectiveness related to carnivores, DDEC states that improvement of waste management practices has been a contributing factor in a general trend of decreasing intentional carnivore mortalities, with no intentional mortalities being reported at Ekati since 2009. While the number of intentional wildlife mortalities provides one metric of assessing improvements to waste management practices, results of the 2013 WEMP highlight other metrics that point to a need for mitigation. Results of landfill monitoring and landfill wildlife observations reported in Section 4 of the 2013 WEMP show that after several years of relatively lower level of wildlife attractants being found and wildlife sightings in the landfill from 2006-2010, there appears to be an increase in these metrics in recent years. DDEC attributed this increase to the opening of the Misery Pit and the associated camp which "introduced many new employees and contractors to the site. This contributed to an increase in misdirected waste." There appears to be a lag period while new employees learn proper waste management at site.

Request (GNWT):

Please elaborate on how DDEC plans to mitigate for this period of acclimatization of new employees to proper waste management.

Response:

Dominion Diamond Ekati Corporation is committed to Environmental Protection as is stated in our Sustainable Development Policy posted across Ekati, Yellowknife, and Sorting and Valuation Facility offices. To achieve this, waste management is a key part of the site orientation, where waste stations and waste streaming is reviewed. Waste streaming and individual responsibility on waste management is outlined in the site orientation that is completed as soon as new employees, contractors, and visitors arrive at site. Waste management is also included as part of the required online training, and both the online training and the site orientation is tracked through the Training Department. As part of the Site Orientation, each person is required to attend a mandatory presentation lead by the President and Chief Operating Officer of Ekati or one of the Managers where the Sustainable Development Policy, Environmental commitments, and individual responsibility are reviewed.

With any update or change to the waste management process, new information and educational materials are distributed site wide via emails, presentations, and workplace Health, Safety and Environment inspections.

DOMINION DIAMOND

Information Request Number:	DAR-GNWT-IR-70
Source:	Government of Northwest Territories – Lands: Paul Mercredi
Subject:	Barren-Ground Caribou
DAR Section(s):	Maps 12.2-5, 3.5.1.5, 12.3.2.2.2, 12.4.2.2.2

Preamble (GNWT):

DDEC is planning to haul kimberlite from the proposed Jay Pit to the processing plant along both the Jay Road (~4km) and Misery Road (~25km). “Traffic volumes on the Misery and Jay roads are anticipated to be 56 round trips per day by road trains. A road train consists of one truck pulling three trailers. There are expected to be seven road trains making eight trips per day (Section 3.5.1.6). There will be approximately 12.3 minutes between each road train. Modified traffic patterns and road closures will be used as necessary to mitigate barrier effects to caribou.”

Request (GNWT):

a) What are the assumptions surrounding the estimated 12.3 minutes between road trains? For instance, are there peak hours or will traffic run at relatively similar levels throughout the 24-hour day?

b) Please provide estimated volumes of traffic from all vehicles types (maintenance, staff transport, resupply etc.).

c) To assess changes in traffic levels GNWT requests that DDEC provide a description of historical traffic monitoring activities and traffic levels on the Misery Road. This could be presented in the form of a table similar to Table 12.3-2: Operating Period and Number of Northbound and Southbound Truck Loads on the Tibbitt to Contwoyto Winter Road, 2000 to 2013.

d) Please describe plans to monitor traffic levels on the Misery Road and Jay Road in future.

e) Please provide more detail on how traffic patterns will be modified, and details of the procedures that guide decisions about road closures.

Response:

a,b,c) Please see Appendix C (Traffic Associated with the Jay Project) for information regarding the above request.

d) A traffic management plan for caribou mitigation is being prepared and will be circulated by Dominion Diamond that will document current practices for protection of safe caribou movement around roads at the Ekati Mine (April 2015). This plan would be extended to cover the Jay Project.

e) The DAR describes the mitigation policies, practices, and procedures that will protect caribou from harm and that will enable their continued movement though the Ekati Mine site. As described in part d), an updated traffic management plan is being prepared that will document current practices for protection of safe caribou movement around roads at the Ekati Mine. The mitigations are based on those that have been developed at the Ekati Mine over the past 15 years of mine operations, and have been augmented for the Jay Project, where needed, to address any new or increased risks/concerns. For example, Dominion Diamond has proposed to increase early monitoring of caribou movement through satellite collar maps obtained from the Government of the Northwest Territories. This would provide advanced warning of when caribou may be approaching the Ekati Mine. Also, Dominion Diamond proposes to construct additional kimberlite stockpile areas so that the Ekati Mine can operate through brief road closures, to allow caribou to safely move through the mine site. The frequency of road reconnaissance surveys, modification of traffic patterns, and road closures would reflect the number and group composition of caribou near the mine site, which is a hierarchical approach.

   The Northwest Territories *Wildlife Act* will require that Dominion Diamond provide a Wildlife and Wildlife Habitat Protection Plan (WWHPP) and a Wildlife Effects Monitoring Program (WEMP) for the Ekati Mine (inclusive of the Jay Project). These plans will provide a compilation of details and procedures for caribou monitoring and mitigation, and would include a hierarchical approach. The WWHPP will contain details on mitigation policies, practices, and procedures, and the results from adaptive management that have been implemented during the operation of the Ekati Mine, and how mitigations will be specifically modified for the Jay Project. The WEMP will provide details on the study designs and sampling methods used to test effects predictions and the effectiveness of mitigation.

Information Request Number: DAR-GNWT-IR-71

Source: Government of Northwest Territories – Lands: Paul Mercredi

Subject: Project Description

DAR Section(s): 3.5.1.5,.12.4.2.2.2, MVERIB IR #83

Preamble (GNWT):

As part of the water management system, the proposed project will construct pumping systems between the Jay site and the Misery Pit, and from the Misery Pit to the Lynx Pit. Each pumping system will consist of a pump station and a pipeline. A pipe bench will be constructed to accommodate the pipelines, which will follow existing and proposed road alignments to the extent practical to minimize the Project footprint. IR #83 from the MVEIRB states that DDEC is planning to place these pipelines alongside these roads to a maximum of 3ft in height. GNWT sees these pipelines as a potential barrier for movement and a possible cause of injury to wildlife.

Request (GNWT):

Please provide some discussion of the potential impact of these pipelines to wildlife movement, how design of these pipelines alongside the road will reduce negative impacts to wildlife and what other mitigations might be used to address impacts to wildlife movements.

Response:

In the Developer's Assessment Report (DAR), Dominion Diamond Ekati Corporation (Dominion Diamond) proposed to construct caribou crossings at appropriate discreet locations along the Jay Road. After receiving input from Aboriginal communities during our engagement process and during site visits, Dominion Diamond has changed its approach to caribou crossings along the Jay Road to reflect that feedback, as described below.

Because of the importance of the esker for caribou movement as identified through community engagement, the portion of the Jay Road that cuts through the esker will be constructed as a caribou crossing. The pipelines will be covered over with crushed rock along this section of road, except where there are valves or joints that require visual inspection for safe operation. Dominion Diamond will strategically construct the pipelines to reduce the number of joints or valves through the esker crossing.

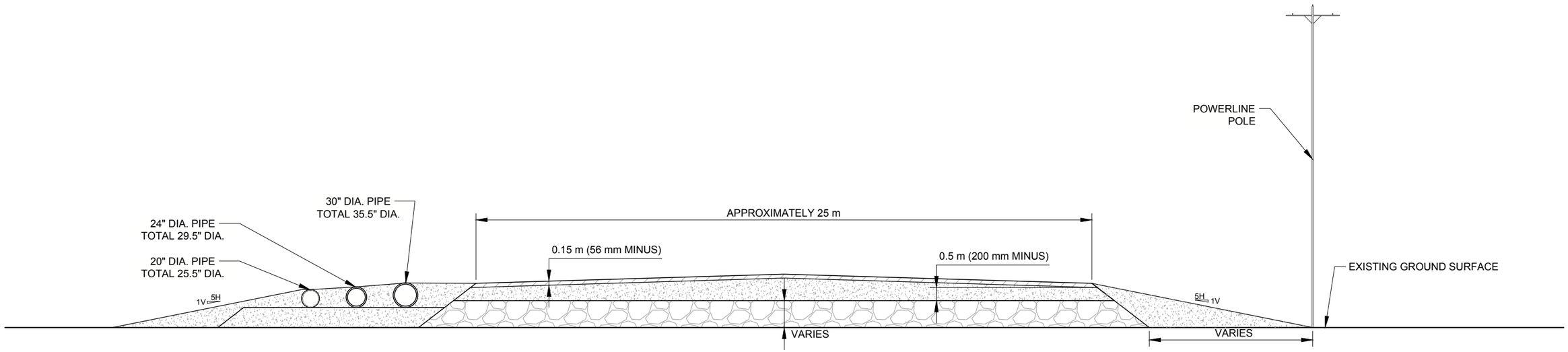
Dominion Diamond's community engagement program has indicated that the area to be crossed by the Jay Road is important for caribou movement. In response to the feedback received through community engagement, Dominion Diamond proposes to construct an increased number of caribou crossings along the main section of the Jay Road (i.e., roughly between King Pond Dam and the approach to the active operations area at Lac du Sauvage). This main section of the Jay Road will be constructed with frequent and wide caribou crossings that will respect the communities' identification of the importance of this area for caribou movement. Caribou crossings will not be built in areas where raised safety berms are required by the Mines Inspector, or at locations where there are necessary joints and valves in the pipelines that require visual inspection for safe operation. The pipelines will be strategically designed to reduce the

number of locations that cannot be constructed as caribou crossings due to joints and valves. This approach also makes beneficial use of 'lessons-learned' from the original Misery Road, where caribou crossings were only installed after construction of the road.

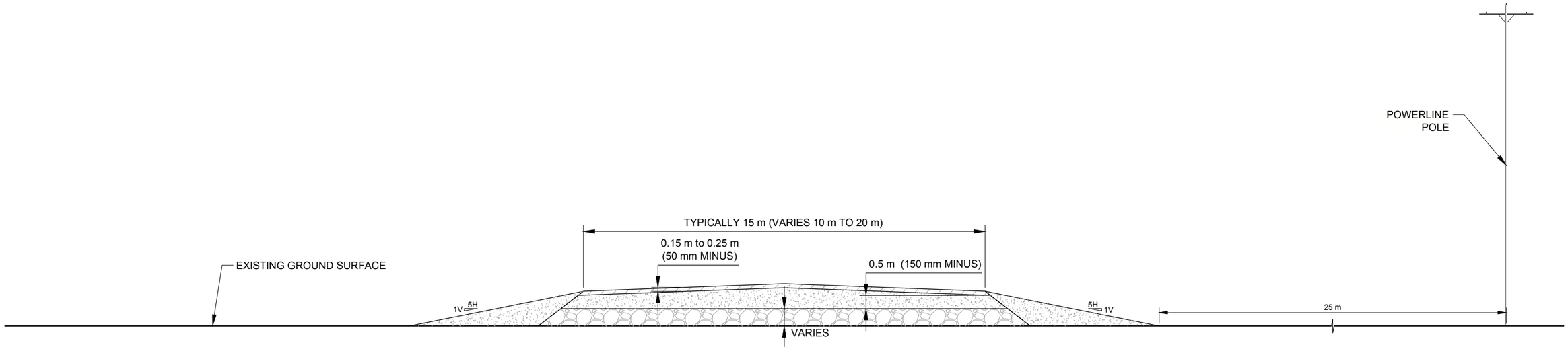
Caribou crossings will be constructed using crushed rock (200 millimetres or less in size) so that the side slopes of the road are flatter and easier walking for caribou than the large roadfill rock. In the caribou crossing areas, the pipelines will also be covered with crushed rock. Once the road is constructed, monitoring, including by Aboriginal community members, will be implemented to assess the effectiveness of the constructed caribou crossings.

The DAR describes the mitigation policies, practices, and procedures that will protect caribou from harm and that will enable their continued movement though the Ekati Mine site. An updated Traffic Management Plan is being prepared and will be circulated by Dominion Diamond that will document current practices for protection of safe caribou movement around roads at the Ekati Mine (under internal review, April 2015). The mitigations are based on those that have been developed at the Ekati Mine over the past 15 years of mine operations, and have been augmented for the Jay Project where needed to address a new or increased risk. For example, Dominion Diamond has proposed to increase early monitoring of caribou movement through satellite collar maps obtained from the Government of the Northwest Territories. This would provide advanced warning of when caribou may be approaching the Ekati Mine. Also, Dominion Diamond proposes to construct additional kimberlite stockpile areas so that the Ekati Mine can operate through brief road closures if this is necessary to allow caribou to safely move through the mine site. The frequency of road reconnaissance surveys, modification of traffic patterns, and road closures would reflect the number and group composition of caribou near the mine site, which is a hierarchical approach.

The Northwest Territories *Wildlife Act* will require that Dominion Diamond provide a Wildlife and Wildlife Habitat Protection Plan (WWHPP) and a Wildlife Effects Monitoring Program (WEMP) for the Ekati Mine (inclusive of the Jay Project). These plans will provide a compilation of details and procedures for caribou monitoring and mitigation, and would include a hierarchical approach. The WWHPP will contain details on mitigation policies, practices, and procedures, and the results from adaptive management that have been implemented during the operation of the Ekati Mine, and how mitigations will be specifically modified for the Jay Project. The WEMP will provide details on the study designs and sampling methods used to test effects predictions and the effectiveness of mitigation.



A **JAY ROAD CARIBOU CROSSING**



B **TYPICAL MISERY ROAD CARIBOU CROSSING**

LEGEND

- ROAD BASE
- ROAD SURFACING
- ROCKFILL

NOTES

1. ALL UNITS IN METRES UNLESS OTHERWISE NOTED.
2. ELEVATION IN METRES ABOVE SEA LEVEL.
3. TOTAL DIAMETER INCLUDES 2.75" OF INSULATION AND HEAT TRACING. DIA. = OUTSIDE DIAMETER DIMENSION.
4. BERM TO BE CONSTRUCTED WHERE ROAD FILL THICKNESS EXCEEDS 3 m. MINIMUM OPERATION WIDTH TO BE MAINTAINED.
5. GEOMETRY OF ROAD AND PIPELINE BENCH VARIES BASED ON TERRAIN.

0 2.5 5
SCALE METRES

REV	DATE	DESCRIPTION	DRW	DES	CHK	RVW
0	2015-04-07	ISSUED FOR FINAL	JK	FE	JR	JV

SEAL / PERMIT

CLIENT: DOMINION DIAMOND

CONSULTANT: Golder Associates

PROJECT: 1419751.3200.35
JAY PROJECT
NORTHWEST TERRITORIES, CANADA

TITLE: TYPICAL SECTION
CARIBOU CROSSING

DRAWING No.: 71-1

SHEET No.: 1 OF 1

SHEET SIZE ANSI D 25 mm 0

Drawing File: N:\Client\dominion diamond\jay-cordroy project\99_projects\1419751\02_PRODUCTION\3200\35\1419751-3200-35_71-1.dwg Layout:TYPICAL SECTION CARIBOU CROSSING Tuesday, March 31, 2015 4:49:12 PM By: JKowalski

DOMINION DIAMOND

Information Request Number: DAR-GNWT-IR-72

Source: Government of Northwest Territories – Lands: Paul Mercredi

Subject: Wildlife and Wildlife Habitat

DAR Section(s): 13.2.2.4

Preamble (GNWT):

The 2013 wolf den survey concluded that there are three gray wolf dens located approximately 400 to 600 m west of the proposed Jay WRSA. One of the three dens was considered active. The proposed project is calculating the removal of ~4 ha of esker habitat in relation to the baseline conditions reported in 2014. According to a summary of the Table 13.2-2 Carnivore Incidents and Mortality at the Ekati, Diavik, Snap Lake, and Jericho Mines, 1996 to 2013, one wolf was intentionally destroyed in 2008, one wolf was un-intentionally killed in 2002 and there were a total of 24 “other” incidents, meaning that the wolf was deterred, relocated, or a damage report was filed.

Request (GNWT):

Please describe how DDEC will deal with the possibility of increased wolf attraction to the project site.

Response:

Among the Ekati, Diavik, Snap Lake, and Jericho mines, there have been approximately 38 years of mine operation (not including exploration and construction phases). Based on the results presented in Table 13.2-2 of the Developer’s Assessment Report, there has been an average of 0.6 wolf incidents per year, and a mortality rate of 0.05 wolves per year. These results suggest that the potential of increased attraction to the Jay Project site is low, particularly considering that these data are associated with the presence of active wolf dens and caribou migrations through the study area, and the likely increase in nutritional stress on wolves due to the recent decline in caribou.

Wolf denning near the Ekati Mine has occurred in the past. In 2004, a wolf den was established at the north end of the Ekati Mine airstrip. One pup was later observed at the den before the wolves left the den in early June (Rescan 2005). There have not yet been any wolf relocations from the Ekati or Diavik mines.

Monitoring of wolf-mine interactions will continue to be carried out at the Ekati Mine through the Jay Project. The monitoring program during operation of the Jay Project will be based on current practice under the Ekati Mine Widlife Effects Monitoring Program (WEMP) as this may evolve over time. Ongoing monitoring of wolf-mine interactions and denning activity will be described in a “Jay Update” of the Wildlife and Wildlife Habitat Protection Plan and a WEMP for the Ekati Mine (inclusive of the Jay Project), which are anticipated to be developed during the permitting phase.

References:

Rescan (Rescan Environmental Services Ltd.). 2005. EKATI Diamond Mine 2004 Wildlife Effects Monitoring Program. Prepared for BHP Billiton Diamonds Inc. by Rescan Environmental Services Ltd. Yellowknife, NWT, Canada.

DOMINION DIAMOND

Information Request Number:	DAR-GNWT-IR-73
Source:	Government of Northwest Territories – Lands: Paul Mercredi
Subject:	Wildlife and Wildlife Habitat
DAR Section(s):	13.2.2.7, Annex VII (Table 3.2-2)

Preamble (GNWT):

Table 3.11-2 only summarizes mortalities and incidents at the Ekati, Diavik and Snap Lake mines. It would seem more appropriate, in conducting this type of regional assessment, to perhaps take a more inclusive review of additional mine sites and camps along the winter road. In their assessment of the GK Project, DeBeers used a more regional perspective on the impacts of mining activity on carnivores. ENR data provided by the North Slave Region during that process also includes wolverines that were killed, relocated, or found dead at Kennedy Lake, Nuna and Lockhart camps. Inclusion of all known wolverine mortalities (and relocations), at multiple sites involved in mining activities, would suggest a higher number of cases (n=27) than reflected in the Jay Project – Wildlife Baseline Report (n=6).

Request (GNWT):

Please revise Table 3.11-2 to include a column that specifically addresses relocations and which includes data from other mining-related camps.

Response:

Table 3.11-2 of the Wildlife Baseline Report (Annex VII of the Developer's Assessment Report [DAR]) was restricted to mines in close proximity to the Jay Project to describe conditions related to carnivore incidents and mortalities in the baseline study area (i.e., Lac de Gras area). Additional results from the Jericho Mine were included in Table 13.2-2 (Section 13.2 of the DAR) to provide broader regional information.

Table 73-1 provides a summary of wolverine and grizzly bear relocations associated with mines and mining-related camps from 1998 to 2014 acquired from the Government of the Northwest Territories (GNWT). There are no GNWT records of wolf and fox relocations during this period. There have been no reported relocations of wolverine, grizzly bear, and wolf at the Snap Lake or Jericho mines. No fox relocations have been reported for the Jericho Mine. A fox was relocated from the Ekati Mine in 1999 and one from the Snap Lake Mine in 2006 according to mine monitoring reports.

There have been improvements in best practices for mitigating and managing wolverine and grizzly bear interactions at operating mine sites. Improvements have been made to waste management procedures and building design that limit access to food waste and use of buildings as shelter. From 1998 to 2014, there have been six relocations of grizzly bear for a rate of 0.13 relocations per mine-year (45 total mine-years) across the Diavik, Ekati, Snap Lake, and Jericho mines. Two of these included a single relocation event at Diavik in 2012 involving a sow and two yearlings. There have been no relocations of wolverines at any mines or camps after 2005.

Table 73-1 Summary of Wolverine and Grizzly Bear Relocations at Mines and Mining-related Camps in the Northwest Territories, 1998 to 2014

Year	Wolverine		Grizzly Bear	
	Location	Relocations	Location	Relocations
1998	Diavik	1	-	-
1998	Ekati	2	-	-
2001	Diavik	2	Diavik	1
2001	Misery	1	Ekati	1
2001	Lockhart	2	-	-
2005	Ekati	2	-	-
2005	Misery	2	Peregrine	1
2007	-	-	Ekati	1
2012	-	-	Diavik	2
2013	-	-	Diavik	1

Information Request Number: DAR-GNWT-IR-74

Source: Government of Northwest Territories – Lands: Paul Mercredi

Subject: Wildlife and Wildlife Habitat

DAR Section(s): 13.3.2.1.2, 13.2.2.7.2 (Table 13.2.2)

Preamble (GNWT):

There appear to be inconsistencies in reports of wildlife mortalities. P. 13-55 states that there have been 6 unintentional carnivore mortalities associated with vehicle collisions at all the mines, while Table 13.2.2 lists a total of 13 non-intentional mortalities across all mines. This is also in contrast to the statement that 11 carnivores were killed in vehicle collision at Ekati alone since 1998, although this metric appears to be consistent with the table.

Request (GNWT):

Please clarify the history of non-intentional mortalities of carnivores that have occurred at Ekati and other mines.

Response:

The number of non-intentional mortalities of carnivores that have occurred at the Ekati, Diavik, Snap Lake, and Jericho mines are presented in Table 74-1 below (data from references cited in the Developer's Assessment Report). There have been a total of 18 non-intentional mortalities at all four mine sites since 1996 (Table 74-1). Eleven of these non-intentional mortalities have been a result of collisions with vehicles. On the Ekati mine site, nine vehicle-related mortalities (seven fox and one wolf pup) have occurred since 1998.

Table 74-1 Non-Intentional Carnivore Mortalities at the Ekati, Diavik, Snap Lake, andJericho Mines, 1996 to 2013

Site	Year	Phase	Species	Number of Non-Intentional Mortalities	Comments
Diavik	Baseline	exploration	wolverine	1	no information available
	2001	construction	wolverine	1	no information available
	2012	production	wolverine	2	found in burnables bin
Ekati	2002	production	fox	1	struck by vehicle
	2002	production	wolf (pup)	1	struck by vehicle
	2005	production	fox	1	struck by vehicle
	2007	production	fox	1	struck by aircraft
	2008	production	fox	1	struck by vehicle
	2009	production	fox	1	struck by vehicle
	2010	production	fox	1	struck by vehicle
	2011	production	fox	1	struck by vehicle
	2012	production	fox	1	found in landfill
	2013	production	fox	1	struck by vehicle

Table 74-1 Non-Intentional Carnivore Mortalities at the Ekati, Diavik, Snap Lake, andJericho Mines, 1996 to 2013

Site	Year	Phase	Species	Number of Non-Intentional Mortalities	Comments
Snap Lake	2009	production	wolverine	1	stuck by vehicle
	2011	production	fox	1	found in accomodations sewage lift station
	2011	production	wolverine	1	found in shipping container
Jericho	2007	production	wolverine	1	struck by vehicle

DOMINION DIAMOND

Information Request Number:	DAR-GNWT-IR-75
Source:	Government of Northwest Territories – Lands: Paul Mercredi
Subject:	SEA
DAR Section(s):	3.4.1.7, Adequacy Response Volume 1

Preamble (GNWT):

In DDEC's Adequacy Response to the DAR, it states that the Ekati SEA commitment for northern employment is 62 percent, and that Ekati has performed well against these SEA commitments. While DDEC has been close to meeting its SEA targets in the past few years, DDEC has actually not met its commitments for both procurement and employment. In addition, the GNWT notes that DDEC states in Section 3.4.1.7 of the Jay DAR that it will continue to provide northern employment of a similar volume as it currently does (52 percent), which is below its operational commitment of 62 percent. The GNWT recognizes that there can be challenges in finding skilled labourers needed within the Northwest Territories, but the GNWT believes that there are several opportunities to reach these commitments, and the GNWT remains willing to continue its work with DDEC to achieve these goals.

Request (GNWT):

n/a

Response:

Dominion Diamond is committed to achieving 62 percent (%) Northwest Territories (NWT) resident employment for the operations phase of our business. It is important to note that we are working diligently towards this target and have begun to make important strides in this direction. In 2013, Dominion Diamond's NWT Resident employment was 59% and we fully expect this number to increase to the stated goal of 62% in the short term.

At the same time, we are turning our attention to our overall workforce numbers which were lower, in part, due to the skilled-labour contractor employees needed to operate the mine site. As the new owner of the mine, we inherited contracts related to the safe and effective operation of the Ekati Mine. Often, these contracts were multi-year agreements. We are in the process of reviewing our contracts as they expire and will work with our incumbent and future contractors, including our northern contractors, to create incentives to increase our overall northern workforce percentages.

Dominion Diamond is committed to working collaboratively with the Government of the Northwest Territories to fully implement Ekati's Socio-Economic Agreement.

DOMINION DIAMOND

Information Request Number: DAR-IEMA-IR-2

Source: Independent Environmental Monitoring Agency: Kevin O'Reilly

Subject: Project Alternatives

DAR Section(s): 2.4.6.1 (Table 2.4-1)

Preamble:

There appears to be a flaw in DDEC's Pre-screening Assessment of Mining Alternatives. For the Environmental Considerations category, all three mining options get the same rating even though the underground method contains significantly lighter impacts on the terrestrial and aquatic environments (i.e. smaller waste rock pile, less noise and dust generation and no need to enclose and dewater a bay in Lac du Sauvage). This rating system ranks the chosen dike method more favorably than one would objectively expect.

Request:

DDEC should re-assess the three mining options with a view to providing a finer differentiation of favourability ratings for each, not just 0 or 1.

Response:

As described in Section 2.4.6 of the Developer's Assessment Report, the Project alternatives were evaluated in a pre-screening assessment that was based on a high-level evaluation of technical feasibility, project economic viability, environmental considerations, and social and economic considerations. The intent of the pre-screening assessment was to eliminate alternatives that were identified to have "fatal flaws" at a high level of assessment, rather than carrying these alternatives forward into the more detailed multiple accounts analysis. A fatal flaw is generally defined as something that is so unfavourable that it cannot be offset by any other benefit. A pre-screening assessment is a common first step used in alternative assessment processes, as it is meaningless to perform a detailed alternatives assessment on projects that are not viable and would not be developed.

For the pre-screening assessment of the Jay Project mining method alternatives, each alternative was given a binary score of either 0 or 1 (i.e., either "no" or "yes"). A score of 0 meant that the alternative did not meet the pre-screening criteria and a score of 1 meant that it did. The four categories assessed during the pre-screening step were: Technical Feasibility, Project Economic Viability, Environmental Considerations, and Social and Economic Considerations. Alternatives were required to meet all the pre-screening criteria to be carried forward into the analysis of alternative means. The pre-screening assessment scoring does not provide a ranking to differentiate between alternatives, or relative scores, as it determined whether the alternative was considered a project suitable to be carried forward into the more detailed alternatives analysis.

All of the Jay Project mining method alternatives (Underground – Jay Only, Diversion and Drawdown – Jay-Cardinal, and Single Dike – Jay Only) were given scores of 1 for Environmental Considerations because it was considered that any of these alternatives could be developed taking into account

Environmental Considerations. This does not imply that these mining method alternatives are considered to be equal from an environmental perspective, but that none of the alternatives were considered to have a “fatal flaw” with respect to Environmental Considerations. However, the Jay-Cardinal Alternative had a much larger footprint than the Single Dike – Jay Only Alternative, which was identified as a concern to local communities during Dominion Diamond’s community engagement program. Dominion Diamond made changes to the original Jay-Cardinal project entirely due to concerns heard during the engagement process with communities and stakeholders, and as such, the Jay-Cardinal Alternative was not carried forward for further consideration.

The Underground – Jay Only alternative was identified to have “fatal flaws” relating to both Project Economic Viability and Technical Feasibility, specifically because it was not economically viable and could not meet the timeline required for ore release and the required production rates. These were flaws that could not be offset by other benefits, which led to the Underground – Jay Only alternative not passing the pre-screening assessment.

For the reasons described above, Dominion Diamond does not believe it is necessary to re-assess the Jay Project mining method alternatives pre-screening assessment.

DOMINION DIAMOND

Information Request Number: DAR-IEMA-IR-03

Source: Independent Environmental Monitoring Agency: Kevin O'Reilly

Subject: Project Design

DAR Section(s): 3.5.6

Preamble:

The Jay Waste Rock Storage Area is designed to have a minimum 100 m buffer zones between it and Lac du Sauvage, but only minimum 30 m between it and streams. This is the case for the streams flowing into Lac du Sauvage from Lakes C1 and C17 (Maps 3.5-1 and 8.4-1).

Request:

DDEC should explain the rationale for the 30 m buffer zone between the Jay waste rock pile and streams flowing into Lac du Sauvage and assess possible impacts to Lac du Sauvage water quality from any waste rock seepage flowing into these streams.

Response:

The 30 metre (m) offset distance from the Jay waste rock storage area (WRSA) to the smaller surrounding waterbodies and streams was chosen for the following reasons:

- It is a typical offset used in land use permits;
- It provides sufficient space to monitor WRSA seepage/runoff water and construct water management structures to collect seepage, if required; and ,
- It balances offsets to Lac du Sauvage and the esker, as well as the footprint and height of the pile.

Precipitation over the Jay WRSA is generally anticipated to infiltrate in to the pile and freeze resulting in minimal seepage/runoff, as has been the experience at the existing WRSAs at the Ekati Mine. Seepage water quality from the Jay WRSA is not anticipated to pose a risk to the receiving environment, based on the assessment described in the Developer's Assessment Report (DAR) for the Jay Project.

Recent (2014) thermal modelling for the design of the Pigeon WRSA at the Ekati Mine (Waste Rock and Ore Storage Management Plan [WROMP] Vers. 4.1) was provided to the Wek'èezhìi Land and Water Board as part of the Water Licence requirements for the Pigeon WRSA Design (Dominion Diamond 2014). This thermal modelling is also relevant for the design of the Jay WRSA. The thermal modelling validated that frozen conditions can be maintained within the pile below the 5-metre (m) granite cover under a 100-year climate change scenario.

The volume and timing of this runoff, and its chemistry profile, were accounted for in the Site Water Quality Model (Appendix 8E), which is an input into the Lac du Sauvage hydrodynamic water quality model (Appendix 8F). The inputs from the Jay WRSA to the Site Water Quality Model were conservative. The chemistry profile of runoff from the Jay WRSA was assigned concentrations from WRSA seepage

flow monitoring data collected from the Misery operations at the Ekati Mine (Section 8E3.4, Appendix 8E). Use of these data is considered conservative since the Misery WRSA contains a higher proportion of potentially acid generating material compared to what will be placed in the Jay WRSA. The rock types stored in the existing Ekati Mine WRSAs are the same as what will be stored in the Jay WRSA; however, there is variability in their composition ratios and placement methods. Additionally, the quantity of WRSA runoff/seepage was conservatively estimated; the modelling assumed permafrost would not develop in the WRSA, leading to higher than anticipated seepage quantities. Runoff from the Jay WRSA was not projected to present any potential risk to the receiving environment.

Following the existing Ekati Waste Rock and Ore Management Plan (WROMP [Dominion Diamond 2014]), seepage surveys of all WRSAs and ore stockpiles at the Ekati Mine are conducted twice a year (during spring freshet, and again in late summer or fall before freeze-up), in accordance with the requirement of the Water Licence. The testing of seepage chemistry is designed to detect changes that may affect the receiving environment. The Jay WRSA will be added to the Ekati WROMP and will be included in these seepage surveys. Seepage monitoring will continue through the operation stage of the project, and for 10 years following the completion of mining until closure objectives are met.

During the, monitoring period, adaptive seepage management strategies will be implemented, if necessary to remedy undesirable water quality trends. The adaptive management strategy outlined in the WROMP for the Ekati Diamond Mine includes the following components:

- Identification of issue, verification of trigger and development of a response plan.
- Additional studies to determine the extent of the impact of seepage (if any), and modification of the WROMP and seepage management program.
- Implementation of modified programs, and design / construction of mitigation structures and facilities (if required).

References:

Dominion Diamond (Dominion Diamond Ekati Corporation). 2014. Waste Rock and Ore Storage Management Plan v.4.1. May 2014.

DOMINION DIAMOND

Information Request Number: DAR-IEMA-IR-4

Source: Independent Environmental Monitoring Agency: Kevin O'Reilly

Subject: Return to Baseline Conditions in Lac de Gras

DAR Section(s): 8.5.4.1.2, 9.4.3.2.1

Preamble (IEMA):

In Lac de Gras, concentrations of various contaminants and nutrients are predicted to return to baseline or near baseline conditions post-closure. The DAR states "Concentrations of these parameters peak in the operations phase, but decrease in post-closure to a steady state concentration that is predicted to be within or slightly higher than the range of existing conditions." (emphasis added) The DAR should state whether this is also the case for background concentrations for Lac de Gras. We would want to see the company strive for concentrations returning to Background (pre-2000) rather than baseline (2010 – 2012) as much as possible. See table 8.5-13 for last column, S2 and S3 for Open Water; background concentrations for at least two nutrients, two metals and one major ion are substantially below the existing condition.

Request (IEMA):

DDEC should clearly indicate whether contaminants of potential concern and nutrients are predicted to return to pre-development background levels in Lac de Gras.

Response:

The modelling used in the Developer's Assessment Report (DAR) was developed under conservative assumptions for source term inputs (e.g., nitrogen source terms, geochemistry inputs, groundwater flows), so it is expected that the modelled results are overestimated. Even with the conservatism in the modelling assessment, the DAR concluded that changes to Lac de Gras as a result of the Project, including considering the activities of the Ekati and Diavik mines under cumulative effects to Lac de Gras, will not cause adverse environmental effects to aquatic life nor prevent the use of the water as a drinking source (Section 8.7.2).

To place some context on the environmental assessment (EA) case presented in the DAR, a further model was developed to present a reasonable estimate case (i.e., modelling inputs represented an average condition for concentrations and flows compared to the EA case that is much more conservative) (Appendix B, Compendium of Supplemental Water Quality Modelling). As expected, the constituent concentrations in Lac de Gras were lower than results from the EA case.

Throughout the life of the Jay Project (Project), concentrations of constituents in Lac de Gras are predicted to change from existing conditions as a result of the activities associated with the Project. However, no constituents of potential concern were identified in Lac de Gras (and also in Lac du Sauvage); changes in constituent concentrations during the Application Case are not predicted to increase above screening values (Section 8.5.4.1.2 of the Developer's Assessment Report [DAR]). That is, maximum modelled constituent concentrations in Lac de Gras remain below guidelines (e.g., Canadian

Water Quality Guidelines, Drinking Water Quality Guidelines) and benchmarks (e.g., Site-Specific Water Quality Objectives) at all prediction locations and during all Project phases.

In the post-closure period of the Jay Project (i.e., 2033 to 2060), water quality in Lac de Gras is modelled under the conservative case presented in the DAR to return to similar to reference (pre-2000) and existing conditions (2010 to 2012) for some constituents and slightly elevated than reference and/or existing conditions for other constituents (i.e., there is a persistent effect to water quality conditions for some water quality constituents) (Section 8.5.6.2.2 of the DAR; also Golder [2015]). In the DAR assessment, changes to water quality included an assessment of cumulative effects; that is, Project effects were assessed in combination with the activities of the Ekati and Diavik mines, which also influence water quality in Lac de Gras.

In comparison to reference conditions, six constituent concentrations at the end of the post-closure period (i.e., total suspended solids, total phosphorus, cadmium, chromium, copper, and lead) are predicted to be consistent with concentrations measured under reference conditions (Base Case). Five constituent concentrations (i.e., aluminum, arsenic, nickel, zinc, and ammonia) are predicted to be higher than median reference condition concentrations, with the concentrations of ammonia and arsenic predicted to be higher than the 75th percentile reference condition concentrations.

In comparison to existing conditions (i.e., 2013), the median and maximum concentrations of 12 constituents at the end of post-closure (i.e., hardness, total dissolved solids, major ions [chloride, fluoride, magnesium, sulphate]), dissolved ortho-phosphate, beryllium, bismuth, mercury, and silver) are predicted to be consistent with existing condition concentrations. Ten constituent concentrations (i.e., nitrate, barium, cobalt, iron, manganese, molybdenum, selenium, strontium, uranium, and vanadium) are predicted to be higher than the existing condition, but well below benchmarks, aquatic life guidelines, and drinking water guidelines.

As described above, the modelling used in the DAR was developed under conservative assumptions for the purpose of ensuring that environmental effects were not underestimated; the reasonable estimate case shows that constituent concentrations in Lac de Gras were lower than results from the EA case (Appendix B).Dominion Diamond is confident that the mine plan and the water management plan have been designed to minimize the extent of any change or adverse effects to the receiving environment. For example, water management infrastructure (e.g., diversion channels, the Jay Pit diked area in Lac du Sauvage, Lynx and Misery pits) have been incorporated into the water management plan to optimize the collection, storage, and monitoring of runoff water and minewater before release to the environment. Additionally, the water management plan includes an extended timeframe for the storage of minewater during Project operations before any release is required to the environment; this period of time provides the opportunity for the collection and evaluation of site-specific data pertaining to the quantity of minewater that has to be managed by the Misery Pit, and the quality of water in Misery Pit in Years 1 to 5 in advance of pit minewater discharge, which can be compared to DAR predictions. If the Misery Pit water quality monitoring data begins to trend beyond, or track outside of, DAR predictions in Years 1 to 5, Dominion Diamond has sufficient time to proactively address through adaptive management.

References:

Golder Associates (Golder). 2015. Jay Project – Lac de Gras Hydrodynamic Model Updates. Submitted to Dominion Diamond Ekati Corporation. January 2015. Submitted to the Mackenzie Valley Environmental Impact Review Board on January 19, 2015. http://www.reviewboard.ca/upload/project_document/EA1314-01_Adequacy_Review_responses_Vol_4_Lac_de_Gras_Hydrodynamic_Model_Updates.PDF

DOMINION DIAMOND

Information Request Number:	DAR-IEMA-IR-05
Source:	Independent Environmental Monitoring Agency: Kevin O'Reilly
Subject:	Map of Water Level Changes
DAR Section(s):	Appendix 1A (Section 7.3.2)

Preamble (IEMA):

The ToR requires DDEC to provide a map showing water level changes and changes in riparian areas of affected lakes. The Agency cannot find this map. Map 9.4.1 only shows drained area within the dike.

Request (IEMA):

DDEC should provide a map of lake water level changes resulting from the Jay project including riparian zones, or indicate where such a map can be found in the DAR.

Response:

Changes in water levels affecting riparian habitat as a result of the Jay Project (Project) were considered in the Developer's Assessment Report (DAR) in both the vegetation assessment (Section 11 of the DAR) and the fish and fish habitat assessment (Section 9 of the DAR).

The Vegetation Baseline Report (Annex VI of the DAR) presents vegetation cover types in an ecological landscape classification (ELC) in the vegetation baseline study area (BSA), and describes the mapped vegetation units. Map 11.2-2 in the DAR shows the ELC in the BSA. A key finding from the analysis of that map in a Geographic Information System (GIS) was that riparian units (riparian tall shrub, birch seep, and shoreline shrub) account for less than 1 percent (%) each of the landscape of the BSA (Annex VI, Section 3.1.1). Similarly, Lac du Sauvage, the Lac du Sauvage-Lac de Gras Narrows (the Narrows), and Lac de Gras have a low abundance of riparian map units associated with them (Map 5-1). There are no discernible riparian habitat units directly adjacent to the shoreline of the Narrows (Map 5-2). Photographs of the shoreline of Lac du Sauvage (taken during boat surveys in 2013) confirm a predominately boulder/rocky shoreline and a general lack of riparian vegetation near the lake shorelines (see Photos 5-1 to 5-4).



LEGEND

- EKATI MINE FOOTPRINT
- DIAVIK MINE FOOTPRINT
- PROPOSED JAY FOOTPRINT
- WINTER ROAD
- TIBBITT TO CONTWOYTO WINTER ROAD
- NORTHERN PORTION OF TIBBITT TO CONTWOYTO WINTER ROAD
- ELEVATION CONTOUR (10 m INTERVAL)
- ESKER
- WATERCOURSE
- WATERBODY

ECOLOGICAL LAND CLASSIFICATION MAP UNITS

- RIPARIAN TALL SHRUB
- BIRCH SEEP AND RIPARIAN SHORELINE SHRUB

DRAFT

REFERENCE

VEGETATION CLASSIFICATION DATA: DIAVIK LANDSAT CLASSIFICATION 1997; WEST KITIKMEOT CLASSIFICATION 2001; MODIFIED BY GOLDER ASSOCIATES 2014
CANVEC © NATURAL RESOURCES CANADA, 2012
NATURAL RESOURCES CANADA, CENTRE FOR TOPOGRAPHIC INFORMATION, 2012
DATUM: NAD83 PROJECTION: UTM ZONE 12N

DOCUMENT

DAR-IEMA-IR-5

4 0 4
SCALE 1:175,000 KILOMETRES

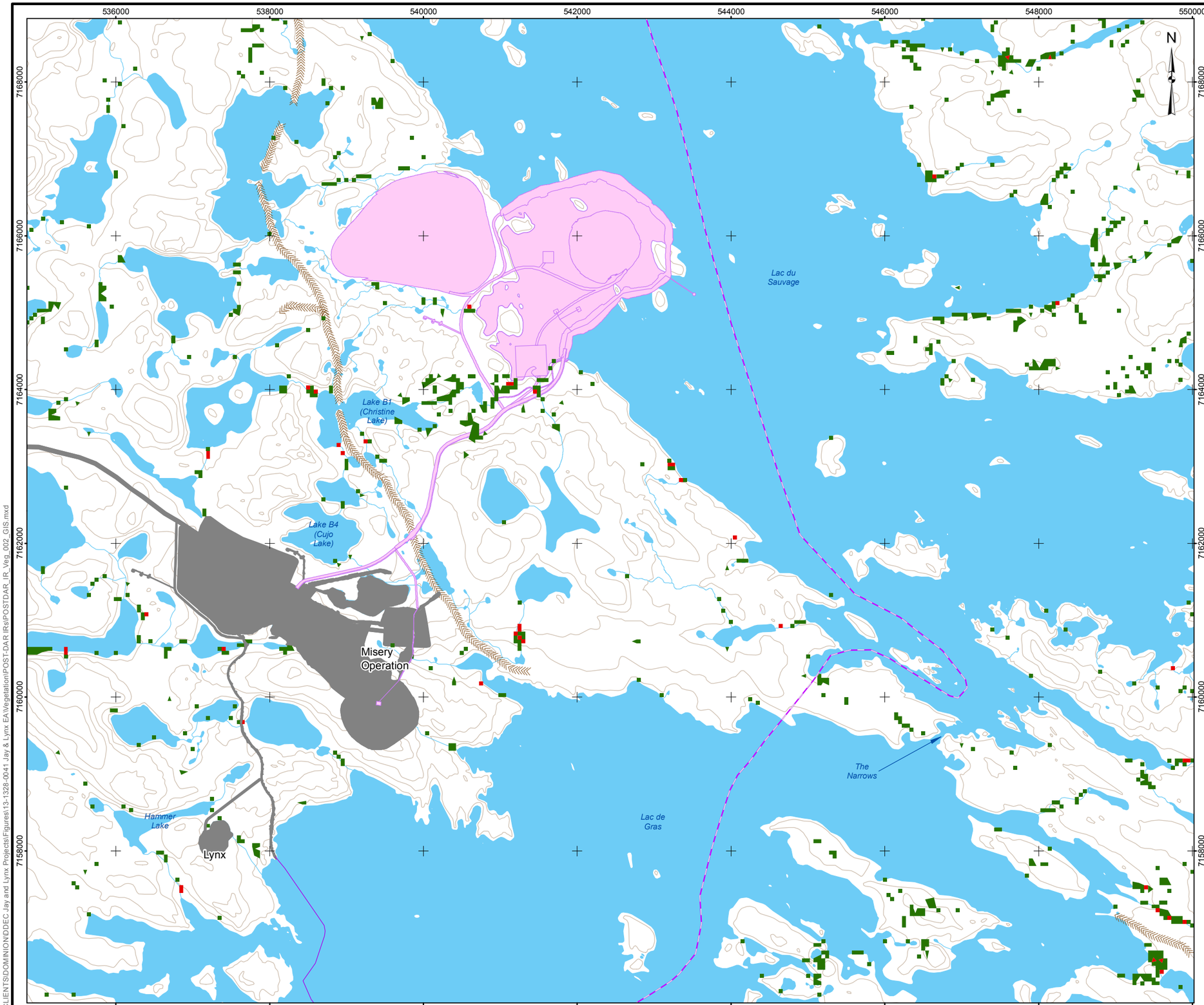
PROJECT
DOMINION DIAMOND™
JAY PROJECT
NORTHWEST TERRITORIES, CANADA

TITLE
RIPARIAN ECOLOGICAL LANDSCAPE CLASSIFICATION MAP UNITS

Golder Associates

PROJECT		1419751	FILE No. POSTDAR_IR_Veg_001_GIS	
DESIGN	JF	09/03/15	SCALE AS SHOWN	REV 0
GIS	AK/LS	13/03/15	MAP 5-1	
CHECK				
REVIEW				

G:\CLIENTS\DOMINION\DDEC Jay and Lynx Projects\Figures\13-1328-0041 Jay & Lynx EA\Vegetation\POST-DAR IR\s\POSTDAR_IR_Veg_001_GIS.mxd



LEGEND

- EKATI MINE FOOTPRINT
- PROPOSED JAY FOOTPRINT
- WINTER ROAD
- NORTHERN PORTION OF TIBBITT TO CONTWOYTO WINTER ROAD
- ELEVATION CONTOUR (10 m INTERVAL)
- ESKER
- WATERCOURSE
- WATERBODY

ECOLOGICAL LAND CLASSIFICATION MAP UNITS

- RIPARIAN TALL SHRUB
- BIRCH SEEP AND RIPARIAN SHORELINE SHRUB

DRAFT

REFERENCE

VEGETATION CLASSIFICATION DATA: DIAVIK LANDSAT CLASSIFICATION 1997; WEST KITIKMEOT CLASSIFICATION 2001; MODIFIED BY GOLDER ASSOCIATES 2014
CANVEC © NATURAL RESOURCES CANADA, 2012
NATURAL RESOURCES CANADA, CENTRE FOR TOPOGRAPHIC INFORMATION, 2012
DATUM: NAD83 PROJECTION: UTM ZONE 12N

DOCUMENT

DAR-IEMA-IR-5

1 0 1
SCALE 1:50,000 KILOMETRES

PROJECT
DOMINION DIAMOND
JAY PROJECT
NORTHWEST TERRITORIES, CANADA

TITLE
RIPARIAN ECOLOGICAL LANDSCAPE CLASSIFICATION NEAR THE JAY PROJECT

Golder Associates

PROJECT		1419751	FILE No. POSTDAR_IR_Veg_002_GIS	
DESIGN	JF	09/03/15	SCALE AS SHOWN	REV 0
GIS	AK/LS	13/03/15	MAP 5-2	
CHECK				
REVIEW				

G:\CLIENTS\DOMINION\DDEC Jay and Lynx Projects\Figures\13-1328-0041 Jay & Lynx EA\Vegetation\POST-DAR IRs\POSTDAR_IR_Veg_002_GIS.mxd

Photo 5-1 **Lac du Sauvage-Lac de Gras Narrows, August 12, 2013**



Photo 5-2 **Lac du Sauvage Shoreline, August 27, 2013**



Photo 5-3 **Lac du Sauvage Shoreline, August 23, 2013**



Photo 5-4 **Lac du Sauvage Aerial Shoreline, August 6, 2013**



Jay Project effects from changes in water levels on riparian vegetation were assessed as a secondary pathway in the vegetation assessment (DAR Section 11.3.2.2.2). Changes in riparian plant communities in Lac du Sauvage and Lac de Gras are predicted to be temporary and within the range of natural variability of water fluctuations that result in cyclic vegetation changes (Section 11.3.2.2.2). Although prolonged drying during the back-flooding period may eliminate some plant species while favouring others because of changes in soil oxygen levels, nutrients, and species tolerance to dry soil conditions (Casanova and Brock 2000), the effects on the abundance and distribution of riparian plant communities are predicted to be minor relative to Base Case conditions. Effects will be temporary, as back-flooding is planned to be completed in less than four years. The effects on riparian habitat from changes to water levels are not presented on Map 5-1 because they are so small that they would not appear different from Base Case conditions.

In the fish and fish habitat assessment (Section 9 of the DAR), residual effects to habitat (including riparian habitat) are identified for Lac du Sauvage and the Narrows when water levels are reduced during back-flooding of the Jay Pit and diked area. Effects from changes in water levels during dewatering are assessed as a secondary pathway in the assessment of fish and fish habitat (DAR Section 9.3.2.2.2). For either pathway, a change in lake levels could potentially alter the distribution of riparian habitats in relation to the changes in soil moisture (Nilsson and Svedmark 2002; Odland and del Moral 2002; Shafroth et al. 2002; Leyer 2005), having potential implications for fish habitat.

The following primary pathway is considered in Section 9.4 of the DAR:

> *Pumping water to back-flood the Jay Pit and diked area of Lac du Sauvage may affect water levels and riparian habitat in Lac du Sauvage and Lac de Gras, and water levels, flows, and riparian habitat in the Lac du Sauvage-Lac de Gras Narrows, affecting fish and other aquatic life*.

The assessment determined that the predicted change in water levels falls within the natural range of variability observed (Section 9.4.3.3.1). The seasonal timing and pattern of lake level fluctuation will be maintained during back-flooding. As a result, the changes in water levels in Lac du Sauvage and Lac de Gras are expected to have a minor residual effect on fish habitat (Section 9.4.3.3.1). Effects will be temporary, as back-flooding is planned to be completed in less than four years. Map 9.4-2 in the DAR shows the Project footprint (dike and dewatered area) in relation to shoreline habitat for fish. Note that as the change in water levels associated Project activities is well within the natural range of variability, a similar map showing Project effects cannot be produced for changes in riparian habitat from dewatering and back-flooding activities.

It should also be noted that the original Terms of Reference were developed in February 2014 for the Jay-Cardinal Project which was anticipated to have water levels changes in lakes upstream of Lac du Sauvage due to large diversions. When the revised Terms of Reference for the Jay Project were issued in July 2014, the reference to a “map that shows water level changes and changes in riparian areas” was not removed, although Project-related changes to water levels have been significantly reduced through the change in the project design.

References:

Casanova MT, Brock MA. 2000. How do depth, duration, and frequency of flooding influence the establishment of wetland plant communities? Plant Ecol 147: 237-250.

Leyer I. 2005. Predicting plant species' responses to river regulation: the role of water level fluctuations. J Appl Ecol 42: 239-250.

Nilsson C, Svedmark M. 2002. Basic principles and ecological consequences of changing water regimes: Riparian plant communities. Environ Manage 30: 468–480.

Odland A, del Moral R. 2002. Thirteen years of wetland vegetation succession following a permanent drawdown, Myrkdalen Lake, Norway. Plant Ecol 162:185-198.

Shafroth PB, Friedman JM, Auble GT, Scott ML, Braatne JH. 2002. Potential responses of riparian vegetation to dam removal. BioScience 52: 703–712.

DOMINION DIAMOND

Information Request Number: DAR-IEMA-IR-06

Source: Independent Environmental Monitoring Agency: Kevin O'Reilly

Subject: Effects of Dike Breaching

DAR Section(s): 9.3.2.2.1

Preamble (IEMA):

The DAR states there is no link to fish on pit back-flooding. It is not clear whether the dike breaching may create currents through the openings that could re-suspend pit lake sediments.

Request (IEMA):

DDEC should explain whether cutting openings into the dike at closure could create currents through the openings that would cause sediment upwelling, and the potential for incoming fish exposure to suspended pit sediments.

Response:

Effects to fish from dike breaching activities are assessed under the secondary pathway of *Release of sediment from dike breaching/removal activities may cause changes in water quality, affecting fish and other aquatic life in Lac du Sauvage* in Section 9.3.2.2.2 of the Developer's Assessment Report (DAR). Additional information, including an assessment of the effects of dike breaching activities on water quality, is provided in Section 8.4.2.4.2 of the DAR under the secondary pathway of *Removal of project infrastructure, including dike breaching/removal activities in Lac du Sauvage, may release sediments and cause a change in downstream water and sediment quality*.

Back-flooding of the diked area and subsequent breaching of the Jay dike will be planned and implemented such that there are no currents or sediment that would negatively affect fish or the Lac du Sauvage receiving environment.

Back-flooding of the dewatered area will be done in a controlled manner (i.e., pumping) to minimize turbulence and generating total suspended solids (TSS). Water quality will be monitored during back-flooding. Back-flooding will proceed to the point of bringing the water level within the diked area close to the lake level, allowing freeboard for water quality verification and mitigating the risk of sedimentation during the subsequent dike breaching. Breaching will occur when water quality within the back-flooded diked area meets acceptability criteria. Note that fish will not be present in the diked area during back-flooding.

Mitigation measures to control potential mobilization of sediment during dike breaching are outlined in Section 8.4.2.4.2 of the DAR. A breaching design will be developed in further detail as part of the Ekati Mine Interim Closure and Reclamation Plan, that will include management of dike breaching and removal activities to limit the potential for effects on water quality. The plan will include selection of breach locations, geometry of the breach, materials to be used, location of turbidity curtains, and other information relevant to mitigation, inspection, and monitoring. Preliminary breach locations and a

conceptual breach geometry are shown on Figure 5-1 in the Jay Project Conceptual Closure and Reclamation Plan Report that is included in Appendix 3B of the DAR. The breach locations will allow for fish movement.

Prior to commencement of breach excavation activities, turbidity (silt) curtains will be deployed, upstream and downstream of the breach zone, to minimize the area affected by increased sediment suspended from construction activities. The majority of dike material consists of coarse rockfill and coarse filter. As this material has a low content of fine particles, turbidity generation should be limited. This material is not prone to erosion. Turbidity levels and TSS will be monitored beyond the curtains and additional mitigations implemented if threshold levels are reached.

The effects from changes in water quality on fish and other aquatic life in Lac du Sauvage during the post-closure period were assessed as a primary pathway in the residual effects analysis (DAR Section 9.4.3.4). The water quality modelling for post-closure (DAR Section 8.5.4.1.2) included the Jay Pit in Lac du Sauvage as an input source. The predicted changes to water quality are minor and are not expected to result in adverse effects to lower trophic communities or fish health through direct exposure in the water column (as concluded in Section 9.4.3.2.1). Most water quality parameters are expected to decrease during post-closure to steady-state concentrations within or slightly higher than the range of existing conditions.

The preamble references a no linkage pathway in Section 9.3.2.1.1 of the DAR, which indicates that there was no linkage to fish from water quality within the diked area during back-flooding. To clarify, this was a no linkage pathway to fish Valued Components, as fish will not be present in the back-flooded area before the dike is breached and reconnection to the lake occurs. Effects on fish from changes to water quality from dike breaching activities and other Project activities once the dike is breached are assessed as secondary or primary pathways, as described above.

DOMINION DIAMOND

Information Request Number: DAR-IEMA-IR-7

Source: Independent Environmental Monitoring Agency: Kevin O'Reilly

Subject: Trends in Fish Contaminants

DAR Section(s): Annex XIV

Preamble (IEMA):

Discussion of historic trends in fish tissue contaminants for the Koala watershed is not complete as the 2012 AEMP results are not included.

Request (IEMA):

DDEC should include the 2012 AEMP fish monitoring results in the DAR discussion of historic fish tissue contaminants.

Response:

The fish tissue chemistry results of the 2012 Aquatic Effects Monitoring Program (AEMP; ERM Rescan 2013) were summarized in the Historical Report Review of the Fish and Fish Habitat Baseline (Section A6, Appendix A, Annex XIV of the Developer's Assessment Report [DAR]). However, an update to the fish tissue chemistry sections in Section 9.2.6 of the DAR is provided below to include the results of the 2012 AEMP; the sentences that are in both bold and italics represent additional information to this section provided by 2012 AEMP fish monitoring results.

Section 9.2.6 (Updated):

A consistent theme across previously completed tissue chemistry studies in the vicinities of the Diavik Mine and the Ekati Mine was natural variation in metal concentrations across time, space (both within and across lakes), and species (Appendix A, Historical Report Review, Annex XIV).

For fish tissue mercury levels, increases in the study lakes may reflect widespread increases in mercury in this part of northern Canada. Golder (2012) reported differences in mercury concentrations in Lake Trout muscle in Lac du Sauvage between 2008 and 2011, and general increases in mercury concentrations in Lac de Gras and Lac du Sauvage before the development of the Diavik Mine to 2011. Importantly, the increase in mercury concentration in Lac du Sauvage trout since baseline was greater than that observed in trout from Lac de Gras; thus, there was no clear indication that the mercury increase in Lac de Gras trout was a result of the Diavik Mine. ***Similar findings were reported in the 2012 AEMP for the Koala and King-Cujo watersheds and Lac de Gras areas as part of monitoring for the Ekati Mine (ERM Rescan 2013).***

Rescan (2008) reported that concentrations of several metals in Round Whitefish liver (barium, mercury, molybdenum, strontium) and muscle (aluminum, barium, mercury, molybdenum, strontium), and in Lake Trout liver (arsenic, mercury, molybdenum) and muscle (barium, mercury) were higher in 2007 versus levels recorded during baseline years, and that most increases appear to be due to natural variation. The

mechanisms underlying changes in metal concentrations in tissue may be shifts in diet, increased metabolism, and/or natural changes in water and sediment chemistry.

Mine-related effects on fish tissue chemistry have also been reported in several historical reports. A tissue chemistry study completed by Golder (2008) concluded that there were several low-level and moderate-level effects observed for Slimy Sculpin in Lac de Gras. The moderate-level effects included elevated mercury concentrations in tissues in exposure areas, which were linked to the mine through observed changes in water quality and sediment quality. Golder (2010) also reported increases in tissue concentrations of bismuth, strontium, titanium, and uranium in Slimy Sculpin from near-field exposure areas in Lac de Gras. These increases were linked to mine-related activities through observed changes in water and sediment chemistry.

ERM Rescan (2013) reported in the 2012 Ekati Mine AEMP that antimony, molybdenum, and selenium concentrations were elevated in fish tissue from monitored lakes in the Koala watershed when compared to reference lakes:

- ***Antimony concentrations were elevated in Lake Trout muscle tissue and Slimy Sculpin from Leslie, Moose, and Nema lakes.***
- ***Molybdenum concentrations were elevated in Lake Trout muscle and Round Whitefish muscle from Leslie and Nema lakes.***
- ***Molybdenum concentrations were elevated in Round Whitefish in Moose Lake.***
- ***Selenium concentrations in Lake Trout muscle and Round Whitefish liver and muscle tissue were elevated in Leslie, Moose, and Nema lakes.***

ERM Rescan (2013) also reported that selenium and uranium concentrations have increased in the King-Cujo watershed due to mine-related effects. Selenium concentrations, while below guideline values, have increased over time in Lake Trout and Round Whitefish in Cujo Lake. Uranium concentrations in Round Whitefish liver tissue have increased at Cujo Lake, while decreasing in reference lakes.

As expected, trends in fish tissue chemistry were species-specific. Lake Trout were consistently reported as having high concentrations of mercury, owing to its top trophic position in the food web and susceptibility to effects from bioaccumulation as a relatively large, long-lived species. Rescan (2008) also reported elevated mercury concentrations in Slimy Sculpin in Lac de Gras, but there was no clear indication that the mercury increase in Lac de Gras Lake Trout was a result of the Diavik Mine. ***Similar results were reported during the 2012 AEMP and it was noted that mercury concentrations have not increased above the 2007 AEMP results (ERM Rescan 2013).***

From a human health perspective, with the exception of the largest fish, mercury levels found in Lake Trout from Lac de Gras and Lac du Sauvage were generally below Health Canada's maximum acceptable levels for the edible portion of retail fish (0.5 micrograms per gram wet weight [µg/g ww])

(Golder 2012). ***ERM Rescan (2013) reported similar results for Lake Trout, Round Whitefish, and Slimy Sculpin in the Koala and King-Cujo watersheds.***

References:

ERM Rescan (ERM Rescan Environmental Services Ltd.). 2013. 2012 Aquatic Effects Monitoring Program (AEMP) Summary Report; Part 1: Evaluation of Effects; Part 2: Data Report; and Part 3: Statistical Report. Prepared for BHP Billiton Diamonds Inc. Yellowknife, NWT, Canada.

Golder (Golder Associates Ltd.). 2008. Fish Report In Support of the 2007 AEMP Annual Report for the Diavik Diamond Mine, NWT. Prepared for Diavik Diamond Mines Inc. Yellowknife, NWT, Canada. Doc No. RPT-616 Ver. 0.

Golder. 2010. Fish Report in Support of the 2010 AEMP Annual Report for the Diavik Diamond Mine, NWT. Prepared for Diavik Diamond Mines Inc. Yellowknife, NWT, Canada. Doc No. RPT-1032 Ver. 0.

Golder. 2012. Mercury in Lake Trout Report in Support of the 2011 AEMP Annual Report for the Diavik Diamond Mine. NWT, Canada. Prepared for Diavik Diamond Mines Inc. Yellowknife, NWT, Canada. Doc No. RPT-1126 Ver. 0

Rescan (Rescan Environmental Ltd.). 2008. 2007 Aquatic Effects Monitoring Program (AEMP) Technical Report; Summary Report; and Appendix B: Data Report. Prepared for BHP Billiton Diamonds Inc., Yellowknife, NWT, Canada.

DOMINION DIAMOND

Information Request Number: DAR-IEMA-IR-9

Source: Independent Environmental Monitoring Agency: Kevin O'Reilly

Subject: Zooplankton Changes

DAR Section(s): 9.4.3.2.2

Preamble:

The DAR states: "Higher concentrations of TDS (in particular calcium) may stimulate growth of Daphnia species and potentially cause a shift in community structure towards larger-sized zooplankton. Calcium limitation may explain the observation that high TDS lakes are associated with higher zooplankton productivity". It is not clear how DDEC reconciles this statement with the results of Rescan 2006 multivariate analysis (in the AEMP Re-Evaluation report) where a decline in the cladocera community in Moose Lake downstream of the LLCF was correlated with elevated TDS, hardness and some major ions.

Request:

DDEC should consider the 2006 Rescan report in re-evaluating the DAR assessment of increasing levels of TDS effects on cladocera growth in the Jay-impacted lake watershed.

Response:

Section 9.4.3.2.2 of the Developer's Assessment Report (DAR) draws an association between *Daphnia* productivity and high total dissolved solids (TDS) in lakes, as increased calcium concentrations may stimulate growth of *Daphnia* and result in a higher proportion of larger-sized zooplankton. The literature indicates that declines in *Daphnia* spp. growth and survival have been correlated with decreases in aqueous calcium levels (Ashforth and Yan 2008; Tan and Wang 2010; Shapiera et al. 2011; Shapiera et al. 2012) and decreases in water hardness (Jesus et al. 2014). The necessity of calcium concentrations above minimum thresholds to *Daphnia* development and survival have also been investigated (Cairns and Yan 2009), as well as the tendency of zooplankton communities to shift towards larger-bodied zooplankton (such as cladocerans) as a result of increased aqueous calcium concentrations (Tessier and Horwitz 1990). Additional information from the literature on the link between TDS and *Daphnia* species was also provided in the response to DAR-MVEIRB-IR-62.

The Aquatic Effects Monitoring Program (AEMP) Re-Evaluation report (Rescan 2006) was reviewed to re-evaluate statements made in the DAR related to the expected relationship between TDS and zooplankton size. The results of multivariate analyses (principal component analysis [PCA] and comparison of Bray-Curtis results with PCA output) in the AEMP Re-Evaluation report (Rescan 2006) indicate that cladoceran abundance was inversely related to the main principal component (PC1). The lower abundance of cladocerans was attributed by Rescan (2006) to higher water hardness, which was found to be significantly correlated along the PC1 axis. However, PC1 was also correlated with other parameters including sulphate, alkalinity, and three metals (antimony, barium, and nickel), which could also have contributed to differences in cladoceran composition.

In addition, the results of the exploratory PCA of water quality data presented by Rescan (2006) in Figures 3.1-1 to 3.1-4 indicate an arch pattern, which suggests the two main axes may not be independent of each other, potentially resulting in a distortion of the relationships inherent in the data. This arch pattern, known as the “horseshoe effect”, is a common mathematical distortion observed in PCA ordinations that can confound the interpretation of ordination results (Legendre and Gallagher 2001).

The more recent analysis in the 2013 Ekati Mine AEMP document (ERM Rescan [2014]), suggests that the decline of cladocerans in Moose and Nema Lakes was due to a reduction in densities of *Holopedium gibberum* whereas *Daphnia* sp. have been observed to increase in these lakes. The increases in *Daphnia* sp. have been small relative to the decline in *H. gibberum* resulting in an overall decline of cladocerans in lakes downstream of mine activities (ERM Rescan 2014). ERM Rescan (2014) attributed changes in zooplankton community composition to availability of nutrients, such as nitrogen and phosphorus.

The decrease in overall cladoceran composition observed in lakes downstream of mine activities does not appear to be linked specifically to increases in TDS in the more recent analysis by ERM Rescan (2014). In addition, the results from the literature suggest that the expected relationship between TDS and *Daphnia* as described in the DAR is valid.

References:

Ashforth D, Yan ND. 2008. The interactive effects of calcium concentration and temperature on the survival and reproduction of *Daphnia pulex* at high and low food concentrations. Limnol Oceanog, *53*(2), 420-432.

Cairns A, Yan N. 2009. A review of the influence of low ambient calcium concentrations on freshwater daphniids, gammarids, and crayfish. *Environmental Reviews*, *17*(NA), 67-79.

ERM Rescan (ERM Rescan Environmental Ltd.). 2014. *Ekati Diamond Mine: 2013 Aquatic Effects Monitoring Program Part 1 – Evaluation of Effects.* Prepared for Dominion Diamond Ekati Corporation by ERM Rescan: Yellowknife, NWT, Canada.

Jesus FT, Martins C, Nogueira AJ. 2014. Changes in life-history parameters of *Daphnia longispina* (Cladocera, Crustacea) as a function of water chemistry. J Limnol, *73*(2).

Legendre P, Gallagher ED. 2001. Ecologically meaningful transformations for ordination of species data. Oecologia. 129: 271-280.

Rescan (Rescan Environmental Ltd.). 2006. AEMP Re-evaluation and Proposed Program for 2007-2009. Prepared for Ekati Diamond Mine, Northwest Territories, BHP Billiton Diamonds, Inc.

Shapiera M, Jeziorski A, Yan ND, Smol JP. 2011. Calcium content of littoral Cladocera in three softwater lakes of the Canadian Shield. Hydrobiologia, 678(1): 77-83.

Shapiera M, Jeziorski A, Paterson AM, Smol JP. 2012. Cladoceran response to calcium decline and the subsequent inadvertent liming of a softwater Canadian lake. Water, Air, & Soil Pollution. 223(5): 2437-2446.

Tan QG, Wang WX. 2010. Interspecies differences in calcium content and requirement in four freshwater cladocerans explained by biokinetic parameters. Limnol Oceanog. 55(3): 1426-1434.

Tessier AJ, Horwitz RJ. 1990. Influence of water chemistry on size structure of zooplankton assemblages. Can J Fish Aquat Sci, 47(10): 1937-1943.

DOMINION DIAMOND

Information Request Number: DAR-IEMA-IR-10

Source: Independent Environmental Monitoring Agency: Kevin O'Reilly

Subject: Phytoplankton Trends

DAR Section(s): Annex XII

Preamble:

The DAR uses Diavik's Lac de Gras AEMP phytoplankton data only to 2011. Data from 2012 and 2013 were not yet available when the report was prepared. The Diavik AEMPs show (1) a declining trend in phytoplankton abundance and biomass in all areas of Lac de Gras from 2008 to 2011, and (2) the FF2 exposure site shows consistently higher phytoplankton abundance and biomass than all the far-field/reference sites, likely due to nutrient enrichment. DDEC should now include the 2012 and 2013 data to confirm whether that trend continues to persist in Lac de Gras. This is important information for the cumulative effects assessment given the suggestion that this phytoplankton trend indicates that "a regional factor beyond Mine-related effects was influencing the phytoplankton community".

Request:

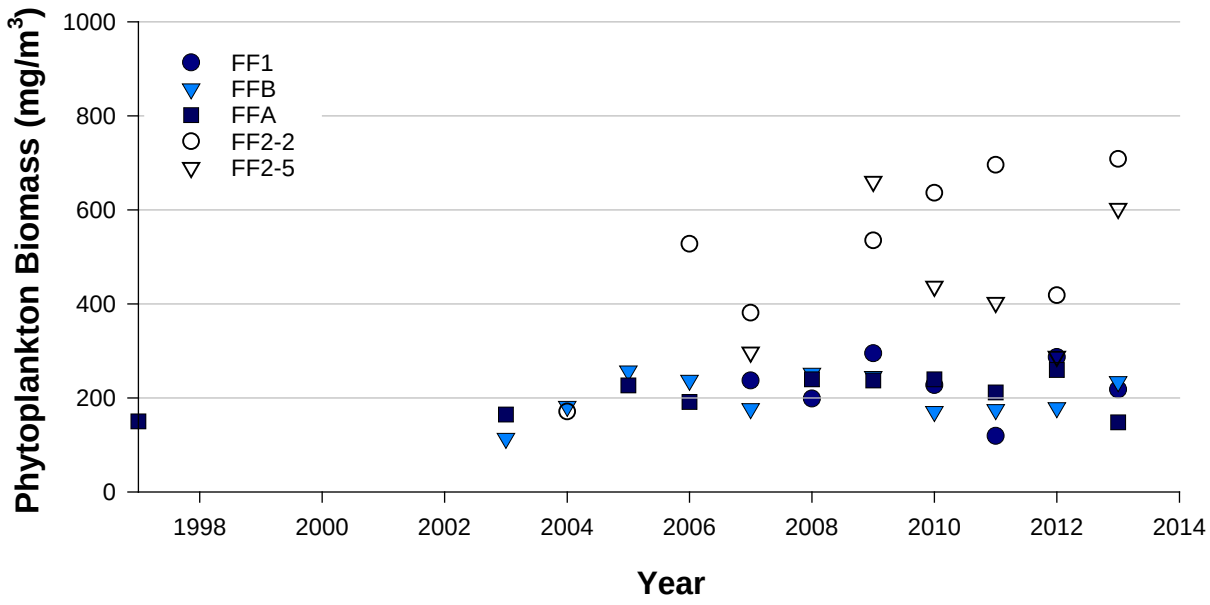
DDEC should incorporate the Diavik 2012 and 2013 AEMP phytoplankton results into its assessment of phytoplankton trends in Lac de Gras.

Response:

The phytoplankton biomass figure (Figure 2.3-26) presented in the Plankton Baseline (Annex XII) of the Developer's Assessment Report has been updated to include the Diavik Mine's Lac de Gras Aquatic Effects Monitoring Program phytoplankton data for 2012 and 2013. Figure 10-1 was reproduced from the Diavik Mine 3-year summary (2011 to 2013) report (Golder 2014), and modified to include all the reference areas (i.e., FF1, FFB, and FFA) along with the FF2 exposure area. Phytoplankton biomass at the two FF2 exposure stations that continue to be sampled by the Diavik Mine (i.e., FF2-2 and FF2-5) decreased in 2012, but increased again in 2013 (Figure 10-1). The FF2 exposure area continues to have higher phytoplankton biomass than the far-field/reference areas. The higher phytoplankton biomass in the FF2 exposure area compared to the far-field/reference areas is thought to be due to nutrient enrichment (Golder 2014). Phytoplankton abundance was not plotted, because biomass is considered to be the ecologically relevant variable, and the 2013 phytoplankton samples were analyzed by a different taxonomist, which reduces comparability of 2013 abundance results to previous years' data (Golder 2014).

Based on the additional data, there do not appear to be any consistent temporal trends in phytoplankton biomass in reference areas and FF2 areas. The apparent decreasing short-term trend noted from 2008 to 2011 does not appear to have persisted in these areas of Lac de Gras. The pattern of FF2 areas being consistently higher than other areas of Lac de Gras remains unchanged and is consistent with the interpretation in the Developer's Assessment Report, Section 9.2.4.3.

Figure 10-1 Total Phytoplankton Biomass in the Far-Field Areas in Lac de Gras, 1997 to 2013



Notes: Phytoplankton taxonomist was changed for the Diavik Mine 2013 Aquatic Effects Monitoring Program.
Source: Golder (2014).
mg/m^3 = milligrams per cubic metre.

Reference:

Golder (Golder Associates Ltd.) 2014. AEMP Version 3.0 (2011 to 2013) Summary Report for the Diavik Diamond Mine, NT. Prepared for Diavik Diamond Mines (2012) Inc. Yellowknife, NWT, Canada. October 2014.

DOMINION DIAMOND

Information Request Number:	DAR-IEMA-IR-11
Source:	Independent Environmental Monitoring Agency: Kevin O'Reilly
Subject:	Blasting Effects on Fish
DAR Section(s):	9.3.2.1.1

Preamble:

The DAR mentions a higher-than-normal blast at Diavik that created some fish egg mortality.

Request:

DDEC should explain (1) what the circumstances were that created this higher-than-normal blast, and (2) what measures will DDEC put in place to ensure this magnitude of blast does not occur at Jay.

Response:

The Developer's Assessment Report (DAR) for the Jay Project included a review of mitigation measures that will be implemented to reduce the effects of blasting in the Jay open pit on fish valued components (VCs) in Lac du Sauvage (DAR Section 9.3.2.1, pages 9-120 to 121). The DAR lists all applicable Fisheries and Oceans Canada (DFO) recommended measures to avoid causing harm to fish from the use of explosives (DFO 2014), all of which will be considered to protect fish. The potential effects of blasting with mitigation measures in place were also screened under the following pathway '*the use of explosives near fish-bearing water can cause injury or mortality to fish in Lac du Sauvage*' in Section 9.3.2.2.1 (pages 9-130 to 131).

As mentioned in Section 9.3.2.2.1 of the DAR, all blasting will occur in the isolated and dewatered area of Lac du Sauvage (i.e., in the Jay open pit and not in water). Additionally, blasting in the Jay open pit will be beyond the recommended DFO setback distances (Wright and Hopky 1998). The setback distances were developed to protect fish and their incubating eggs from maximum allowable limits for blasting-induced overpressure (100 kilopascals [kPa] in the swimbladder of a fish) and peak particle velocity (PPV; 13 millimetres/second [mm/s] in a spawning bed).

The DAR does not mention a higher-than-normal blast at the Diavik Mine that created some fish mortality. To clarify, the DAR refers to a scientific study performed by University of Alberta researchers that examined various effects of overpressure and PPV on eggs of Lake Trout (*Salvelinus namaycush*) positioned at varying distances from the Diavik Mine A154 pit (Faulkner et al. 2006). Eggs were placed in Plexiglass incubators at four sites; three sites were within 220 metres (m) of the A154 pit dike, in a zone where PPVs were predicted to exceed guidelines, and a reference site was located well away of the blast zone (2 kilometres [km] away from the pit). Six blasting events occurred during the early development period of the study (20 days), a period of greatest egg sensitivity to physical disturbance, and all blasts were below the PPV guideline of 13 mm/s at the exposure sites. A total of 96 blasting events occurred over the entire incubation period (September to July), of which, 20 blasts may have exceeded guidelines at the exposure sites during the study.

The University of Alberta study found that after a 20-day exposure period during early development, egg mortality was lower at two of three sites within 220 m of the A154 pit dike, than at the reference location (2 km away from the pit); mortality at the third site did not differ from the reference site (Faulkner et al. 2006). Analysis of eggs retrieved after ice-out (i.e., after the full incubation period) showed that only 10 percent of eggs from one site (one that used non-natural substrate from dike construction) had higher mortality than at the reference site, while mortality at the other two exposure sites did not differ from the reference level. The largest blast exposure (28.5 mm/s) throughout the incubation period was more than double the DFO guideline for PPV, and since it produced egg mortality levels similar to the reference location, Faulkner et al. (2006) concluded that current DFO guidelines provide ample protection. These findings were also supported by a similar study performed by the same researchers in a controlled laboratory setting (Faulkner et al. 2008).

There are currently procedures at the Ekati Mine for the storage and handling of explosives, as well as for blasting. All blasting will occur in the isolated and dewatered area of Lac du Sauvage, and blasting in the Jay open pit will be beyond the recommended DFO setback distances. If these recommended setback distances are approached, then site-specific operating mitigations could be implemented if necessary to protect fish. For example, if necessary, it may be possible to adjust blasting practices during the time of highest biological sensitivity (i.e., the window of early development for eggs of Lake Trout and Lake Whitefish). But even if a nearby spawning bed (which there are none) is exposed to a blast of approximately 28.5 mm/s, egg mortality would remain low given that several studies have demonstrated that eggs are resilient to effects from vibrations within this range (e.g., Faulkner et al. 2006, 2008). Effects to fish populations in Lac du Sauvage are not expected given that the closest known (suitable) spawning shoal for fish VCs is approximately 315 m from the edge of the proposed dike (shoal identified as S4 in DAR Map 9.4-2).

Thus, survival and reproduction rates of fish in nearby surface waters during Project operation will remain unchanged from blasting in the Jay open pit. In Lac du Sauvage, the effect of pressure changes and vibrations from blasting on fish is considered a no linkage pathway because all blasting and excavation will occur in the dewatered areas of the lake where no fish VCs will be present, and at a considerable distance from the fish-bearing portions of the lake outside of the dike. Consequently, the assessment of the pathway in the DAR remains valid. There is no linkage to Arctic Grayling, Lake Trout, and Lake Whitefish populations.

References:

DFO (Fisheries and Oceans Canada). 2014. Measures to avoid causing harm to fish and fish habitat. DFO, Winnipeg, Ontario. Website: http://www.dfo-mpo.gc.ca/pnw-ppe/measures-mesures/index-eng.html. Accessed July 21, 2014.

Faulkner SG, Tonn WM, Welz M, Schmitt DR. 2006. Effects of explosives on incubating lake trout eggs in the Canadian Arctic. N Am J Fish Manage. 26: 833-842.

Faulkner SG, Welz M, Tonn WM, Schmitt DR. 2008. Effects of simulated blasting on mortality of rainbow trout eggs. T Am Fish Soc. 137:1-12.

Wright DG, Hopky GE. 1998. Guidelines for the use of explosives in or near Canadian fisheries waters. Canadian technical report of fisheries and aquatic sciences 2107. DFO, Winnipeg, MB, Canada.

DOMINION DIAMOND

Information Request Number: DAR-IEMA-IR-12

Source: Independent Environmental Monitoring Agency: Kevin O'Reilly

Subject: TK Use in Evaluation of Impacts

DAR Section(s): Appendix 1A – Section 2.2

Preamble (IEMA):

The ToR states: "DDEC will make all reasonable efforts to incorporate traditional knowledge from Aboriginal culture holders as a tool to ... evaluate the specific impacts." The DAR states "The Yellowknives Dene have noted concerns about the effects on fish populations of spilled oil and winter roads." It is not clear whether there are aspects of winter roads that Yellowknives Dene believe could have affected the Lac du Sauvage fish habitat baseline beneath the winter road that crosses that water body.

Request (IEMA):

DDEC should clarify the concerns of the Yellowknives Dene regarding the impact of hydrocarbon spills on fish populations.

Response:

In Weledeh Yellowknives Dene (1997), the Yellowknives Dene First Nation noted the following concerns regarding potential environmental effects from winter roads on water and fish in Ek'ati (Lac du Gras):

> *"There are some very old, large fish in this lake [Lac du Gras]. They could be damaged […] from any spills resulting from trucks going through the winter road" (Weledeh Yellowknives Dene 1997, p. xi).*
>
> *"Mining companies will use Weledeh Yellowknives Dene land owners during winter road construction to identify currents and channels in lakes, so that ice over them does not become part of roads. Ice over currents and channels remains thin because of continual water action; thin ice results in trucks crashing into lakes with their loads of supplies, such as diesel fuel" (Weledeh Yellowknives Dene 1997, p. xv).*

As noted in the Developer's Assessment Report (DAR; Section 9.3.2.2.1) spills during construction, operations, or decommissioning and reclamation activities have the potential to runoff and affect surface water quality, and therefore, fish and aquatic life. Although spills that occur in high enough concentrations could contaminate water and cause direct toxicity to fish and aquatic life, spills are generally preventable and local in nature. Mitigation identified in the existing Ekati Mine Spill Contingency Plan and environmental design features will be in place to limit the frequency and extent of spills that have potential to occur during Project activities.

As described in Section 8.4.2.4.2 of the DAR, a spill contingency plan that is currently in place at the Ekati Mine will be extended for the Project, and will include information on actions that will be followed to respond to spills in the Project area. Complementary plans under the Water Licence and Land Use Permit for the Ekati Mine will also be extended to detail storage, handling and spill clean-up of hazardous and

non-hazardous material specific to the Project (e.g., Emergency Response Plan, Waste Management Plan, Hazardous Waste Management Plan, Hydrocarbon Impacted Material Management Plan). These plans include Project activities at the main site and the satellite facilities (e.g., Misery and Fox pits), and roads. This also includes adhering to plans developed for the Tibbitt to Contwoyto Winter Road (TCWR) that are not directly managed by Dominion Diamond. Note that the Jay Project will not require the use of the TCWR north of Lac de Gras (i.e., as it crosses Lac du Sauvage); the existing seasonal access provided by the TCWR to Lac de Gras will be utilized for construction and operations (DAR Section 3.4.2).

Hazardous materials and fuel will be stored according to regulatory requirements to protect the environment and workers. Fuel storage for the Project is the existing Misery, Fox, and Main Camp dispensing facilities where fuel storage tanks are located in lined and bermed containment areas. Emergency spill kits will be provided wherever hazardous materials or fuel are stored and transferred. Hydrocarbon-impacted snow and ice (e.g., on the existing winter road on Lac de Gras) will be contained in the contaminated snow containment facility (Section 3.4.1.8.6). Individuals working on site and handling hazardous materials will be trained in spill response as per the spill contingency plan.

The implementation of the Ekati Mine Spill Contingency Plan and existing mitigation and environmental design features are anticipated to reduce the likelihood and extent of the release of hydrocarbon spills and hazardous materials on-site. Due to the implementation of emergency response and contingency plans, environmental design features, and monitoring programs, spills occurring from Project construction and operations are not expected to measurably change fish and fish habitat endpoints. Therefore, this pathway was determined to have no linkage to fish Valued Components.

References:

Weledeh Yellowknives Dene. 1997. “Weledeh Yellowknives Dene: a traditional knowledge study of Ek’ati”. Detta: Yellowknvies Dene First Nation Council.

DOMINION DIAMOND

Information Request Number: DAR-IEMA-IR-14

Source: Independent Environmental Monitoring Agency: Kevin O'Reilly

Subject: Effects of Dust on Fish

DAR Section(s): 8.5.4.2.1, 9.3.2.2.2

Preamble (IEMA):

In assessing possible impacts on the aquatic environment from dust deposition, the DAR focuses on water quality (e.g., TSS) and not sediments. It is not clear how dust deposition from Jay might affect fish spawning and rearing habitat. DDEC's dust models show dust particles of 30 µm diameter descending over half of Lac du Sauvage at a daily maximum of more than 120 µg/m^3 (Map 7.4-19, Jay Project Air Quality Assessment Update). Within that deposition zone are a number of shoals considered as spawning habitat (S2 to S8, with S3 considered higher quality for trout, round whitefish and lake cisco).

Request (IEMA):

DDEC should assess how dust generated during the Jay Project dust may impact fish and fish habitat in lakes receiving dust.

Response:

For the Developer's Assessment Report (DAR) assessment, fugitive dust[1] generated by the Jay Project (the Project) was modelled (Section 7 in the DAR), and the deposition of the projected dust emissions to the aquatic environment and potential effect to water quality evaluated (Section 8.5.4 in the DAR). The DAR concluded that water quality would not be adversely affected by dust deposition as deposition of dust was not predicted to change concentrations of total suspended solids (TSS), nutrients, or metals in the water (Section 8.5.6.2 in the DAR). If TSS concentrations are similar to existing conditions, there will be no change in deposition rates to the sediment or sediment quality. Based on the results of the water quality assessment, fish, fish habitat, and fish health will not be adversely affected by dust deposition (Section 8.5.5; Section 9.3.2.2.2).

As requested, dust deposition near the spawning habitat in Lac du Sauvage was predicted to assess how dust generation may affect fish and fish habitat. Updated results from the air dispersion model (Golder 2015) were used to predict the flux of dust from the mine to the shoals, which was interpreted in the context of potential changes in water and sediment quality.

Dust fluxes are predicted to peak at 8,175 kilograms per hectare per year (kg/ha/y) near the centre of the Jay pit during the Application Case, and decrease to less than 1,000 kg/ha/y within 1 kilometre (km) of the Jay pit during the Application Case (Golder 2015; Map 14-1). Predicted fluxes of dust at shoals S2 to S8 are predicted to range from 59 to 590 kg/ha/y (Table 14-1). Deposition rates are predicted to decrease to the north, east, and south (i.e., towards Lac du Sauvage) of the Project at an approximate exponential rate, and approach background conditions within 4 km of the peak location.

[1] Dust is also referred to as total suspended particles (TSP) and is operationally less than 100 microns (µm) in diameter.

Granite waste rock is the source for most of the fugitive dust, and granites have a density around 2,700 kilograms per cubic metre. At deposition rates of 1,000 kg/ha/y (which is greater than the fluxes estimated at the shoals), annual sediment accumulation is negligible (i.e., on order of 50 µm per square metre; 1 µm = 0.001 millimetre). This calculation assumes that all of the deposited material settles and remains in the sediment. If all of the deposited dust was suspended in the water column, the total amount of TSS in the lake would increase. Assuming a mean lake depth around the shoals of 8 metres (m), and no settling or mixing within the lake outside the shoals, the increase in average TSS concentration would be small (approximately 7 mg/L). On a whole-lake basis, this equates to a projected maximum increase in TSS concentration of approximately 3 mg/L due to dust deposition.

538000 540000 542000 544000

7168000 7166000 7164000

S3 S5 S4 S2 S7 S8

100 200 300 400 500 600 700 800 900 1000

Lake Ad4 Lake Ad3 Lake C16 Lake C1 Lake C15 Lake C14 Lake C13 Lake C12 Lake C9 Lake C17 Lake C10 Lake C11 Lake Ac10 Lake Ac11 Lake C8 Lake Ac9 Lake Ac8 Lake Ac7 Lake Ac6 Lake Ac5 Lake Ac4 Lake Ac13 Lake Ac12 Lake Ac14 Lake B19 Lake B22 Lake Ac15 Lake B21 Lake B20 Lake B28 Lake Ac16 Lake B15 Lake B0 Lake B1 (Christine Lake) Lake B29 Lake B24 Lake B2 Lake B14 Lake B3 Lake B13 Lake B4 (Cujo Lake) Lake B25 Lake Ac36 Lake Ac35 Lake Ac2 Lake Ab7 Lake Ac3 Lake du Sauvage

Proposed Jay Waste Rock Storage Area

Proposed Jay Dike Alignment

Drawdown Area

Proposed Laydown

Proposed Jay Pit

Dust Deposition Contours > 1000 kg/ha/yr not shown

Proposed Misery Discharge Diffuser Location

Proposed Jay Project Magazine

Proposed Mine Inflows Pumping System

Proposed Runoff Pumping System

Proposed Sub-basin B Diversion Channel

Proposed Ore Transfer Pad

Proposed Jay Road, Pipeline and Power Line

N

LEGEND

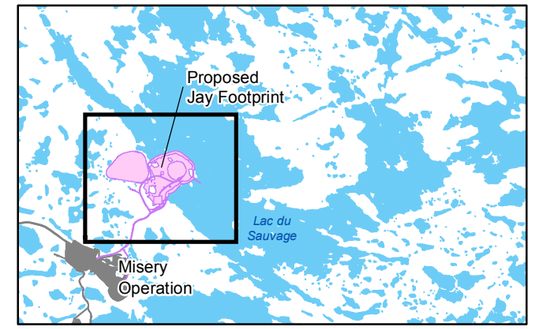
- WATERCOURSE
- WATERBODY
- BATHYMETRY CONTOUR (5 M INTERVAL)
- ELEVATION CONTOUR (10 M INTERVAL)
- SPAWNING HABITAT
- DUST DEPOSITION (kg/ha/yr)

SUBSTRATE TYPE

- BO/CO - BOULDER/COBBLE
- BO/FI - BOULDER/FINES
- BR - BEDROCK
- FI - FINES
- FI/BO - FINES/BOULDER
- FI/CO - FINES/COBBLE

JAY PROJECT FOOTPRINT

- EXISTING SHORELINE OF DEWATERED AREA
- POWER LINE
- PROPOSED JAY PROJECT INFRASTRUCTURE
- PROPOSED JAY ROAD NORTH (HAUL ROAD)
- PROPOSED JAY ROAD (HAUL ROAD, PIPELINE AND POWER LINE)
- PROPOSED OPERATION ROADS



REFERENCE

1. GOLDER. 1997. TECHNICAL MEMORANDUM #12-2, SHOAL HABITAT SURVEY, LAC DE GRAS AND LAC DU SAUVAGE, SUMMER 1996. ENVIRONMENTAL BASELINE PROGRAM. SUBMITTED TO DIAVIK DIAMOND MINES INC. YELLOWKNIFE, NWT, CANADA. DOC NO. TM12-2.
2. CANVEC © NATURAL RESOURCES CANADA, 2012
3. NATURAL RESOURCES CANADA, CENTRE FOR TOPOGRAPHIC INFORMATION, 2012
4. BATHYMETRIC DATA OBTAINED FROM AURORA, 2013

DATUM: NAD83 PROJECTION: UTM ZONE 12N

DOCUMENT

DAR-EIMA-IR-14

500 0 500

SCALE 1:25,000 METRES

PROJECT

DOMINION DIAMOND™

JAY PROJECT
NORTHWEST TERRITORIES, CANADA

TITLE

MODELLED DUST FLUX TO LAC DU SAUVAGE NEAR POTENTIAL SPAWNING SHOALS

Golder Associates

PROJECT		1419751	FILE No. POSTDAR_IR_Aqua_005_GIS	
DESIGN	CS	10/03/15	SCALE AS SHOWN	REV 0
GIS	SG	02/04/15		
CHECK	CS	02/04/15	MAP 14-1	
REVIEW	KM	02/04/15		

G:\CLIENTS\DOMINION\DDEC Jay and Lynx Projects\Figures\13-1328-0041 Jay & Lynx EA\Aquatics\POST-DAR IRs\POSTDAR_IR_Aqua_005_GIS.mxd

Table 14-1 Modelled Dust Flux at Potential Spawning Shoals Near the Jay Dike During the Application Case

Shoal Name	Suitability for Fall-Spawning Fish [(a)]	Distance from Point of Maximum Influence (m)	Predicted Dust Flux (kg/ha/y)
S2	Unsuitable	1,490	517
S3	Unsuitable	2,979	90
S4	Poor to fair	1,518	590
S5	Unsuitable	3,468	93
S6	Unsuitable	3,921	59
S7	Fair	2,331	87
S8	Fair to Good	2,177	144

a) Spawning and rearing habitat for Cisco, Lake Trout, and Round Whitefish (defined by Golder 1997a).
m = metre; kg/ha/y = kilograms per hectare per year.

Dust deposition is monitored at the Ekati Mine and is investigated, along with aquatic data, to evaluate potential effects of dust deposition on the aquatic environment. Key findings from this monitoring show:

- Dustfall contribution from waste rock storage areas are lower than dustfall contributions from haul roads, but contributions from both sources are comparable to background levels past 90 m from a facility (Rescan 2012).
- Monitoring results suggest that winter dust generation (and thus dustfall accumulation) is a small fraction of summer dust generation (Rescan 2012); this is supported by a study at other northern mines (Golder 2012).
- Deposition of dust (and related metals) to the aquatic environment has a negligible potential to change water quality as compared to direct deposition of effluent (and related metals) to the aquatic environment, which has a high potential to change water quality (Rescan 2010)

The low potential of dust deposition to change water quality was confirmed as part of the 2012 Ekati Mine Aquatic Effects Monitoring Project re-evaluation study (Rescan 2012), which is prepared every three-years for approval by the Wek'eezhii Land and Water Board in accordance with the Ekati Mine Water Licence.

Dustfall has also been measured at the Diavik Mine (DDMI 2009), and studies have been conducted to evaluate effect of dust deposition on aquatic habitat (DDMI 2011). Based on sediments collected from six transects radiating away from the dike (and the centre of mining activity), it was concluded that dust deposition had a minimal effect on water or sediment chemistry. In general, fine sediments have the same chemical composition as the dust (they share the same source material), so aquatic life in the lake will have minimal exposure to dust-derived sediment with different chemistry. In addition, the wave action and associated currents that often characterize high-quality shoals for spawning (e.g., reviewed in Lane et al. 1996; Richardson et al. 2001) likely maintains shoals relatively free of sediment accumulation in Lac de Gras.

The spawning shoals in close proximity to the Jay Pit are not expected to be affected by dust deposition (Table 14-1; Map 14-1). The closest suitable shoal for spawning in proximity to the dike is shoal S4 (Map

14-1; Table 14-1; also see the response to DAR-MVEIRB-IR-67). This is a ‘fair’ quality shoal for Lake Trout and Cisco, which is approximately 315 metres (m) northeast of the edge of the dike (or 1,518 m from the maximum point of influence). Most of the high-quality shoal habitats in the Effects Study Area for fish Valued Components are located in Lac de Gras (Golder 1997a,b,c; Rescan 2007) where dust deposition from the Project will not occur.

As part of construction and operations for the Project, dust generation and deposition will be monitored. To minimize dust generation, mitigation such as limiting vehicle speeds, applying dust suppressants, or road watering will be implemented.

In summary, changes to the quality of shoals for spawning and rearing (through changes in dust deposition) in Lac du Sauvage during construction and operations are expected to be negligible. Most, if not all, of the suitable spawning shoals in Lac de Sauvage are over 1,500 m from the point of maximum influence. At this distance, the projected maximum change in TSS concentration (assuming no settling) would be small, and the accumulation of dust in the sediment is predicted to be negligible. In addition, wave action and associated currents likely prevent the accumulation of sediment on the shoals in Lac du Sauvage. Any changes to habitat are considered are expected to be very small and reversible, as dust deposition is expected to return to near baseline conditions following closure.

References:

DDMI (Diavik Diamond Mines Inc.). 2009. Aquatic Effects Monitoring Program. 2008 Annual Report. Yellowknife, NT. April 2009.

DDMI. 2011. Lakebed Sediment, Water Quality and Benthic Invertebrate Study. A154 Dike: Year 4 Results. A418 Dike: Year 2 Results. Yellowknife, NT. August 2011.

Golder (Golder Associates Ltd.). 1997a. Technical Memorandum #12-2, Shoal Habitat Survey, Lac de Gras and Lac du Sauvage, Summer 1996. Environmental Baseline Program. Submitted to Diavik Diamond Mines Inc. Yellowknife, NWT, Canada. Doc No. TM12-2.

Golder. 1997b. Technical Memorandum #13-3, Inland Lake Survey Report. 1996 Environmental Baseline Program. Submitted to Diavik Diamond Mines Inc. Yellowknife, NWT, Canada. Doc No. TM13-3.

Golder. 1997c. Technical Memorandum #14-2, Intensive Shoreline Habitat Survey. 1996 Environmental Baseline Program. Submitted to Diavik Diamond Mines. Yellowknife, NWT, Canada. Doc No. TM14-2.

Golder. 2012. Determination of Natural Winter Mitigation of Road Dust Emissions from Mining Operations in Northern Canada. Final Report. Prepared for De Beers Canada Ltd. DCN-091. September 2012.

Golder. 2015. Technical memorandum: Jay Project air quality assessment update. Issued January 19, 2015.

Lane JA, Portt CB, Minns CK. 1996. Spawning habitat characteristics of Great Lakes fishes. Fisheries and Oceans Canada.

Rescan. 2007. Ekati Diamond Mine. 2006 Jay Pipe Aquatic Baseline. Prepared for BHP Billiton Diamonds Inc. Yellowknife, NWT, Canada, 325 pp.

Rescan (Rescan Environmental Services Ltd.). 2010. Ekati Diamond Mine, 2009 Aquatic Effects Monitoring Program Re-evaluation. Prepared for BHP Billiton Canada Inc. Yellowknife, NWT, Canada.

Rescan 2012. Ekati Diamond Mine, 2012 Aquatic Effects Monitoring Program Re-evaluation. Prepared for BHP Billiton Canada Inc. Yellowknife, NWT, Canada.

Richardson ES, Reist JD, and Minns CK. 2001. Life history characteristics of freshwater fishes occurring in the Northwest Territories and Nunavut, with major emphasis on lake habitat requirements. Fisheries and Oceans.

DOMINION DIAMOND

Information Request Number: DAR-IEMA-IR-15

Source: Independent Environmental Monitoring Agency: Kevin O'Reilly

Subject: Effects of Phosphorus Loading

DAR Section(s): 8.5.4.2.2

Preamble (IEMA):

The assessment of impacts of elevated phosphorus in Lac du Sauvage and Lac de Gras focuses on concentrations only and not total loadings. Over a prolonged time period, the total loadings of nutrients into lakes can change their trophic status without necessarily being exposed to waters that are significantly above thresholds.

Request (IEMA):

DDEC should assess what would be the expected total loadings (i.e. kg/month) of Total Phosphorus into Lac du Sauvage and Lac de Gras and the likely impacts to the trophic level status and to aquatic life.

Response:

In the Developer's Assessment Report (DAR), the water quality assessment related to increases in phosphorus in Lac du Sauvage and Lac de Gras considered both concentrations and total loadings.

To evaluate surface water quality effects resulting from the Jay Project in the DAR, hydrodynamic water quality models were developed for Lac du Sauvage and Lac de Gras (Appendix 8F of the DAR). As detailed in Appendix 8F of the DAR, each flow entering Lac du Sauvage or Lac de Gras was either assigned or calculated a chemical water quality profile. For example, the modelled Misery Pit discharge water quality (Appendix 8E of the DAR) was applied to the Misery Pit discharge flow entering Lac du Sauvage. Using two key parameters (i.e., flow and chemical profiles), chemical loadings for each source (e.g., pit discharge, natural runoff) entering the lakes were calculated and mixed with other loading sources. Therefore, the hydrodynamic lake models used in the DAR already account for the total constituent load (including total phosphorus) in kilograms per unit time (kg/time) for all sources entering the lake.

The lake hydrodynamic models were also designed to track the advective transport of mass that is entering and/or is stored in the lake. As such, the models account for the cumulative load of all constituents stored in the lake at any point in time, at any of the assessment locations. Since an evaluation of the trophic status of the lake through the Application Case (i.e., construction, operation, and closure phases) is defined by a range of total phosphorous (TP) concentrations in the lakes over the life of the mine (as per CCME 2004), model outputs were presented as TP concentrations. Based on the predicted concentrations of TP and referencing the TP trigger range levels for Canadian lakes (CCME 2004), Lac du Sauvage is predicted to be remain oligotrophic to slightly mesotrophic (Section 8.5.4.2.2, page 356), and Lac de Gras will remain ultra-oligotrophic (Section 8.5.4.2.2, page 372). The predicted water quality results were evaluated for potential effects to lower trophic assemblages and aquatic life in Section 9 of the DAR. Based on the predicted nutrient concentrations,

it is expected that there will be a general increase in productivity in the main basin of Lac du Sauvage, with a less pronounced effect in the eastern part of Lac de Gras, but a clear, defined change in composition of plankton and benthic invertebrate communities is not expected (DAR Section 9.4.4). Based on the predicted water quality, adverse effects to aquatic health are not anticipated (DAR Section 8.5.5).

In summary, predicted loading of phosphorus to the lakes, plus predicted concentration of TP within the lakes, were included in the DAR, and used to evaluate potential effects to trophic status, lower trophic levels, and aquatic health.

References

Canadian Council for the Minister of the Environment (CCME). 2004. Canadian Guidance Framework for the Management of Freshwater Systems. Canadian Environmental Quality Guidelines, 2004. Winnipeg, MB, Canada.

DOMINION DIAMOND

Information Request Number:	DAR-IEMA-IR-16
Source:	Independent Environmental Monitoring Agency: Kevin O'Reilly
Subject:	Meromixis Predictions
DAR Section(s):	Appendix 8G

Preamble (IEMA):

There are no documented cases of meromixis occurring in reclaimed flooded diked areas in the Arctic (DAR, pg. 9-204). There are no predictions of impacts to benthic invertebrate colonization, fish use and habitat suitability in a scenario where meromixis is not established. The DAR also states: "Ultimately, even the best of models cannot compare with operational monitoring data..." In addition, for pit lake stratification patterns, "A lack of under-ice field data at most sampling locations throughout the lake added uncertainty in the calibration of the model to seasonal trends..." (pg. 8G-25).

Request (IEMA):

DDEC should reassess the uncertainty ratings for water quality in flooded pits and predict the effects on closure requirements if meromixis is not be established in Misery and Jay pits.

Response:

The hydrodynamic modelling completed for the Developer's Assessment Report (DAR) water quality Section 8.3.4 indicated that stable meromixis will persist in both Project pit lakes. This prediction is supported by empirical evidence of similar northern pit lake case studies, as described below.

Gunnar Pit Lake in Northern Saskatchewan, near Lake Athabasca, was first described by Tones (1982), and later by Muldoon and Schramm (2009). Gunnar Pit Lake is located at a former uranium mine that closed in 1964. After closure, a trench was blasted to connect the pit lake to Lake Athabasca, and the entire pit was flooded, but with no induced stratification. The trench was later closed by backfilling with about 2.7 million cubic metres of waste rock. Over time, the lake established a meromictic density gradient and pycnocline (zone of vertically changing densities). The lake stratifies seasonally at a depth of about 10 metres (m) and has a pycnocline over a gradient from 75 to 90 m deep. The specific conductivity is reported as 300 micromhos per centimetre (µmho/cm; equivalent to microSiemens per centimetre) in the mixolimnion and 1,900 µmho/cm in the monimolimnion.

Pieters and Lawrence (2014) describe six meromictic pit lakes in Northern BC, the Yukon Territories, and the Northwest Territories (NWT). They also discuss factors that affect meromixis in northern mine pit lakes, such as high depth, steep walls, and brackish water.

- Faro Pit at the Faro Mine in the Yukon is at least 90 m deep with a pycnocline at 20 m due to a salinity difference of about 200 mg/L (approximately 1,020 mg/L in mixolimnion and 1,250 mg/L in monimolimnion).

- Grum Pit Lake, also at the Faro Mine, is at least 50 m deep and is strongly stratified at 7 m. It has a uniform salinity of almost 900 mg/L in the monimolimnion and a variable salinity of about 700 to 770 mg/L (during the four surveys completed in 2011) in the mixolimnion.
- Vangorda Pit Lake is also at the Faro Mine. It is at least 50 m deep and was stratified at 5 m depth. The total dissolved solids (TDS) concentration in the monimolimnion is approximately 2,000 mg/L, and 1,050 to 1,450 mg/L in the monimolimnion (the maximum concentration in the monimolimnion was measured under ice, when salt exclusion from ice is high).
- Zone 2 pit lake at the former Colomac Mine, NWT and Waterline pit lake at the Equity Silver Mine, BC, are 110 and 40 m deep, respectively, and have pycnoclines at less than 20 m. The physical limnology of these lakes is altered by deep inflows, which are also changing the overall salinity of the lakes with time. The range of mixolimnion to monimolimnion TDS concentrations for these pit lakes are approximately 600 to 770 mg/L and approximately 1,000 to 2,000 mg/L, respectively. As described in the response to DAR-IEMA-IR-17, deep inflows are not expected to be an issue in either Jay or Misery pit lake.
- Main Zone pit lake at the Equity Silver Mine in BC is mechanically stirred by the disposal of acid mine drainage sludge into the water column. Little congruence would be expected to this pit lake since sludge will not be pumped through the water column of either Jay or Misery pit lakes.

With the possible exception of lakes that are being influenced by ongoing mining activities (e.g., Main Zone pit), all of the abovementioned case studies involve meromictic lakes. This empirical evidence supports the prediction that Dominion Diamond's pit lakes (i.e., Misery and Jay) will be permanently stratified, and possibly at shallower depths than predicted in the DAR (Section 8.5.4.2.3; Appendix 8G). A shallower pycnocline would mean that the downward movement of the pycnocline predicted in the DAR, and concomitant upward advection of saline water, would have been over-predicted (i.e., would conservatively over-predict the load of TDS and other constituents delivered to receiving waterbodies at closure). Put another way, the observations at the referenced pit lakes in the literature indicate that the DAR predictions regarding pit lake limnology are conservative. Therefore, there is no need to consider other closure scenarios in the water quality model.

References:

Muldoon J, Schramm LL. 2009. Gunnar Uranium Mine Environmental Remediation: Northern Saskatchewan. In ASME 2009 12th International Conference on Environmental Remediation and Radioactive Waste Management (pp. 621-632). American Society of Mechanical Engineers.

Pieters R, Lawrence GA. 2014. Physical processes and meromixis in pit lakes subject to ice cover. Can J Civil Eng, 41(6), 569-578.

Tones PI. 1982. Limnological and fisheries investigation of the flooded open pit at the Gunnar uranium mine. Saskatchewan Research Council, Saskatoon (Canada).

DOMINION DIAMOND

Information Request Number: DAR-IEMA-IR-17

Source: Independent Environmental Monitoring Agency: Kevin O'Reilly

Subject: Meromixis Predictions

DAR Section(s): Appendix 8G

Preamble:

The DAR should discuss what factors (e.g., pit wall slumping and other causes of extreme water column turbulence) could cause meromixis to be disrupted or prevented. There does not appear to be any predictions of the probability of these scenarios in the case of Misery and Jay pits. This is important information as a stable, thick picnocline is what is thought to provide a barrier to chemicals of concern in the bottommost water depths from entering the water column, which would degrade surface pit-lake water.

Request:

DDEC should discuss what factors could cause the picnocline in reclaimed mine pits to be destabilized, thus disrupting meromixis in reclaimed mine pits. It should assess what the probability is of this occurring in pit lakes at Ekati.

Response:

Multiple lines of evidence (e.g., conceptual model, numerical model, analogous lakes; see response to DAR-GNWT-IR-62) suggest that meroximis will be maintained in the pit lakes. In theory, there are three types of mechanisms that could cause a disruption to meromixis in the Jay and Misery pits: climate or meteorological events, direct physical disruption, and human error. Each of these types of mechanisms is discussed below.

Climate or Meteorological Events

Most turbulent mixing that occurs in lakes is a result of wind shear forces that are propagated downwards from the lake surface. The model applied to the pit lakes, CE-QUAL-W2, was selected because it considers these forces mechanistically and it has been shown to generate reasonably accurate predictions of vertical stratification with minimal calibration (Wells and Cole 2008). The model simulation that predicted the stability of the pycnocline considered measured wind events at an hourly frequency over the past 14 years. A sensitivity analysis that considered a 25% higher wind speed over the entire duration of the simulation resulted in a slightly deeper pycnocline, but not a complete turnover event in either the Jay or Misery Pit. Given that the simulation exceeded any reasonably foreseeable meteorological event, a disruption of the pycnocline due to a prolonged wind storm is considered highly unlikely.

Direct Physical Disruption

The stability of the pycnocline could be disrupted by direct input of materials into the monimolimnion. For example pit wall failures have been documented to disrupt meromixis in Summer Camp Lake (Parshley

and Bolwell 2003) and Berkely Pit Lake (Gammons and Duaime 2006). Pit wall stability will be monitored and managed in Misery Pit during the ten years while it is being used to store water associated with the Jay Project. During this time, a 10 metre (m) freeboard will be maintained which will reduce the likelihood of any water in the Misery Pit from entering the receiving environment, even in the case of a pit wall failure.

Back-flooding of Jay Pit will occur once mining of the Jay deposit is complete and will take approximately 3 years, and a further 9 months to fill the dewatered portion of the lakebed in the diked area (Appendix 3A of the Developer's Assessment Report, Mine Water Management Plan). During this time, water in the Jay Pit will continue to be isolated from Lac du Sauvage. Monitoring will occur during the refilling. Water quality will need to meet closure criteria, prior to local breaching of the Jay Dike and hydraulically reconnecting the Jay Pit area to Lac du Sauvage.

Pit wall instability is more likely to occur during the initial re-flooding as a result of the change in water pressures in the pit walls and thawing of rock mass. In the long term, having the pits filled with water increases the stability.

As is standard practice throughout open pit development, pit wall stability will be reviewed to assess and compare conditions to the geotechnical and geomechanical models for the pit designs. Site-specific data gathered including mapping of structural features and groundwater inflows will be used in this assessment. Information gathered throughout open pit development will be utilized to assess the likelihood of large scale pit wall failures that could impact the long term stability of the meromictic condition with the pits.

A second source of direct physical disruption to meromixis would be a large magnitude earthquake. This scenario is highly unlikely because the Project is not within an active seismic area. In the case of a distant earthquake, consequence to the pit lake would most likely be an internal seiche, as has been observed in other lakes affected by earthquakes (USGS 2015).

Finally, direct input of water from underwater adits has been observed to disrupt meromixis in pit lakes that are connected to underground mines, such as Waterline pit at the Equity Mine (Peiters and Lawrence 2014). This source of disruption is not applicable to either of the Project pit lakes because neither will have underwater adits.

Human Error

As with all endeavours, there is the potential for human error in managing the pit lake. Human error could disrupt meromixis if the pit filling waters were not placed in such a way as to maximize the density gradient and minimize turbulence. The designs for the discharge pipe location and outlet configuration that will be used to inject high total dissolved solids water into the Misery Pit and the Jay Pit have been developed and will continue to be developed through the detailed design stage in a manner to reduce the turbulence and minimize potential disturbance to the meromixis. The design includes that the diameter of the last 10 m of the pipe will be increased, such the discharge velocity will be decreased to 1 metre per second (m/s), to minimize disturbance. During mining of the Jay open pit, monitoring of the water quality in the Misery Pit will be conducted. These data will be utilized to assess the effectiveness of the water management system and modifications can be implemented if deemed necessary to create the stable meromixis condition.

Human error will be minimized by studying other pit lakes with induced meromixis (e.g., Island Copper on Vancouver Island [Fisher and Lawrence 2006], Anchor Hill Pit Lake [Lewis et al. 2003] and Lake Vollert-Süd in Germany [Stottmeister et al. 1998 as cited in Geller et al. 2012]) to incorporate best practices developed at those sites, and will be incorporated into the mine closure plan.

References:

Fisher TSR, Lawrence GA. 2006. Treatment of acid rock drainage in a meromictic mine pit lake. J Environ Eng 132(5):515–526.

Gammons CH, Duaime TE. 2006. Long term changes in the limnology and geochemistry of the Berkeley Pit Lake Butte, Montana. Mine Water and the Environment. 25: 76-85.

Geller W, Schultze M, Kleinman B Wolkersdorfer C (Eds). 2012. Acidic Pit Lakes; The Legacy of Coal and Metal Surface Mines. Springer Heidelberg. 536pp. DOI 10.1007/978-3-642-29384-9

Lewis NM, Wangerud KW, Park BT, Fundingsland SD Jonas JP. 2003. Status of in situ treatment of Anchor Hill pit lake, Gilt Edge Mine Superfund site, South Dakota, USA. In: Farell T, Taylor G (Eds) Proceedings, 6th International Conference on Acid Rock Drainage (ICARD), Australian Inst of Mining and Metallurgy Publ. Series No: 3/2003, Carlton Victoria, Australia, pp 779–788.

Parshley JV, Bowell RJ. 2003. The Limnology of Summer Camp Pit Lake: A Case Study. Mine Water and the Environment. 22:170–186.

Stottmeister U, Weißbrodt E, Becker PM, Pörschmann J, Kopinke FD, Martius GGM, Wießner A, Kennedy C. 1998. Analysis, behaviour and fate of a lignite pyrolysis wastewater deposite. In: Proceedings Contaminated Soil ‘98. Thomas Telford Publ, London, UK, pp 113–121.

USGS (United States Geological Survey). 2015. Seismic Seiches. http://earthquake.usgs.gov/learn/topics/seiche.php

Wells SA, Cole TM. 2008. CE-QUAL-W2: A Two-Dimensional, Laterally Averaged, Hydrodynamic and Water Quality Model, Version 3.6. User’s Manual. U.S. Army Corps of Engineers Instruction Report EL-08-1. 712 pp.

DOMINION DIAMOND

Information Request Number: DAR-IEMA-IR-18

Source: Independent Environmental Monitoring Agency: Kevin O'Reilly

Subject: Traditional Knowledge Reference

DAR Section(s): Annex XVII

Preamble (IEMA):

The TK literature review for Lutsel K'e Dene First Nation appears to be incomplete. Not listed are two sources of TK for that First Nation: (1) Parlee, B. et al. 2005. Understanding and communicating about ecological change: Denesoline indicators of ecosystem health. P. 165-182. In: Breaking Ice: renewable resource and ocean management in the Canadian North. Ed: F. Berkes et al. Univ Calgary Press.396 p. and (2) Parlee B. et al. 2005. Using Traditional Knowledge to adapt to ecological change: Denesoline monitoring of caribou movements. Arctic 53:1. The former in particular explains how Lutsel Ké Dene traditionally assess health of land and water and the fish and animals living in it.

Request (IEMA):

DDEC should reference and incorporate any relevant TK from the two Parlee et al. (2005) papers.

Response:

Dominion Diamond appreciates the identification of the Parlee et al. (2005a and 2005b) reports for attention and inclusion into the overall summary of baseline traditional land use and traditional knowledge information and assessment of the Jay Project. These reports have now been referenced. Summaries of the information relevant to the Jay Project are provided below for the public record. Upon review of this information, no change to the assessment results in Section 15 of the Developer's Assessment Report (DAR) are expected.

Seasonal Use Cycle

The Denesǫłıne have been described as the most widely travelled and most numerous of the Northern Athapascans. Traditionally, the Denesǫłıne did not inhabit a single community (i.e., Lutsel K'e) but organized themselves into local and regional family groups across the 'forest-tundra ecozone' of the southeastern Northwest Territories (NWT) and northern Saskatchewan, encompassing the fall and winter ranges of the Bathurst, Beverly, and Ahiak caribou herds (Parlee et al. 2005a, b).

Fall

Prior to the fall hunt, families organized themselves into hunting parties at camps established along the northern shores of Great Slave Lake where fish and moose could be captured. Hunters would then make their way north/northwest towards Tha K'ai Tué (McKay Lake) or north/northeast toward Tla Kai Tué (Alymer Lake), the Lockhart River, and Edacho Tué (Artillery Lake). The narrow parts of the lakes or narrows (eda) found between two large lakes were key areas for finding caribou. Some of the major caribou crossings known to the Denesǫłıne area found on Tha K'ai Tué, Tla Kai Tué, and Edacho Tué (Parlee et al. 2005b).

Winter

By the end of the fall, many families would often congregate for the winter. Camps were established near the treeline where wood was available and near where caribou would overwinter. Excess meat was shared between families, cached for later use of dried for the winter (Parlee et al. 2005b). During the winter, wolverine, wolf, and fox are typically harvested through trapping (Parlee et al. 2005a).

Spring

In addition to caribou, the Denesǫłıne hunt geese, ducks, northern pintail, scaup and white-winged scoter, and fish for whitefish, lake trout, and herring in the spring (Parlee et al. 2005a)

Summer

By the end of the summer, caribou would begin returning to K'ai Tué and Tla Kai Tué areas, beginning with the fat bulls, followed by the cows and calves. Calfless cows travel alone. The fat bulls were the ideal harvest, especially before the beginning of the rut when they become thin and etsen (smelly with an unpleasant taste). Any extra meat harvested during the late summer migration would be cached away for others to use, or for later use (Parlee et al. 2005b).

Land Use Sites

Cultural or Spiritual Sites

Place names provide a lot of information about land use, culture and spirituality. Sacred sites to the Denesǫłıne include tsankui theda (the Old Lady of the Falls) on the Lockhart River, Beaver Dam and Hachoghe's Shovel on Edacho Tué which are associated with traditional stories and legends as well as physical features on the landscape such as kahdele (areas of open water) and eda (narrows) that are important for the wellbeing of both wildlife and humans.

Camps were not established at eda because they are considered sacred. Instead, camps would be located some distance away and offerings given to the crossing for protection and respect. Such demonstrations of respect are a means of limiting the "uncertainty associated with caribou movements by limiting the impact of small-scale human disturbance" (Parlee 2005b: 34).

Camps and Cabins

Prior to the fall hunt, families organized themselves into hunting parties at camps established along the northern shores of Great Slave Lake where fish and moose could be captured. Once in the barrenlands, travelling hunters would periodically reconnect at familiar camping locations in areas where resources such as wood and water were available and where caribou were known to have passed in previous years. The best camps were those which provided a good lookout of the surrounding area, some shelter from the elements, good drinking water, and both dry and green wood for fuel and camp construction. Periodic meetings at these strategic locations provided the opportunity for hunters to share food and information about caribou movements (Parlee et al. 2005b).

Similarly, hunters would situate themselves on high points of land near eda to wait, watch and listen for approaching caribou. These k'a (waiting places) provided a good view of the surrounding area and often contained large boulders or erratics behind which the hunters could hide. Where large boulders were not present, hunting blinds would be constructed using smaller stones and rocks. Camps were not established at these crossings because they are considered sacred. Instead, camps would be located some distance away and offerings given to the crossing for protection and respect (Parlee et al. 2005b).

Depending on where the caribou were found in a given year, families would remain in existing camps or move to other camps to join families nearer the hunt. By the end of the fall, many families would often congregate for the winter. Camps were established near the treeline where wood was available and near where caribou would overwinter (Parlee et al. 2005b).

According to the Denesǫłıne, the identification of traditionally used areas can be determined by the availability of wood (green and dry), water, vegetation (traditional plants and berries), animal denning habitat, and shelter. Common signs of previous use include hunting blinds and camp remains (Parlee et al. 2005a).

Travel Routes

Countless trails lead into the barrenlands from the shores of Great Slave Lake but the main trails used by the Denesǫłıne are known as That a Deze, Des Delgahi Deze, Des Tsel Che Deze, and Desnethche. While hunting in the barrenlands, hunters could cover 10 to 20 kilometres (km) per day depending on the distribution and movements of the caribou and location of familiar camping locations. Whenever possible, hunters traveled along lake shorelines, eskers, and other heights of land which allowed for easier movement and increased the likelihood of finding game (Parlee et al. 2005b).

Knowledge and Use of Resources

Denesǫłıne elders distinguish between edo (natural change) and edo aja (unnatural change) in the environment. These changes can have effects on the health of the land and waters, the health and populations of wildlife, and the health and wellness of people. Edo aja and the feeling of helplessness associated with the changes have been identified as significant sources of anxiety in communities since the increased development of the lands for mining and because of changes in water and vegetation as a result of climate change (Parlee et al. 2005a).

The body fat of the harvested animals provide an indication of species health for all harvested animals. Questions harvesters will ask themselves as they assess the health of hunted and captured wildlife include: are the animals a normal size and shape?; is the weight proportionate to the size?; are there any deformities?; are the animals fat or skinny?; are there any cuts or parasites on the organs?; is the flesh soft or firm?; what is the color of the meat?; how does the meat taste? (Parlee et al. 2005a).

Similarly, the Denesǫłıne recognize and communicate many ecological indicators of health for the lands and water on which they depend: is game abundant?; have populations changed?; have uncommon species been seen?; have some species disappeared?; does the land look or smell clean?; has the ground or vegetation been disturbed?; are the water levels changing?; is travel becoming more difficult as a result of lowering water levels?; have portages gotten longer?; has the water changed color?; does water turn black in tea?;does the water taste different? If the annual range of wildlife has changed it is a sign that something in the region has caused that change (Parlee et al. 2005a).

Land and Water

Nene (land, a word similar to the concept of ecosystem) is a Chipewyan word reflecting the interconnectedness of the physical and spiritual worlds including humans and the rest of the environment. It reflects the human and wildlife on productive lands and clean waters for sustaining healthy populations (Parlee et al. 2005a).

Kahdele (areas of open water) are important to both wildlife and people travelling through the barrenlands. Fish benefit from the higher levels of productivity in open water areas while birds and other wildlife depend on these locations for food during the winter when food is scarce and during the spring migrations. The loss of such areas could have impacts on the entire nene (Parlee et al. 2005a).

Wildlife

Caribou

Caribou are the most important source of traditional food for the Denesǫłıne of Lutsel K'e, driving traditional land use patterns and social organization (Parlee et al. 2005a).

Some of the major fall caribou crossings known to the Denesǫłıne area found on Tha K'ai Tué, Tla Kai Tué, and Edacho Tué. Caribou are known to be good swimmers but will follow the shoreline of lakes until they find narrow points (eda) to cross. Like the funnel for caribou movement created by eda, other physical landscape features, such as vegetation and boulders, could also be used to predict caribou movement. Caribou are most likely to be found on thai nen (flat land), sheth (hills), or thai t'ath (eskers), and in areas vegetated with foods such as caribou lichen. They are less likely to be found among na yaghe (boulder fields), ni horelghus nen (hummocky lands), or elel (very wet areas). Along eda, hunters would wait, watch and listen for approaching caribou. Here, they could observe the health of the herds by making note of the size and composition of the groups, the direction of their movement, their behavior and overall body condition (Parlee et al. 2005a,b).

Environmental conditions such as insects would sometimes affect caribou health and signs of stress in animals would help the Denesǫłıne decide which animals to harvest. The healthier bulls were the ideal harvest, identified by their wide chests, hidden tail, thick coat, and large antlers. The absence of caribou in some years was often attributed to a lack of respect shown for the animals (Parlee et al. 2005a,b). Traditionally, all parts of a caribou should be used: "In the olden days, they didn't even throw away caribou bones. They used the bones for fat… Everything was kept from the caribou" (Parlee et al. 2005b: 34).

Other factors affecting caribou movements include human disturbances and forest fires. Roads are of particular concern for caribou movement and several Denesǫłıne have identified the Misery Road at Ekati as being of particular concern: "The road is like a corral or wall, blocking the caribou from moving west through the area (Parlee et al. 2005b: 34). Some Denesǫłıne have recommended that if the road must be constructed, they should be built closer to the ground so that the caribou can cross at any location (Parlee et al. 2005b). When caribou are seen during the fall migration with injured or broken legs, the Denesǫłıne attribute the injuries to the impacts of roads and other structures along the migration route (Parlee et al. 2005a).

Other Animals

During the winter, fur-bearers such as wolverine, wolf, and fox are trapped. The Denesǫłıne hunt geese, ducks, northern pintail, scaup, and white-winged scoter in the spring. The Denesǫłıne harvest fish including whitefish, lake trout, and herring in the spring and summer. Like caribou, body fat and other characteristics of the animals harvested provide an indication of species health (Parlee et al. 2005a).

Plants

Wood

The small pockets of black spruce and thickets of willow and birch found in ts'u dzaii (valleys) and ts'u dza aze (along rivers) in the barrenlands provided a significant source of fuel for travelling hunters and are often a sign of a good camping or meeting place (Parlee et al. 2005a,b). Trees were also used to protect and mark the location of cached meat: "Small trees would be cut down to mark the spot because of the severe winter with its blizzards and bad weather" (Parlee et al. 2005b: 33).

Berries and Medicinal Plants

Berries, such as cranberries and blueberries and plants, such as Labrador tea and spruce gum, are harvested in the summer (Parlee et al. 2005a).

Lichen and Moss

The availability of caribou lichen, caribou food, could be used as a predictor for where caribou might be during their migration. In addition to physical limitation to travel, the availability of food was a limiting factor for caribou movement (Parlee et al. 2005b). Elders have identified concerns with the increased frequency of fires in recent years and the impacts fire have on lichen: "If the lichen burns, it will take over 100 years for the plants to grow back… There never used to be so many forest fires" (Parlee et al. 2005b: 34).

Moss was used to help preserve cached caribou meat: "Some of the meat would be cached under the moss and it freezes there" (Parlee et al. 2005b: 33).

References:

Parlee B, Manseau M, Lutsel K'e Dene First Nation. 2005a. Understanding and communicating about ecological change: Denesoline indicators of ecosystem health. In: Breaking Ice: Renewable Resource and Ocean Management in the Canadian North. Ed: F. Berkes et al. Univ Calgary Press, Calgary AB. P. 165-182.

Parlee B, Manseau M, Lutsel K'e Dene First Nation. 2005b. Using Traditional Knowledge to adapt to ecological change: Denesoline monitoring of caribou movements. In Arctic: Journal of the Arctic Institute of North America. 58:1. Ed: K.M. McCullough et al. Univ Calgary Press, Calgary AB. P. 26-37.

DOMINION DIAMOND

Information Request Number:	DAR-IEMA-IR-19
Source:	Independent Environmental Monitoring Agency: Kevin O'Reilly
Subject:	Cumulative Effects
DAR Section(s):	17.2.3

Preamble:

For Caribou, Grizzly Bear and Wolverine, the Lupin and Jericho mines are listed under future projects (column 3). If these mines are currently under care and maintenance, it would seem that they should also be listed under Base Case since they have open pits, roads and exposed tailings ponds.

Request:

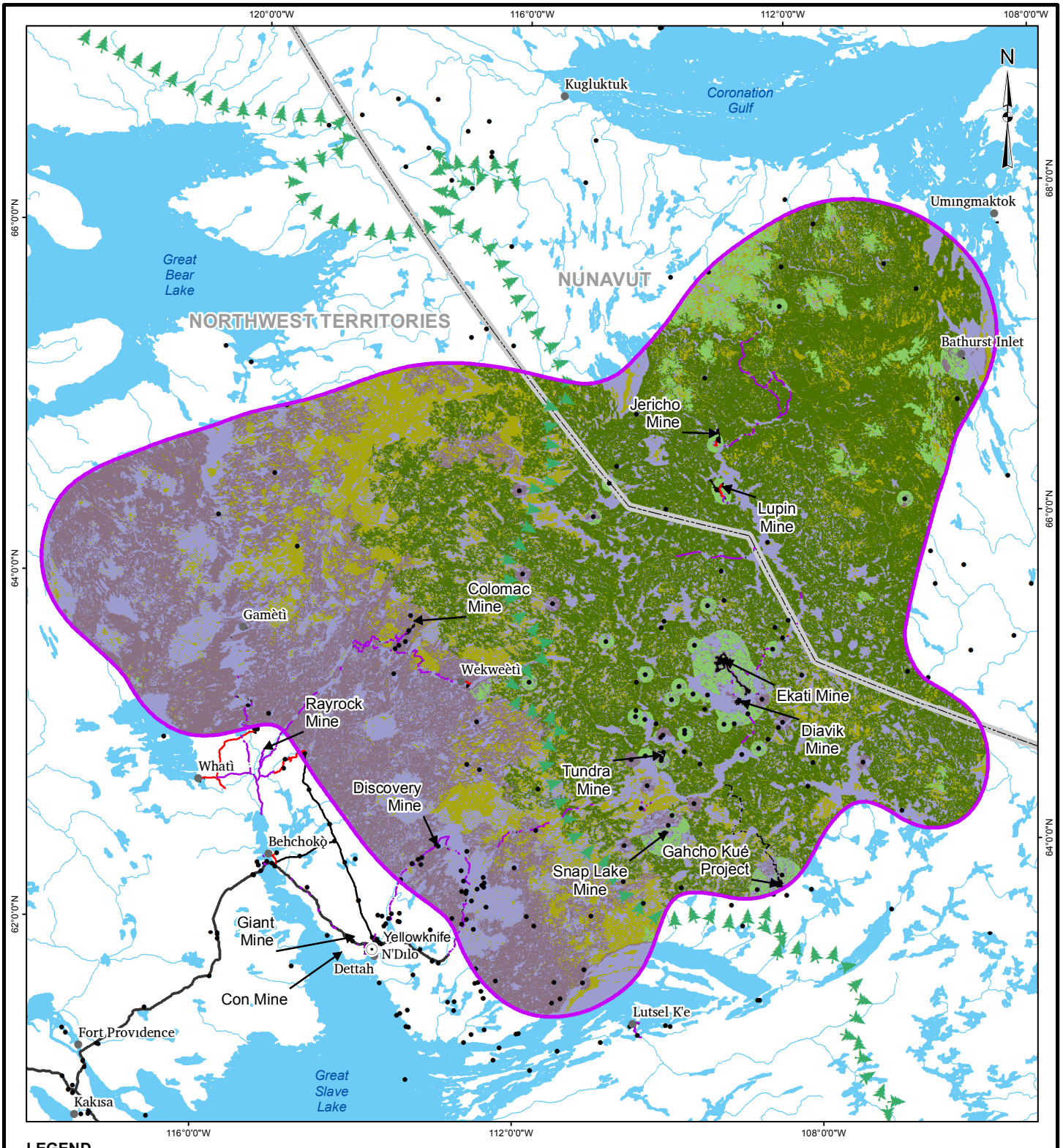
DDEC should assess cumulative effects incorporating the Lupin and Jericho mines within the Base Case.

Response:

For caribou, grizzly bear, and wolverine, the Lupin and Jericho mines were included in the Base Case with associated zones of influence in the Developer's Assessment Report (DAR). Examples from the DAR of 2014 Baseline Condition seasonal ranges for caribou (Map 13A-2), grizzly bear (Map 13C-19), and wolverine (Map 13C-11) are included in this response which show the inclusion of the Lupin and Jericho mines in the 2014 Baseline Condition, and in the cumulative effects analysis of these valued components (Attachment 19-1). Additional maps of 2014 Baseline Condition for each caribou, grizzly bear and wolverine seasonal range are presented in Appendices 12A and 13C of the DAR.

The Lupin and Jericho mines were also listed as reasonably foreseeable future developments to manage the uncertainty that these projects may become operational again during the life span of the Jay Project (i.e., Lupin and Jericho projects were carried through the Reasonably Foreseeable Development Case so that effects would not be underestimated).

ATTACHMENT 19-1



LEGEND

- TERRITORIAL CAPITAL
- POPULATED PLACE
- HIGHWAY
- ALL-SEASON ROAD
- PORTAGE
- TRANSMISSION LINE
- TERRITORIAL/PROVINCIAL BOUNDARY
- TREELINE
- WATERCOURSE
- WATERBODY
- DEVELOPMENT
- DEVELOPMENT
- CARIBOU EFFECTS STUDY AREA (SPRING RANGE)

HABITAT QUALITY

- HIGH
- GOOD
- LOW
- POOR
- NIL

75 0 75

SCALE 1:3,750,000 KILOMETRES

REFERENCE

WATER OBTAINED FROM ATLAS OF CANADA
NATURAL RESOURCES CANADA, CENTRE FOR TOPOGRAPHIC INFORMATION, 2012
PROJECTION: CANADA LAMBERT CONFORMAL CONIC

DOCUMENT

DEVELOPER'S ASSESSMENT REPORT

PROJECT

DOMINION DIAMOND

JAY PROJECT
NORTHWEST TERRITORIES, CANADA

TITLE

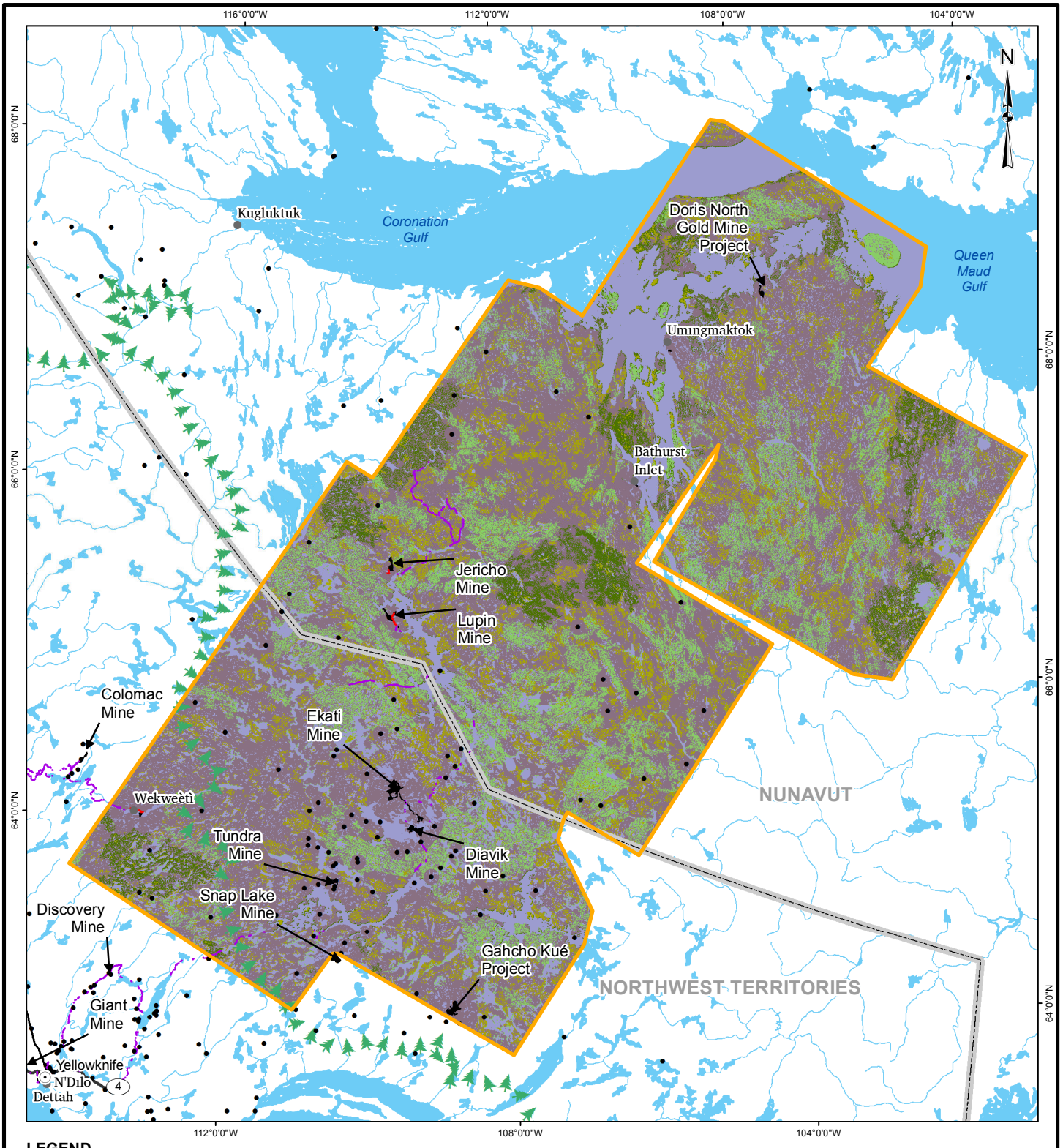
HABITAT QUALITY FOR CARIBOU IN THE SPRING RANGE: 2014 BASELINE CONDITION

Golder Associates

PROJECT	13-1328-0041		FILE No. DAR_Wild_071_GIS	
DESIGN	LD	15/07/14	SCALE AS SHOWN	REV. 0
GIS	ANK	01/10/14		
CHECK	JR	01/10/14		
REVIEW	LD	01/10/14		

MAP 12A-2

G:\CLIENTS\DOMINION\DDEC Jay and Lynx Projects\Figures\13-1328-0041 Jay & Lynx EA\Wildlife\DAR\DAR_Wild_071_GIS.mxd



LEGEND

- TERRITORIAL CAPITAL
- POPULATED PLACE
- HIGHWAY
- ALL-SEASON ROAD
- PORTAGE
- TRANSMISSION LINE
- TERRITORIAL/PROVINCIAL BOUNDARY
- TREELINE
- WATERCOURSE
- WATERBODY
- DEVELOPMENT
- DEVELOPMENT
- EFFECTS STUDY AREA

HABITAT SUITABILITY

- HIGH
- GOOD
- LOW
- POOR
- NIL

REFERENCE

WATER OBTAINED FROM ATLAS OF CANADA
NATURAL RESOURCES CANADA, CENTRE FOR TOPOGRAPHIC INFORMATION, 2012
PROJECTION: CANADA LAMBERT CONFORMAL CONIC

DOCUMENT

DEVELOPER'S ASSESSMENT REPORT

75 0 75
SCALE 1:3,750,000 KILOMETRES

PROJECT
DOMINION DIAMOND
JAY PROJECT
NORTHWEST TERRITORIES, CANADA

TITLE
HABITAT SUITABILITY FOR GRIZZLY BEAR IN THE SPRING: 2014 BASELINE CONDITION

Golder Associates

PROJECT		13-1328-0041	FILE No. DAR_Wild_043_GIS	
DESIGN	LD	15/07/14	SCALE AS SHOWN	REV. 0
GIS	ANK	01/10/14		
CHECK	LD	01/10/14		
REVIEW	LD	01/10/14		

MAP 13C-19

G:\CLIENTS\DOMINION\DDEC Jay and Lynx Projects\Figures\13-1328-0041 Jay & Lynx EA\Wildlife\DAR\DAR_Wild_043_GIS.mxd



LEGEND

- TERRITORIAL CAPITAL
- POPULATED PLACE
- HIGHWAY
- ALL-SEASON ROAD
- PORTAGE
- TRANSMISSION LINE
- TERRITORIAL/PROVINCIAL BOUNDARY
- TREELINE
- WATERCOURSE
- WATERBODY
- DEVELOPMENT
- DEVELOPMENT
- EFFECTS STUDY AREA

HABITAT SUITABILITY

- HIGH
- GOOD
- LOW
- POOR
- NIL

REFERENCE

WATER OBTAINED FROM ATLAS OF CANADA
NATURAL RESOURCES CANADA, CENTRE FOR TOPOGRAPHIC INFORMATION, 2012
PROJECTION: CANADA LAMBERT CONFORMAL CONIC

DOCUMENT

DEVELOPER'S ASSESSMENT REPORT

75 0 75
SCALE 1:3,750,000 KILOMETRES

PROJECT
DOMINION DIAMOND
JAY PROJECT
NORTHWEST TERRITORIES, CANADA

TITLE
HABITAT SUITABILITY FOR WOLVERINE IN THE SPRING TO AUTUMN: 2014 BASELINE CONDITION

Golder Associates

PROJECT		13-1328-0041	FILE No. DAR_Wild_035_GIS	
DESIGN	LD	15/07/14	SCALE AS SHOWN	REV. 0
GIS	ANK	07/10/14	MAP 13C-11	
CHECK	LD	07/10/14		
REVIEW	LD	07/10/14		

G:\CLIENTS\DOMINION\DDEC Jay and Lynx Projects\Figures\13-1328-0041 Jay & Lynx EA\Wildlife\DAR\DAR_Wild_035_GIS.mxd

DOMINION DIAMOND

Information Request Number: DAR-IEMA-IR-20

Source: Independent Environmental Monitoring Agency: Kevin O'Reilly

Subject: Cumulative Effects

DAR Section(s): 17.9.1

Preamble (IEMA):

For the predicted cumulative impacts on water birds, habitat loss and sensory disturbance are the impacts considered. However, based on past experience, this should be supplemented with direct mortalities from accidental by-catch during fish-out of the diked Jay area. In 2007, a red-throated loon was killed when tangled in gill nets in Kodiak Lake. It is not clear to what lessons have been learned from water bird mortalities from fish-outs and what mitigation measures may have developed to avoid similar occurrences.

Request (IEMA):

DDEC should document and discuss direct water bird mortalities from previous fish-outs, lessons learned and mitigation measures to prevent reoccurrences. Incidental mortalities during fish-outs should also be included in the cumulative effects assessment on water birds.

Response:

Incidental mortality of water birds during fish-outs at mine sites was assessed as a secondary pathway in the Developer's Assessment Report (DAR; Section 13.3.2.2.2, page 13-92) and acknowledged in the Conceptual Fish-Out Plan provided with the DAR (Appendix 9B). The pathway was predicted to result in a measurable minor change to the risk of mortality to diving birds from fish-outs, but would have a negligible residual effect on the populations relative to the Base Case and is not expected to contribute to effects of other existing, approved, or reasonably foreseeable projects to cause a significant effect (Section 13.3.1 of the DAR).

The fish-out within the diked area of Lac du Sauvage will require a *Fisheries Act* Authorization from Fisheries and Oceans Canada, which will be part of permit applications following the environmental assessment review. To avoid the incidental take of birds protected by the *Migratory Birds Convention Act* during the fish-out, Dominion Diamond will develop a diving bird mitigation strategy with Environment Canada, which will be included in the final fish-out plan. Lessons learned from fish-outs at Ekati, Diavik, and Gahcho Kué will be considered and incorporated into the development of the diving bird mitigation strategy.

DOMINION DIAMOND

Information Request Number: DAR-IEMA-IR-21

Source: Independent Environmental Monitoring Agency: Kevin O'Reilly

Subject: Reclamation Cost Estimate

DAR Section(s): Appendix 3B

Preamble (IEMA):

The Terms of Reference state that 'the likely effectiveness of proposed mitigation and management plans that are demonstrably viable both economically and technically while providing sufficient information and analysis for the Review Board and parties to analyze and evaluate the environmental acceptability of the proposed development' (pg. 44). Since the Closure Plan is the key mitigation strategy for the post-closure period, information that demonstrates the Plan does not threaten the economic viability of the Project should be provided.

Request (IEMA):

DDEC should provide an initial estimate of the costs of reclamation and closure, including post-closure monitoring and upkeep, to a sufficient level of detail that can demonstrate the measures proposed will not threaten the economic feasibility of the project.

Response:

The Developer's Assessment Report (DAR) describes the Conceptual Closure Plan for the Ekati Mine with Jay Project (Appendix 3B). The Conceptual Closure Plan demonstrates that the Ekati Mine with Jay Project can be reclaimed according to the objectives and methods already established for the Ekati Mine through the Interim Closure and Reclamation Plan (ICRP) as approved by the Wek'eezhii Land and Water Board (WLWB). The effect of the Jay Project on the ICRP is the addition of some new reclamation activities and the reduction in scope of some existing reclamation activities (which are described in the DAR). For example, flooding of the diked area of Lac du Sauvage is a new activity, while the volume requirement for flooding of the Panda and Koala pits is reduced in scope due to the partial infilling with fine processed kimberlite; as a result, the change in the overall work requirements for the pit back-flooding program is largely neutral.

The net financial effect of the offsetting changes to individual reclamation activities is that the overall cost for closure and reclamation of the Ekati Mine is expected to remain effectively the same as the current estimate. Closure and reclamation was included in the economic assessment of the Jay Project as described in the DAR (DAR Appendix 14A). The economic assessment of the Jay Project quantitatively demonstrates that the costs for closure and reclamation do not compromise the economic viability of the Ekati Mine with Jay Project.

The Dominion Diamond Ekati Corporation (Dominion Diamond) most recent conceptual estimate of costs for closure and reclamation of the Ekati Mine with the Jay Project is presented in Dominion Diamond's March 2015 update to its "NI 43-101 Technical Report". The Technical Report represents Dominion Diamond's public reporting to the investment community by Qualified Persons, according to regulatory

criteria, and is publicly available (Dominion Diamond 2015). The Technical Report describes a conceptual closure cost (including long term monitoring) that is effectively the same as the current cost ($251 million with Jay Project versus $254 million currently). This determination is made at a level of detail consistent with the stage of development and approval of the Jay Project.

Dominion Diamond anticipates and has proposed that the ICRP should be updated through the WLWB as part of its requirements following regulatory approval of the Project. This approach ensures that the ICRP update accurately reflects the Project as approved through environmental assessment and regulatory permitting. Similarly, any necessary changes to reclamation security would be determined by the WLWB at that time.

References:

Dominion Diamond (Dominion Diamond Ekati Corporation). 2015. Ekati Diamond Mine, Northwest Territories, Canada, NI 43-101 Technical Report. Available at: http://www.ddcorp.ca/docs/default-source/43-101/2015-ekati-diamond-mine-technical-report.pdf?sfvrsn=9 Accessed: March 2015.

DOMINION DIAMOND

Information Request Number:	DAR-IEMA-IR-22
Source:	Independent Environmental Monitoring Agency: Kevin O'Reilly
Subject:	Jay Waste Rock Storage Area (WRSA) Seepage and Contingency
DAR Section(s):	3.5.6, 16.4, Appendix 3B

Preamble (IEMA):

The Jay WRSA will be as close as 100 m from the shore of Lac du Sauvage and there will be no separation of PAG rock within the WRSA to allow for potential seepage away from the shore. DDEC is relying on permafrost encapsulation to prevent acid generation in the Jay WRSA. As experience with the Misery and Fox dumps has shown, freezing may not occur as predicted. There does not appear to be any information presented on thermal monitoring of the Jay WRSA. Closure plans should consider the 'worst case' wherein internal freezing of the Jay dump (which, like Misery, contains significant portion of metasediments) does not occur, and present an adaptive management plan to deal with drainage that may require treatment prior to discharge. There does not appear to be any contingency measures outlined for potential seepage should encapsulation fail either in design or over the long-term with climate change.

Request (IEMA):

DDEC should provide analysis of the potential effects of climate change on the performance of the Jay WRSA. DDEC should indicate how it intends to monitor thermal performance of the Jay WRSA and how monitoring data will be used for adaptive management that includes how seepage and run-off will be monitored, what triggers and thresholds will be used, and what mitigation or treatment methods will be applied if dumps fail to freeze. DDEC should indicate what the contingencies are for seepage from the Jay WRSA should encapsulation fail as a result of design or over the long-term with climate change.

Response:

The Jay Project (Project) waste rock storage area (WRSA) does not need to be frozen to maintain physical stability or for geochemical management; however, a frozen condition within the WRSA is beneficial and will be promoted.

The ground within the footprint and surrounding the proposed Jay WRSA is currently permafrost with only a shallow active layer that thaws annually during the summer and re-freezes during the winter. The Jay WRSA is anticipated to freeze by permafrost aggradation into the pile. Permafrost aggradation into the WRSA can be promoted by placement of a basal layer of granitic rock, and by creating stepped side slopes, which are practices that have evolved from site-specific experience at the Ekati Mine. The 5-m-thick granitic cover will be placed on an ongoing basis on the sides and upper surface of the WRSA rather than waiting until final reclamation.

Recent (2014) thermal modelling for the design of the Pigeon WRSA at the Ekati Mine (Waste Rock and Ore Storage Management Plan [WROMP] Vers. 4.1) was provided to the Wek'èezhìi Land and Water Board (WLWB) as part of the Water Licence requirements for the Pigeon WRSA Design (Dominion

Diamond 2014). This thermal modelling is also relevant for the design of the Jay WRSA. The thermal modelling validated that frozen conditions can be maintained within the pile below the 5 m granite cover under a 100-year climate change scenario. The climate change scenario was described as follows (excerpted from Section 4.5 of Tetra Tech EBA 2014):

> *Global warming was integrated into the model to help predict long-term thermal effects. Environment Canada's 2009 report from Adaptation and Impacts Research Section (AIRS) (Environment Canada 2009) reviewed the most recent modelling assessment for the Arctic. An ensemble approach (multi-model means/medians) was adopted by AIRS reduce the uncertainty associated with any individual model. Model validation over the historical period from 1971 to 2000 was first used to identify those models which best reproduced the mean annual temperature of this period against the National Centre for Environmental Prediction global gridded dataset. Subsequently, only the four best-agreement models were used to produce the final ensemble projections. The four best-ranking models within each sector were then used as an ensemble to produce projections of temperature changes in the 2020s, 2050s, and 2080s for both the A1B (balanced emission emphasis), and A2 (high emission) scenarios. CSA (2010) adopted the climate change projections from Environment Canada (Environment Canada, 2009). A moderate A1B greenhouse gas emission scenario was adopted in the thermal analyses, which represents a reasonably conservative case.*
>
> *Ekati (64°43`N 110°37`W) is located in Arctic Sector C1 as classified in Environment Canada (Environment Canada, 2009) and CSA (CSA, 2010). The predicted mean temperature changes from 1971 to 2000 baseline under the moderate greenhouse gas emission scenario at the Arctic Sector C1 (CSA, 2010) are presented in Table 4. These rates of the predicted temperature change were applied in the thermal analyses.*

Table 4 Predicted Seasonal Air Temperature Changes in Arctic Sector C1 (CSA 2010)

Period	Predicted Seasonal Air Temperature Changes from 1971-2000 Baseline under the Moderate (A1B) Green-house Gas Emission Scenario (°C)			
	Winter	Spring	Summer	Autumn
2011 to 2040	1.9	1	0.8	1.3
2041 to 2070	4.2	2.1	1.8	2.7
2070 to 2100	6.2	2.8	2.4	3.4

Source: Tetra Tech EBA 2014

Thermistors will be installed in the Jay WRSA after completion of the pile to monitor temperatures in the pile foundation and within the pile itself.

Operational mixing of potentially acid generating (PAG) and non-potentially acid generating (non-PAG) mine rock (on top of a basal layer of granite) will mitigate the acid generation potential of PAG rock in the Jay WRSA. Co-deposition of PAG and non-PAG rock during waste rock deposition minimizes the potential for formation of zones of PAG rock with a greater susceptibility for acid generation. Co-deposition of waste rock from the Jay Pit on an "as-mined" basis during operations is possible because of the simultaneous production of both metasediment and granite, with a predominance of granite, throughout the mine life.

According to the guidance in the Mine Environment Neutral Drainage prediction manual (MEND 2009), waste rock with greater than two times more neutralization potential (NP) than acid potential (AP) is generally regarded to be non-PAG. The mine plan was used to calculate the NP/AP ratio of the waste rock material mined from the Jay Pit on a quarterly basis. The purpose of this evaluation was to confirm that an NP/AP ratio greater than 2 can be achieved based on the amount of each rock type (metasediment, granite, and overburden) mined each quarter. An NP/AP ratio of at least 2 was achieved over the life of mine.

The assumption that the Jay WRSA would not become acid generating was carried forward into the Developer's Assessment Report (DAR) water quality predictions. Constant values were assigned to Jay WRSA seepage and runoff during spring melt (i.e., freshet) and the summer period, since these are the only periods when drainage from the facility is expected to occur. Seepage water quality monitoring results from 2001 to 2004 collected from the Misery WRSA during the months of June through September were used to represent the seepage and runoff quality from the Jay WRSA. Use of these data is considered conservative since the Misery WRSA contains a higher proportion of PAG material compared to other WRSAs located at the Ekati Mine operations. The rock types stored in the existing Ekati Mine WRSAs are the same as proposed for the Jay WRSA; however, there is variability in their composition ratios and placement methods. Details of the model inputs used to represent the quality of the Jay WRSA runoff quality are provided in Section 8E3.4 of Appendix 8E of the DAR.

Flow estimates from the Jay WRSA used in the site water balance model did not consider the development of permafrost in the pile, and application of the WRSA chemical profile to this flow provides a conservative estimate of the load from this facility. Under the assumption that the WRSA will not become acid generating, the model case provided in the DAR conceptually represents a model case for no development of permafrost in the Jay WRSA. Projected water quality constituent concentrations in Lac du Sauvage and Lac de Gras, accounting for operational, closure, and post-closure discharges from the Project that includes runoff from the Jay WRSA, indicate the Project is not expected to have a significant adverse effect to surface water quality.

It is recognized that water quality modelling is based on several inputs, all of which have inherent uncertainty. Dominion Diamond will develop a robust monitoring plan to validate water quality predictions and proactively apply adaptive management strategies, if required. Following the existing Ekati Mine WROMP Vers. 4.1, seepage surveys of all WRSAs and ore stockpiles at the Ekati Mine are conducted twice a year (during spring freshet, and again in late summer or fall before freeze-up), in accordance with the requirement of the Water Licence. The testing of seepage chemistry is designed to detect changes that may affect the receiving environment. The Jay WRSA will be added to the Ekati WROMP and will be included in these seepage surveys.

If monitoring identifies any seeps as 'potentially problematic', the frequency of monitoring will increase where necessary and, if required, seepage water will be collected and managed. The objectives of seepage monitoring include detection of undesirable changes in chemistry and unacceptable high concentrations of specific constituents.

The Ekati Mine has an adaptive management process in place for the existing WRSAs that is described in Section 7.7 of the WROMP Ver. 4.1; this adaptive management process will also apply to the Jay WRSA. The adaptive management strategy outlined in the WROMP for the Ekati Mine includes the following components:

- identification of issue, verification of trigger, and development of a response plan;
- additional studies to determine the extent of the impact of seepage (if any), and modification of the WROMP and seepage management program; and,
- implementation of modified programs, and design / construction of mitigation structures and facilities (if required).

At the time of closure of the Jay WRSA, monitoring data of seepages and runoff will have been collected for approximately 10 years at the Jay WRSA and for approximately 25 years at the other Ekati Mine WRSAs. This long-term monitoring will provide valuable data and insight into water quality trends, if they occur.

References:

Dominion Diamond (Dominion Diamond Ekati Corporation). 2014. Ekati Diamond Mine Waste Rock and Ore Storage Management Plan. Version 4.1, May 2014.

CSA (Canadian Standards Association). 2010. Technical Guide – Infrastructure in Permafrost: A Guideline for Climate Change Adaptation. CSA Reference Number: Plus 4011-10.

Environment Canada. 2009. Arctic Ensemble Scenarios, 2009. Prepared by Adaptation and Impacts Research Section (AIRS) Climate Research Division, Environment Canada, 2009, 26 p.

MEND (Mine Environment Neutral Drainage). 2009. Prediction Manual for Drainage Chemistry from Sulphidic Geologic Materials. MEND Report 1.20.1. December 2009.

Tetra Tech EBA Inc. 2014. Pigeon Pit Waste Rock Storage Area Design – Revision 1, Ekati Diamond Mine, NT. April 2014.

DOMINION DIAMOND

Information Request Number: DAR-IEMA-IR-23

Source: Independent Environmental Monitoring Agency: Kevin O'Reilly

Subject: Waste Rock Storage Area Cover

DAR Section(s): Appendix 3B (Section 5.4.1.2)

Preamble (IEMA):

A 5 m cap of non-PAG granite is proposed to cover the Jay WRSA at closure. No estimate of the volume of rock is provided, or where/how it will be stored during operations.

Request (IEMA):

DDEC should provide Information to demonstrate that there are adequate supplies of NAG, where it will be stored during operations, and that it will remain accessible for use in reclamation.

Response:

The estimated volume of non-potentially acid generating (non-PAG) waste rock required to construct the 5 metre (m) cover on the Jay waste rock storage area is 12,300,000 cubic metres (m^3). The total volume of granite (non-PAG) waste rock that will be excavated from the Jay Pit is estimated to be 75,819,000 m^3.

The 5 m non-PAG rock cover around the perimeter of the pile will be progressively placed, as will the top cover as portions of the pile reach the final geometry. As 90 percent (%) of the waste rock produced in the last four years (2026 to 2029) of mining will be non-PAG rock, portions of the pile are anticipated to have more than the required 5 m of non-PAG cover.

Table 3.5-4 of the Project Description (Section 3 of the Developer's Assessment Report), and included below as Table 23-1, for reference, presents the estimated annual schedule of waste rock production from the Jay Pit. Due to the geometry of the Jay pipe, granite (non-PAG rock) and metasediment (potentially acid generating rock) will be produced simultaneously between 2020 and 2027. Little to no metasediment is anticipated in the last two years of operation (Table 23-1).

Table 23-1 Jay Annual Schedule of Waste Rock Production

By End of Year	Mass Overburden (tonnes)	Mass Granite (tonnes)	Mass Metasediment (tonnes)	Percentage of Metasediments to Granite (%)
2020	12,831,000	21,158,532	7,888,476	37
2021	-	20,609,209	11,057,541	54
2022	-	22,113,574	10,063,454	46
2023	-	18,640,257	7,170,387	39
2024	-	12,808,764	4,150,368	32
2025	-	10,959,372	2,441,854	22
2026	-	9,300,616	572,299	6
2027	-	6,037,945	27,018	0.4

Table 23-1 Jay Annual Schedule of Waste Rock Production

By End of Year	Mass Overburden (tonnes)	Mass Granite (tonnes)	Mass Metasediment (tonnes)	Percentage of Metasediments to Granite (%)
2028	-	3,425,750	-	0
2029	-	804,986	-	0
Total	**12,831,000**	**125,859,005**	**43,371,397**	**34**

- = not applicable;% = percent.

Due to the following points regarding the mine waste rock schedule, segregation and stockpiling of non-PAG waste rock during operations will not occur:

- There is a large quantity of non-PAG waste rock compared to PAG waste rock;
- Non-PAG waste rock is available on an annual basis; and,
- 90% of the waste rock produced in last four years is non-PAG, which will be more than adequate to complete construction of the 5 m cover.

DOMINION DIAMOND

Information Request Number: DAR-IEMA-IR-24

Source: Independent Environmental Monitoring Agency: Kevin O'Reilly

Subject: Caribou Aerial Survey Data

DAR Section(s): 12.2.2.1 and Annex VII

Preamble (IEMA):

Wildlife baseline report Table 1.5-1 (pg. 1-8) states Ekati conducted "aerial surveys to determine the abundance and distribution of caribou" from 1998 to 2009, but Section 2.1.1.1.1 (pg. 2-1) states "Caribou aerial surveys were completed at the Ekati Mine from 1998 to 2009 and 2012". The 2012 Ekati WEMP (Rescan 2013) does not mention aerial surveys. The wildlife baseline report does not provide or refer to data from 2012 (pg. 3-1), and the assessment report shows data only from 1998 to 2009 (Map 12.2-4). The most recent data available should be used in this assessment.

Request (IEMA):

DDEC should clarify whether aerial surveys to determine caribou abundance and distribution around the Ekati mine complex were carried out in 2012, and demonstrate how these data were considered in the caribou assessment.

Response:

Section 2.1.1.1.1 of the Wildlife Baseline Report (Annex VII of the Developer's Assessment Report [DAR]) correctly indicates that aerial surveys for caribou were conducted in 2012. The surveys, in the combined survey area (Map 2.1-1 of Annex VII) were completed by the Diavik Mine from July to October 2012 as reported in their 2012 Wildlife Monitoring Report (DDMI 2013).

As noted in the Preamble to this request, Table 1.5-1 of DAR Annex VII (Wildlife Baseline Report) is missing the 2012 survey year. Table 24-1 below is an updated version of DAR Annex VII Table 1.5-1. The years included for aerial surveys to determine the abundance and distribution of caribou now extends to 2012 under the list of studies conducted by Diavik.

In the Existing Environment Section of Section 12 of the DAR, Table 12.2-1 (page 12-8) indicates that surveys were carried out in the combined Ekati and Diavik study area in 2009 and 2012. The survey transects are shown in Map 12.2-1 (also Wildlife Baseline Report Map 2.1-1). The results of the 2009 surveys are shown in Map 12.2-4, but the results of the 2012 surveys are not included. Map 24-1 is an updated version of DAR Map 12.2-4; it includes the results of the 2012 aerial surveys.

The absence of the 2012 data from Map 12.2-4 did not affect the assessment of the Jay Project. The assessment of the effects of the Jay Project on barren-ground caribou was conducted over the extent of the barren-ground caribou effects study area, which was delineated from radio-collar and GPS (global positioning system) collar data from the Bathurst herd. Aerial survey data were not used directly in the residual effects analyses in the DAR and the absence of the 2012 aerial survey data does not affect the assessment methods, results, or conclusions.

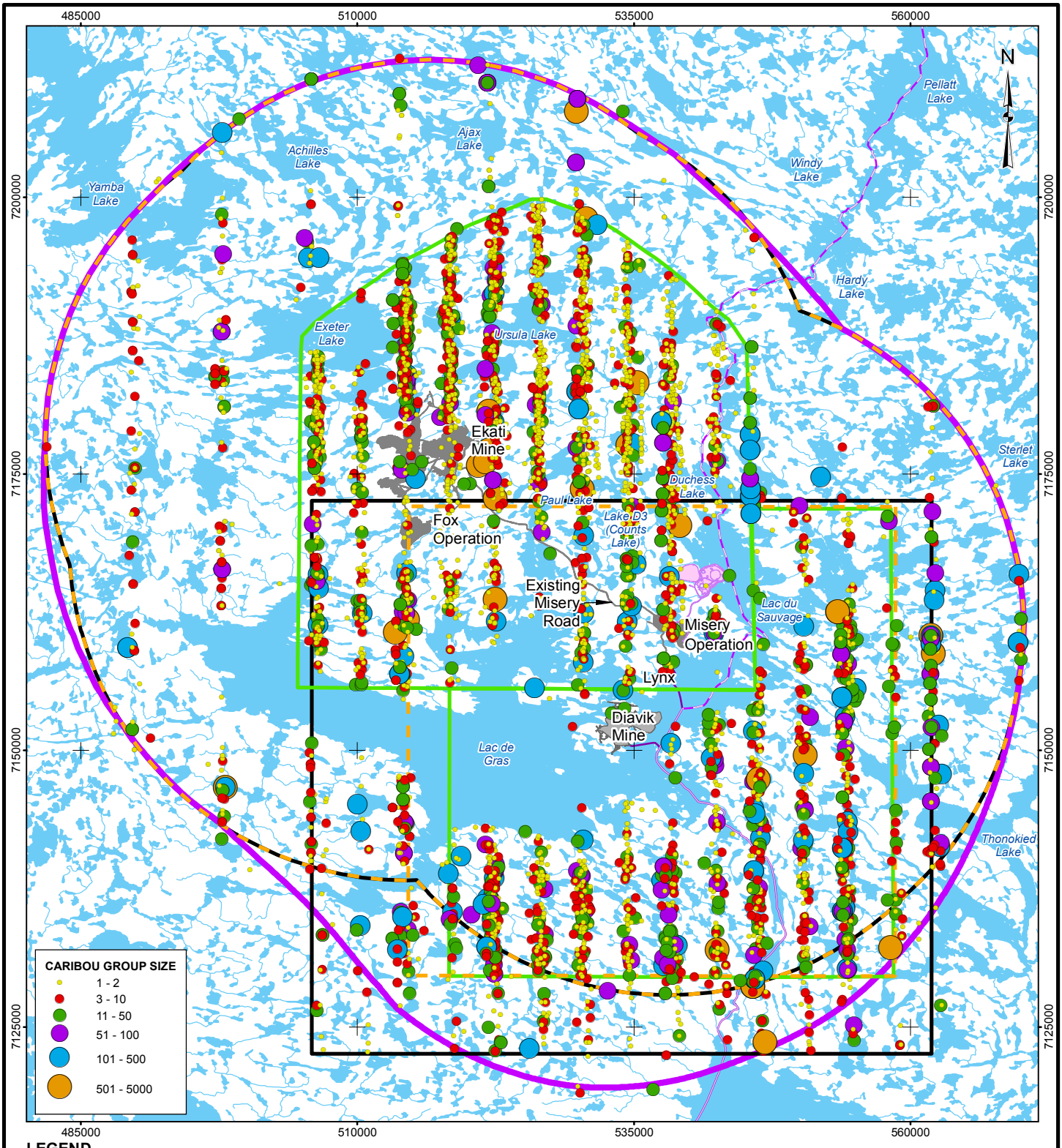
Table 24-1 Summary of Wildlife Monitoring, Surveys, and Studies Completed in the North Slave Region, 1995 to 2013

Originator	Description	Years
Ekati Mine	aerial surveys to determine the abundance and distribution of caribou	1998 to 2009
	caribou remote camera monitoring program	2011 to 2013
	monitoring of caribou behaviour near the mine	1998 to 2013
	monitoring of road permeability to caribou during the northern migration (snow track surveys)	2002 to 2010
	monitoring to: determine whether any caribou are injured by the presence and operation of the Long Lake Containment Facility (LLCF); determine the frequency with which caribou use the LLCF; and, determine group size, group composition, and dominant group behaviours of caribou observed within the LLCF	1999 to 2013
	DNA hair snagging surveys to estimate the abundance, density, and movement of wolverine	2005, 2006, 2010, and 2011
	ground-based surveys to determine the presence of grizzly bear sign within and adjacent to high-quality habitat	2000 to 2008
	DNA hair snagging surveys to estimate the abundance, density, and demographic parameters of grizzly bear	2010 and 2011
	regional DNA hair snagging surveys to estimate the abundance, density, and demographic parameters of grizzly bear	2012 and 2013
	pit wall nest monitoring	2004 to 2013
	North America Breeding Bird Survey	2003 to 2013
	incidental observations of wildlife	2001 to 2013
Diavik Mine	aerial surveys to determine the abundance and distribution of caribou	1995 to 2012
	monitoring of caribou behaviour near the mine	1998 to 2013
	pellet-group count surveys to document the relative use of common vegetation/land cover types by wildlife	1995 and 1996
	ground-based surveys to determine the presence of grizzly bear sign within and adjacent to high-quality habitat	2002 to 2008
	DNA hair snagging surveys to estimate the abundance, density, and demographic parameters of grizzly bear	2010 and 2011
	regional DNA hair snagging surveys to estimate the abundance, density, and demographic parameters of grizzly bear	2012 and 2013
	regional DNA hair snagging surveys to estimate the abundance, density, and demographic parameters of wolverine	2005, 2006, 2010, and 2011
	winter track count surveys to determine the relative use and distribution of wolverine	2003 to 2013
	pit wall/mine infrastructure inspections to determine whether bird nests are present in pit wall or mine infrastructure, identify bird species in these locations, determine location of nesting activity, identify egg- and chick-bearing nests, and determine whether deterrent actions are necessary	2004 to 2013
	ground-based surveys to document the presence of waterbird species	1996 to 2013
	monitoring of caribou behaviour near the mine	2002 to 2013
	ground-based surveys to document use of mine-altered waterbodies by waterfowl	2001 to 2013

Table 24-1 Summary of Wildlife Monitoring, Surveys, and Studies Completed in the North Slave Region, 1995 to 2013

Originator	Description	Years
Gahcho Kué Project	aerial surveys to determine the abundance, distribution, and habitat use of caribou	1999 to 2005
	habitat surveys to determine relative use of preferred habitat by grizzly bear	2005 and 2007
	winter track count surveys to determine the relative use and distribution of carnivores, ungulates, and furbearers that are active during the winter in the wildlife study area	2004 and 2005
	winter track count surveys to measure wolverine activity and distribution in the wildlife study area	2010 to 2012
	DNA hair snagging surveys to estimate the abundance, density, and demographic parameters of wolverine	2005, 2006, 2013
	hair snagging surveys to estimate the abundance of barren-ground grizzly bear	2010 and 2011
	regional DNA hair snagging surveys to estimate the abundance of barren-ground grizzly bear	2013
	breeding bird linear transect surveys to determine the relative abundance, distribution, and habitat use of upland breeding birds	2004 and 2005
	waterbird surveys to document species occurrence, relative abundance, and habitat use during the spring migration, breeding season, and fall migration	2004
	waterbird surveys to determine species occurrence and composition at Kennady Lake and a reference waterbody	2010 to 2013
	raptor nest surveys to document nest sites and breeding success	2004 and 2010
Snap Lake Mine	incidental observations of wildlife	1999 to 2013
	aerial surveys to determine the abundance and distribution of caribou	1999 to 2011
	ground-based surveys to detect changes in bear activity and distribution	2001 to 2009
	hair snagging surveys to estimate the abundance of barren-ground grizzly bear	2010 and 2011
	regional DNA hair snagging surveys to estimate the abundance of wolverine	2013
	winter track count surveys to measure wolverine activity and distribution	2003 to 2009, 2011, and 2012
	regional DNA hair snagging surveys to estimate the abundance, density, and demographic parameters of grizzly bear	2012 and 2013
	DNA hair snagging survey trials to estimate the abundance, density, and demographic parameters of wolverine	2013
	surveys to determine presence and distribution of wolf dens in the study area and determine whether active dens were productive	1995 to 2013
	aerial raptor nest surveys	1999 to 2010
Government of the Northwest Territories	surveys for muskoxen populations	1991, and 1998
	satellite-collar studies to document the seasonal movements of caribou herds	1996 to 2013
	DNA hair snagging surveys to estimate the abundance, density, and demographic parameters of wolverine	2005, 2006, 2010, 2011, and 2013
	Bathurst caribou population monitoring, including cow:calf ratios, composition counts, and calving ground census	Ongoing
	Surveys of known wolf den sites to estimate production	2000 to 2013

Note: Updated from Developer's Assessment Report, Annex VII: Wildlife Baseline Report for the Jay Project, Table 1.5-1.
This is not a comprehensive list of all monitoring studies.
DNA = Deoxyribonucleic acid.



LEGEND

- EKATI MINE FOOTPRINT
- DIAVIK MINE FOOTPRINT
- PROPOSED JAY FOOTPRINT
- WINTER ROAD
- TIBBITT TO CONTWOYTO WINTER ROAD
- NORTHERN PORTION OF TIBBITT TO CONTWOYTO WINTER ROAD
- WATERCOURSE
- WATERBODY
- DIAVIK AND EKATI WILDLIFE STUDY AREAS, 1998 - 2005
- DIAVIK AND EKATI WILDLIFE STUDY AREAS, 2006
- DIAVIK AND EKATI WILDLIFE STUDY AREAS, 2007 - 2008
- DIAVIK AND EKATI WILDLIFE STUDY AREA, 2009, 2012

10 0 10

SCALE 1:500,000 KILOMETRES

REFERENCE

NATIONAL TOPOGRAPHIC BASE DATA (NTDB) 1:250,000
CANVEC © NATURAL RESOURCES CANADA, 2012
NATURAL RESOURCES CANADA, CENTRE FOR TOPOGRAPHIC INFORMATION, 2012
DATUM: NAD83 PROJECTION: UTM ZONE 12N

DOCUMENT

IEMA-IR-24

PROJECT
DOMINION DIAMOND

JAY PROJECT
NORTHWEST TERRITORIES, CANADA

TITLE

DISTRIBUTION AND SIZE OF CARIBOU GROUPS OBSERVED DURING POST-CALVING SEASON SURVEYS, 1998 TO 2012

Golder Associates

PROJECT		1419751	FILE No. POSTDAR_IR_Wild_026_GIS	
DESIGN	JR	16/03/15	SCALE AS SHOWN	REV. 0
GIS	AK/LS	18/03/15	MAP 24-1	
CHECK	JR	18/03/15		
REVIEW	JV	18/03/15		

G:\CLIENTS\DOMINION\DDEC Jay and Lynx Projects\Figures\13-1328-0041 Jay & Lynx EA\Wildlife\POST-DAR IRs\POSTDAR_IR_Wild_026_GIS.mxd

References:

DDMI (Diavik Diamond Mines Inc.). 2013. 2012 Wildlife Monitoring Program Report. Yellowknife, NWT, Canada. March 2013.

Information Request Number:	DAR-IEMA-IR-25
Source:	Independent Environmental Monitoring Agency: Kevin O'Reilly
Subject:	Conclusions from wildlife cameras on caribou deflection rates and implications to uncertainty and confidence in mitigation
DAR Section(s):	Annex VII

Preamble (IEMA):

Snow track surveys from 2002-11 indicate that caribou deflected from crossing the Misery Road ~57% of the time, suggesting the road was a partial barrier to caribou movement (Rescan 2012). The DAR refers to caribou deflection rates on roads within the Ekati mine complex in the 1-2% range based on data obtained from remote cameras (pg. 12-21, 12-96). The DAR justifies this large difference by stating the track counts couldn't differentiate caribou that chose a different location to cross the road (implying that the cameras could). Primary objectives of the caribou camera monitoring program do not list deflection rates (12.2.1.1.6, pg. 12-11), yet DDEC claims that the camera-recorded deflection rates are correct despite acknowledging that the effective range of the cameras is limited (pg. 12-96). The DAR claims that "the effective range of the cameras is likely limited to less than 500 m" (pg. 12-96), but given a far shorter trigger distance for the cameras, how the fate of an animal observed >30 m away would be discerned is not clarified. The trigger range of the cameras is ~25-30 m, and field of view (often down along the road) is not described or quantified. It appears that the cameras are recording presumed crossings of animals that are close enough to trigger a camera. The implication of accepting a 1-2% deflection rate on the road means that mitigation measures do not need to be as rigorous if higher deflection rates were assumed.

Request (IEMA):

DDEC should

a) justify that the cameras are recording actual deflection rates of caribou approaching the Misery Road at any distance,

b) provide details on the mitigation measures in place (and proposed) to enable caribou to freely cross the Misery Road at the traffic volumes suggested.

Response:

a) It is recognized by Dominion Diamond Ekati Corporation (Dominion Diamond) that the cameras recording caribou interaction along roads at the Ekati Mine do not reflect deflection rates that may be occurring at a broader spatial scale. However, the results from these cameras and from the snow trail surveys do indicate that these roads do not act as a complete barrier to caribou movements as was assumed in the Developer's Assessment Report (DAR). Implementation of traffic-related mitigation for the Misery and Jay roads is not dependent on the results from the camera monitoring. Please see the response to DAR-KIA-IR-07 for additional discussion of Dominion Diamond's use of the Camera Report.

b) The mitigations to be used for the Jay Project (Project) is identified in Table 12.3-1 of the DAR and includes mitigation practices and procedures already in place at the Ekati Mine. For review, mitigation associated with road vehicle traffic, which was identified in Table 12.3-1 includes:

- As the Project is an expansion of the Ekati Mine, existing surface facilities will be utilized (i.e. plant site, air strip, Misery Road, main Ekati camp) thereby reducing the area disturbed and new sensory disturbances relative to the Jay Project being a standalone operation;
- A single access road crosses the Lac du Sauvage esker;
- The Jay waste rock storage area is set back 200 metres (m) from the esker;
- Kimberlite stockpile areas have been designed in strategic locations that facilitate continued mine operations while allowing various types of temporary road closures to be implemented;
- The current, effective practices and mitigations for safety of wildlife on roads, the airstrip, and other areas of the Ekati Mine will be continued and expanded as necessary to include the Project. These practices include reporting of wildlife sightings by all employees, and control of encounters with wildlife by Environment staff;
- A minimum flying altitude of 600 m above ground level (except during takeoff and landing, and during field work) will be maintained for cargo, passenger aircraft, and helicopters outside of the Project site;
- Environmental training will be provided for personnel;
- The Wildlife Effects Monitoring Program (WEMP) implemented at the Ekati Mine will include the Project;
- Wildlife always have the right-of-way;
- Vehicles encountering wildlife on roads will communicate the presence of wildlife on the roads to the Environment Department and others in the area;
- Use of signage to alert drivers to the presence of caribou;
- Caribou crossings will be constructed along roads;
- Spatially and temporally staged monitoring of the Bathurst caribou herd will be used to track migratory movements via satellite radio collars and road surveys (i.e., provide advanced information on approaching caribou); and,
- Modified traffic patterns and road closures will be used as necessary to protect caribou and people.

The additional mitigation proposed for the Project includes using a combination of collared caribou locations and road surveys to provide advanced information on the location of caribou relative to the active roads. It is expected that collar locations detected in the Ekati Mine WEMP study area will trigger more frequent road surveys. This monitoring will help determine when and where additional mitigation, such as signage, modification of traffic patterns and road closures, is required. Advanced information on caribou locations will also be communicated to vehicle operators so they may be more vigilant and aware of the presence of caribou.

DOMINION DIAMOND

Information Request Number: DAR-IEMA-IR-26

Source: Independent Environmental Monitoring Agency: Kevin O'Reilly

Subject: Wildlife Management Plan

DAR Section(s): 3

Preamble (IEMA):

The project description states "The Wildlife Management Plan will be amended to include the relevant information and changes resulting from the Project. This amendment will be addressed during the regulatory process subsequent to successful completion of the EA. The DAR will provide the basis for the amendment" (3.4.3.9). The current Plan is out-dated (the last version the Agency is aware of is dated 2001). An updated Plan that incorporates the Jay Project will enable a more knowledgeable assessment of the implications of the project.

Request (IEMA):

To enable full assessment of the implications of the Jay Project, DDEC should provide an updated Wildlife Management Plan that addresses the Jay Project.

Response:

The Developer's Assessment Report describes the mitigation measures that will protect caribou from harm and that will enable their continued movement though the Ekati Mine site. The mitigation measures are based on those that have been developed at the Ekati Mine over the past 15 years of mine operations. The mitigation measures have been augmented for the Jay Project (Project) where needed to address a new or increased risk. For example, Dominion Diamond Ekati Corporation (Dominion Diamond) has proposed to increase early monitoring of caribou movement by working with the Government of the Northwest Territories to access satellite collar maps. This provides advanced warning of when caribou may be approaching the Ekati Mine. Also, Dominion Diamond proposes to construct additional kimberlite stockpile areas so that the Ekati Mine can operate through brief road closures if this is necessary to allow caribou to safely move through the mine site.

Dominion Diamond is confident that these descriptions of mitigation measures are sufficient for this environmental assessment, given that the Jay Project is an extension of an existing mine. As is also the case with other monitoring and mitigation plans, Dominion Diamond anticipates that the detailed wildlife monitoring and mitigation plans will be provided during the permitting phase of the Project. This approach provides confidence that the detailed mitigation plans and monitoring programs are designed specifically for the Project as it has been approved through the Environmental Assessment process.

The Northwest Territories *Wildlife Act* will require that Dominion Diamond provide a Wildlife and Wildlife Habitat Protection Plan (WWHPP) and a Wildlife Effects Monitoring Program (WEMP) for the Ekati Mine (inclusive of the Jay Project). These plans will provide a compilation of details and procedures for caribou monitoring and mitigation. The WWHPP will contain details on mitigation policies, practices, and procedures, and the results from adaptive management that has been implemented during the operation of the Ekati Mine, and how mitigations will be specifically modified for the Jay Project. The WEMP will provide details on the study designs and sampling methods used to test effects predictions and the effectiveness of mitigation.

DOMINION DIAMOND

Information Request Number: DAR-IEMA-IR-27

Source: Independent Environmental Monitoring Agency: Kevin O'Reilly

Subject: Adequacy of proposed mitigation measures

DAR Section(s): 12

Preamble (IEMA):

Mitigation measures proposed (Table 12.3-1 and s. 12.3.2.1) provide inadequate detail and result in reduced confidence in predicted effects. The Yellowknives Dene First Nation have identified the Narrows, and the Lac du Sauvage esker as critical caribou migration routes. They expect caribou use of the Narrows to increase as the animals attempt to avoid active mining operations (12.2.3.1 pg. 12-31). The anticipated traffic rate of 1 ore truck every 12 minutes does not include "bulk explosives trucks, crew transport vehicles, road maintenance equipment, garbage trucks, low-bed trucks to transport larger equipment, water trucks, emergency vehicles, and light vehicles" (3..5.1.6). Thus actual traffic passages on the Jay to Misery roads will be much higher. The DAR states that the Ekati mine monitoring program will be expanded during migratory periods to "identify concentrations and movements of animals that may interact with the roads" (pg. 12-133), but offer no details on this proposed expansion. DDEC states that it will implement spatially and temporally staged monitoring of the Bathurst caribou herd to track migratory movements with the use of (i) satellite radiocollars, (ii) aerial reconnaissance surveys near the roads, and (iii) road surveys". (Table 12.3-1; pg. 12-49). What is proposed for the aerial surveys and road surveys is unclear. Details on what monitoring triggers each mitigation and how mitigation will be implemented are lacking.

Request (IEMA):

DDEC should provide a comprehensive table or a decision tree detailing mitigation measures, monitoring that will trigger those measures, and how mitigation will be hierarchical (intensified or reduced) as appropriate. The table or decision tree should include specifics considering how traffic and mining activity should react to differing group sizes and composition of caribou at different distances for development, and when staged shutdowns of activity should be implemented. The Proponent should also clarify what is meant by "aerial reconnaissance surveys near the roads" (also noted in response to adequacy review item 8.5, 19 Jan 2015), and clarify how the concerns of the YKDFN regarding use of the Narrows and the Lac du Sauvage esker will be mitigated.

Response:

In the Developer's Assessment Report (DAR), Dominion Diamond Ekati Corporation (Dominion Diamond) proposed to construct caribou crossings at appropriate discreet locations along the Jay Road. After receiving input from Aboriginal communities during our engagement process and during site visits, Dominion Diamond has changed its approach to caribou crossings along the Jay Road to reflect that feedback, as described below.

Because of the importance of the esker for caribou movement as identified through community engagement, the portion of the Jay Road that cuts through the esker will be constructed as a caribou

crossing. The pipelines will be covered over with crushed rock along this section of road, except where there are valves or joints that require visual inspection for safe operation. Dominion Diamond will strategically construct the pipelines to reduce the number of joints or valves through the esker crossing.

Dominion Diamond's community engagement program has indicated that the area to be crossed by the Jay Road is important for caribou movement. In response to the feedback received through community engagement, Dominion Diamond proposes to construct an increased number of caribou crossings along the main section of the Jay Road (i.e., roughly between King Pond Dam and the approach to the active operations area at Lac du Sauvage). This main section of the Jay Road will be constructed with frequent and wide caribou crossings that will respect the communities' identification of the importance of this area for caribou movement. Caribou crossings will not be built in areas where raised safety berms are required by the Mines Inspector, or at locations where there are necessary joints and valves in the pipelines that require visual inspection for safe operation. The pipelines will be strategically designed to reduce the number of locations that cannot be constructed as caribou crossings due to joints and valves. This approach also makes beneficial use of 'lessons-learned' from the original Misery Road, where caribou crossings were only installed after construction of the road.

Caribou crossings will be constructed using crushed rock (6 inches / 200 millimetres or less in size) so that the side slopes of the road are flatter and easier walking for caribou than the large roadfill rock. In the caribou crossing areas, the pipelines will also be covered with crushed rock. Once the road is constructed, monitoring, including by Aboriginal community members, will be implemented to assess the effectiveness of the constructed caribou crossings.

The DAR describes the the mitigation policies, practices, and procedures that will protect caribou from harm and that will enable their continued movement though the Ekati Mine site. An updated Traffic Management Plan is being prepared and will be circulated by Dominion Diamond that will document current practices for protection of safe caribou movement around roads at the Ekati Mine (under internal review, April 2015). The mitigations are based on those that have been developed at the Ekati Mine over the past 15 years of mine operations, and have been augmented for the Jay Project where needed to address a new or increased risk. For example, Dominion Diamond has proposed to increase early monitoring of caribou movement through satellite collar maps obtained from the Government of the Northwest Territories. This would provide advanced warning of when caribou may be approaching the Ekati Mine. Also, Dominion Diamond proposes to construct additional kimberlite stockpile areas so that the Ekati Mine can operate through brief road closures if this is necessary to allow caribou to safely move through the mine site. The frequency of road reconnaissance surveys, modification of traffic patterns, and road closures would reflect the number and group composition of caribou near the mine site, which is a hierarchical approach.

The Northwest Territories *Wildlife Act* will require that Dominion Diamond provide a Wildlife and Wildlife Habitat Protection Plan (WWHPP) and a Wildlife Effects Monitoring Program (WEMP) for the Ekati Mine (inclusive of the Jay Project). These plans will provide a compilation of details and procedures for caribou monitoring and mitigation, and would include a hierarchical approach. The WWHPP will contain details on mitigation policies, practices, and procedures, and the results from adaptive management that have been implemented during the operation of the Ekati Mine, and how mitigations will be specifically modified for the Jay Project. The WEMP will provide details on the study designs and sampling methods used to test effects predictions and the effectiveness of mitigation.

DOMINION DIAMOND

Information Request Number: DAR-IEMA-IR-28

Source: Independent Environmental Monitoring Agency: Kevin O'Reilly

Subject: Location of Jay Road

DAR Section(s): Jay DAR Sable Addendum: Appendix I – Section 2 and Section 3

Preamble:

The 3 alternative routes for the Jay Road examined environmental considerations in the selection process (2.5.1.1; pg. 2-43). The selected (alternative 3) portion of the Jay road crossing the esker is designed as a cut through a naturally occurring narrow section (3.5.1.5; pg. 3-46). However, field work from 2013 and 2014 couple with GIS modelling suggests that the proposed road alignment is adjacent to a high concentration of caribou trails and cuts through several areas of medium to high trail classification, especially on the section of road close to Misery and adjacent to the esker crossing compared with other alternatives (DAR Sable Addendum: Appendix I; Map I-5). Road alternative 1 in fact crosses far fewer areas of medium to high trail classification. It is not clear that the selection among alternative road routes was informed by the caribou trail survey/modelling (released in Dec 2014).

Request:

DDEC should re-evaluate the Jay road options and demonstrate that from a caribou movement perspective that the route selected has the least potential to disturb caribou movement through the project.

Response:

As part of the alternatives assessment, three alignments for the Jay Road were evaluated. It was recognized that each alignment would also provide the corridor for the power line, and three pipelines, associated with water management for the Jay Project. Therefore, a single, optimal alignment for the road, pipelines, and power line was sought.

The assessment was conducted prior to the caribou distribution mapping information being available and prior to the 2014 field work (included in the Sable Addendum [Dominion Diamond 2014]). Map 28-1 presents the three alternative road alignments evaluated with the caribou trail distribution mapping. Table 28-1 presents the approximate distribution of grid cells crossed by each of the road alignments, in terms of high (red squares), medium (yellow squares), and low (green squares) caribou trails. For the road Alternative 3, the number in brackets represents the entire number of grid cells crossed in each category. The number outside of the bracket represents the number of grid cells crossed by Alternative 3 alignment, excluding those cells also touched by the King Pond Dam.

Table 28-1 Estimated Frequency of Caribou Distribution Cells Crossed by Alignments

Ranking (Map 28-1)	Estimated Frequency		
	Alternative 1	Alternative 2	Alternative 3[(a)]
Red	4	8	5 (9)
Yellow	15	11	16 (20)
Green	28	33	24 (27)
Total	47	52	45 (56)

a) Values outside the brackets represent grid squares crossed by Alternative 3 alignment, excluding those also contacted by King Pond Dam. Values inside the brackets represent grid squares crossed by the entire alignment.

It is important to recognize that caribou trails identified from the aerial photographs and used for the distribution mapping are not able to distinguish between historic caribou trails and trails that are actively in use. For example, just north of the King Pond there are visible caribou trails; however, the quality and frequency of use of these trails has likely decreased since the construction of the Misery operations, and in particular, the King Pond Dam.

The main caribou migration route in the Project area runs northwest from the Narrows. The three road alternatives must run in an approximately east-west direction to connect the Misery Road to the Jay Pit, and as such, will cross the main caribou migration path and are predicted to have similar effects on caribou movement, due to the amount of traffic that will operate on the road.

As per the request, the alternatives assessment for the combined route selection (road, pipelines, and power line) has been updated with results summarized on Table 28-2. The following types of information have been considered in the evaluation:

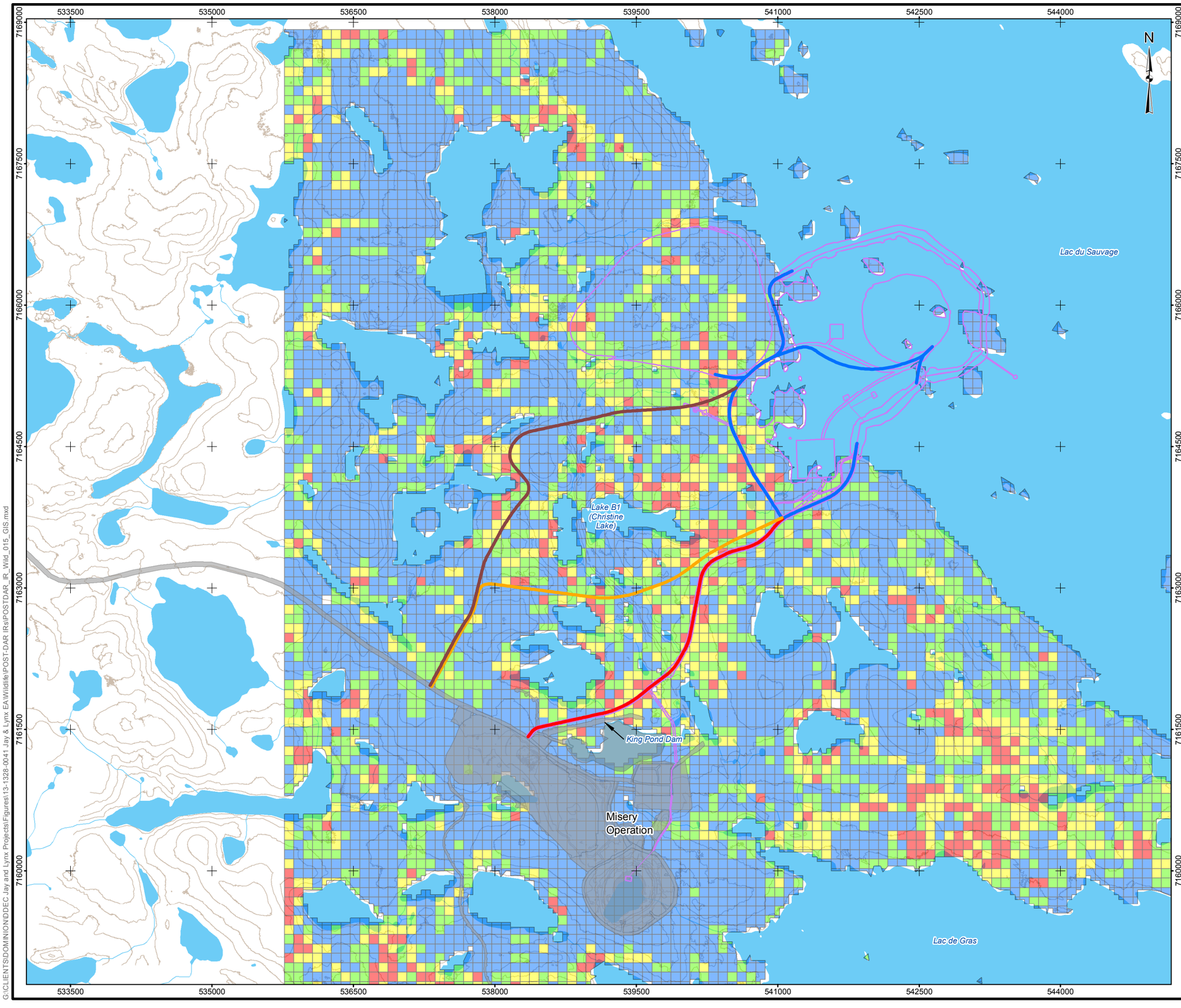
- length of road (shorter road length is positive in terms of economic and environmental factors);
- length of pipeline (shorter length is positive in terms of economic factors);
- length and height of esker crossing;
- area of esker disturbed;
- road grades (flatter route is positive in terms of economic and environmental factors, and results in fewer areas that require berms be constructed along the roadway, and therefore, less of a potential physical barrier to wildlife movement; where berms are required, caribou crossings will not constructed);
- footprint of the mine and proximity to disturbed areas;
- fragmentation of disturbed areas;
- location of waterbodies, stream, and drainage crossings and potential to affect fish and/or fish habitat;
- proximity to archaeological sites;
- visual impact to the esker;

- ability to reclaim the esker during closure;
- input from Impact Benefit Agreement (IBA) community members during engagement meetings and site visits to the esker conducted during the summer of 2014;
- amount of fill material required for construction;
- caribou migration routes (information gathered from Traditional Knowledge, mapped caribou trails in 2013 (Map 12.2-5 of the DAR; and Map 4.2-4 of the Dominion Diamond [2014]);
- relation to high, medium, and low caribou trail distribution trail mapping (Map 28-1 and values shown in Table 28-1);
- closure and reclamation; and,
- diesel fuel usage and associated greenhouse gas (GHG) emissions.

Alternate 3 remains as the overall preferred alignment for the road, pipeline, and power line (Table 28-2).

Table 28-2 Jay Road, Pipeline, and Power Line Corridor Alternatives Assessment for Route Selection - Updated Results

Account	Alternative 1	Alternative 2	Alternative 3
Technical Feasibility	• The grade for Alternative 1 is between the other alternatives. • Requires additional fill/cut for crossing the esker. • Requires the most fill for construction.	• Alternative 2 has the steepest maximum grade. • Requires the most fill/cut for crossing the esker. • Requires the second most fill for construction.	• Alternative 3 has the shallowest maximum grade. • Requires the least fill/cut for crossing the esker. • Requires the least fill for construction.
Relative Scores	**2**	**1**	**3**
Economic Viability	• Alternative 1 requires the longest section of new road, pipeline, power line, and most fill. • Alternatives 1 and Alternative 3 have similar haul distances, which are longer than Alternative 2. • Alternative 1 has the longest pipeline alignment. • Alternative 1 grade is between Alternative 2 and Alternative 3.	• Alternative 2 requires less road length and fill than Alternative 1, but more than Alternative 3. • Alternative 2 has the shortest haul distance. • The length of the pipeline for Alternative 2 is between Alternatives 1 and Alternative 3. • Alternative 2 grade is steepest.	• Alternative 3 requires the shortest section of new road and the least amount of fill. • Alternatives 1 and Alternative 3 have similar haul distances, which are longer than Alternative 2. • Alternative 3 has the shortest pipeline. • Alternative 3 grade is shallower.
Relative Scores	**1**	**2**	**3**
Environmental Considerations	• Alternative 1 is the furthest from the Misery Camp and existing disturbed land, greatest extension of area of environmental impact, and largest fragmentation of land by development (largest footprint). • All Alternatives cross two of the significant caribou trails identified during the 2013 aerial survey (DAR Map 12.2-5) north of Christine Lake. • Alternative 1 crosses one of the Traditional Knowledge caribou paths (Map 4.2-4 Sable Addendum). • Alternative 1 and Alternative 2 have marginally fewer high and medium density caribou trails (Map 28-1). • Alternative 1 crosses approximately 150 m of esker, with an elevation of 10 m (longest crossing, intermediate elevation). • Alternative 1 and Alternative 2 disturb more of the esker. • Alternative 1 has the medium grade between alternatives, would have the medium amount of road length requiring berms (areas without caribou crossings). • Alternative 1 requires three watercourse crossings. • Alternative 1 is estimated to have the highest diesel fuel usage and GHG emissions (combination of road length and grades). • Alternative 1 and Alternative 2 have similar work for reclamation of the esker.	• Alternative 2 is mid-way between Alternative 1 and Alternative 3, in terms of existing disturbed land, fragmentation of land by development, and footprint. • All Alternatives cross two of the significant caribou trails identified during the 2013 aerial survey (DAR Map 12.2-5) east of Christine Lake. • Alternative 1 and Alternative 2 have marginally fewer high and medium density caribou trails (Map 28-1). • Alternative 2 crosses approximately 130 m of esker, with an elevation of 15 m (intermediate length of esker, highest elevation). • Alternative 1 and Alternative 2 disturb more of the esker. • Alternative 2 has the highest grade, so would require the most berms (areas without caribou crossings). • Alternative 2 requires two watercourse crossings. • Alternative 2 and Alternative 3 are estimated to have lower diesel fuel usage and GHG emissions (combination of road length and grades). • Alternative 1 and Alternative 2 have similar work for reclamation of the esker.	• Alternative 3 is most proximal to Misery Camp and existing disturbed land, least extension of area of environmental impact and fragmentation of land by development (smaller footprint). • All Alternatives cross two of the significant caribou trails identified during the 2013 aerial survey (Map 12.2-5) east of Christine Lake. • Alternative 3 has marginally more high and medium density caribou trails (Map 28-1). • Alternative 3 crosses approximately 80 m of esker, with an elevation of 6 m (shortest and lowest). • Alternative 3 least disturbance to the esker. • Alternative 3 has the lowest grade, so would require the least amount of berms (areas without caribou crossings). • Alternative 3 requires two watercourse crossing. • Alternative 2 and Alternative 3 are estimated to have lower diesel fuel usage and GHG emissions (combination of road length and grades). • Alternative 3 requires the least amount of work to reclaim the esker.
Relative Scores	**2**	**2**	**3**
Social and Economic Considerations	• One unmitigated archaeological site of low significance is located within 150 m of Alternative 1.	• No archaeological sites have been identified within 150 m of Alternative 2.	• No archaeological sites have been identified within 150 m of Alternative 3.
Relative Scores	**2**	**3**	**3**
Total Scores	**7**	**8**	**12**



LEGEND

- EKATI MINE FOOTPRINT (MISERY OPERATION)
- PROPOSED JAY FOOTPRINT
- ELEVATION CONTOUR (10 m INTERVAL)
- WATERCOURSE
- WATERBODY

CARIBOU TRAIL CLASSIFICATION

- NONE
- LOW
- MEDIUM
- HIGH

JAY ROAD ALTERNATIVES

- ROAD COMMON TO ALL ALTERNATIVES
- ALTERNATIVE 1
- ALTERNATIVE 2
- ALTERNATIVE 3

NOTES

ROAD, PIPELINES, AND POWER LINE ARRANGEMENT TO BE DETAILED AS PART OF FEASIBILITY DESIGN. APPROXIMATE CORRIDOR WIDTHS ARE SHOWN.
POTENTIAL QUARRY MAY BE REQUIRED WITHIN THE FOOTPRINT OF THE PROPOSED JAY WASTE ROCK STORAGE AREA

REFERENCE

JAY PROJECT CONCEPTUAL ENGINEERING REPORT, EKATI MINE, DOC#: 1313280041-E14037-R-REV0-4060, DATED: MAY 13, 2014
JAY PROJECT DESIGN BASIS MEMORANDUM FOR PRE-FEASIBILITY DESIGN OF PROJECT ROADS AND PIPELINE BENCHES, DOC#: 1313280041-E14031-TM-REVD-2020, DATED: AUGUST 1, 2014
LIDAR DATA OBTAINED FROM AURORA, 2013
WATER OBTAINED FROM CANVEC © NATURAL RESOURCES CANADA, 2012
DATUM: NAD83 PROJECTION: UTM ZONE 12N

DOCUMENT

DAR-IEMA-IR-28

1 0 1
SCALE 1:40,000 KILOMETRES

PROJECT
DOMINION DIAMOND™
JAY PROJECT
NORTHWEST TERRITORIES, CANADA

TITLE
HISTORIC CARIBOU TRAIL USE AND JAY ROAD ALTERNATIVES

Golder Associates

PROJECT		1419751	FILE No. POSTDAR_IR_Wild_015_GIS	
DESIGN	FE	01/03/15	SCALE AS SHOWN	REV 0
GIS	EN/AK	02/04/15	MAP 28-1	
CHECK	FE	02/04/15		
REVIEW	KM	02/04/15		

G:\CLIENTS\DOMINION\DDEC Jay and Lynx Projects\Figures\13-1328-0041 Jay & Lynx EA\Wildlife\POST-DAR IRs\POSTDAR_IR_Wild_015_GIS.mxd

References:

Dominion Diamond (Dominion Diamond Ekati Corporation). 2014. Jay Project Developer's Assessment Report Sable Addendum. Prepared by Golder Associates Ltd., December 2014. Yellowknife, NWT, Canada.

DOMINION DIAMOND

Information Request Number: DAR-IEMA-IR-29

Source: Independent Environmental Monitoring Agency: Kevin O'Reilly

Subject: Project Effects on Caribou

DAR Section(s): 12.5 Adequacy response DAR-MVEIRB-15

Preamble (IEMA):

The prediction confidence and uncertainty section devotes much discussion to the uncertainty of climate change and fires. Several aspects of uncertainty are not fully discussed: a) The DAR acknowledges that "little specific research has been completed on how low voltage distribution lines affect caribou movement and distribution" (pg. 12-123), but does not discuss implications.

Request (IEMA):

DDEC should re-examine these sources of uncertainty and reconsider how they would affect the conclusions of the DAR with regard to predicted effects on caribou.

Response:

A qualitative analysis of the potential effects of the power distribution line was presented in the Developer's Assessment Report (DAR) Section 12.4.2.2.2 (pages 12-97 and 12-98). The analysis identified a range of magnitude of observed effects from power lines, roads, traffic, and human activity levels on caribou (Berger et al. 2000; Reimers et al. 2000; Vistnes and Nellemann 2001; Reimers et al. 2007; Vistnes et al. 2008). Potential effects from corona noise were also discussed and evaluated (Flydal et al. 2003, 2009; Harper 2014). Overall, the limited information suggests that above-ground power lines have smaller effects on caribou movement and distribution than roads and traffic. Therefore, the focus of mitigation and monitoring for the power distribution lines, Jay and Misery roads is directed at Jay Road design, caribou crossings, modification of traffic patterns and road closures.

The uncertainty associated with the shortage of specific research on low voltage distribution lines and caribou movement and distribution was considered and determined not to affect the conclusions in the DAR.

References:

Berger R, Martinez I, Wisener M. 2000. Analysis of GPS Relocation Data (1995-1999) for the Owl Lake Woodland Caribou – Report to Manitoba Hydro, Manitoba Conservation, Pine Falls Paper Company, Manitoba Model Forest and Time to Respect Earth's Ecosystems. 88 pp + appendices.

Flydal K, Rogstad I, Per E, Reimers E. 2003. Reindeer (Rangifer tarandus tarandus) Perception of noise from powerlines. Rangifer 23:21-24.

Flydal K, Korslund L, Reimers E, Johansen F, Colman JE. 2009. Effects of power lines on area use and behaviour of semi-domestic reindeer in enclosures. Int J Ecol: 2009.

Harper M. 2014. Lines Designer, McGregor Construction 2000 Ltd. Calgary, AB, Canada. E-mail. July 8, 2014.

Reimers E, Flydal K, Stenseth R. 2000. High Voltage Power Lines and Their Effect on Reindeer: A Research Programme in Progress. Polar Res: 75-82.

Reimers E, Dahle B, Eftestøl S, Colman JE, Gaare E. 2007. Effects of a power line on migration and range use of wild reindeer. Biol Conserv 134: 484-494.

Vistnes I, Nellemann C. 2001. Avoidance of cabins, roads, and power lines by reindeer during calving. J Wildlife Manage 65: 915–925.

Vistnes II, Nellemann C, Jordhøy P, Støen, O-G. 2008. Summer distribution of wild reindeer in relation to human activity and insect stress. Polar Biol 31:1307-1317.

DOMINION DIAMOND

Information Request Number: DAR-IEMA-IR-30

Source: Independent Environmental Monitoring Agency: Kevin O'Reilly

Subject: Project Effects on Caribou

DAR Section(s): 12.5, Adequacy response DAR-MVEIRB-15

Preamble (IEMA):

b) The DAR does not appear to consider the implications of only Bathurst cows (not bulls) being collared on range use patterns and timing; c) The DAR does not appear to address the implications of the apparent extreme collapse in Bathurst herd numbers in 2014 (Boulanger et al. 2014b), and likely lower resilience to development impacts. This fact is mentioned in modelling provided in response to DAR-MVEIRB-15, but model parameter inputs (e.g., cow survival) do not reflect demography likely during the rapid decline since 2012 (but instead use parameters consistent with a stable herd from 2009 to 2012).

Request (IEMA):

DDEC should re-examine these sources of uncertainty and reconsider how they would affect the conclusions of the DAR with regard to predicted effects on caribou.

Response:

b) The Developer's Assessment Report (DAR) implicitly considers the implications of only female Bathurst herd caribou being collared for the spatial and temporal analysis of range use patterns. The assessment of the effects of the Jay Project is based on the best available data, which are limited to cows only. Overall changes in ungulate population sizes are generally accepted to depend upon combinations of adult female survival rates and calf recruitment rates (Gaillard et al. 1998). Both of these rates can be robustly assessed with female animals alone.

c) As noted in the preamble, population modelling was completed in response to Mackenzie Valley Environmental Review Board (MVEIRB) Jay Project Adequacy Review Item 8.8 and presented in the response to DAR-MVEIRB-15 (hereafter "modelling report"). The apparent continued decline of the Bathurst herd between 2012 and 2014 (Boulanger 2014b) would require demographic vital rates different from those used for the core population modelling presented in the modelling report, which was identified in the report (page 12).

Specifically, for the 2012 to 2014 period, calf:cow ratios were obtained from the Government of the Northwest Territories (GNWT) composition surveys completed in October 2012 (2012 birth year, 24 calves:100 cows) and spring 2014 (2013 birth year, 32 calves:100 cows). However, adult female survival rates from the same period are important in the interpretation of recruitment from calf:cow ratios as they affect the denominator in the ratio. For example, if adult female survival in an interval is 50 percent (%) and calf survival is 100%, then the denominator is half of what is was at the start of the interval and the calf:cow ratio doubles even though the number of calves does not change. Data to confidently estimate adult female survival for 2012 to 2014 are not available. The approach to estimating a set of vital rates for the Bathurst herd used in Boulanger et al. (2011, 2014a) has not

been applied to account for the apparent 2012 to 2014 decline. The vital rates provided following the 2012 calving ground photographic survey (Boulanger et al. 2011, 2014a) are the most recent vital rates that have been calculated for the Bathurst herd that reconcile all available sources of information (Adamczewski 2015). The information required for the determination of vital rates (Boulanger et al. 2014a) requires information not gathered in the 2014 reconnaissance survey.

In the absence of empirical vital rates for the Bathurst herd for the 2012 to 2014 period, the modelling report (page 12) identified that adult survival rates between 51% and 62% were consistent with the 2014 Bathurst herd reconnaissance survey population estimate. Regardless of the specific vital rates that would fit the observed population data, the end result would be the same: an annual decline of 48% over a two-year period.

The absence of information from adult male caribou was implicitly considered in the determination of significance in the DAR and is not considered to be a source of uncertainty that reduces confidence in the impact predictions and determination of significance. As noted in the modelling report (pages 12-13), the current low population of the Bathurst herd should allow more selective use of habitat. As there is no strong mechanism by which development reduces adult female survival, the negative trend in population growth associated with the current estimates of vital rates is predicted to be similar with and without the development-related cumulative changes in habitat quantity and quality, and caribou behaviour and energetics. Consequently, the use of a lower annual adult female survival rate (e.g., consistent with a decline as indicated by results of the 2014 reconnaissance survey) will not change the conclusions regarding the classification of impacts and determination of significance on caribou.

References:

Adamczewski J., 2015. Wildlife Biologist, Ungulates – Environment & Natural Resources, Wildlife Division, Government of the Northwest Territories. Phone call with J. Rettie, Golder Associates. March 2, 2015.

Boulanger J, Croft B, Adamczewski J. 2014a. An Estimate of Breeding Females and Analyses of Demographics For The Bathurst Herd of Barren-ground Caribou: 2012 Calving Ground Photographic Survey. Integrated Ecological Research Unpublished File Report No. 142 for Environment and Natural Resources, GNWT. 81 pp.

Boulanger J, Croft B, Cluff D. 2014b. Trends in size of the Bathurst caribou herd from the 2014 calving ground reconnaissance survey. Integrated Ecological Research. July 31, 2014.

Boulanger J, Gunn A, Adamczewski J, Croft B. 2011. A Data-Driven Demographic Model to Explore the Decline of the Bathurst Caribou Herd. J Wildlife Manage 75: 883-896.

Gaillard JM, Festa-Bianchet M, Yuccoz N. 1998 Population dynamics of large herbivores: variable recruitment with constant adult survival. Trends Ecol Evol 13:58-63.

DOMINION DIAMOND

Information Request Number:	DAR-IEMA-IR-31 and DAR-IEMA-IR-32
Source:	Independent Environmental Monitoring Agency: Kevin O'Reilly
Subject:	Project Effects on Wolves
DAR Section(s):	13.1.4.4 and 13.2.1.1.4

Preamble (IEMA):

The wolf assessment focusses on denning, but the wolf effects study area (ESA) is only 3% of the size of the wolverine and grizzly bear ESA (pg. 13-9 to 13-11). Wolf movements are often long-distance from den sites. Wolf populations are affected by and tied closely to caribou, and any impacts of development on caribou would impact wolves. A study area that considers wolf denning in the larger context of treeline (Heard and Williams 1992) and long distance movements during denning would be more appropriate. The Review of Regional Effects Monitoring and Research for wolves (13.2.1.1.4) ignored several regional papers (Heard and Williams 1992, Walton et al. 2001, Mattson et al. 2009, Dean Cluff and current student's larger study areas).

Request (IEMA):

DDEC should a) redefine the wolf ESA to consider an area that encompasses wolf movements during the denning period, or justify why the ESA selected is adequate to assess potential impacts on wolves, and b) update the literature review and discussions of wolf denning success and pup productivity (all declining in recent years), and provide this context for the evaluation of development impacts on wolves.

Response:

The request in DAR-IEMA-IR-31 is incomplete and appears to be the same as the request in DAR-IEMA-IR-32. It is assumed that the response provided here also applies to DAR-IEMA-IR-31.

Several sources of information were considered when selecting the Effects Study Area (ESA) for wolf. Caribou are the primary prey of barren-ground wolf, as noted in the preamble, and the annual distribution of barren-ground wolf are associated with movements of barren-ground caribou (Hansen et al. 2013). Wolf populations are believed to be most sensitive to development disturbance during the denning stage of their annual life cycle (Thiel et al. 1998; Theuerkauf et al. 2003). Barren-ground wolf prefer esker as denning habitat (Cluff et al. 2000; McLoughlin et al. 2004), which represents a small proportion of different habitat types available in the North Slave region. The ESA used in the Developer's Assessment Report (DAR) incudes 23 wolf dens monitored for occupancy and productivity from 1995 to 2013, which occur within the central band of eskers in the North Slave region where wolf dens have been historically abundant (Heard and Williams 1992; Cluff et al. 2000). The ESA used in the DAR also includes a high proportion of previous and active developments relative to the Jay Project and non-disturbed area, which represents an ecologically relevant scale for assessing the cumulative direct and indirect effects to the reproductive portion of the wolf population. Use of a larger ESA would reduce the amount of direct and indirect changes to wolf habitat resulting from development disturbance relative to undisturbed habitats. The ESA used in the DAR is appropriate to assess potential impacts on wolves.

The lines of evidence supporting the assessment of impacts to wolf are provided in Sections 13.2.2.2.1 and 13.2.2.2.2 and include reference to Walton et al. (2001) along with recent publications (e.g., Nesbitt and Adamczweski 2013; Cluff and Klaczek 2014). Patterns of wolf den productivity are discussed in Section 13.2.2.4.1 in the context of including possible explanations for the apparent decline in productivity related to wolf denning ecology (Frame et al. 2007) and relationships to the Bathurst caribou herd (Nesbitt and Adamczweski 2013; Cluff and Klaczek 2014). In 2009, at a Wildlife Monitoring Workshop hosted by the Government of the Northwest Territories and attended by regulators, community organizations, mine agencies (including the Independent Environmental Monitoring Agency), and mining companies, it was agreed that the mines are successful at mitigating conflicts with wolves and are not causing any measurable degradation to wolf den habitat or productivity (Marshall 2009).

References:

Cluff D, Walton L, Paquet P. 2000. Northwest Territories wolf notes: A newsletter on wolf studies in the central Arctic, NWT Canada. Issue number 5. Prepared by the Department of Resources, Wildlife and Economic Development, GNWT, Canada.

Cluff D, Klaczek M. 2014. NWT Wolf Project 2013. Yellowknife, NWT, Canada. 20 pp.

Frame PF, Cluff DF, David SH. 2007. Response of wolves to experimental disturbance homesites. J Wild Manage 71:316–320.

Hansen IJ, Johnson CJ, Cluff HD. 2013. Synchronicity of movement paths of barren-ground caribou and tundra wolves. Polar Biol DOI:10.1007/s0030-013-1356-y. 9pp.

Heard DC, Williams TM. 1992. Distribution of wolf dens on migratory caribou ranges in the Northwest Territories, Canada. Can J Zool 70:1504-1510.

Marshall R. 2009. Diamond Mine Wildlife Monitoring Workshop Report. Prepared for Environment and Natural Resources. Yellowknife, NWT, Canada.

McLoughlin PD, Walton LR, Cluff HD, Paquet PC, Ramsay MA. 2004. Hierarchical habitat selection by tundra wolves. J Mammal 85:576-580.

Nesbitt L, Adamczewski J. 2013. Decline and Recovery of the Bathurst Caribou Herd: Workshops Held in Yellowknife, NWT October 1 and 2, and 5 and 6, 2009. Manuscript Report No. 238. 66 pp.

Theuerkauf J, Rouys S, Jedrzejewski W. 2003. Selection of den, rendezvous, and resting sites by wolves in the Bialowieza Forest, Poland. Can J Zool 81: 163-167.

Thiel RP, Merrill S, Mech LD. 1998. Tolerance by denning wolves, Canis lupus, to human disturbance. Can Field-Natur 122: 340-342.

Walton LR, Cluff HD, Paquet PC, Ramsay MA. 2001. Movement patterns of barren-ground wolves in the central Canadian Arctic. J Mammal 82: 867-876.

DOMINION DIAMOND

Information Request Number: DAR-IEMA-IR-33

Source: Independent Environmental Monitoring Agency: Kevin O'Reilly

Subject: Project Effects on Raptors

DAR Section(s): 13.2.1.2.2

Preamble (IEMA):

The DAR states under baseline surveys that "An aerial survey was completed on July 24 and 25, 2013, of 36 potential nest sites located in highly suitable habitat (high elevation and steep terrain) to determine the presence of raptors" (pg. 13-38). Late July does not capture nest site occupancy (misses nest sites occupied earlier in the nesting period and abandoned and thus gives a misleading indication of occupancy; and gyrfalcons would have likely fledged by this period). The raptor distribution and abundance section (13.2.2.3, pg. 13-41 to 42) does not provide any data from 2013.

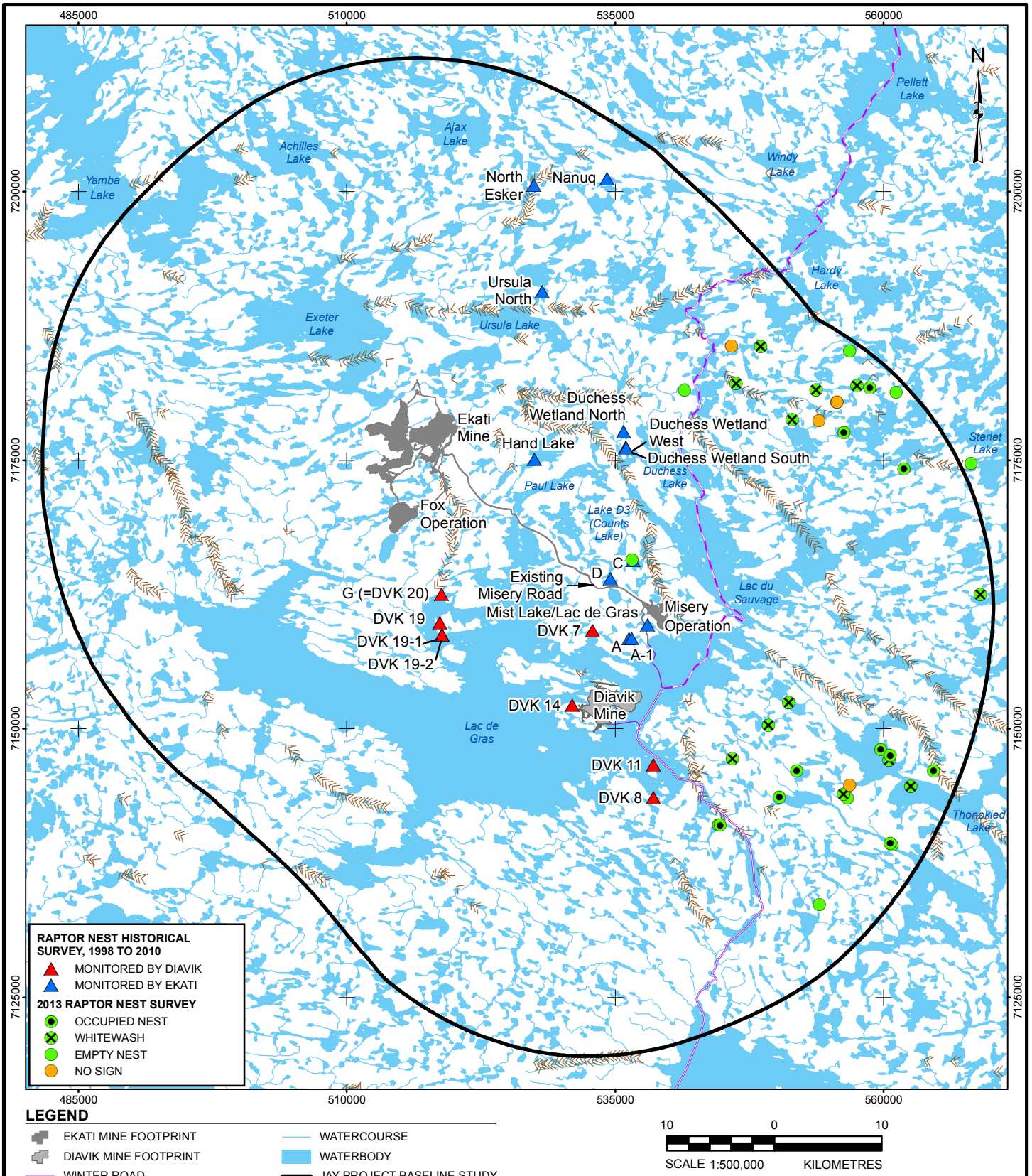
Request (IEMA):

DDEC should provide the results of the 2013 raptor survey data, justify why these data represent a rigorous assessment of the raptors nesting within the study area, and demonstrate how the 2013 data were incorporated into the Project and cumulative assessment.

Response:

The section referenced in the preamble provides the description of the Existing Environment for raptors (falcons, hawks, eagles, and owls) in the Developer's Assessment Report (Section 13.2.2.3). The methods and results of the analysis of primary pathways on the abundance and distribution of raptors are in Sections 13.4.2 and 13.4.3. The survey completed in 2013 was to determine the presence of previously unidentified nests in the area surrounding the Jay Project that may be directly affected. The survey was focused on highly suitable nest habitat (high elevation, steep slopes adjacent to deep water) as indicated by the scientific literature (Poole and Bromley 1988; Wightman and Fuller 2005; Coulton et al. 2013). A total of 31 of 36 locations visited indicated evidence of use by raptors, such as, the presence of an empty stick nest (n=7), an active nest (n=12), or perches with whitewash (n=12) in the targeted search areas (Map 33-1). The nest sites will become part of the regional falcon nest database that will be monitored during the Canadian Peregrine Falcon Survey (CPFS), next to occur in 2015. During the CPFS, species using these sites will be determined. Annual surveys for raptor nest occupancy and productivity are no longer required as part the effects monitoring programs for diamond mines (Handley 2010).

The incremental and cumulative direct and indirect effects to the abundance and distribution of raptors were quantified and assessed using a habitat suitability index (HSI) model described in Section 13.4.2. This model followed the approach of peer-reviewed research on the cumulative effects to the use and success of nests monitored from 1998 to 2010 by the Ekati and Diavik diamond mines and in the Effects Study Area for raptors (Coulton et al. 2013). As described in Section 13.4.3.1.1, the HSI scores of nest sites monitored historically from 1998 to 2010 and newly detected in 2013 (stick and active nests) were used to qualify the distribution of high, good, low, and poor HSI categories used in the assessment.



LEGEND

- EKATI MINE FOOTPRINT
- DIAVIK MINE FOOTPRINT
- WINTER ROAD
- TIBBITT TO CONTWOYTO WINTER ROAD
- NORTHERN PORTION OF TIBBITT TO CONTWOYTO WINTER ROAD
- ESKER
- WATERCOURSE
- WATERBODY
- JAY PROJECT BASELINE STUDY AREA

10 0 10

SCALE 1:500,000 KILOMETRES

REFERENCE

NATIONAL TOPOGRAPHIC BASE DATA (NTDB) 1:250,000
CANVEC © NATURAL RESOURCES CANADA, 2012
NATURAL RESOURCES CANADA, CENTRE FOR TOPOGRAPHIC INFORMATION, 2012
DATUM: NAD83 PROJECTION: UTM ZONE 12N

DOCUMENT

IEMA IR 33

PROJECT
DOMINION DIAMOND
JAY PROJECT
NORTHWEST TERRITORIES, CANADA

TITLE

RAPTOR NEST SITES, 1998 TO 2013

Golder Associates

PROJECT		1419751	FILE No. POSTDAR_IR_Wild_010_GIS	
DESIGN	DC	24/02/15	SCALE AS SHOWN	REV. 0
GIS	ANK	26/02/15	MAP 33-1	
CHECK	DC	26/02/15		
REVIEW	DP	26/02/15		

G:\CLIENTS\DOMINION\DDEC Jay and Lynx Projects\Figures\13-1328-0041 Jay & Lynx EA\Wildlife\POST-DAR IRs\POSTDAR_IR_Wild_010_GIS.mxd

References:

Coulton DW, Virgl JA, English C. 2013. Falcon nest occupancy and hatch success near two diamond mines in the southern Arctic, Northwest Territories. Avian Conserv Ecol 8: 14. http://dx.doi.org/10.5751/ACE-00621-080214.

Handley J. 2010. Diamond Mine Wildlife Monitoring Workshop Report. Prepared for Environment and Natural Resources. Yellowknife, NWT, Canada.

Poole KG, Bromley RG. 1988. Interrelationships within a raptor guild in the central Canadian Arctic. Can J Zool 66: 2275-228.

Wightman CS, Fuller MR. 2005. Spacing and physical selection patterns of peregrine falcons in Central West Greenland. Wilson Bull 117:226-236.

DOMINION DIAMOND

Information Request Number: DAR-IEMA-IR-35

Source: Independent Environmental Monitoring Agency: Kevin O'Reilly

Subject: Winter Road Operating Season

DAR Section(s): 16.3

Preamble (IEMA):

The dataset used to generate Figure 16.3-2 and resultant conclusions is based on the period 1994-2006. As the data is used to determine future effects and related mitigation, the latest data should be used to confirm or amend projections.

Request (IEMA):

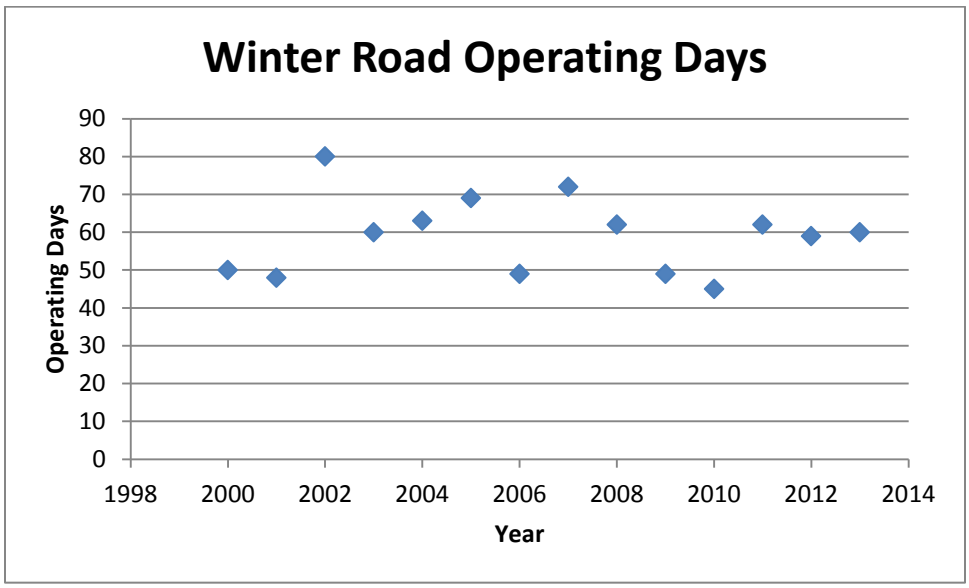
DDEC should provide the latest data and confirm or amend the conclusions drawn from the dataset.

Response:

As described in Section 16.3 of the Developer's Assessment Report (DAR), a study was conducted by EBA Engineering Consultants Ltd. (EBA 2007) to examine the risks from climate warming on future operations of the Tibbitt to Contwoyto Winter Road by developing a correlation between length of operating season and the cumulative air freezing index for the season (McGregor et al. 2008). Figure 16.3-1 and Figure 16.3-2 presented in Section 16.3 of the DAR are sourced from the McGregor et.al. (2008) report, and therefore, only present information up until 2006. The report found that the combination of winter freezing index and snow cover controls the rate of natural ice growth and the ability of the ice sheet to sustain loads late in the season.

However, conclusions presented in Section 16.3 of the DAR have also included the analysis of annual air temperature data from 1959 to 2013 which indicated a positive statistically significant trend (Section 10.3.1 of the DAR). Annual air temperatures have increased at an estimated rate of 0.05 degrees Celsius per year. The data indicates that the current operational winter road season consists of approximately 65 days. Figure 35-1 graphically shows the number of days the winter road has operated between 2000 and 2013. However, projected changes to the winter freezing index suggests that the operational days may decrease approximately to 54 days by 2020 or beyond. As such, the conclusions within Section 16.3 of the DAR remain appropriate.

Figure 35-1 Winter Road Operating Days (2000 – 2013)



References:

EBA (EBA Engineering Consultants Ltd.). 2007. An Overview of Strategic Transportation Options to Supplement the Tibbitt to Contwoyto Winter Road. Submitted to Tibbitt to Contwoyto Winter Road Joint Venture.

McGregor RV, Hassan M, and Hayley D. 2008. Climate Change Impacts and Adaptations: Case Studies of Roads in Northern Canada. EBA Engineering Consultants Inc. Paper prepared for presentation at the “Climate Change and the Design and Management of Sustainable Transportation” Session of the 2008 Annual Conference of the Transportation Association of Canada, Toronto, ON, Canada.

DOMINION DIAMOND

Information Request Number: DAR-IEMA-IR-36

Source: Independent Environmental Monitoring Agency: Kevin O'Reilly

Subject: Cumulative Effects on Caribou

DAR Section(s): 17.8

Preamble (IEMA):

It is generally agreed that the collapse of the Bathurst Caribou (from over 400 000 animals to approximately 15 000 animals) is largely a natural event. However, concerns over whether human developments in the region have an adverse effect on this valued component led to caribou impacts being included as a Key Line of Inquiry. Moreover, the Jay project would also adversely affect the herd, even if not greatly. The question that needs to be asked is how great is the cumulative effect on the herd? If it is great enough that the herd has been pushed beyond its recovery threshold, then this is surely a significant adverse cumulative effect and, since Jay would add to it, the cumulative effect would be significant. The Agency agrees that the answer to this important question to the recovery threshold for the herd is not known. But the risk to the very important valued component is great. DDEC has committed to using the precautionary principle (the Environmental Agreement). For the record, the Agency is of the view that it is more correct to proceed in a precautionary manner and assume the Bathurst herd is suffering a significant adverse cumulative effect than to assume the cumulative effect is not significant without evidence.

Request (IEMA):

In the absence of scientific certainty, DDEC should provide information on what measures it is proposing to mitigate the (presumed) significant adverse cumulative effect on the Bathurst Caribou Herd. It should be demonstrated that these measures will be adequate to offset the adverse effects of the Jay Project so that the Bathurst herd would be better off after the Jay Project than it would be without the project.

Response:

The Jay Project is expected to contribute little to the cumulative effects on barren-ground caribou; most changes are likely to be ecologically not measurable. For example, incremental direct and indirect changes of the Jay Project to preferred seasonal habitats are predicted to be between 0.0% and 0.2% (Section 12.4.2.2.2 of the Developer's Assessment Report [DAR]). The incremental decrease in fecundity from the Base Case to the Application Case (which includes the Project) was predicted to be 0.3% (Section 12.4.2.3.2 of the DAR). The cumulative effects analysis shows that natural factors (such as population cycles and insect harassment) remain the determining factors in caribou energetics, abundance, and distribution. The population modelling completed for MVEIRB-IR-15 (Adequacy Review Item 8.8) demonstrates that the Bathurst herd's ability to increase is dependent on caribou vital rates and is not prevented by cumulative effects of development disturbance. Conservative assumptions were used throughout the assessment to predict maximum effects and manage uncertainty. Analysis of primary pathways and measurement indicators (lines of evidence) demonstrate that the adverse incremental and cumulative changes from the Project and other developments do not significantly contribute to cumulative effects on caribou abundance and distribution.

Monitoring and mitigation will be undertaken to measure and reduce incremental effects of the Jay Project and decrease uncertainties about effects from development. The Ekati Mine Wildlife Effects Monitoring Program will be expanded to encompass the Jay Project and a Wildlife and Wildlife Habitat Protection Plan is anticipated to be required under the Northwest Territories *Wildlife Act*.

Dominion Diamond is now and will continue to work diligently and collaboratively with the Government of the Northwest Territories (GNWT) and other community and industry partners on regional programs. The DAR, and associated follow up work, demonstrates that the Jay Project will not cause significant adverse effects on the Bathurst herd. Dominion Diamond will maintain its commitment throughout the life of the Jay Project to doing what it reasonably can to contribute to and support GNWT-led regional programs to improve the state of the Bathurst caribou herd.

DOMINION DIAMOND

Information Request Number:	DAR-IEMA-IR-37
Source:	Independent Environmental Monitoring Agency: Kevin O'Reilly
Subject:	Response to Aboriginal Concerns
DAR Section(s):	Annex XVII

Preamble (IEMA):

Throughout the document DDEC notes that a particular Aboriginal group "Has expressed concern(s) about the impacts of mining on…(a VEC). There is no explanation given as to how DDEC has addressed or mitigated these concerns in the development of the project.

Request (IEMA):

DDEC should make specific reference to the concerns expressed by the Aboriginal organizations and how they have addressed these concerns in the development of the project.

Response:

The Traditional Land Use and Traditional Knowledge Baseline Report (TLU and TK Baseline) for the Jay Project (Annex XVII of the Developer's Assessment Report [DAR]) provides a summary of existing, publicly available information shared by affected communities concerning land use and knowledge of resources near the Ekati Mine and the proposed Jay Project. The TLU and TK Baseline also intends to provide evidence of ongoing efforts to maintain communication with communities and consider TK in the development of site plans, and monitoring and mitigation efforts. This report provides information and preliminary evaluations based on available knowledge and data on land use near the Ekati Mine. The primary goal of this report is to summarize available TLU and TK values related to the Baseline Study Area (BSA) including:

- use by, and importance of the area to, potentially affected communities;
- knowledge and management of resources and the ecosystem in the BSA; and,
- existing areas of lost use resulting from impacts by past developments in the BSA.

Through representation of the available information regarding TLU and TK, many concerns coming from the First Nation, Inuit, and Métis communities were identified. In some cases, Dominion Diamond's response to concerns have been identified in the TK Baseline. Examples include:

- In response to concerns about impacts on caribou and other wildlife as a result of the Ekati Mine, Inokhok/Inokhuit (stone marker) were built at strategic locations around the mine site and made more visible by adding flagging tape, by making them larger, or by painting "hats" on them. Fences were also constructed to deflect and protect caribou from mining at the Beartooth Pit, Pigeon Pit, Misery camp, and airstrip.

- In 2011, community participants in the Wildlife Effects Monitoring Program (WEMP) Community Engagement Program helped Ekati staff identify 23 habitat locations around the Ekati Mine for establishing plots for the grizzly bear DNA Program that is designed to assess and monitor the distribution and occupancy of grizzly bears near the mine.
- In 2013, participants in the vegetation workshop suggested that Ekati should make the tailings beaches wavy with little hills at closure so that the plants can grow more easily, and further, that Ekati should include fine clays and soils on the waste rock piles to support vegetation growth, till the lands to encourage progressive regrowth and even moisture distribution, and limit the transplanting of sedges to 10% of the source material.

In preparation for submission of the DAR, Dominion Diamond carried out a series of Community Engagement Workshops with the Kitikmeot Inuit Association, Łutselk'e Dene First Nation, North Slave Métis Alliance, Tłı̨chǫ Government, and Yellowknives Dene First Nation in March, June, and July 2014. Workshops in March were held in Yellowknife while workshops in June and July were held in the communities of Lutsel K'e, N'Dilo, Behchokǫ̀, Yellowknife, and Kugluktuk.

Furthermore, as described in the response to DAR-NSMA-IR-04, Dominion Diamond made changes to the original Jay-Cardinal project to mine the Jay pipe only and remove the Cardinal pipe from the project entirely due to concerns heard during the engagement process with communities and stakeholders.

Also, in the DAR, Dominion Diamond proposed to construct caribou crossings at appropriate discrete locations along the Jay Road. After receiving input from Aboriginal communities during the engagement process and during site visits, Dominion Diamond has changed its approach to caribou crossings along the Jay Road to reflect that feedback. The main section of the Jay Road will be constructed with frequent and wide caribou crossings that will respect the communities' identification of the importance of this area for caribou movement. Once the road is constructed, monitoring, including by Aboriginal community members, will be implemented to assess the effectiveness of the constructed caribou crossings. The mine plan utilizes several environmental design features and mitigation to eliminate or reduce the potential for Project activities to result in adverse environmental effects on hydrogeology, hydrology, and water quality. The majority of concerns are addressed throughout the body of the DAR and can be found under the relevant component sections.

Table 37-1 provides a list of the concerns identified by First Nations, Inuit, and Métis in the TLU and TK Baseline and elsewhere in the DAR and the sections and subsections of the DAR where they are addressed, including Ekati Mine or Jay Project mitigation to be employed.

Table 37-1 Community Concerns Addressed in DAR

Valued Component (VC) or Subject of Note (SON)	Concerns Expressed by Aboriginal Communities in the TLU and TK Baseline and DAR	How Concerns were Addressed in the DAR	Subsection of DAR
Air Quality	Effects of the Project on air quality.	Air quality assessment in Section 7 of the Developer's Assessment Report (DAR). Traditional Knowledge (TK) considered in pathway screening. Assessment considered emissions of sulphur dioxide (SO2), nitrogen oxide (NOX), carbon monoxide (CO), and particulate matter (PM2.5, TSP) from construction equipment, mining operations and processing equipment, and vehicle fleet; and, fugitive dust emissions from mining activities, material movement and storage, drained lakebed, and haul roads. Mitigation to reduce effects includes: follow general management approaches for air emissions from the Project: Project mine equipment and haul vehicles will be regularly maintained to reduce emissions and maximize fuel efficiency; low sulphur (15 parts per million by weight [ppmw]) diesel will be used in fleet vehicles; and site road topping surfaces will be regularly maintained for operational efficiencies and to minimize fuel consumption; and energy conservation initiatives such as maintaining site road topping surfaces for energy efficiency will be undertaken. At Ekati Mine, community participation in group workshops and site visits are carried out annually to demonstrate and discuss air quality, dust, and vegetation monitoring, and other specific topics of interest.	7.3.2, 7.4
	The effects of dust on the vegetation and water in and around Lac de Gras (i.e., the impacts of dust on the caribou food in the area of the mines, such as moss, lichen, and muskeg and accumulation or deposition of dust in water). Dust affecting animal migration (e.g., avoidance of the Project by local game due to dust), small furbearing animals, birds, hatching birds and birthing animals, vegetation, fish (and specifically in the Lac de Gras area).	Air quality assessment in Section 7 of the DAR. TK considered in pathway screening. Assessment considered fugitive dust emissions from mining activities, material movement and storage, drained lakebed, and haul roads. Results passed on to vegetation and water quality teams for their assessments. Community participation in group workshops and site visits are carried out annually to demonstrate and discuss air quality, dust, and vegetation monitoring, and other specific topics of interest. Mitigation to reduce effects includes the following management practices: water spray and chemical suppressant application to control dust emissions on haul roads during summer or non-frozen season; and, managing vehicle speed to limit road dust from vehicle wheel entrainment.	7.2.4, 7.3.2.2
	Cumulative effects of dust on the entire environment, including lakes, plants, fish, and the wildlife - How the impacts of dust could rise through the food chain, affecting more wildlife in the area.	Results from the air quality assessment passed on to vegetation and water quality teams for their assessments, which are then is considered in barren-ground caribou, wildlife, fish and fish habitat assessment. Ambient air quality monitoring program will be used to guide adaptive management strategies and the implementation of mitigation, if and as required, to maintain exposure to particulate matter ($PM_{2.5}$) levels below those that would be of concern.	7.4.2.2.4, 7.4.2.2.5

Table 37-1 Community Concerns Addressed in DAR

Valued Component (VC) or Subject of Note (SON)	Concerns Expressed by Aboriginal Communities in the TLU and TK Baseline and DAR	How Concerns were Addressed in the DAR	Subsection of DAR
Water –Quality and Quantity	Changing water levels and the impact on wildlife.	Changes to surface water quantity (including changes to flows and water levels) assessed in Section 8 of the DAR. TK considered in pathway screening. Results passed on to the vegetation, wildlife and fish and fish habitat teams for their assessments. Mitigation to reduce effects includes the mine water management plan. The water management plan includes environmental design features and mitigation to reduce the potential for effects to water levels and water flows: enhancing water recycling opportunities on site, containment of mine site water, use of dikes and diversion channels, appropriately designed cross-drainage structures for mine site roads, and planned pumped discharge rates (for dewatering activities) to avoid adverse erosion at lake outlets and channels. Monitoring will be conducted at specified lake outlets and channels (including the Lac du Sauvage Narrows) for evidence of erosion, and for monitoring of flow rates and water levels. Adaptive management, consistent with that currently applied at the Ekati Mine, will be implemented at the Jay Project should unacceptable effects be observed.	3, 8.3, 8.4.2, Appendix 3A, Appendix 8D
	Impacts of development on the quality of water (i.e., quality of water in the Coppermine watershed). These include dust generation and deposition, leakage or release of contaminants from tailings ponds, spills and leaks to downstream environments, quality of water that may affect fish health, quality of water in pits, reconnection of pits to downstream environments, and linkage of effects on quality of plants and health of animals such as caribou.	Changes to surface water quality assessed in Section 8 of the DAR. TK considered in pathway screening. Results passed on to the fish and fish habitat team for their assessments, as well as wildlife and culture. Environmental design features and mitigation to reduce the potential for effects to water quality in the downstream environment were developed as an integral part of the Project's design through an iterative process between the Project's engineering and environmental teams to avoid or mitigate adverse effects. Mitigation to reduce or eliminate potential effects to water quality include spill management, explosives management (both for storage and use), sediment and erosion controls around altered drainage and construction areas (including the use of silt curtains), dust suppression on the roads, use of the Long Lake Containment Facility for process water management, use of the mined out pits for containment of operational minewater on site for the first five years of operations (i.e., no discharge until about mining operation year 5), use of an engineered diffuser to enhance dispersion and mixing of released minewater in the environment (i.e., to reduce peak plume concentrations), and use of the mined-out pits in post-closure to store minewater with higher total dissolved solids (TDS).	8.2.6, 8.3, 8.4.2, 8.7.2
	The stagnation of water in the pits if they remain isolated after closure and the overflow of that water during freshet.	Changes to surface water quality assessed in Section 8 of the DAR. Hydrodynamic models of the pits were developed. At closure, the mined-out pits will be back-flooded with freshwater sourced from local lakes to form a freshwater cap over the minewater remaining at the bottom of the pits. The freshwater cap will be of sufficient depth to prevent mixing of the higher TDS water at the bottom and the freshwater at the top. The Misery pit lake will be reconnected to the downstream environment (i.e., allowed to spill over). Before the pit lakes are connected to the downstream environment, water quality must meet acceptable criteria. Monitoring will be conducted in the pit lakes and in the receiving environments to validate the predictions, confirm that water quality in the pits meets discharge limits, and confirm that there are no negative effects in the receiving environment.	8.5.4.2, Appendix 8G

Table 37-1 Community Concerns Addressed in DAR

Valued Component (VC) or Subject of Note (SON)	Concerns Expressed by Aboriginal Communities in the TLU and TK Baseline and DAR	How Concerns were Addressed in the DAR	Subsection of DAR
Water –Quality and Quantity (con't)	Accessibility of the tailings ponds to animals and the potential health impacts it could create.	Effects on caribou and wildlife assessed in Sections 12 and 13 of the DAR. TK considered in pathway screening. Wildlife risk assessment completed and submitted as part of the adequacy review submission. The presence of wildlife at site will be monitored as part of a Wildlife Effects Monitoring Program and animals will be deterred. Wildlife deterrent actions will be implemented by knowledgeable and trained personnel. The goal of these deterrents is to manage wildlife encounters in ways that will keep both humans and animals safe.	12.3.2.2.2 13.3.2.2.1 Wildlife risk assessment
	Impacts of spills on birds and other animals.	Changes to surface water quality assessed in Section 8 of the DAR. TK considered in pathway screening. Results passed on to wildlife teams. Mitigation to minimize effects from spills include the following. During the construction, operation, and closure phases of the Jay Project, all reasonable measures will be taken to avoid spills, and all regulations will be followed for the storage, handling, and disposal of materials, consistent with practices already in place at the Ekati Mine. The Spill Contingency Plan that is currently in place at the Ekati Mine will be extended for the Project, and will include information on actions that will be followed to respond to spills in the Project area. Complementary plans under the Water Licence and Land Use Permit for the Ekati Mine will also be extended to describe storage, handling, and spill clean-up of hazardous and non-hazardous material specific to the Project (e.g., Waste Management Plan, Hazardous Waste Management Plan, Hydrocarbon-impacted Material Management Plan).	8.4.2

Table 37-1 Community Concerns Addressed in DAR

Valued Component (VC) or Subject of Note (SON)	Concerns Expressed by Aboriginal Communities in the TLU and TK Baseline and DAR	How Concerns were Addressed in the DAR	Subsection of DAR
Caribou	Caribou spending reduced time in the calving grounds as a result of increasing development activity, and habitat disturbance putting the very young animals at risk.	Effects on caribou assessed in Section 12 of the DAR. TK considered in pathway screening. The increased sensitivity of the Bathurst herd in some seasons, especially the calving season, is acknowledged. The analyses in the DAR were conducted separately for each season to maximize the predicted effects of the Project and other development on the range used in each season. The Project will use existing infrastructure at the Ekati Mine to minimize newly disturbed caribou habitat. Both the Project and the Existing Ekati Mine infrastructure are well removed from the Bathurst herd calving grounds.	12.4.2.3, 12.6.2
	Impacts of noise on caribou near the mine and winter road.	Effects on caribou assessed in Section 12 of the DAR. TK considered in pathway screening. Residual effects on Bathurst caribou are analyzed using measurement indicators (e.g., habitat quantity and fragmentation, habitat quality, survival, and reproduction). Changes in habitat quality, movement, and behaviour include influences from noise, lights, dust deposition, viewscape), and the presence of vehicles and people. The combination of direct (physical footprint) and indirect (noise, dust, viewscape and other sensory disturbances) effects can create a zone of influence (ZOI) around the Project that can change the behaviour and occurrence of caribou (Section 12.2.2.2). Mitigations include: • Wildlife always have the right-of-way • A minimum flying altitude of 600 metres (m) above ground level (except during takeoff and landing, and during field work) will be maintained for cargo, passenger aircraft, and helicopters outside of the Project site. • Modified traffic patterns and road closures will be used as necessary to protect caribou and people. • Noisy equipment will use mufflers or be housed inside. • Vehicles will be maintained regularly to prevent excessive noise.	12.2.2.2, 12.2.2.3, 12.3.2.2, 12.4.2.2
	Potential for the smell of oil and gas from developments overpowering the smell of food that would normally guide caribou to the best range.		
	The number of bulls hunted by outfitters.	Description of sport hunting camps for caribou provided in Section 12.2 of the DAR. Effects on caribou assessed in Section 12 of the DAR. TK considered in pathway screening. Effects of hunting on the Bathurst caribou herd discussed in Section 12.3.	12.2.2.3, 12.2.2.4, 12.3.2.2
	Potential contamination from traffic on the roads, particularly due to spills and accidents.	Effects on caribou assessed in Section 12 of the DAR. TK considered in pathway screening. Mitigation related to spills on roads include: vehicles will be regularly maintained to minimize leaks and spills; spill Response Plan will be effect; the integrity and performance of the pumping and pipeline systems will be monitored throughout the Project construction and operations phases to prevent the unintentional release of minewater to the environment.	12.3.2.2.1

Table 37-1 Community Concerns Addressed in DAR

Valued Component (VC) or Subject of Note (SON)	Concerns Expressed by Aboriginal Communities in the TLU and TK Baseline and DAR	How Concerns were Addressed in the DAR	Subsection of DAR
Caribou (con't)	Impacts that mining developments are having on the caribou herds, their health, and their migration patterns (i.e. infrastructure inhibiting the movement of caribou through the Ekati Mine site).	Effects on caribou assessed in Section 12 of the DAR, including predicted losses of preferred habitat among the four seasonal ranges and migration patterns. Wildlife risk assessment completed and submitted as part of the adequacy review submission. From 2011 to 2012, motion detection wildlife cameras were used to investigate caribou interactions with the Misery Road and other mine site roads. Traffic will be managed including suspension to allow large groups of caribou to move through the Ekati mine area. The DAR also describes the mitigation policies, practices and procedures that will protect caribou from harm and that will enable their continued movement though the Ekati Mine site. For example, Dominion Diamond has proposed to increase early monitoring of caribou movement by working with the Government of the Northwest Territories (GNWT) to access satellite collar maps. This provides advanced warning of when caribou may be approaching the Ekati Mine. Also, Dominion Diamond proposes to construct additional kimberlite stockpile areas so that the Ekati Mine can operate through brief road closures if this is necessary to allow caribou to safely move through the mine site. The frequency of road reconnaissance surveys, modification of traffic patterns, and road closures would reflect the number and group composition of caribou near the mine site, which is a hierarchical approach. Other mitigation measures include designing the portion of the road that crosses (cuts through) the esker as a caribou crossing, and as such, the pipelines will be buried, with the exception of any valve or joint. Design will be advanced to minimize the need for joints or valves through the esker crossing. Other portions of the Jay Road will also be constructed as caribou crossings except where road height requires side berms, where surface conditions preclude caribou use, or where maintenance access is essential for pipe valves. Caribou crossings will be designed so that the side slopes of the road are flatter and have finer crushed rock (200 millimetres or less). In the caribou crossing areas, the pipelines will also be covered with fine gravel material; however, valves and pipeline joints will not be covered. Once the road is constructed, monitoring, including by Aboriginal community members, will be implemented to assess the effectiveness and extent of the constructed caribou crossings; modifications can be incorporated based on the outcome of monitoring through adaptive management.	12.3.2.2.1, 12.4.2.2.2 Wildlife risk assessment
	The presence of the large open pits.	Caribou mitigation in the vicinity of open pits has included the installation of 'snow' fence in the Beartooth and Pigeon areas. In response to concerns about impacts on caribou and other wildlife as a result of the Ekati project, Inokhok (stone marker) were built at strategic locations around the mine site and made more visible by adding flagging tape, by making them larger, or by painting "hats" on them. Fences were also constructed to deflect and protect caribou from mining at the Beartooth Pit, Pigeon Pit, Misery Camp, and airstrip. Monitoring at the Ekati mine indicates no caribou injuries or mortalities associated with open-pits have occurred.	12.3.2.1.4

Table 37-1 Community Concerns Addressed in DAR

Valued Component (VC) or Subject of Note (SON)	Concerns Expressed by Aboriginal Communities in the TLU and TK Baseline and DAR	How Concerns were Addressed in the DAR	Subsection of DAR
Caribou (con't)	Caribou's ability to travel.	Effects on caribou assessed in Section 12 of the DAR. The permeability of roads to caribou was monitored by recording snow track patterns along the side of the Misery Road at the Ekati Mine during the northern migration, and wildlife camera monitoring. To determine the energetic cost of a deflection movement, two hypothetical routes that avoided the Project, Misery Road, and the Ekati or Diavik mine infrastructure were assumed and compared to seven alternate caribou paths determined by Traditional Knowledge. Modified traffic patterns and road closures will be used as necessary to mitigate barrier effects to caribou. The implementation of modified traffic patterns and road closures is also expected to limit the effect of increased traffic from the Jay Project on caribou movement through the Ekati Mine area.	12.2.1.1.4, 12.2.2.2, 12.3.2.2, 12.4.2.2.2, 12.4.2.3
	Declining caribou numbers and shifting migration patterns.	Effects on caribou assessed in Section 12 of the DAR, and includes discussion of the decline in the barren-ground caribou herds in the Northwest Territories (NWT). An energetics model was included in the DAR which included a deflection cost that assumed caribou would not cross the Misery and Jay roads (i.e., a complete barrier effect), and would be required to travel using longer alternate routes to continue migration through the Lac de Gras area. Subsequent to the DAR, an assessment was made of temporal trends in seasonal range use and migration patterns. This was completed in response to Mackenzie Valley Environmental Impact Review Board (MVEIRB) Jay Project Adequacy Review Item 8.2 and was submitted as DAR-MVEIRB-9.	12.2.2.3, 12.4.2.3, 12.4.3, 12.6.2
	Caribou mortalities near Ekati.	Effects on caribou assessed in Section 12 of the DAR, and includes mine-related wildlife mortalities in the NWT. Mine-related mortalities are monitored in several ways. Personnel undergo environmental orientation and are required to report all wildlife incidents (including mortalities) they observe. Environmental data collection programs also occur at the mine sites, such as wildlife monitoring, water quality sampling, and dust and vegetation monitoring programs. Any wildlife mortalities located during these monitoring or sampling events are reported to environmental personnel. Mitigations will include the following: • Roads and the Sub-Basin B Diversion Channel will be constructed with caribou crossings that reduce risk of injury related to coarse road fill. • Blasting in the pit and quarry, if necessary, will be carefully planned and controlled to minimize fly rock that might injure caribou. • The use of guy wires for power poles will be minimized as much as feasible, and those guy wires that are required will be made more visible with coloured plastic sleeves to reduce risk of injury to caribou. • Ramps to facilitate the access and egress of wildlife from the waste rock storage area (WRSA) will be constructed for closure. Wildlife deterrent actions will be implemented by knowledgeable and trained personnel. The goal of these deterrents is to manage wildlife encounters in ways that will keep both humans and animals safe.	12.2.1.4.1, 12.2.2.4.1, 12.2.2.4.3, 12.3.2.1.2, 12.3.2.2.2

Table 37-1 Community Concerns Addressed in DAR

Valued Component (VC) or Subject of Note (SON)	Concerns Expressed by Aboriginal Communities in the TLU and TK Baseline and DAR	How Concerns were Addressed in the DAR	Subsection of DAR
Culture	Community well-being, culture and identity.	The assessment endpoints for the TLU valued component (VC) centre on the protection of continued opportunities to participate in culturally important uses of the land, such as traditional harvesting activities. Involvement of potentially affected Aboriginal groups in monitoring programs. Regular involvement with, meetings, updating, and communication of the results of monitoring plans to potentially affected Aboriginal groups. Mitigation measures as described in the Maximizing Benefits and Minimizing Impacts Key Lines of Inquiry (KLOI) (Section 14): • Points of hire or fly points in all rural local study area (LSA) communities. • Source construction labour preferentially from point of hire or fly point communities (including Yellowknife). • Maintain priority hiring and contracting for Northerners and Northern Aboriginals. • Transition existing Ekati operations workforce to the Project operations. • Provide a first responder medical station at the accommodation camp facilities to meet workers' medical needs while at site, to limit the demand for governmental health facilities for work related injuries. • First aid training. • Driver training and enforcement of a driver code of conduct, to control speeds and encourage considerate driving. • Support Community Liaison Coordinator positions to work with communities throughout the Project • Offer drug and alcohol programming and other counselling to employees and their immediate families. • Offer Employee and Family Assistance Program to employees and their immediate family members.	14.1.4.2, 14.6 15.2.2, 15.3.2, 15.4.1.2.1, 15.4.1.2.4
	Impacts on human health.	The assessment endpoints for the TLU VC centre on the protection of continued opportunities to participate in culturally important uses of the land, such as traditional harvesting activities. Involvement of potentially affected Aboriginal groups in monitoring programs. Regular involvement with, meetings, updating, and communication of the results of monitoring plans to potentially affected Aboriginal groups. Dominion Diamond intends to mitigate this concern through the involvement of potentially affected Aboriginal groups in their monitoring programs (i.e., Wildlife Effects Monitoring Program [WEMP], Aquatic Effects Monitoring Program [AEMP], Air Quality Monitoring Program [AQMP]) and through the communication of the results of these monitoring programs to each community through meetings and other engagement opportunities.	15.2.2, 15.3.2, 15.4.1.1.5, 15.4.1.2.1

Table 37-1 Community Concerns Addressed in DAR

Valued Component (VC) or Subject of Note (SON)	Concerns Expressed by Aboriginal Communities in the TLU and TK Baseline and DAR	How Concerns were Addressed in the DAR	Subsection of DAR
Culture (con't)	The impacts on improved access to traditional hunting areas.	The only new access route associated with the Jay Project will be the Jay Access Road. This road will not be available for use by the public, and will not allow for any increased access into the area for harvesting.	15.3.2, 15.4.1.1.1
	Ability to participate in the fall and spring hunts (waterfowl and caribou) in the Ek'atì area	The assessment endpoints for the TLU VC centre on the protection of continued opportunities to participate in culturally important uses of the land, such as traditional harvesting activities. • The Project maximizes the use of the existing infrastructure to reduce the environmental footprint as much as possible. • The esker will be sloped to allow for continued use by caribou. • Siting and construction of the Project will be planned to avoid environmentally sensitive areas (e.g., critical wildlife habitat, rare plants and wildlife species, and wetlands) as much as possible. • Wildlife will be actively deterred from areas of risk. • The WEMP implemented at the Ekati Mine will include the Jay Project. • Animals will be deterred from entering the diked area where most fly rock will occur (until pit is too deep for escape of fly rock). • Project activities will be completed in accordance with the Migratory Bird Convention Act. • If lake water level increases are to occur during migratory bird breeding season, then vegetation removal will be completed before nesting season, or nest searches will be completed before construction. • If nests are found during nest searches, mitigation will be applied to avoid incidental take of nesting individuals. • Habitat changes will be monitored as part of the WEMP. • Periodic review of the WEMP and engagement with potentially affected Aboriginal groups. • Construction of caribou ramps and crossings at strategic points along the Misery Road. • Road closures during peak caribou migration throughout the Ekati Mine site. • Use of truck convoys with wildlife monitor escorts to reduce periods of traffic along the roads. • Vehicles will be restricted to designated roads and prepared work areas (recreational use of off-road vehicles is prohibited). • Hazards will be fenced to prevent wildlife interaction. • Continued use of measures currently in place to minimize human-wildlife interactions. Wildlife will be actively deterred from areas of risk. • Final reclamation will be completed so that the landscape is safe for wildlife use. • Additional mitigations as described in the Caribou KLOI and Wildlife and Wildlife Habitat SON (Sections 12 and 13).	15.2.2, 15.3.2, 15.4.1.2.1

Table 37-1 Community Concerns Addressed in DAR

Valued Component (VC) or Subject of Note (SON)	Concerns Expressed by Aboriginal Communities in the TLU and TK Baseline and DAR	How Concerns were Addressed in the DAR	Subsection of DAR
Culture (con't)	Protection of drinking water and continued use of water for traditional and non-traditional activities.	The assessment endpoints for the TLU VC centre on the protection of continued opportunities to participate in culturally important uses of the land, such as traditional harvesting activities. • A Lac du Sauvage Dewatering Plan will be prepared for the Wek'èezhìı Land and Water Board (WLWB) that will include flow rates and locations. • Reduced pumping rates will be implemented during low-flow periods to preserve downstream flow levels. • Operational discharge will meet the discharge criteria for water quality. • Discharge water will be regularly sampled and monitored as part of the Water Licence Surveillance Network Program. • The AEMP implemented at the Ekati Mine will include the Jay Project. • Regular involvement with, meetings, updating, and communication of the results of the AEMP to potentially affected Aboriginal communities. • At closure, natural water levels in Lac du Sauvage will be re-established. • Other mitigations as described in the Water Quantity and Quantity KLOI (Section 8).	15.2.2, 15.3.2
	The potential negative impacts of development on their ability to trap (i.e. ongoing ability to trap foxes in the area).	The assessment endpoints for the TLU VC centre on the protection of continued opportunities to participate in culturally important uses of the land, such as traditional harvesting activities. The Project maximizes the use of the existing infrastructure to reduce the environmental footprint as much as possible. • The esker will be sloped to allow for continued use by caribou. • Siting and construction of the Project will be planned to avoid environmentally sensitive areas (e.g., critical wildlife habitat, rare plants and wildlife species, and wetlands) as much as possible. • Wildlife will be actively deterred from areas of risk. • The WEMP implemented at the Ekati Mine will include the Jay Project. • Animals will be deterred from entering the diked area where most fly rock will occur (until pit is too deep for escape of fly rock). • Periodic review of the WEMP and engagement with potentially affected Aboriginal groups. • Construction of caribou ramps and crossings at strategic points along the Misery Road. • Road closures during peak caribou migration throughout the Ekati Mine site. • Use of truck convoys with wildlife monitor escorts to reduce periods of traffic along the roads. • Vehicles will be restricted to designated roads and prepared work areas (recreational use of off-road vehicles is prohibited). • Hazards will be fenced to prevent wildlife interaction. • Continued use of measures currently in place to minimize human-wildlife interactions. Wildlife will be actively deterred from areas of risk. • Final reclamation will be completed so that the landscape is safe for wildlife use. • Additional mitigation measures as described in the Caribou KLOI and Wildlife and Wildlife Habitat SON (Sections 12 and 13).	15.2.2, 15.3.2, 15.4.1.2.1

Table 37-1 Community Concerns Addressed in DAR

Valued Component (VC) or Subject of Note (SON)	Concerns Expressed by Aboriginal Communities in the TLU and TK Baseline and DAR	How Concerns were Addressed in the DAR	Subsection of DAR
Culture (con't)	Availability of fish in the Ek'atì area.	The assessment endpoints for the TLU VC centre on the protection of continued opportunities to participate in culturally important uses of the land, such as traditional harvesting activities. • The Project footprint disturbance area will be limited to the extent practical. • A diversion channel will be constructed to maintain habitat corridors between Lac du Sauvage and waterbodies in the small contributing sub-basins around the diked area. • A fish-out will occur according to Fisheries and Oceans Canada (DFO) guidance, and with engagement of the Ekati Mine Impact Benefit Agreement (IBA) groups. • An offsetting plan will be developed with DFO and with engagement of the Ekati Mine IBA groups. • The dike and dewatering area will be positioned away from known spawning locations. • The road route alignment will minimize stream crossings and avoid sensitive habitat as feasible. • Culverts will be designed to allow for fish passage where appropriate. • The AEMP implemented at the Ekati Mine will include the Jay Project. • Diversions will be designed to take into account fish movement. • A Lac du Sauvage Dewatering Plan will be prepared for the WLWB that will include flow rates and locations. • Direct discharge flow rates will be developed and maintained such that there are no measurable changes to fish habitat. • During pumping of water from areas that contain fish, appropriately sized fish screens that meet DFO guidelines will be fitted to pumps to limit fish impingement and entrainment. • In-stream works will either be avoided or limited to when watercourses are not flowing, where possible. • Where possible, construction will take place during the winter to minimize disturbance to soils and vegetation, and runoff to local waterbodies. • A closure plan for back-flooding dewatering areas will be developed. • Natural, local water will be used to back-flood dewatering areas. • Water quality will be monitored during the back-flooding period. • Back-flooding will be managed so that there will be no measurable effects to fish habitat at downstream locations in the Coppermine River. • Surface water will be diverted to the pit and dewatered area at a rate that does not significantly alter downstream flow rates. • During pumping of water from areas that contain fish, appropriately sized fish screens that meet DFO guidelines will be fitted to pumps to limit fish impingement and entrainment. • Additional mitigation measures as described in the Fish and Fish Habitat KLOI (Section 9).	15.2.2, 15.3.2. 15.4.1.2.2
	Potential effects of climate on the ecology of the species that Aboriginal groups rely on for cultural values and subsistence harvests.	The assessment endpoints for the TLU VC centre on the protection of continued opportunities to participate in culturally important uses of the land, such as traditional harvesting activities.	15.2.2, 15.3.2

Table 37-1 Community Concerns Addressed in DAR

Valued Component (VC) or Subject of Note (SON)	Concerns Expressed by Aboriginal Communities in the TLU and TK Baseline and DAR	How Concerns were Addressed in the DAR	Subsection of DAR
Culture (con't)	Changes in available plant populations or communities.	The assessment endpoints for the TLU VC centre on the protection of continued opportunities to participate in culturally important uses of the land, such as traditional harvesting activities. • The Project footprint disturbance will be limited to the extent possible, while maintaining safe construction and operation practices. • The site access road route will follow existing roads and/or trails to the extent possible, to limit land clearing. • Banks and vegetated areas will be stabilized, if disturbed. • Where possible, construction will take place during the winter to minimize disturbance to soils and vegetation, and runoff to local waterbodies. • Progressive reclamation will begin as early as possible, starting with areas that are no longer needed for mine operations. Reclamation activities will continue throughout the life of the mine. • Lake shorelines will be assessed for erosion potential, and mitigation will be applied for areas identified with high potential for erosion/generation of suspended sediments/contaminant release. • The AEMP implemented at the Ekati Mine will include the Jay Project. • Dust suppression will be applied as appropriate to roads, the airstrip, and laydown areas. • Disturbed areas will be reclaimed and the surface stabilized. • Reclamation objectives will reflect the local native vegetation communities. • Additional mitigations as described in the Vegetation SON (Section 11).	11.6.2.3, 15.2.2, 15.3.2, 15.4.1.2.3
	Impacts on archaeological sites, specifically grave sites.	The assessment endpoint for the heritage resources VC is the continued protection of archaeological or historic sites, burial sites, artifacts, and other objects of historical, cultural, or religious significance. • The Project footprint disturbance will be limited to the extent possible, while maintaining safe construction and operation practices. • The site access road route will follow existing roads and/or trails to the extent possible, to limit land clearing. • The new access road will be as narrow as possible, while maintaining safe construction and operation practices.	15.2.1.4, 15.2.2, 15.3.2, 15.4.1.2.4, 15.4.2, 15.4.3

Table 37-1 Community Concerns Addressed in DAR

Valued Component (VC) or Subject of Note (SON)	Concerns Expressed by Aboriginal Communities in the TLU and TK Baseline and DAR	How Concerns were Addressed in the DAR	Subsection of DAR
Fish and Fish Habitat	The overall sustainability of fish populations.	Effects on fish and fish habitat assessed in Section 9 of the DAR. TK considered in pathway screening. The maintenance of self-sustaining and ecologically effective fish populations are assessment endpoints for the fish VCs, which would maintain the ongoing productivity of fisheries important to the Aboriginal groups in NWT and Nunavut. VCs included fish species that are an important cultural, subsistence, and economic resource for people in the NWT and Nunavut. The selection of the boundary for effects study areas (ESA) for the fish VCs was based on the biological properties of the fisheries unit under examination. A Conceptual Offsetting plan, developed with DFO and local Aboriginal communities, is provided.	9.1.3, 9.3, 9A
	The potential impacts draining Lac du Sauvage would have on spawning habitat and fish populations.	Effects on fish and fish habitat assessed in Section 9 of the DAR. TK considered in pathway screening. The assessment used three complementary methods and resulting datasets to describe baseline conditions and to evaluate the direct effects to shoal habitat (i.e., as potential spawning locations for fish VCs). To reduce effects to spawning habitat and fish populations, the spatial extent of the mine footprint will be minimized, where possible. For describing baseline conditions of fisheries in Lac du Sauvage, hydroacoustic data on fish densities were combined with species composition data collected primarily from the use of short-duration gill net sets to predict densities and total abundance of fish in Lac du Sauvage. This approach provides a reliable description of baseline conditions for predicting effects. A detailed dike construction plan will be developed and implemented for dike construction and breaching, and will include information relevant to mitigation, inspection, monitoring, and corrective action if necessary. Erosion and sediment control measures will be implemented (e.g., installation of silt curtains) for turbidity control. Indirect effects to spawning habitat through changes in water quality in Lac du Sauvage and Lac de Gras during the operational period and closure are evaluated and described. Appropriately-sized fish screens will be placed on all water intake pipes (e.g., during back-flooding) in fish-bearing waterbodies to minimize potential harm to fish. A Conceptual Fish-Out Plan, developed according to DFO guidance and with feedback from the local Aboriginal communities, is provided.	9.2.3.3, 9.2.4.1.1, 9.3.2.1.2, 9.3.2.2.2, 9.4.3.1.1, 9.4.3.1.2, 9.4.3.2.2, 9.4.3.2.3, 9B

Table 37-1 Community Concerns Addressed in DAR

Valued Component (VC) or Subject of Note (SON)	Concerns Expressed by Aboriginal Communities in the TLU and TK Baseline and DAR	How Concerns were Addressed in the DAR	Subsection of DAR
Fish and Fish Habitat (con't)	The long-term impacts on fish health as a result of lost habitat and changes in migration patterns (protecting the sediment, vegetation, and migration routes for the resident species is important to maintain the fish health and productivity in the area).	Effects on fish and fish habitat assessed in Section 9 of the DAR, including changes in migration patterns. The proposed Sub-Basin B Diversion Channel will be designed to create a temporary fish passage corridor to facilitate movement of spawning Arctic Grayling from Lac du Sauvage to upstream tributary reaches in Stream B1 (above Lake B0 and Stream B0) and Stream Ac35 during the period of mine operations (i.e., 10 years). It is expected that this design will also provide a corridor for other species that use habitat in the affected streams. To prevent potential barriers to fish passage at any of the proposed road crossings of the channel or upstream, culverts will be designed and installed in such a manner to maintain adequate flows and velocities for fish passage, using appropriate federal and territorial guidelines. Potential effects on fish health from changes to water quality and lake ecosystem productivity are assessed for the early operations, closure, and closure phases (Section 8.5.5). Related environmental design features and mitigation practices are listed under water quality. Direct and indirect effects from the Jay Project footprint on riparian habitat are assessed. The spatial extent of the mine footprint will be minimized, where possible, to reduce effects to riparian habitat and fish populations. During back-flooding, the seasonal timing and pattern of lake level fluctuation will be maintained such that effects to riparian habitat will be minor. A Conceptual Offsetting Plan, developed with DFO and local Aboriginal communities, is provided.	8.5.5 9.3.2.1.3, 9.3.2.2.2, 9.4.3.1.1, 9.4.3.1.3, 9.4.3.2, 9.4.3.3.1, 9A
	Impacts of spills on fish.	Effects on fish and fish habitat assessed in Section 9 of the DAR. The potential effects of spills (i.e., fuels, petroleum products, reagents) to habitat quality through a change in surface water quality are assessed. Mitigation identified in the existing Ekati Mine Spill Contingency Plan and environmental design features will be in place to limit the frequency and extent of spills that have potential to occur during Project activities.	9.3.2.2.1

Table 37-1 Community Concerns Addressed in DAR

Valued Component (VC) or Subject of Note (SON)	Concerns Expressed by Aboriginal Communities in the TLU and TK Baseline and DAR	How Concerns were Addressed in the DAR	Subsection of DAR
Fish and Fish Habitat (Con't)	Impacts of blasting, dust, sedimentation during runoff, and increased metals and nutrients on fish.	The potential effects of the use of explosives on fish are assessed. Mitigation measures will be implemented to minimize the effects of blasting in the Jay open pit on fish VCs in nearby waterbodies (i.e., Lac du Sauvage). For example, blasting operations will follow DFO's "Guidelines for the Use of Explosives in or Near Canadian Fisheries Waters" (Wright and Hopky 1998) for setback distances from fish-bearing waterbodies. In addition, blasting and excavation will occur in the dewatered areas of Lac du Sauvage where no water or fish will be present. The indirect effects to fish habitat quality through changes in air and dust emissions (including sulphur dioxide, nitrogen oxides, and particulate matter) and subsequent deposition are assessed. A suite of mitigation practices will be considered, including dust suppression measures on roads, the development of operational procedures for equipment, the use of industry-standard emission control systems. Release of sediment through changes in hydrology from surface disturbance, and erosion related to the construction of watercourse crossings are assessed. A suite of environmental design features and mitigation practices will be considered. For example, erosion and sediment control management practices (e.g., silt fences, runoff management) applicable to northern environments and already in place at the Ekati Mine will be used during construction around disturbed areas, where appropriate. Instream works will either be avoided or limited to when watercourses are not flowing, where possible. Potential effects on fish health from changes to water quality and lake ecosystem productivity are assessed for the early operations, closure, and closure phases. Related environmental design features and mitigation practices are listed under water quality.	9.3.2.2.1, 9.3.2.2.2 9.3.2.2.1, 9.3.2.2.2, 9.4.3.2

Table 37-1 Community Concerns Addressed in DAR

Valued Component (VC) or Subject of Note (SON)	Concerns Expressed by Aboriginal Communities in the TLU and TK Baseline and DAR	How Concerns were Addressed in the DAR	Subsection of DAR
Wildlife and Wildlife Habitat	Impacts of dust on migratory and non-migratory wildlife.	Air quality assessment in Section 7 of the DAR considered fugitive dust emissions from mining activities, material movement and storage, drained lakebed, and haul roads. Results passed on to vegetation and wildlife teams for their assessments. Specifically with respect to dust control, the largest emissions are transport related. Dominion Diamond will manage dust and particulate emissions by continuing and evolving the following management practices: water spray and chemical suppressant application to control dust emissions on haul roads during summer or non-frozen season; and, managing vehicle speed to limit road dust from vehicle wheel entrainment.	7.2.4, 7.3.2.2
	Impacts as a result of potential contaminant spills.	Spills considered in the water quality assessment (Section 8) and well as wildlife (Section 13). The existing Spill Contingency Plan in place for the Ekati Mine will be expanded to include the Jay Project. • Regular equipment maintenance (e.g., regular checks for leaks) will continue. • Drip trays and/or absorbent pads are used during servicing and refuelling. • Hazardous substances are stored and handled on site in accordance with applicable regulations. • Fuel is stored at a central bulk fuel farm at the Ekati main camp and at satellite fuel farms located at Misery, Fox, and Koala North. Fuel tanks are housed within bermed areas. • The Project will follow Ekati's standard policies in the event of a spill; spill response training is provided and updated. • Soil and snow affected by hydrocarbon spills will continue to be handled in accordance with the existing Hydrocarbon-impacted Materials Management Plan and soil will be remediated in the landfarm or shipped off-site. • Dewatering and mine water management in the Wastewater and Processed Kimberlite Management Plan (WPKMP) will include the pipelines used for ongoing water management of the Jay Pit. • Mine water and fine processed kimberlite slurry pipelines will be monitored and inspected throughout construction (i.e., dewatering of diked area), operations, and closure. Additional mitigation will be applied, if required. • Any leaks or spills identified along the pipelines will be addressed and clean-up, if required, will be implemented following the existing Spill Contingency Plan.	13.3
	Small furbearers will be affected through destruction of their habitat and subsequent displacement.	Wildlife assessment in Section 13 of the DAR, included an assessment of habitat for wolves and wolverines. Esker habitat is preferred at the home range scale for wolves in the North Slave Region, possibly because it provides suitable denning habitat. The assessment estimated the removal of esker habitat, relative to the 2014 Baseline Condition in the wolf ESA, as well as changes to den occupancy and productivity in the wolf ESA. For wolverine, the assessment estimated the removal of preferred wolverine habitats, relative to the 2014 Baseline Condition.	13.2.2.4.2, 13.3.2.2.2, 13.4.5.1.2

Table 37-1 Community Concerns Addressed in DAR

Valued Component (VC) or Subject of Note (SON)	Concerns Expressed by Aboriginal Communities in the TLU and TK Baseline and DAR	How Concerns were Addressed in the DAR	Subsection of DAR
Wildlife and Wildlife Habitat (con't)	Impacts of roads and other developments on bear denning habitat, specifically any construction that affects eskers.	Wildlife assessment in Section 13 of the DAR, included an assessment of habitat for grizzly bear habitat and dens. Jay-specific mitigations include: • Only one access road crosses the Lac du Sauvage esker. • The Jay WRSA is set back 200 m from the Lac du Sauvage esker.	13.2.1.2.3, 13.2.2.6.1, 13.3.2.2
	Concerns about grizzly bears being attracted to mines because of smells.	Wildlife assessment in Section 13 of the DAR (including attractants to site [smells]). In 2011, community participants in the WEMP Community Engagement Program helped Ekati staff identify 23 habitat locations around the Ekati Mine for establishing plots for the grizzly bear DNA Program that is designed to assess and monitor the distribution and occupancy of grizzly bears near the mine. Environmental design features and mitigation strategies have been established to reduce the numbers of carnivores attracted to the Project (Table 12.3-1). A Waste Management Plan as approved by the Wek'èezhìi Land and Water Board is in place that works in concert with the WEMP to effectively manage various types of wastes, including wildlife attractants. These strategies include the following: • Workers and visitors to the site are educated about the importance of proper waste management practices. • People are educated on the risks associated with feeding wildlife and careless disposal of food garbage. • Separate bins are located throughout facilities on-site for immediate sorting of domestic waste. • Food waste is stored inside for transport directly to the incinerator for incineration. • Incinerator ash from combustion of kitchen and office waste is stored inside and transported to the landfill. • The landfill is covered regularly with crushed or mine rock. • Ongoing review of the efficiency of the waste management program and improvement through adaptive management.	12.3.2.2.2

Table 37-1 Community Concerns Addressed in DAR

Valued Component (VC) or Subject of Note (SON)	Concerns Expressed by Aboriginal Communities in the TLU and TK Baseline and DAR	How Concerns were Addressed in the DAR	Subsection of DAR
Soils and Vegetation	Difficulty for vegetation to re-grow in the barrenlands	Vegetation assessment in Section 11 of the DAR, and considered closure. In 2013 participants in the vegetation workshop suggested that Ekati should make the tailings beaches wavy with little hills at closure so that the plants can grow more easily. Further, that Ekati should include fine clays and soils on the waste rock piles to support vegetation growth, till the lands to encourage progressive regrowth and even moisture distribution, and limit the transplanting of sedges to 10% of the source material (Dominion Diamond 2013). Research completed at the Mine has indicated that recontouring disturbed sites and surface roughening (e.g., deep ripping, placement of large rocks) creates microsites that are favourable for seed germination and natural colonization of adjacent tundra plant species (BHP Billiton 2012). The riparian (shoreline) and littoral (shallow) areas within the diked area will be reclaimed where necessary to enable natural regrowth of riparian and aquatic vegetation. The reclamation work is envisioned to include localized repair of erosion and re-vegetation of select areas with aquatic and riparian plants. This work will be based on experience gained through operations, reclamation research, and closure of other areas of the Ekati Mine. The terrestrial area that contains the Project footprint is considered a permanent disturbance on the landscape because of the expected long time for vegetation to recover, and it is not known what the reclaimed landscape will look like in the future. The Ekati Mine Interim Closure and Reclamation Plan (ICRP) works to facilitate and promote this nature of natural colonization of disturbed areas.	10.4, 11.3.2.2.2, 11.4.2.2.2 11A
	Effects of dust on the vegetation	The vegetation assessment (Section 11) considered the results of the air quality assessment with respect to dust. The area receiving dust deposition extending beyond the Project footprint was considered. Dust deposition on vegetation has been observed to cause a shift in the plant community, where sensitive species (e.g., *Sphagnum* moss and lichen) are removed and more tolerant species (e.g., haircap moss, Bryum moss, cottongrass and willow) increase (Everett 1980; Walker and Everett 1987; Farmer 1993; Auerbach et al. 1997; Grantz et al. 2003; Golder 2014). Environmental design features and mitigation have been incorporated into the Project to reduce potential effects from dust deposition (Table 11.3.1). For example, dust suppression will be applied as appropriate to roads, airstrip, and laydown areas and speed limits are established on all roads to reduce the production of dust. These environmental design features and mitigation, which should reduce dust deposition, have not been incorporated into the modelling; thus, the modelling results provide conservative estimates of deposition rates (Section 7.4). Because of the conservatism used for the air quality modelling, it is expected that the actual dust deposition from the Project will be lower than predicted, closer to the concentrations measured currently at the Ekati Mine.	7.4, 11.3.2.2.2

In addition to the DAR references identified above, Dominion Diamond aims to include and directly address community concerns through ongoing engagement. To engage community members, actively demonstrate existing monitoring programs, and provide hands-on experience, community representatives observe and participate in site activities designed to determine whether mine activities have effects on the environment, wildlife, or their habitats, and if so, how to mitigate these effects. Active participation in these programs provides an opportunity for communities and participants to provide feedback on how the Ekati Environment Department conducts its monitoring programs at the Ekati Mine. Since Dominion Diamond acquired the Ekati Mine, the focus of the Community Engagement Programs has been on Aboriginal engagement in the environmental monitoring programs. The overall intent of the Community Engagement Programs are to demonstrate and provide hands-on experience for community members (Elders, adults, and youth) so that they may gain a general awareness, as active participants, on how the Ekati Environment Department conducts its day-to-day, site-based, environmental monitoring programs.

Site-based TK and community engagement programs related to the environmental monitoring programs, include:

- youth and Elder participation in fish sampling and assessment programs for the Aquatic Effects Monitoring Program (AEMP) (every three years);
- youth and Elder visits for caribou monitoring as part of the Wildlife Effects Monitoring Program (WEMP) (annual);
- community participation in wolverine and grizzly bear DNA (deoxyribonucleic acid) field programs as part of WEMP (varying schedules);
- community participation in group workshops and site visits to demonstrate and discuss air quality, dust, and vegetation monitoring, and other specific topics of interest (annual);
- Caribou and Roads program with Kugluktuk Elders group as part of the WEMP (annual to 2008);
- Winter Road tours;
- archaeological site visits; and,
- vegetation for closure planning workshops with youth and Elders (2013).

Recently, the Ekati Mine is supported two specific community-based TK projects that include the following:

- the What'aa Eskers Research Project with the Tłįchǫ that involved the study of properties of natural eskers close to Mesa Lake, NWT for the purpose of identifying community-based concepts that may be useful in planning, construction and reclamation of mine waste rock piles; and,
- a TK Research project for the Project that reviewed previous TK research and community site visits to work with an archaeologist on identifying locations of cultural significance at the Project site.

Additionally, Ekati Mine staff regularly participate in community-based meetings and workshops to discuss questions and concerns about ongoing mining activities and monitoring programs.

References:

Auerbach NA, Walker MD, Walker DA. 1997. Effects of roadside disturbance on substrate and vegetation properties in Arctic tundra. Ecol Appl 7: 218-235.

BHP Billiton. 2012. Ekati Diamond Mine 2012 Environmental Impact Report. Yellowknife, NWT, Canada.

Dominion Diamond. 2013. Appendix A. 2013 Community Vegetation Workshop Summary. Dominion Diamond Ekati Corporation, Yellowknife, NT, Canada.

Everett KR. 1980. Distribution and properties of road dust along the northern portion of the haul road. In Brown J, Berg R, eds, Environmental Engineering and Ecological Baseline Investigations Along the Yukon River-Prudhoe Bay Haul Road. U.S. Army Cold Regions Research and Engineering Laboratory. CRREL Report 80-19:101-128.

Farmer AM. 1993. The effects of dust on vegetation – a review. Environ Pollut 79:63-75.

Golder (Golder Associates Ltd.). 2014. 2013 Wildlife Monitoring Report. Prepared for Diavik Diamond Mines (2012) Inc. Yellowknife, NWT, Canada.

Grantz DA, Gamer JHB, Johnson DW. 2003. Ecological effects of particulate matter. Environ Int 213-239.

Walker DA, Everett KR. 1987. Road dust and its environmental-impact on Alaskan taiga and tundra. Arct Alpine Res 19: 479-489.

Wright DG, Hopky GE. 1998. Guidelines for the use of explosives in or near Canadian fisheries waters. Canadian technical report of fisheries and aquatic sciences 2107. DFO, Winnipeg, MB, Canada.

DOMINION DIAMOND

Information Request Number:	DAR-IEMA-IR-38
Source:	Independent Environmental Monitoring Agency: Kevin O'Reilly
Subject:	Documentation of community Concerns
DAR Section(s):	4.4 and 5.3

Preamble (IEMA):

Columns that are labeled: Relevant Comments/Issues/Commitments. These columns do not include relevant comments or issues or commitments made as the title indicates, they only summarizes what the objectives of the consultation was intended to provide. This is misleading.

Request (IEMA):

DDEC should re-label the column with a different title such as "Objective for Meeting". A reference should be provided as to where in the DAR the general and TK comments, issues and commitments made at the workshops, scoping sessions, site visits and other consultation meetings can be found (i.e., Section 15 Culture).

Response:

Dominion Diamond acknowledges the observation identified by the Independent Environmental Monitoring Agency (IEMA) and provides the following suggested changes for the title of the last column of Tables 4.4-1, 4.4-2, 4.4-3, and 5.3-1 in Sections 4 and 5 of the Developer's Assessment Report (DAR) for the public record; these tables have been updated below as Tables 38-1, 38-2, 38-3, and 38-4, respectively.

A summary of general commitments made during community workshops, scoping sessions, site visits, and other consultation meetings can be found in Appendix 1E of the DAR.

Table 38-1 Summary of Pre-Application Community, Regulatory, and Public Engagement Activities (from DAR Table 4.4-1)

Date	Community/ Stakeholder	Potentially Affected Community / Stakeholder Participants	Dominion Diamond Participants	Objective/Comments
29-Apr-13	Tłı̨chǫ	Grand Chief Edward Erasmus	Brendan Bell	Introduction letter to meet informally, introduce Dominion Diamond executives in their new roles, hear interests and priorities, and share vision for Dominion Diamond's future in the North.
29-Apr-13	AT8 – YKDFN and LKDFN	Chief Dora Enzoe, Chief Edward Sangris, Acting Chief Roy Erasmus Sr.	Brendan Bell	Introduction letter to meet informally, introduce Dominion Diamond executives in their new roles, hear interests and priorities, and share vision for Dominion Diamond's future in the North.
29-Apr-13	Inuit – Hamlet of Kugluktuk and KIA	Mayor Ryan Nivingalok and President Charlie Evalik	Brendan Bell	Introduction letter to meet informally, introduce Dominion Diamond executives in their new roles, hear interests and priorities, and share vision for Dominion Diamond's future in the North.
08-May-13	NSMA	NSMA Board of Directors	Brendan Bell Bob Overvold	First meeting since Dominion Diamond assumed ownership of Ekati Mine; included discussion on plans to extend mine life through the Project. Introduced the new Head of Environment and Communities, Bob Overvold. Dominion Diamond assured the group that the company purchased the Ekati Mine to try to keep it open, and committed to keeping them informed via regular meetings. Dominion Diamond committed to keeping IBA groups informed of any changes prior to information being publically available through the WLWB Dominion Diamond also requested that if the group had any fundamental concerns regarding Dominion Diamond's plans, it would be ideal if Dominion Diamond was aware of those concerns sooner rather than later.
10-May-13	AANDC	Zoe Raemer and Benoit Gendron	Deana Twissell	Email requesting meeting with AANDC Assistant Deputy Minister (ADM) Janet King to introduce concept of mining the Jay Pipe.
23-May-13	Tłı̨chǫ	Chiefs' Executive Council	Bob Gannicott Brendan Bell Bob Overvold	First meeting since Dominion Diamond assumed ownership of Ekati Mine; included discussion on plans to extend mine life through the Project. Introduced the new Head of Environment and Communities, Bob Overvold. Dominion Diamond assured the group that the company purchased the Ekati Mine to try to keep it open, and committed to keeping them informed via regular meetings. Dominion Diamond committed to keeping IBA groups informed of any changes prior to information being publically available through the WLWB. Dominion Diamond also requested that if the group had any fundamental concerns regarding Dominion Diamond's plans, it would be ideal if Dominion Diamond was aware of those concerns sooner rather than later.

Table 38-1 Summary of Pre-Application Community, Regulatory, and Public Engagement Activities (from DAR Table 4.4-1)

Date	Community/ Stakeholder	Potentially Affected Community / Stakeholder Participants	Dominion Diamond Participants	Objective/Comments
24-May-13	AT8 – YKDFN and LKDFN	Chief Edward Sangris and Acting Chief Roy Erasmus Sr. (Chief Dora Enzoe was supposed to attend but did not)	Brendan Bell Bob Overvold	First meeting since Dominion Diamond assumed ownership of Ekati Mine; included discussion on plans to extend mine life through the Project. Introduced the new Head of Environment and Communities, Bob Overvold. Dominion Diamond assured the group that the company purchased the Ekati Mine to try to keep it open, and committed to keeping them informed via regular meetings. Dominion Diamond committed to keeping IBA groups informed of any changes prior information being publically available through the WLWB. Dominion Diamond also requested that if the group had any fundamental concerns regarding Dominion Diamond's plans, it would be ideal if Dominion Diamond was aware of those concerns sooner rather than later.
24-May-13	AANDC	Marc Lange, Mike Byrne, Julian Kanigan, Malcolm Robb	Bob Overvold Eric Denholm	First meeting with AANDC to discuss the Project and relevant AANDC programs.
27-May-13	AT8 – LKDFN	Chief Dora Enzoe	Deana Twissell	Follow-up email from meeting to LKDFN Chief requesting dates to visit Ekati Mine and tour the Project by helicopter; no reply received.
28-May-13	AANDC	ADM Janet King, RDG Kathryn Bruce	Bob Gannicott Brendan Bell Bob Overvold	First meeting with AANDC senior staff to discuss the Project and relevant AANDC programs.
30-May-13	Hamlet of Kugluktuk	Hamlet Council	Brendan Bell Bob Overvold	First meeting since Dominion Diamond assumed ownership of Ekati Mine; included discussion on plans to extend mine life through the Project. Introduced the new Head of Environment and Communities, Bob Overvold. Dominion Diamond assured the group that the company purchased the Ekati Mine to try to keep it open, and committed to keeping them informed via regular meetings. Dominion Diamond committed to keeping IBA groups informed of any changes prior to information being publically available through the WLWB .Dominion Diamond also requested that if the group had any fundamental concerns regarding Dominion Diamond's plans, it would be ideal if Dominion Diamond was aware of those concerns sooner rather than later.
04-Jun-13	AT8 – YKDFN	Chief Edward Sangris, Acting Chief Roy Erasmus Sr.	Deana Twissell	Follow-up email from meeting to YKDFN Chiefs requesting dates to visit Ekati Mine and tour the Project by helicopter; no reply received.
04-Jun-13	Tłįchǫ	Chiefs' Executive Council	Bob Gannicott Brendan Bell Bob Overvold Deana Twissell John Bekale	Signing of Contribution Agreement for Khon Go Cho Complex; included update on the Project.

Table 38-1 Summary of Pre-Application Community, Regulatory, and Public Engagement Activities (from DAR Table 4.4-1)

Date	Community/ Stakeholder	Potentially Affected Community / Stakeholder Participants	Dominion Diamond Participants	Objective/Comments
04-Jun-13	AT8	Chief Edward Sangris, Acting Chief Roy Erasmus, and Chief Dora Enzoe	Deana Twissell	Follow-up to a lunch meeting two weeks prior with Dominion Diamond senior management, and also to inquire when it might be convenient to host an Ekati Mine site visit. The visit is to include Misery site and a helicopter tour of Lac du Sauvage in August or September.
14-Jun-14	NSMA	NSMA Board of Directors	Bob Gannicott Brendan Bell Bob Overvold Deana Twissell John Bekale Anne-Marie Beaton Kirsten Berg Robert Beaulieu	First meeting since Dominion Diamond assumed ownership of Ekati Mine; included discussion on plans to extend mine life through the Project. Introduced the new Head of Environment & Communities, Bob Overvold. Dominion Diamond assured the group that the company purchased the Ekati Mine to try to keep it open, and committed to keeping them informed via regular meetings. Dominion Diamond committed to keeping IBA groups informed of any changes prior to information being publically available through the WLWB. Dominion Diamond also requested that if the group had any fundamental concerns regarding Dominion Diamond's plans, it would be ideal if Dominion Diamond was aware of those concerns sooner rather than later.
18-Jun-13	KIA	KIA Board of Directors	Bob Gannicott Brendan Bell Bob Overvold Charles Klengenberg	Met with KIA Board in Gjoa Haven to provide update on the Project. Met with KIA Board in Gjoa Haven to provide update on Jay Pipe. Introduction to Bob Gannigott, Brendand Bell and Bob Overvold and Dominion Diamond as a company. First meeting since Dominion Diamond assumed ownership of Ekati Mine; included discussion on plans to extend mine life through the Project. Introduced the new Head of Environment and Communities, Bob Overvold. Dominion Diamond assured the group that the company purchased the Ekati Mine to try to keep it open, and committed to keeping them informed via regular meetings. Dominion Diamond committed to keeping IBA groups informed of any changes prior to information being publically available through the WLWB. Dominion Diamond also requested that if the group had any fundamental concerns regarding Dominion Diamond's plans, it would be ideal if Dominion Diamond was aware of those concerns sooner rather than later.

Table 38-1 Summary of Pre-Application Community, Regulatory, and Public Engagement Activities (from DAR Table 4.4-1)

Date	Community/ Stakeholder	Potentially Affected Community / Stakeholder Participants	Dominion Diamond Participants	Objective/Comments
18-Jun-13	Hamlet of Kugluktuk	Hamlet Council	Bob Gannicott Brendan Bell Bob Overvold Charles Klengenberg	Met with Hamlet Council in Kugluktuk to provide update on the Project. Introduction to Bob Gannigott, Brendand Bell and Bob Overvold and Dominion Diamond as a company. First meeting since Dominion Diamond assumed ownership of Ekati Mine; included discussion on plans to extend mine life through the Project. Introduced the new Head of Environment & Communities, Bob Overvold. Dominion Diamond assured the group that the company purchased the Ekati Mine to try to keep it open, and committed to keeping them informed via regular meetings. Dominion Diamond committed to keeping IBA groups informed of any changes prior to information being publically available through the WLWB. Dominion Diamond also requested that if the group had any fundamental concerns regarding Dominion Diamond's plans, it would be ideal if Dominion Diamond was aware of those concerns sooner rather than later.
24-Jun-13	AT8 – LKDFN	Chief Dora Enzoe and Council	Bob Gannicott Brendan Bell Bob Overvold John Bekale	Met with Chief and Council to provide update on the Project. Introduction to Bob Gannigott, Brendand Bell and Bob Overvold and Dominion Diamond as a company. First meeting since Dominion Diamond assumed ownership of Ekati Mine; included discussion on plans to extend mine life through the Project. Introduced the new Head of Environment & Communities, Bob Overvold. Dominion Diamond assured the group that the company purchased the Ekati Mine to try to keep it open, and committed to keeping them informed via regular meetings. Dominion Diamond committed to keeping IBA groups informed of any changes prior to information being publically available through the WLWB. Dominion Diamond also requested that if the group had any fundamental concerns regarding Dominion Diamond's plans, it would be ideal if Dominion Diamond was aware of those concerns sooner rather than later.
25-Jun-13	Tłįchǫ	KBWG	Bob Gannicott Bob Overvold Eric Denholm John Bekale	First meeting with KBWG to provide update on the Project. Introduction to Bob Gannigott, Brendand Bell and Bob Overvold and Dominion Diamond as a company. First meeting since Dominion Diamond assumed ownership of Ekati Mine; included discussion on plans to extend mine life through the Project. Introduced the new Head of Environment & Communities, Bob Overvold. Dominion Diamond assured the group that the company purchased the Ekati Mine to try to keep it open, and committed to keeping them informed via regular meetings. Dominion Diamond committed to keeping IBA groups informed of any changes prior to information being publically available through the WLWB. Dominion Diamond also requested that if the group had any fundamental concerns regarding Dominion Diamond's plans, it would be ideal if Dominion Diamond was aware of those concerns sooner rather than later.

Table 38-1 Summary of Pre-Application Community, Regulatory, and Public Engagement Activities (from DAR Table 4.4-1)

Date	Community/ Stakeholder	Potentially Affected Community / Stakeholder Participants	Dominion Diamond Participants	Objective/Comments
26-Jun-13	AT8 – YKDFN	Chief Ernest Betsina	Bob Overvold Charles Klengenberg	Introduction to new Chief of N'Dilo and update on the Project. First meeting since Dominion Diamond assumed ownership of Ekati Mine; included discussion on plans to extend mine life through the Project. Introduced the new Head of Environment & Communities, Bob Overvold. Dominion Diamond assured the group that the company purchased the Ekati Mine to try to keep it open, and committed to keeping them informed via regular meetings. Dominion Diamond committed to keeping IBA groups informed of any changes prior to information being publically available through the WLWB. Dominion Diamond also requested that if the group had any fundamental concerns regarding Dominion Diamond's plans, it would be ideal if Dominion Diamond was aware of those concerns sooner rather than later. Introduction to Project and to the new Head of Environment & Communities, Bob Overvold.
26-Jun-13	IEMA	Bill Ross (chair), Laura Johnston, Tim Byers, Jaida Ohokannoak, Kim Poole, Arnold Enge (all Directors), Kevin O'Reilly and Jessica Simpson (staff)	Bob Overvold Eric Denholm	Introduction to Project and to the new Head of Environment and Communities, Bob Overvold. First meeting since Dominion Diamond assumed ownership of Ekati Mine; included discussion on plans to extend mine life through the Project. Introduced the new Head of Environment & Communities, Bob Overvold. Dominion Diamond assured the group that the company purchased the Ekati Mine to try to keep it open, and committed to keeping them informed via regular meetings. Dominion Diamond committed to keeping IBA groups informed of any changes prior to information being publically available through the WLWB. Dominion Diamond also requested that if the group had any fundamental concerns regarding Dominion Diamond's plans, it would be ideal if Dominion Diamond was aware of those concerns sooner rather than later. Introduction to Project and to the new Head of Environment & Communities, Bob Overvold.
27-Jun-13	AANDC	Malcolm Robb, Acting Director Minerals and Petroleum Directorate	Bob Overvold Eric Denholm	Meeting to discuss the Project.
27-Jun-13	CanNor	Patrick Borbey, CanNor	Brendan Bell Bob Overvold	Introduction to the Project.
07-Jul-13	AANDC	Policy and Regional Affairs Advisor (Nunavut, NWT Yukon) Paul Komaromi	Bob Gannicott Brendan Bell Bob Overvold	Meeting to discuss the Project and the possible impact of devolution on the project such as regulatory changes and the possible change from regional boards to a single super board.
08-Jul-13	AANDC	Acting ADM Mimi Fortier and Janet King	Bob Gannicott Brendan Bell Bob Overvold	Meeting to provide update on the Project, and to inquire about Devolution and the Fisheries Regulatory reforms, and what those might mean for the Project and the extension of the Ekati mine life.

Table 38-1 Summary of Pre-Application Community, Regulatory, and Public Engagement Activities (from DAR Table 4.4-1)

Date	Community/ Stakeholder	Potentially Affected Community / Stakeholder Participants	Dominion Diamond Participants	Objective/Comments
08-Jul-13	AT8 – YKDFN	Todd Slack, Advisor	Eric Denholm Nicole Spencer	Provided update on the Project to YKDFN Advisor.
09-Jul-13	DFO	Christine Loth-Bown, Director General Ecosystem Programs Policy, Steve Burgess, Program Policy and Nick Winfield, Fisheries Protection Policy	Bob Gannicott Brendan Bell Bob Overvold	Meeting to discuss new *Fisheries Act* legislation and policy and potential implications for the Project and associated offsetting. Discussed the new changes to the Fisheries Act and the new policy direction in relation to fish offsetting.
29-Jul-13	DFO	Steve Burgess, Rich Rudolph	Eric Denholm Bob Overvold Golder – Amy Langhorne	Provided update on the Project to DFO. Discussed new legislation and potential implications for the Project.
01-Aug-13	AT8 – LKDFN	Graeme Drew, SAO	Deana Twissell	Email to confirm acceptance of LKDFN's proposed date of August 23, 2013 to meet with Dominion Diamond senior management on the Project. Discussion around meeting with Chief and Council versus the Wildlife Lands and Environment Committee. Also requested to schedule a date for the upcoming IBA annual meeting.
02-Aug-13	AT8 – YKDFN	Chief Sangris and Chief Betsina	Brendan Bell Bob Overvold	Provided update on the Project to YKDFN Chiefs to complete Phase 2 of the engagement with IBA leaders.
13-Aug-13	WLWB	Violet Camsell-Blondin (chair), Joe Mackenzie (Board Member), Brett Wheeler and Sarah Elsasser (staff)	Chantel Lavoie Eric Denholm Claudine Lee	Meeting and site visit.
13-Aug-13	Kugluktuk	Don Leblanc, SAO	Ora-naja Wah-Shee,	Call and follow up email to confirm a Project meeting on August 22, 2013 in Kugluktuk including Dominion Diamond senior management and the Hamlet of Kugluktuk. Also requested to schedule a date for the annual IBA meeting to be held in September or October. Discussed the proposal for a Community Liaison position to liaise between Dominion Diamond and the community, particularly in relation to recruitment.
14-Aug-13	KIA	Paul Emingak, Executive Director	Ora-naja Wah-Shee,	Requested a date to meet with Dominion Diamond senior management on the Project. Requested a date for the annual IBA meeting. KIA tentatively confirmed the August 22, 2013 Project meeting date in Cambridge Bay.

Table 38-1 Summary of Pre-Application Community, Regulatory, and Public Engagement Activities (from DAR Table 4.4-1)

Date	Community/ Stakeholder	Potentially Affected Community / Stakeholder Participants	Dominion Diamond Participants	Objective/Comments
14-Aug-13	AT8 – YKDFN	Ernie Abel, Assistant Chief Executive Officer	Ora-naja Wah-Shee,	Call and follow-up email to discuss the details of the August 21, 2013 YKDFN site visit.
15-Aug-13	AT8 – YKDFN	Ernie Abel, Assistant Chief Executive Officer	Ora-naja Wah-Shee,	Follow-up on the YKDFN site tour.
15-Aug-13	KIA	Paul Emingak, Executive Director	Ora-naja Wah-Shee,	Confirmed a Project presentation to Paul Emingak and the President on August 22, 2013, in Cambridge Bay.
16-Aug-13	AT8 – LKDFN	Graeme Drew, Florence Catholique, and Mike Tollis	Bob Overvold	Confirmed a Project presentation to the Wildlife Lands and Environment Committee in Łutsel K'e on August 23, 2013.
19-Aug-13	AT8 – YKDFN	Ernie Abel, Assistant Chief Executive Officer	Ora-naja Wah-Shee,	Discussed Lac du Sauvage site tour logistics.
20-Aug-13	AT8 – YKDFN	Ernie Abel, Assistant Chief Executive Officer	Ora-naja Wah-Shee,	Dominion Diamond had to re-schedule the August 21, 2013 Lac du Sauvage tour due to unforeseen circumstances.
21-Aug-13	AT8 – YKDFN	Ernie Abel, Assistant Chief Executive Officer	Ora-naja Wah-Shee,	Confirmed a re-scheduled Lac du Sauvage site tour for September 6, 2013.
21-Aug-13	MVEIRB	Vern Christianson and Chuck Hubert, Senior Environmental Assessment Officer	Ora-naja Wah-Shee,	Emailed to confirm a Lac du Sauvage helicopter tour for September 5, 2014, and to discuss logistics.
21-Aug-13	AT8 – LKDFN	Graeme Drew, SAO	Ora-naja Wah-Shee,	Discussed August 23 meeting logistics.
22-Aug-13	Hamlet of Kugluktuk	Deputy Mayor Grant Newman Mayor Ryan Nivingalok Councillor Peter Taktogon Councillor Barry Garrett Councillor David Nivingalok Councillor Luigi Torretti Councillor Lucy Taipana Councillor Sven Kerkovius Councillor Colin Adjun SAO Don LeBlanc Council Admin Korina Harvey	Bob Gannicott Brendan Bell Bob Overvold Ora-naja Wah-Shee,	Provided presentation on the Project. Discussed issues such as the fish out for the project, and scheduling a public community presentation.

Table 38-1 Summary of Pre-Application Community, Regulatory, and Public Engagement Activities (from DAR Table 4.4-1)

Date	Community/ Stakeholder	Potentially Affected Community / Stakeholder Participants	Dominion Diamond Participants	Objective/Comments
22-Aug-13	KIA	Charlie Evalik, Paul Emingak, John Stevenson	Bob Gannicott Brendan Bell Bob Overvold Ora-naja Wah-Shee,	Provided presentation on the Project. Discussed Lynx, Environmental Assessment Process and engaging communities.
23-Aug-13	AT8 – LKDFN	Florence Catholique, Stephanie Poole, Angie Lantz, Emily Saunders, Joseph Catholique, Ron Fatt, Roy Desjarlais, Mike Tollis	Bob Gannicott Brendan Bell Bob Overvold Ora-naja Wah-Shee,	Provided presentation on the Project. Discussed the project footprint, water, fish, reclamation, employment, contracts, caribou, roads, renegotiation of the IBAs, business opportunities, hiring practices and the incorporation of the TK into monitoring programs and utilizing community members to conduct those programs.
23-Aug-13	AT8 – YKDFN	Chief Edward Sangris	Ora-naja Wah-Shee,	Chief Sangris had prior commitments and cancelled the re-scheduled September 6, 2013 site tour.
26-Aug-13	NSMA	President Bill Enge	Ora-naja Wah-Shee,	Discussed scheduling a Project meeting and was eventually able to confirm for September 3, 2013.
26-Aug-13	Tłı̨chǫ	Itoah Scott-Enns, Negotiations and Policy Assistant	Ora-naja Wah-Shee,	Discussed meeting logistics for the next day's meeting with Kwe Beh Working Group.
26-Aug-13	AT8 – LKDFN	Graeme Drew, SAO and Mike Tollis, Director Wildlife Lands and Environment	Ora-naja Wah-Shee,	Requested a copy of the LKDFN Thaydene Nene Tourism Strategy discussed at the meeting the previous Friday.
27-Aug-13	NSMA	President Bill Enge	Ora-naja Wah-Shee,	Cancelled September 3 and rescheduled for August 28, 2013. Discussed meeting logistics.
27-Aug-13	Tłı̨chǫ	KBWG and YKDFN Observer Todd Slack	Bob Gannicott Brendan Bell Ori Wah-Shee	Provided presentation on the Project. Refer to meeting notes. Discussed employee grievance processes, technical reports, reclamation and water quality.
28-Aug-13	NSMA	President Bill Enge and Marc Whitford, Secretary Treasurer	Bob Gannicott Brendan Bell Ora-naja Wah-Shee,	Provided presentation on the Project. Refer to meeting notes. Discussed the dike, dewatering, fish, fish offsetting, contracts and water quality.
28-Aug-13	AT8 – LKDFN	Mike Tollis, Director Wildlife Lands and Environment	Ora-naja Wah-Shee,	Discussed draft Exploration Agreement and meeting invoice.
28-Aug-13	MVEIRB	Chuck Hubert, Senior Environmental Assessment Officer	Ora-naja Wah-Shee,	Discussed Lac du Sauvage site tour logistics.

Table 38-1 Summary of Pre-Application Community, Regulatory, and Public Engagement Activities (from DAR Table 4.4-1)

Date	Community/ Stakeholder	Potentially Affected Community / Stakeholder Participants	Dominion Diamond Participants	Objective/Comments
29-Aug-13	MVEIRB	Chuck Hubert, Senior Environmental Assessment Officer	Ora-naja Wah-Shee,	Provided Lac du Sauvage tour agenda.
30-Aug-13	IEMA	Jessica Simpson, Communications and Environmental Specialist	Ora-naja Wah-Shee,	Discussed scheduling and meeting logistics.
03-Sep-13	IEMA	Jessica Simpson, Communications and Environmental Specialist	Ora-naja Wah-Shee,	Discussed upcoming Project presentation.
03-Sep-13	IEMA	Vice Chair Tim Byers and Jessica Simpson, Communications and Environmental Specialist	Bob Gannicott Brendan Bell Bob Overvold Ora-naja Wah-Shee,	Provided presentation on the Project. Discussed reclamation, water levels, erosion, water quality, contaminants, fish, fish out, terrestrial vegetation, aquatic vegetation, caribou, roads and community engagement.
03-Sep-13	MVEIRB	Chuck Hubert, Senior Environmental Assessment Officer	Ora-naja Wah-Shee,	Confirmed Lac du Sauvage tour itinerary and other logistics.
04-Sep-13	Kugluktuk	Don LeBlanc, SAO	Ora-naja Wah-Shee,	Requested list of meeting participants for the Project presentation on August 22, 2013.
04-Sep-13	IEMA	Kevin O'Reilly, Executive Director	Claudine Lee	Discussed Lac du Sauvage site tour itinerary.
04-Sep-13	MVEIRB	Richard Edjericon, Sunny Munroe, John Curran, Percy Hardisty, Michael McLeod, Vern Christensen, Simon Toogood, Chuck Hubert, Stacey Menzies, John Donihee	Bob Gannicott Brendan Bell	Provided presentation on the Project and Lac du Sauvage site tour via helicopter.
05-Sep-13	IEMA	Jessica Simpson, Communications and Environmental Specialist	Ora-naja Wah-Shee,	Discussed scheduling a Project presentation in mid-September.
06-Sep-13	IEMA	Jessica Simpson, Communications and Environmental Specialist	Ora-naja Wah-Shee,	Emailed a copy of the meeting notes recorded by Dominion Diamond for the IEMA's review and comment.

Table 38-1 Summary of Pre-Application Community, Regulatory, and Public Engagement Activities (from DAR Table 4.4-1)

Date	Community/ Stakeholder	Potentially Affected Community / Stakeholder Participants	Dominion Diamond Participants	Objective/Comments
10-Sep-13	AT8 – YKDFN	Shannon Gault, Executive Assistant	Ora-naja Wah-Shee,	Shannon Gault, Executive Assistant to Chief Sangris returned call and confirmed that YKDFN was available on September 17, 2013 for the Lac du Savage site tour. Chief Sangris, Chief Betsina, staffer Joanne Black, and Shannon Gault would be participating.

MVEIRB = Mackenzie Valley Environmental Impact Review Board; DFO = Fisheries and Oceans Canada; WLWB = Wek'èezhìı Land and Water Board; IEMA = Independent Environmental Monitoring Agency; NSMA = North Slave Métis Alliance; YKDFN = Yellowknives Dene First Nation; LKDFN = Łutselk'e Dene First Nation; KIA = Kitikmeot Inuit Association; AANDC = Aboriginal Affairs and Northern Development Canada.

Table 38-2 Summary of Community, Regulatory, and Public Engagement Activities Occurring during the Mackenzie Valley Review Board Scoping Sessions (From DAR Table 4.4-2)

Date	Stakeholder/ Affected Party	Stakeholder/ Affected Party Participants	Dominion Diamond Participants	Contact Method/ Location	Objective/Comments
07-Jan-14	MVEIRB – Yellowknife Community Scoping Session	Board staff	**Dominion Diamond:** Brendan Bell Eric Denholm **Golder**: Shannon Hayden Damian Panayi Kristine Mason Peter Chapman	In person/ Yellowknife	Review MVEIRB public scoping session.
08-Jan-14	MVEIRB – Yellowknife Technical Scoping Session	Board staff	**Dominion Diamond:** Eric Denholm **Golder:** Shannon Hayden Damian Panayi Kristine Mason Peter Chapman	In person/ Yellowknife	Review MVEIRB public scoping session. Attendees included AANDC, IEMA, EC, GNWT, DFO, Tłı̨chǫ Government, NSMA, and YKDFN.

Table 38-2 Summary of Community, Regulatory, and Public Engagement Activities Occurring during the Mackenzie Valley Review Board Scoping Sessions (From DAR Table 4.4-2)

Date	Stakeholder/ Affected Party	Stakeholder/ Affected Party Participants	Dominion Diamond Participants	Contact Method/ Location	Objective/Comments
14-Jan-14	MVEIRB – Behchokǫ̀ Scoping Session	Chuck Hubert Simon Toogood Stacey Menzies	**Dominion Diamond:** Brendan Bell Eric Denholm Ora-naja Wah-Shee John Bekale **Golder:** Peter Chapman Damien Panayi Kristine Mason	In person/ Behchokǫ̀	MVEIRB scoping session with 50 community participants.
16-Jan-14	MVEIRB – Łutsel K'e Scoping Session	Chuck Hubert Simon Toogood Stacey Menzies	**Dominion Diamond:** Bob Overvold Eric Denholm Ora-naja Wah-Shee, John Bekale **Golder:** Peter Chapman Damien Panayi Kristine Mason	In person/ Łutsel K'e	MVEIRB scoping session with 40 community participants.

MVEIRB = Mackenzie Valley Environmental Impact Review Board.

Table 38-3 Summary of Terms of Reference Workshops with Impact Benefit Agreement Communities in Yellowknife, March 2014 (From DAR Table 4.4-3)

Date	Stakeholder/ Affected Party	Stakeholder/ Affected Party Participants	Dominion Diamond Participants	Contact Method/ Location	Objective/Comments
10-Mar-14	North Slave Métis Alliance	Matt Hoover Wayne Langenhan Ed Jones Robert Mercredi Joel Dragon Smith	**Dominion Diamond:** Richard Bargery Ora-naja Wah-Shee Claudine Lee **Golder:** Cameron Stevens Darryl Arsenault Jim Rettie Shannon Hayden Fiona Esford Damien Panayi **Facilitator:** Maureen Van Overliw	Workshop/ Yellowknife	This workshop was intended to provide additional community input concerning fish and wildlife and to assist Dominion Diamond in meaningfully linking Traditional Knowledge into the Jay-Cardinal Project and the extension of the Ekati mine life. Dominion Diamond was specifically interested in community input on the fisheries offsetting, fish-out, and the mitigation and management of wildlife, particularly caribou. A summary report of the workshop was provided to the participant organization.
11- Mar-14	AT8	Mike Tollis August Enzoe Terri Enzoe Ron Fatt Sunrise Lockhart Fred Sangris Bobby Drygeese Leroy Betsina Todd Slack Joanne Black Ricky Drygeese	**Dominion Diamond:** Richard Bargery Ora-naja Wah-Shee **Golder:** Cameron Stevens Darryl Arsenault Jim Rettie Shannon Hayden Fiona Esford Damien Panayi **Facilitator:** Maureen Van Overliw	Workshop/ Yellowknife	This workshop was intended to provide additional community input concerning fish and wildlife and to assist Dominion Diamond in meaningfully linking Traditional Knowledge into the Jay-Cardinal Project and the extension of the Ekati mine life. Dominion Diamond was specifically interested in community input on the fisheries offsetting, fish-out, and the mitigation and management of wildlife, particularly caribou. A summary report of the workshop was provided to the participant organization.

Table 38-3 Summary of Terms of Reference Workshops with Impact Benefit Agreement Communities in Yellowknife, March 2014 (From DAR Table 4.4-3)

Date	Stakeholder/ Affected Party	Stakeholder/ Affected Party Participants	Dominion Diamond Participants	Contact Method/ Location	Objective/Comments
12-Mar-14	Tłįchǫ	Joseph Judas Samuel Mantla Jr Noel Bishop Russell Drybones Sjoerd van der Wielen	**Dominion Diamond:** Richard Bargery Ora-naja Wah-Shee Claudine Lee **Golder:** Cameron Stevens Darryl Arsenault Jim Rettie Shannon Hayden Fiona Esford Damien Panayi **Facilitator:** Maureen Van Overliw	Workshop/ Yellowknife	This workshop was intended to provide additional community input concerning fish and wildlife and to assist Dominion Diamond in meaningfully linking Traditional Knowledge into the Jay-Cardinal Project and the extension of the Ekati mine life. Dominion Diamond was specifically interested in community input on the fisheries offsetting, fish-out, and the mitigation and management of wildlife, particularly caribou. A summary report of the workshop was provided to the participant organization.
13-Mar-14	Kitikmeot Inuit Association /Kugluktuk	David Nivingalok-Councillor Peter Taktogon- Harvester James Algona- Elder Chelsea Kapakatoak-Youth Frank Ipakohak-Elder	**Dominion Diamond:** Richard Bargery Ora-naja Wah-Shee Claudine Lee **Golder:** Cameron Stevens Darryl Arsenault Jim Rettie Shannon Hayden Fiona Esford Damien Panayi **Facilitator:** Maureen Van Overliw	Workshop/ Yellowknife	This workshop was intended to provide additional community input concerning fish and wildlife and to assist Dominion Diamond in meaningfully linking Traditional Knowledge into the Jay-Cardinal Project and the extension of the Ekati mine life. Dominion Diamond was specifically interested in community input on fisheries offsetting, fish-out, and the mitigation and management of wildlife, particularly caribou. A summary report of the workshop was provided to the participant organization.

Table 38-4 Summary of Terms of Reference Workshops with Impact Benefit Agreement Communities in Yellowknife, March 2014 (From DAR Table 5.3-1)

Date	Stakeholder/Affected Party	Stakeholder/Affected Party Participants	Dominion Diamond Participants	Contact Method/ Location	Objectives/Comments
March 13, 2014	Kitikmeot Inuit Association/Kugluktuk	David Nivingalok (Councillor) Peter Taktogon (Harvester) James Algona (Elder) Chelsea Kapakatoak (Youth) Frank Ipakohak (Elder)	**Dominion Diamond:** Richard Bargery Ora-naja Wah-Shee Claudine Lee **Golder Associates Ltd.:** Cameron Stevens Darryl Arsenault Jim Rettie Shannon Hayden Fiona Esford Damien Panayi **Facilitator:** Maureen Van Overliw	Workshop/ Yellowknife	This workshop was intended to provide additional community input concerning fish and wildlife, and to assist Dominion Diamond in meaningfully linking Traditional Knowledge into the Jay-Cardinal Project and the extension of the Ekati Mine life. Dominion Diamond was specifically interested in community input on fisheries offsetting, fish-out, and the mitigation and management of wildlife, particularly caribou. A final report was provided to the community.
March 12, 2014	Tłı̨chǫ	Joseph Judas Samuel Mantla Jr. Noel Bishop Russell Drybones Sjoerd van der Wielen	**Dominion Diamond:** Richard Bargery Ora-naja Wah-Shee Claudine Lee **Golder Associates Ltd.:** Cameron Stevens Darryl Arsenault Jim Rettie Shannon Hayden Fiona Esford Damien Panayi **Facilitator:** Maureen Van Overliw	Workshop/ Yellowknife	This workshop was intended to provide additional community input concerning fish and wildlife, and to assist Dominion Diamond in meaningfully linking Traditional Knowledge into the Jay-Cardinal Project and the extension of the Ekati Mine life. Dominion Diamond was specifically interested in community input on the fisheries offsetting, fish-out, and the mitigation and management of wildlife, particularly caribou. A final report was provided to the community.

Table 38-4 Summary of Terms of Reference Workshops with Impact Benefit Agreement Communities in Yellowknife, March 2014 (From DAR Table 5.3-1)

Date	Stakeholder/Affected Party	Stakeholder/Affected Party Participants	Dominion Diamond Participants	Contact Method/ Location	Objectives/Comments
March 11, 2014	Akaitcho Treaty 8 First Nation	Mike Tollis August Enzoe Terri Enzoe Ron Fatt Sunrise Lockhart Fred Sangris Bobby Drygeese Leroy Betsina Todd Slack Joanne Black Ricky Drygeese	**Dominion Diamond:** Richard Bargery Ora-naja Wah-Shee **Golder Associates Ltd.:** Cameron Stevens Darryl Arsenault Jim Rettie Shannon Hayden Fiona Esford Damien Panayi **Facilitator:** Maureen Van Overliw	Workshop/ Yellowknife	This workshop was intended to provide additional community input concerning fish and wildlife, and to assist Dominion Diamond in meaningfully linking Traditional Knowledge into the Jay-Cardinal Project and the extension of the Ekati Mine life. Dominion Diamond was specifically interested in community input on the fisheries offsetting, fish-out, and the mitigation and management of wildlife, particularly caribou. A final report was provided to the community.
March 10, 2014	North Slave Métis Alliance	Matt Hoover Wayne Langenhan Ed Jones Robert Mercredi Joel Dragon Smith	**Dominion Diamond:** Richard Bargery Ora-naja Wah-Shee Claudine Lee **Golder Associates Ltd.:** Cameron Stevens Darryl Arsenault Jim Rettie Shannon Hayden Fiona Esford Damien Panayi **Facilitator:** Maureen Van Overliw	Workshop/ Yellowknife	This workshop was intended to provide additional community input concerning fish and wildlife, and to assist Dominion Diamond in meaningfully linking Traditional Knowledge into the Jay-Cardinal Project and the extension of the Ekati Mine life. Dominion Diamond was specifically interested in community input on the fisheries offsetting, fish-out, and the mitigation and management of wildlife, particularly caribou. A final report was provided to the community.

DOMINION DIAMOND

Information Request Number:	DAR-IEMA-IR-39
Source:	Independent Environmental Monitoring Agency: Kevin O'Reilly
Subject:	Meteorological Data
DAR Section(s):	7.2.2

Preamble:

The DAR states that Koala station was the only sampling site that recorded year-round data from 2009-2013. There is no mention that for a four month period in 2011 when there were no meteorological data collected due to power failures. No mention if the data and calculations were adjusted accordingly.

Request:

DDEC should ensure calculations using meteorological data are adjusted accordingly to account for missing data from 2011.

Response:

The Koala station data from 2009 to 2013 in the Developers' Assessment Report (DAR) for the Jay Project were not adjusted to account for missing data. The meteorological data used for the dispersion model was based on Mesoscale Model Version 5 (MM5) simulation provided by Environment Canada and was further processed by CALMET, the meteorological pre-processor for the CALPUFF dispersion model, in no observation mode. The Koala station data were not used meteorological data in the dispersion modelling, and any adjustments to Koala station data will not affect modelling results and the conclusions of the air quality assessment. This Information Request (IR) response provides a discussion on how the gaps in the Koala station meteorological data affect the data analysis included in the DAR.

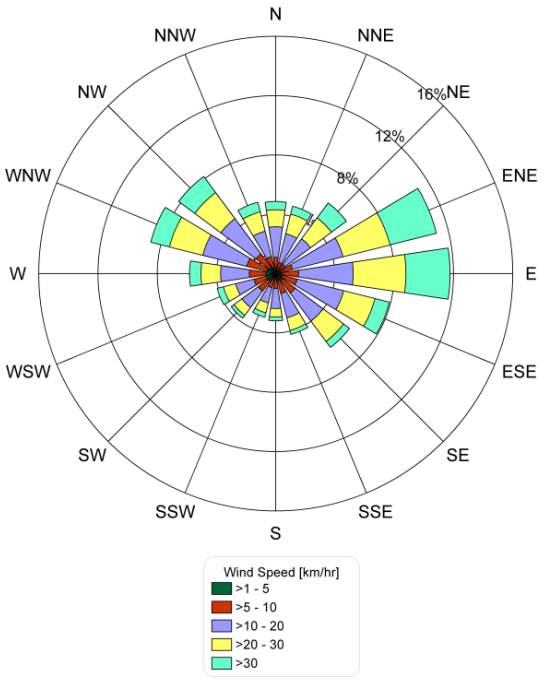
The Koala station data presented in this IR response were adjusted to remove missing data using the methods outlined for calculating the 1981 to 2010 Climate Normals for Canada (Environment Canada 2015). Based on this method, data used in monthly average estimation (i.e., temperature, wind, humidity) were considered valid if at least 90 percent (%) of the hourly data were available for the month. Data used in total monthly value estimates (i.e., total monthly precipitation) were considered valid only when 100% of the data were available for the month.

Wind:

The original DAR Section 7, Figure 7.2-1 to Figure 7.2-3, and Annex I (Air Quality and Meteorological Baseline Report) Figures 4.1-1 to Figure 4.1-3 are reproduced in Figure 39-1 to Figure 39-3 to assist in this discussion. In the original DAR section, none of the data were excluded from developing the windroses. Fourteen of the 60 months (2009 to 2013) were below the 90% threshold with no year having all 12 months with at least 90% of data in each month.

The year 2009 had the most complete dataset (98% complete with only the month of February having 80% data completeness) and the windroses are provided in Figure 39-4 to Figure 39-6. The 2009 annual, summer, and winter windroses are similar to the 2009 to 2013 windroses shown in Figure 39-1 to Figure 39-3. This comparison indicates that the DAR's 2009 to 2013 windroses are representative of the site even if there are missing data and updated data are not required.

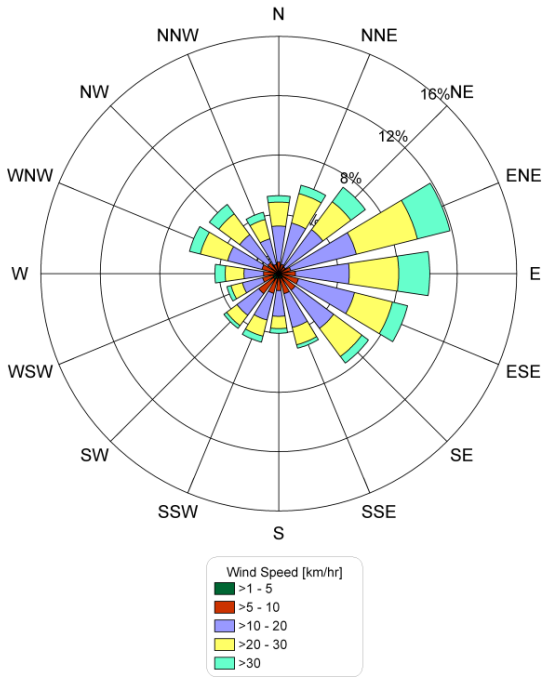
Figure 39-1 Koala Meteorological Station Windrose, 2009 to 2013 from DAR



Note: Windrose is based on year-round measurements of wind speed and direction from 2009 to 2013 and includes 14 months with less than 90% of hourly data.

km/ hr = kilometres per hour; >= greater than;% = percent.

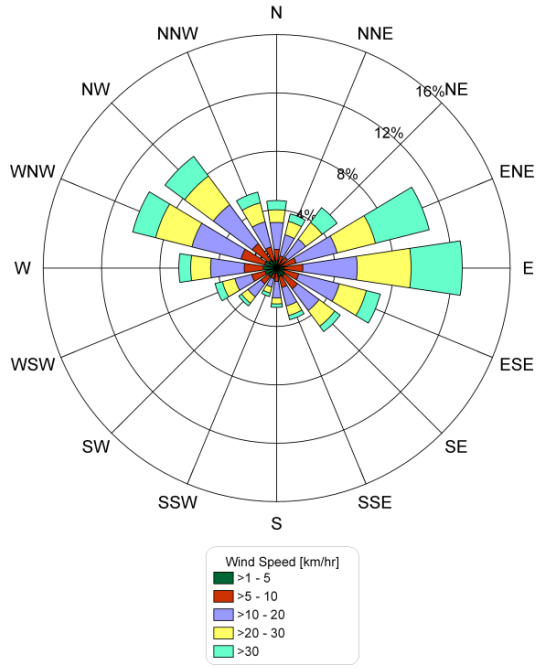
Figure 39-2 Koala Meteorological Station Summer Windrose, 2009 to 2013 from DAR



Note: Windrose is based on measurements of wind speed and direction from June to October, each summer from 2009 to 2013.

km/ hr = kilometres per hour; >= greater than;% = percent.

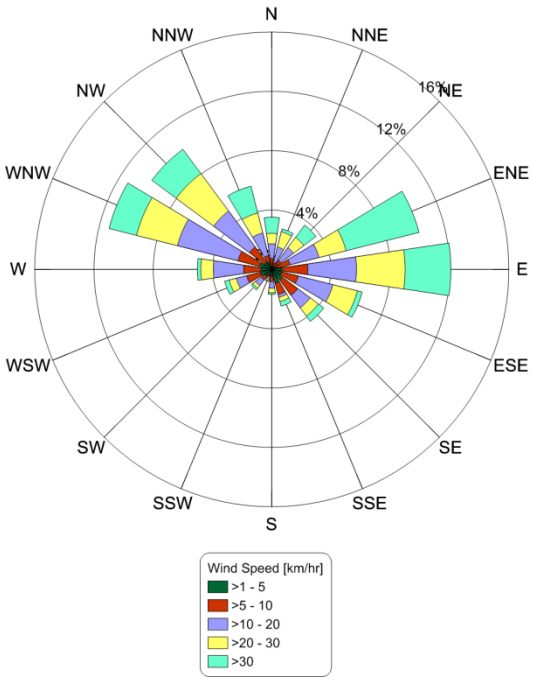
Figure 39-3 Koala Meteorological Station Winter Windrose, 2009 to 2013 from DAR



Note: Windrose is based on measurements of wind speed and direction from November to May, each winter from 2009 to 2013 and includes 14 months with less than 90% of hourly data.

km/ hr = kilometres per hour; >= greater than;% = percent.

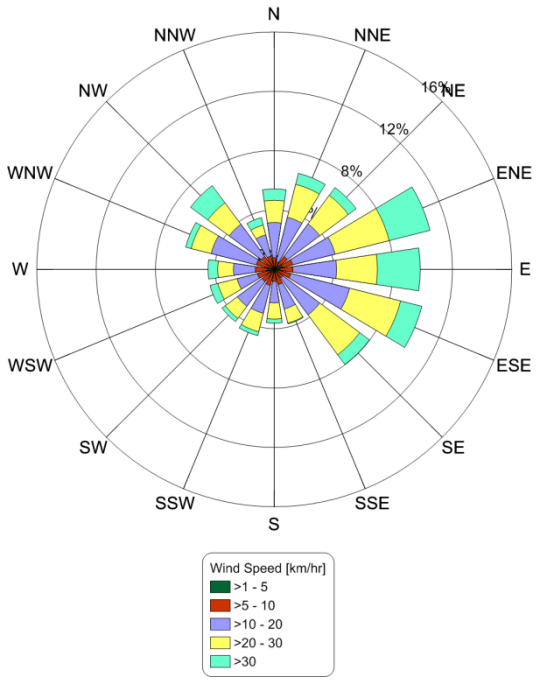
Figure 39-4 Koala Meteorological Station Windrose, 2009



Note: Windrose is based on year-round measurements of wind speed and direction for 2009 and includes February 2009, which had 80% of the hourly data.

km/ hr = kilometres per hour; >= greater than;% = percent.

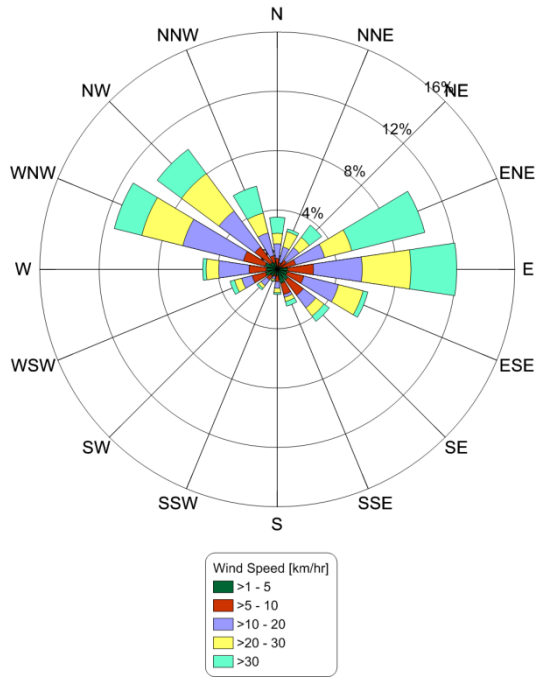
Figure 39-5 Koala Meteorological Station Summer Windrose, 2009



Note: Windrose is based on measurements of wind speed and direction for June to October 2009.

km/ hr = kilometres per hour; >= greater than;% = percent.

Figure 39-6 Koala Meteorological Station Winter Windrose, 2009



Note: Windrose is based on measurements of wind speed and direction for January to May and November to December 2009. February had 80% of the hourly data.

km/ hr = kilometres per hour; >= greater than;% = percent.

Temperature:

The Koala station 2009 to 2013 temperature data contained eight months with less than 90% of hourly data. DAR Section 7, Table 7.2-3 and Figure 7.2-6, and Annex I, Table 4.3-1 and Figure 4.3-1 have been revised to exclude months with less than 90% hourly data and are replaced with Table 39-1 and Figure 39-7. The revised tables and figures are not substantially different than those in the DAR.

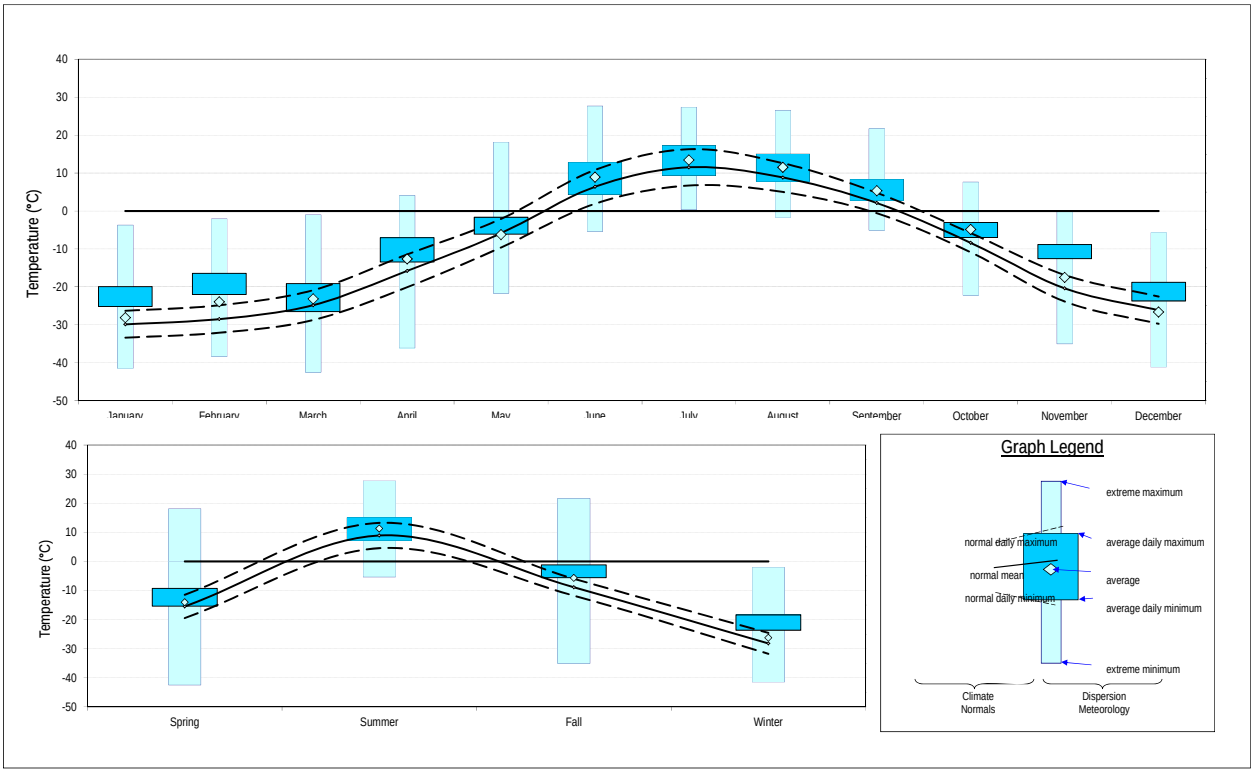
Table 39-1 Updated Observed Temperatures at Koala Meteorological Station, 2009 to 2013

	Jan (°C)	Feb (°C)	Mar (°C)	Apr (°C)	May (°C)	Jun (°C)	Jul (°C)	Aug (°C)	Sep (°C)	Oct (°C)	Nov (°C)	Dec (°C)
Daily Average	-28.1	-23.9	-23.2	-12.7	-6.2	8.9	13.4	11.5	5.3	-4.9	-17.5	-26.6
Standard Deviation	7.1	7.2	9.3	7.1	6.5	6.5	4.7	4.7	4.5	5.6	6.6	6.4
Daily Maximum	-19.9	-16.4	-19.1	-7.0	-1.6	12.8	17.3	15.1	8.4	-3.0	-8.8	-18.8
Daily Minimum	-25.2	-22.0	-26.5	-13.4	-6.1	4.3	9.3	7.8	2.8	-7.0	-12.6	-23.7
Extreme Maximum	-3.7	-2.0	-1.0	4.1	18.1	27.7	27.4	26.6	21.7	7.7	0.0	-5.7
Extreme Minimum	-41.5	-38.4	-42.5	-36.1	-21.7	-5.4	0.3	-1.7	-5.0	-22.2	-35.0	-41.2

°C = degrees Celsius.

Note: The following months had less than 90% hourly data and were excluded from the analysis – December 2010, January, February, April, May and November 2011, May 2012 and November 2013.

Figure 39-7 Updated Average Measured Temperatures at the Koala Meteorological Station, 2009 to 2013

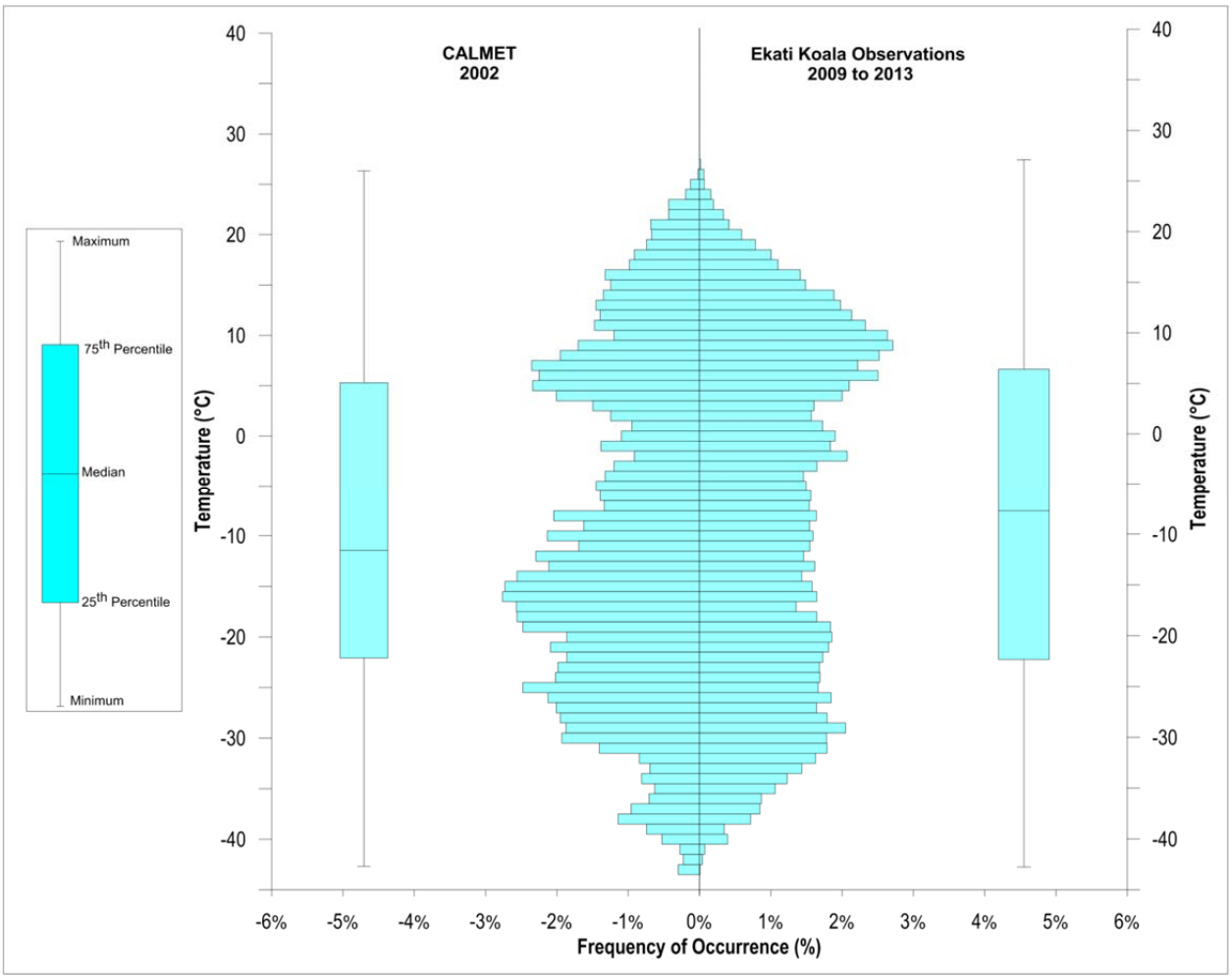


°C = degrees Celsius;% = percent.

Note: excludes 8 months of data with less than 90% hourly data.

DAR Appendix 7C, Section 7C Figure 7C4.2-2 has been revised with Figure 39-8 and now compares the CALMET data to Ekati Koala Observations with the eight months with less than 90% hourly data removed. The revised figure is similar to the figure in the DAR.

Figure 39-8 Updated Comparison of Observed and CALMET-Derived Temperatures for the Koala Station



°C = degrees Celsius;% = percent.

Precipitation:

Snowfall data from the Koala station for 2008 to 2012 had 29 months (mostly summer) that had less than 100% data. As was noted in Section 7.2.2.3, precipitation data for 2013 were not complete, so the 5-year period from 2008 to 2012 was used in the assessment. Section 7, Table 7.2-4 and Annex I, Table 4.2-1 were revised to exclude these months as shown in Table 39-2.

Rainfall data from the Koala station for 2008 to 2012 had 19 months with less than 100% data. DAR Section 7, Table 7.2-5 and Annex I, Table 4.2-2 were revised to exclude these months, except in the case of seven months that were only missing one data point, which is noted in Table 39-3.

The updated snowfall and rainfall data in Tables 39-2 and 39-3 were combined to determine the total precipitation data at the Koala station. The revised total precipitation data are presented in Table 39-4.

Table 39-2 Updated Total Snowfall Measured at Koala Meteorological Station, 2008 to 2012

	Jan (mm)	Feb (mm)	Mar (mm)	Apr (mm)	May (mm)	Jun (mm)	Jul (mm)	Aug (mm)	Sep (mm)	Oct (mm)	Nov (mm)	Dec (mm)
2008	29.6	1.2	6.6	25.0	—	—	—	—	—	—	18.9	6.0
2009	6.8	16.6	18.9	41.0	16.0	—	—	—	—	—	58.1	13.9
2010	26.8	4.8	7.3	23.5	—	—	—	—	—	16.8	39.4	18.6
2011	11.0	23.6	3.4	13.6	—	—	—	—	—	56.1	49.8	52.8
2012	44.5	83.8	55.9	15.1	—	—	—	—	—	—	—	—

Source: Dominion Diamond (2014).

mm = millimetres; — = less than 100 percent of data available.

Table 39-3 Updated Total Rainfall Measured at Koala Meteorological Station, 2008 to 2012

	Jan (mm)	Feb (mm)	Mar (mm)	Apr (mm)	May (mm)	Jun (mm)	Jul (mm)	Aug (mm)	Sep (mm)	Oct (mm)	Nov (mm)	Dec (mm)
2008	0.0	0.0	0.0	0.0	5.3	45.0[(a)]	—	156.2[(a)]	—	8.1	0.0	0.0[(a)]
2009	0.0[(a)]	0.0	0.0	0.0	0.0	17.0	41.9	20.1	38.9	3.0	0.0	0.0
2010	0.0[(a)]	—	—	0.0	0.0	32.4	52.0[(a)]	7.2	12.2	12.0	0.0[(a)]	—
2011	—	—	—	—	—	—	47.8	91.7	98.3	15.2	—	0.0
2012	0.0	0.0	0.0	1.5	8.9	0.8	22.1	50.0	45.5	12.4	0.0	0.0

Source: Dominion Diamond (2014).

a) One hourly data point was missing in the entire month. Data for the month was still included despite not being 100% complete.

mm = millimetres; — = less than 100 percent of data available.

Table 39-4 Updated Total Precipitation Measured at Koala Meteorological Station, 2008 to 2012

	Jan (mm)	Feb (mm)	Mar (mm)	Apr (mm)	May (mm)	Jun (mm)	Jul (mm)	Aug (mm)	Sep (mm)	Oct (mm)	Nov (mm)	Dec (mm)
2008	29.6	1.2	6.6	25.0	—	45.0[(a)]	—	156.2[(a)]	—	—	18.9	6.0
2009	6.8	16.6	18.9	41.0	16.0	17.0	41.9	20.1	38.9	—	58.1	13.9
2010	26.8	4.8	7.3	23.5	—	32.4	52.0[(a)]	7.2	12.2	16.8	39.4	18.6
2011	11.0[(b)]	23.6	3.4	13.6	—	—	47.8	91.7	98.3	56.1	49.8	52.8
2012	44.5	83.8	55.9	15.1	—	0.8	22.1	50.0	45.5	—	—	—

Source: Dominion Diamond (2014).

a) One hourly data point was missing in the entire month. Data for the month was still included despite not being 100% complete.

mm = millimetres; — = less than 100 percent of data available.

Humidity:

The humidity data for the Koala station from 2009 to 2013 contained eight months with less than 90% of hourly data. DAR Section 7, Table 7.2-7 and Annex I, Table 4.4-1 were revised to exclude these months as shown in Table 39-5.

Table 39-5 Updated Monthly Average Humidity at Koala Meteorological Station, 2008 to 2013

Year	Jan (%)	Feb (%)	Mar (%)	Apr (%)	May (%)	Jun (%)	Jul (%)	Aug (%)	Sep (%)	Oct (%)	Nov (%)	Dec (%)
2009	76.3	76.9	75.6	86.5	82.8	74.7	70.7	75.8	84.1	87.7	86.6	77.2
2010	76.5	81.7	84.5	87.7	84.9	69.8	73.3	72.0	86.8	90.7	86.5	—
2011	—	—	78.0	—	—	65.7	62.0	78.0	86.3	95.9	—	83.2
2012	79.5	82.5	81.7	85.3	—	62.5	62.6	75.2	80.9	92.6	85.2	78.0
2013	74.2	79.8	80.7	82.3	85.7	62.8	72.5	69.0	87.4	91.4	67.7	61.5
Average	76.9	80.2	80.1	85.5	84.4	67.1	68.2	74.0	85.1	91.7	81.5	75.0

Source: Dominion Diamond (2014).

% = percent; — = less than 90 percent of data available.

References:

Dominion Diamond (Dominion Diamond Ekati Corporation). 2014. Meteorological Station data received via electronic transfer. Yellowknife, NWT, Canada.

Environment Canada. 2015. Calculation of the 1981 to 2010 Climate Normals for Canada. Available online: http://climate.weather.gc.ca/climate_normals/normals_documentation_e.html?docID=1981. Last Accessed February 2015.

DOMINION DIAMOND

Information Request Number:	DAR-IEMA-IR-40
Source:	Independent Environmental Monitoring Agency: Kevin O'Reilly
Subject:	Base Case Emission Sources
DAR Section(s):	7.4

Preamble (IEMA):

It is not clear why the airstrip and Misery Haul Road are not included in the Base Case as an emission source. These facilities are both used frequently and contribute a significant amount of dust and other emissions to the air.

Request (IEMA):

DDEC should adjust the map and text to reflect that both the Airstrip and Misery Haul Road as emission sources for the Base Case.

Response:

The Misery Haul Road is included as a source of emissions in the modelling of the Base Case in the Developers' Assessment Report (DAR) as well as the subsequent Jay Project Air Quality Assessment Update (Golder 2015). Map 7.4-2 in Section 7.4.2.1 of the DAR has been updated to include the Misery Haul Road as an emission source and is replaced by Map 40-1.

Air emissions associated with the airstrip were not included in the modelling due to the intermittent nature of the aircraft take-off and landing activities that result in air emissions as well as a lack of standardized methodology to accurately quantify some of these emissions (e.g., fugitive dust emissions due to aircraft take-off and landing). There are two types of emissions associated with the airstrip operation. The first type of emission is aircraft exhaust emissions during take-off or landing. The second type of emission is fugitive dust that may be generated when the surface material of the airstrip is disturbed by the air turbulence and wheel entrainment created during aircraft take-off and landing.

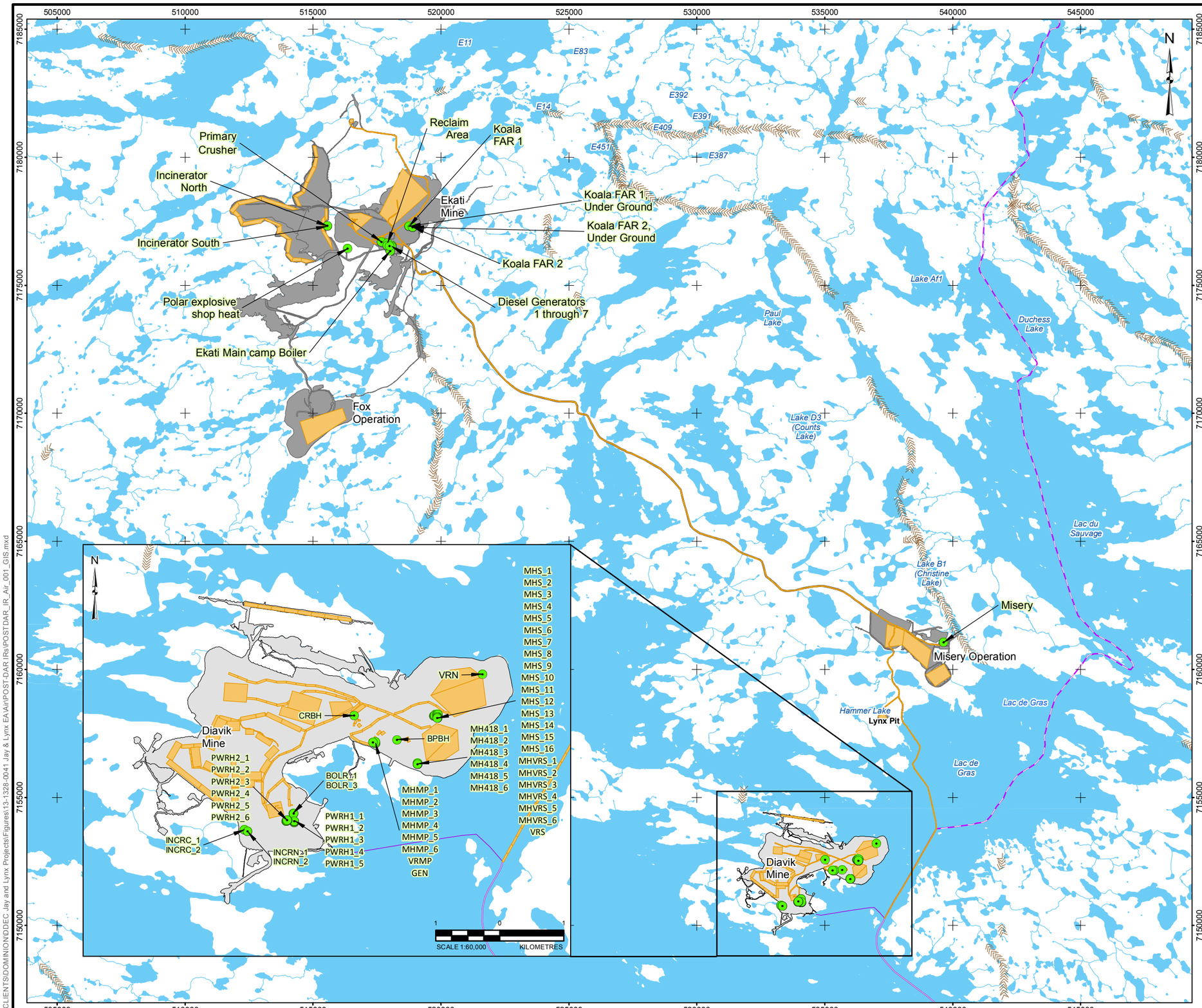
Aircraft exhaust is a minor source of air emissions at the Jay Project. Aircraft take-offs and landings are intermittent activities and occur in short durations (e.g., minutes). Furthermore, a considerable portion of the aircraft exhaust emissions during a take-off and landing cycle occur when an aircraft is in the air, well above ground-level in the approach or climb modes. Therefore, the effects of the aircraft exhaust emissions on the ground-level predictions are expected to be negligible.

Fugitive dust emissions associated with aircraft take-off and landing are also intermittent in nature and are more of a concern during drier and warmer, non-frozen days when the airstrip surface material has a higher potential to be disturbed by wheel entrainment and turbulence created by aircraft take-off and landing. The effects of the fugitive dust emissions associated with aircraft take-off and landing are not expected to be higher than the existing effects at the Ekati Mine because the Jay Project operations phase is not expected to increase the amount of air traffic at the airstrip. Fugitive dust will be mitigated by appropriate dust mitigation practices at the airstrip. The existing Ekati Mine Air Quality Monitoring and

Management Plan includes total suspended particulate and particulate matter with a mean aerodynamic diameter of 2.5 microns or smaller monitoring at several locations at the Ekati Mine. The potential effects of the emissions associated with the airstrip will continue to be monitored throughout the life of the Project.

References:

Golder (Golder Associates Ltd.). 2015. Technical Memorandum. Jay Project Air Quality Assessment Update. Prepared for Dominion Diamond Ekati Corporation. Yellowknife, NWT, Canada. January 19, 2015. Submitted to the Mackenzie Valley Environmental Impact Review Board on January 19, 2015.


505000
510000
515000
520000
525000
530000
535000
540000
545000
7185000
7180000
7175000
7170000
7165000
7160000
7155000
7150000
N
E11
E83
E14
E392
E391
E409
E451
E387
Reclaim Area
Koala FAR 1
Primary Crusher
Incinerator North
Ekati Mine
Koala FAR 1 Under Ground
Koala FAR 2, Under Ground
Incinerator South
Koala FAR 2
Polar explosive shop heat
Diesel Generators 1 through 7
Ekati Main camp Boiler
Fox Operation
Lake Af1
Paul Lake
Duchess Lake
Lake D3 (Counts Lake)
Lac du Sauvage
Lake B1 (Christine Lake)
Misery
Misery Operation
Hammer Lake
Lynx Pit
Lac de Gras
Lac de Gras
N
Diavik Mine
VRN
CRBH
BPBH
PWRH2_1
PWRH2_2
PWRH2_3
PWRH2_4
PWRH2_5
PWRH2_6
BOLR_1
BOLR_3
INCRC_1
INCRC_2
INCRN_1
INCRN_2
PWRH1_1
PWRH1_2
PWRH1_3
PWRH1_4
PWRH1_5
MHS_1
MHS_2
MHS_3
MHS_4
MHS_5
MHS_6
MHS_7
MHS_8
MHS_9
MHS_10
MHS_11
MHS_12
MHS_13
MHS_14
MHS_15
MHS_16
MH418_1
MH418_2
MH418_3
MH418_4
MH418_5
MH418_6
MHMP_1
MHMP_2
MHMP_3
MHMP_4
MHMP_5
MHMP_6
VRMP
GEN
MHVRS_1
MHVRS_2
MHVRS_3
MHVRS_4
MHVRS_5
MHVRS_6
VRS
1 0 1
SCALE 1:60,000 KILOMETRES
Diavik Mine
LEGEND
EKATI MINE FOOTPRINT
DIAVIK MINE FOOTPRINT
WINTER ROAD
TIBBITT TO CONTWOYTO WINTER ROAD
NORTHERN PORTION OF TIBBITT TO CONTWOYTO WINTER ROAD
WATERCOURSE
WATERBODY
ESKER
EMISSION LOCATIONS
EMISSION POINT SOURCE
EMISSION AREA SOURCE
REFERENCE
CANVEC © NATURAL RESOURCES CANADA, 2012
NATURAL RESOURCES CANADA CENTRE OFR TOPOGRAPHIC INFORMATION, 2012
DATUM: NAD83 PROJECTION: UTM ZONE 12N
DOCUMENT
DAR-IEMA-IR-40
3 0 3
SCALE 1:150,000 KILOMETRES
PROJECT
DOMINION DIAMOND
JAY PROJECT
NORTHWEST TERRITORIES, CANADA
TITLE
BASE CASE
EMISSION SOURCE LOCATIONS
Golder Associates
PROJECT 1419751
FILE No. POSTDAR_IR_Air_001_GIS
DESIGN DC 27/08/14
SCALE AS SHOWN
REV 0
GIS SBM/JR 01/04/15
CHECK DC 01/04/15
REVIEW CM 01/04/15
MAP 40-1
G:\CLIENTS\DOMINION\DDEC Jay and Lynx Projects\Figures\13-1328-0041 Jay & Lynx EA\Air\POST-DAR IRs\POSTDAR_IR_Air_001_GIS.mxd

DOMINION DIAMOND

Information Request Number: DAR-IEMA-IR-41

Source: Independent Environmental Monitoring Agency: Kevin O'Reilly

Subject: Air Quality Standard Exceedences

DAR Section(s): 7.4.2.2.4

Preamble (IEMA):

Dominion Diamond plans to develop an ambient air quality monitoring program that will be used to guide adaptive management strategies and the implementation of mitigation, if and as required, to maintain exposure to PM2.5 levels below those that would be of concern. It is not clear what mitigation strategies are currently being proposed to minimize or eliminate exceeding the air quality standards for the monitoring parameters, particularly PM2.5.

Request (IEMA):

DDEC should revise and provide an updated Air Quality Monitoring and Management Plan that includes current plans to mitigate or eliminate air quality standard exceedences from the Jay Project.

Response:

The Developer's Assessment Report provides Dominion Diamond Ekati Corporation's intention to amend the Air Quality Monitoring and Management Program (AQMMP) to address monitoring and mitigation of air quality for the Jay Project. This will build on the current Ekati Mine AQMMP. Detailed changes to the AQMMP will be developed as part of the regulatory permitting based on the outcome of the Environmental Assessment. The Government of the Northwest Territories, Environment Canada, aboriginal communities, and other organizations will be engaged during the amendment of the AQMMP.

DOMINION DIAMOND

Information Request Number:	DAR-IEMA-IR-42
Source:	Independent Environmental Monitoring Agency: Kevin O'Reilly
Subject:	Project Alternatives
DAR Section(s):	2.1

Preamble:

It is not clear whether DDEC consulted or involved any of the parties, or whether Traditional Knowledge was used in any way, in the identification, evaluation and selection of project alternatives or alternatives means of carrying out the development.

Request:

DDEC should clearly indicate how and where any of the parties were consulted or engaged regarding the identification, evaluation and selection of project alternatives or alternative means of carrying out the development.

Response:

Section 4 (Community Engagement) of the Developer's Assessment Report (DAR) provides a detailed summary of the community, regulatory and public engagement conducted for the Jay Project (Project). Section 5 (Traditional Knowledge) describes how local and Traditional Knowledge (TK) information was integrated into Project planning, including the Project design, the environmental assessment, and the development of monitoring plans and the reclamation and closure plan.

Based on Ekati Mine Engagement Plan, engagement activities have focused on communicating the technical, environmental, and socio-economic aspects of the Project as a means of gathering feedback for consideration in Project design. Engagement activities have also served as an opportunity for Dominion Diamond Ekati Corporation (Dominion Diamond) to develop an understanding of community concerns and aspirations related to Dominion Diamond's plan to extend the life of the Ekati Mine through the development of the Project.

The Project-specific community engagement approach undertaken by Dominion Diamond began before the initial Project application was submitted, and focused on hearing, understanding, and documenting the communities' key areas of concern, including relevant TK, and then adapting the proposed Project's design to mitigate these concerns. The focus of the engagement efforts was, and continues to be, directed towards parties that will likely be the most directly affected if the Project is implemented or not implemented, which include potentially affected Aboriginal communities, other Northerners, government and regulatory agencies, and the Independent Environmental Monitoring Agency.

The following bullets summarize engagement activities for the various Project milestones:

- pre-application engagement (April 2013 to September 2013);
- exploration land use permit and Jay water licence application (October 2013 to December 2013);

- Mackenzie Valley Environmental Impact Review Board (MVEIRB) scoping workshops (January 2014);
- initial Terms of Reference (TOR) issuance (February 21, 2014);
- revised TOR issuance (July 17, 2014); and,
- post-DAR submission (November 2014 onwards).

The revised TOR for the Jay Project issued by the MVEIRB on July 17, 2014 were developed using input from participants in an extensive scoping exercise conducted by the MVEIRB in 2014. The Key Lines of Inquiry, Subjects of Note, and areas of concerns indicated in the TOR span the breadth of participants' biophysical, environmental, social, cultural, and economic concerns about the Project in particular.

The Project alternatives assessment in Section 2 of the DAR followed the requirements outlined in the TOR Section 7.3.4 (MVEIRB 2014). The evaluation criteria in the alternatives assessment focused on the Key Lines of Inquiry in the TOR (water quality and quantity, fish and fish habitat, and caribou) that were based on input from the parties at the scoping sessions.

In addition to the key milestone engagement activities above, Dominion Diamond conducted several community engagement meetings and workshops. These meetings and workshops included discussion of the Project components, such as the roads, dike, open pit, waste rock storage area, water management, and esker crossing. Primary focus of the meetings related to:

- caribou and other wildlife and their interaction with the Project;
  - road alignments;
  - caribou interactions with roads and caribou crossings;
  - the esker crossing;
- fish and fish habitat;
  - the fish-out of the diked area; and,
  - potential fisheries offsetting options.

In the evaluation criteria for the Multiple Accounts Analysis (Section 2.4.7.4 of the DAR), the issues raised by communities and regulators were considered under Environmental Considerations (e.g., potential effects on caribou, water quality, aquatic ecosystems) and Social and Economic Considerations (e.g., potential effect on archaeological sites, traditional land use, job opportunities).

In its original application, Dominion Diamond proposed a project that mined both the Jay and Cardinal kimberlite pipes that was referred to as the Jay-Cardinal Project. The January 2014 scoping workshops, early consultation, the initial TOR and the March 2014 community workshops were based on the Jay-Cardinal Project. Dominion Diamond made changes to the original Jay-Cardinal project to mine the Jay pipe only, removing the Cardinal pipe from the project due to concerns heard during the engagement process with communities and stakeholders. The Jay Project has significantly decreased the project

footprint compared to the Jay-Cardinal project. Therefore, as per Section 2.4.6.1 of the DAR, although the Jay-Cardinal Alternative met all the pre-screening criteria and would be a viable project alternative, it was not carried forward into the alternatives analysis for further consideration.

Another example of where feedback collected in community engagement was incorporated in to the alternatives assessment relates to the Jay Road alternatives. Community preferences regarding how and where the Jay road crosses the esker were incorporated into defining and evaluating the road alignment alternatives.

References:

MVEIRB (Mackenzie Valley Environmental Impact Review Board). 2014. Revised Terms of Reference EA1314-01 Jay Project Dominion Diamond Ekati Corporation. July 17, 2014.

DOMINION DIAMOND

Information Request Number:	DAR-IEMA-IR-43
Source:	Independent Environmental Monitoring Agency: Kevin O'Reilly
Subject:	Esker Crossing Design and Mitigation
DAR Section(s):	3.5.1.5

Preamble (IEMA):

It would be helpful to have a conceptual diagram showing the full width and configuration of a combined road, pipeline bench and power line corridor. Given the importance of eskers as wildlife habitat, there do not seem to have been any alternative mitigation measures discussed that could include a reduced corridor configuration through the esker, burying the pipeline and/or power line, one-way traffic with stop lights, reduced speed limits or other options.

Request (IEMA):

DDEC should provide a conceptual diagram showing the full width and configuration of a combined road, pipeline bench and power line corridor. To reduce the impact of the corridor on the esker crossing, DDEC should discuss alternative mitigation measures discussed that could include a reduced corridor configuration through the esker, burying the pipeline and/or power line, one-way traffic with stop lights, reduced speed limits or other options. A rationale for discarding any options should be provided.

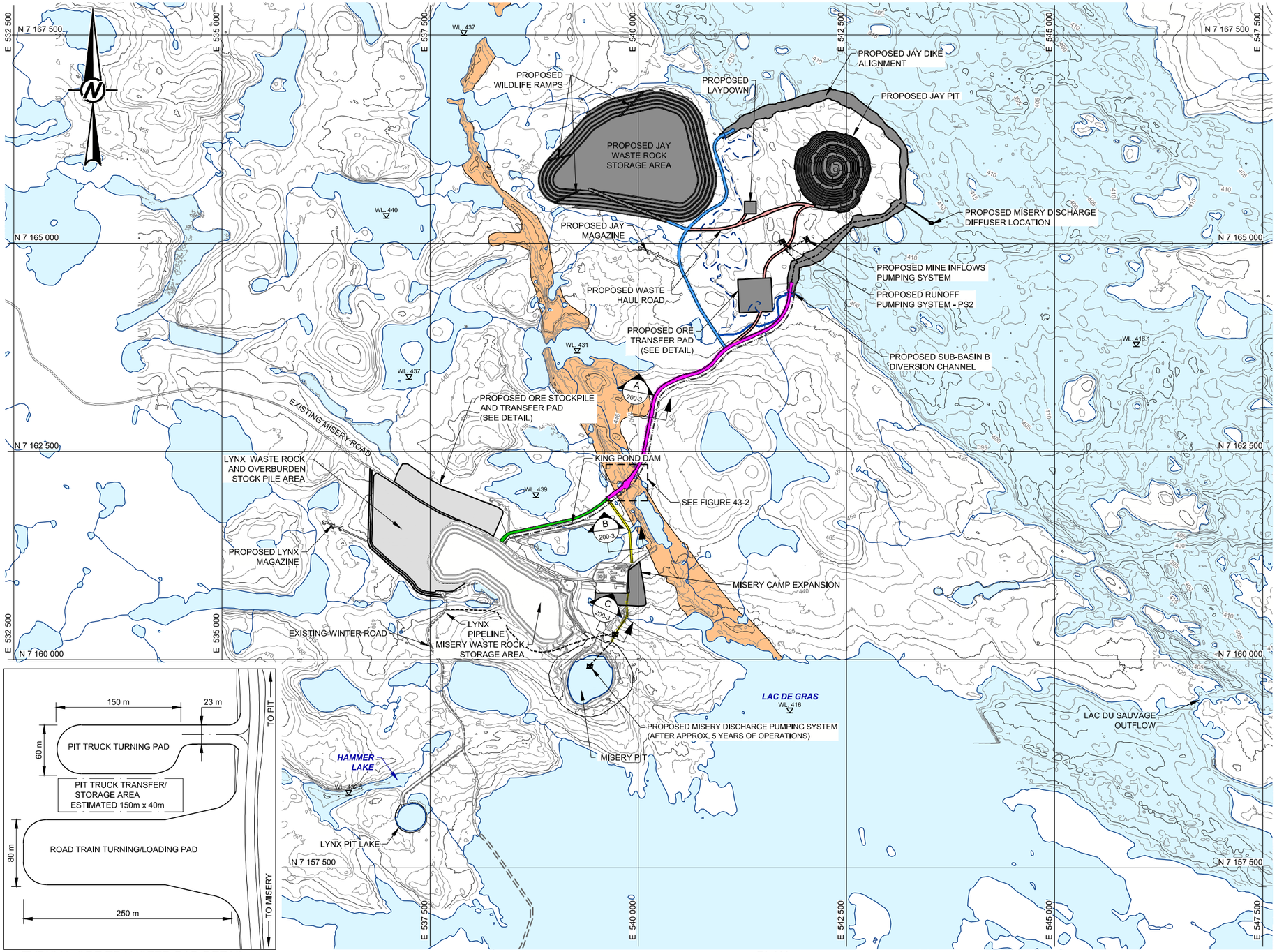
Response:

In response to the request, the following figures have been created:

- Figure 43-1 shows the proposed roads for the Jay Project;
- Figure 43-2 shows a plan view of the Jay Road (including the pipelines and power line) crossing the esker; and,
- Figure 43-3 shows a profile view of the Jay Road cutting through the esker, and a cross sectional view of the Jay Road, pipelines and power line at the esker cut.

The location where the road crosses the esker has been selected to minimize disturbance to the esker, by selecting a portion of the esker with a natural depression and where the width of the esker is narrow. The total length of the esker cut is approximately 80 metres (m), as shown in plan (Figure 43-2) and in profile (Figure 43-3). Community engagement was conducted to aid in the selection of the most appropriate location to cross the esker. This included numerous visits to the esker. Community members who visited the esker were in general agreement that having the road cross at this location was most appropriate.

The esker will be excavated to form stable slopes on either side of the road, and so that the slopes will be gradual enough for caribou and other wildlife to safely traverse, as shown on the cross-section in Figure 43-3.



TYPICAL ORE TRANSFER PAD DETAIL
SCALE: B

PLAN
SCALE: A

LEGEND

- WATERBODY
- WATERCOURSE
- EXISTING SHORELINE OF DEWATERED AREA
- ROAD
- WINTER ROAD - YEARLY CONSTRUCTION
- PROPOSED PUMPING SYSTEM
- PROPOSED POWER LINE
- WL — WATER LEVEL ELEVATION
- ESKER (APPROXIMATE)

JAY PROJECT FOOTPRINT

- PROPOSED SUB-BASIN B DIVERSION CHANNEL
- PROPOSED JAY PROJECT INFRASTRUCTURE
- PROPOSED JAY ROAD NORTH (HAUL ROAD)
- PROPOSED JAY ROAD (HAUL ROAD AND POWER LINE)
- PROPOSED JAY ROAD (HAUL ROAD, PIPELINE AND POWER LINE)
- PROPOSED JAY PIPELINE ROAD (ACCESS ROAD AND PIPELINE)
- PROPOSED WASTE AND ORE HAUL ROADS

LYNX PROJECT FOOTPRINT

- LYNX PROJECT INFRASTRUCTURE

NOTES

1. ELEVATIONS ARE IN METERS ABOVE SEA LEVEL (masl).
2. GROUND SURFACE AND BATHYMETRY CONTOURS ARE SHOWN AT 5 m INTERVALS.
3. COORDINATES ARE SHOWN IN DATUM: NAD 83, PROJECTION: UTM ZONE 12.
4. LOCATION OF WILDLIFE CROSSINGS ALONG THE ROAD ALIGNMENT ARE NOT SHOWN. WILDLIFE CROSSING LOCATIONS TO BE FINALIZED DURING FUTURE STAGES OF DESIGN.

REFERENCES

1. CONTOUR AND BATHYMETRIC DATA PROVIDED BY AURORA GEOSCIENCES LTD., FILE: Final 1m Contours - Priority Area.dxf, DATE RECEIVED: OCTOBER 29, 2013.
2. WATER OBTAINED FROM CANVEC NATURAL RESOURCES CANADA, 2012.
3. JAY PIT MODEL: GOLDER ASSOCIATES LTD., 2014. DOMINION DIAMOND JAY PIT - PRE-FEASIBILITY MINE DESIGN STUDY. SUBMITTED TO DOMINION DIAMOND EKATI CORPORATION, DATED OCTOBER 7, 2014. REFERENCE NO: 1313280041-E14065-R-Rev0-2020. (FILE NAME: pit_v6_OL.dxf).

0 100 200 300
SCALE: B METRES

0 1,000 2,000 3,000
SCALE: A METRES

REV	DATE	REVISION DESCRIPTION	DES	CADD	CHK	RVW
0	2015-04-06	ISSUED FOR REVIEW	FE	EA	FE	KM

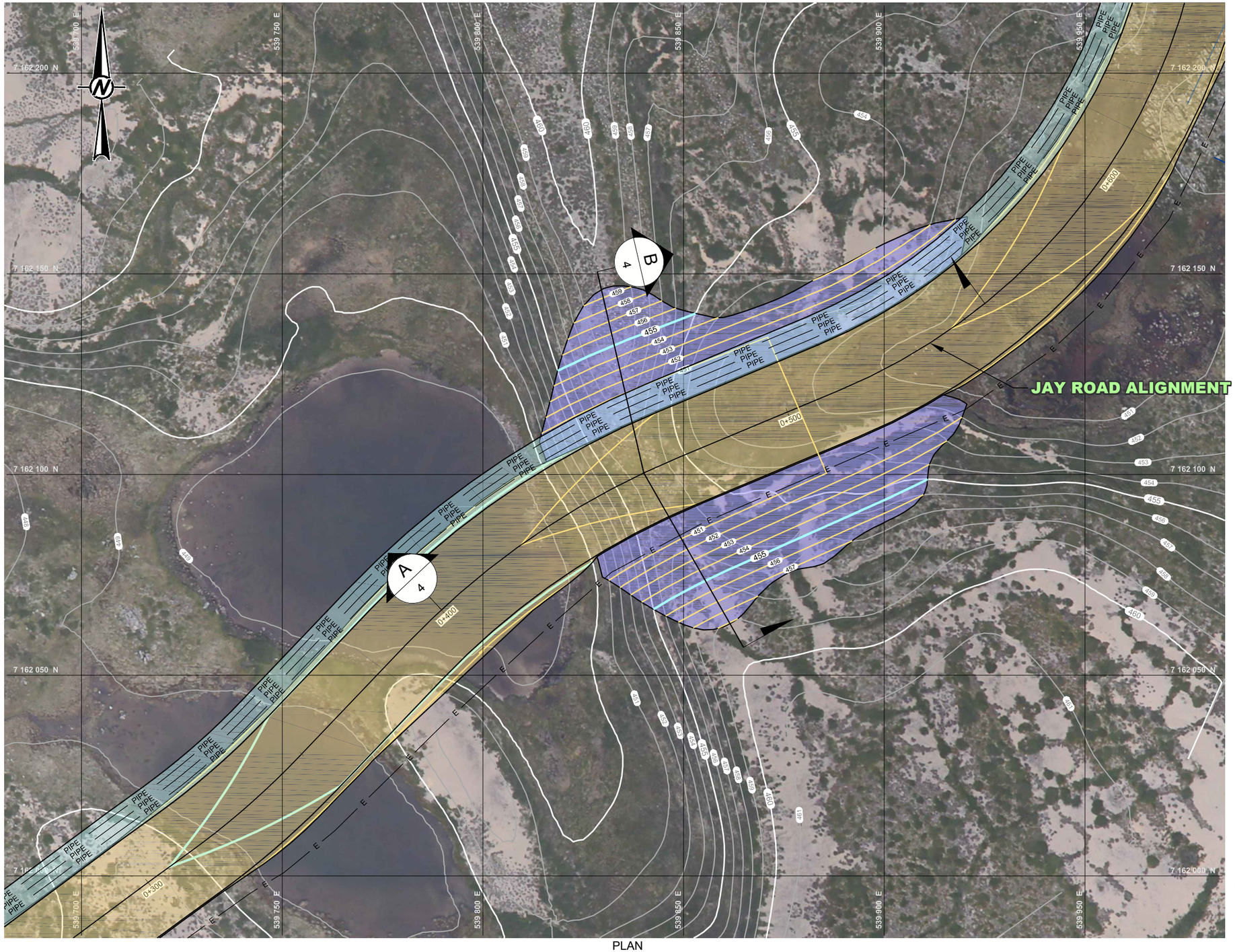
PROJECT
DOMINION DIAMOND
JAY PROJECT
NORTHWEST TERRITORIES, CANADA

TITLE
JAY PROJECT ROADS

Golder Associates

PROJECT No.	13-1328-0041.3200.35		FILE No.	1313280041-2020-43-01	
DESIGN	FE	2015-03-25	SCALE	AS SHOWN	
CADD	EA	2015-03-25	FIGURE		
CHECK	FE	2015-04-06		43-1	
REVIEW	KM	2015-04-06			

N:\Client\dominion Diamond\jay-cardinal Project\99_projects\1419751\02_PRODUCTION\3200\35\1313280041-2020-43-01.dwg | Layout: 43-1 | Modified: eabella 04/02/2015 11:58 AM | Plotted: jsled 04/06/2015



PLAN

LEGEND

- PIPE — PIPE LINE
- E — POWER LINE
- ROAD
- ESKER CUT SLOPES

NOTES

1. ALL UNITS ARE IN METRES UNLESS OTHERWISE NOTED.
2. COORDINATES ARE SHOWN IN DATUM: NAD 83, PROJECTION: UTM ZONE 12.
3. POWER POLE LOCATIONS TO BE DETERMINED IN DETAILED DESIGN.

REFERENCES

1. CONTOUR AND BATHYMETRY DATA PROVIDED BY AURORA GEOSCIENCES LTD., FILE: Final 1m Contours - Priority Area.dxf, DATE RECEIVED: OCTOBER 29, 2013.
2. WATER OBTAINED FROM CANVEC NATURAL RESOURCES CANADA, 2012.
3. ORTHOPHOTO PROVIDED BY AURORA GEOSCIENCES LTD. DATED: AUGUST 21, 2013.

0 20 40 60
SCALE METRES

REV	DATE	REVISION DESCRIPTION	DES	CADD	CHK	RVW
0	2015-04-06	ISSUED FOR REVIEW	FE	EA	FE	KM

PROJECT
DOMINION DIAMOND™
JAY PROJECT
NORTHWEST TERRITORIES, CANADA

TITLE
JAY ROAD AT ESKER CROSSING PLAN

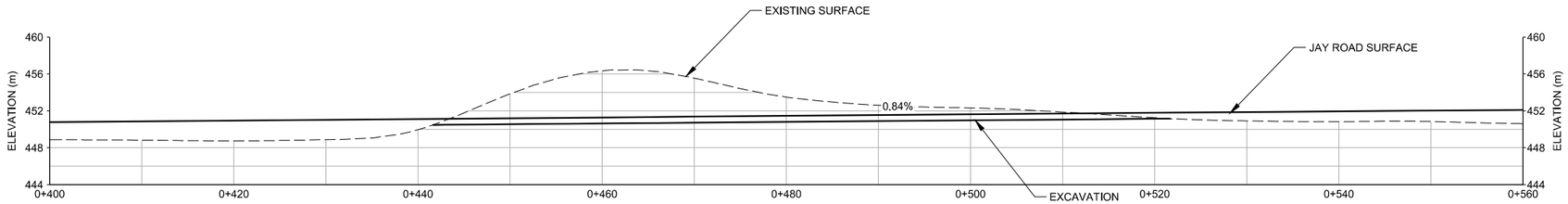
Golder Associates

PROJECT No.	13-1328-0041.3200.35		FILE No.	1419751-3200-35_3
DESIGN	FE	2015-03-25	SCALE	AS SHOWN
CADD	EA	2015-03-25	FIGURE	43-2
CHECK	FE	2015-04-06		
REVIEW	KM	2015-04-06		

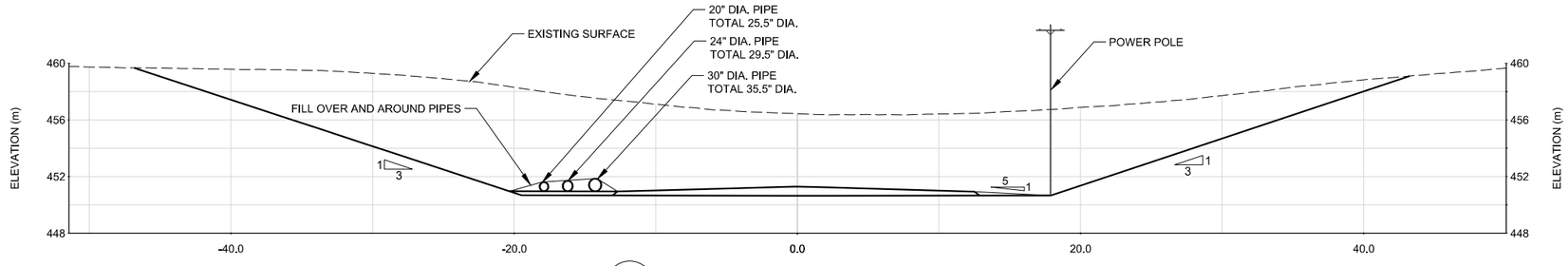
N:\Clients\dominion Diamond\jay-cardinal Project\09_projects\1419751\02_PRODUCTION\3200\35\1419751-3200-35_3.dwg | Layout: 3 JAY PROJECT ROAD AND TRAFFIC ASSESSMENT | Modified: jdeol 04/06/2015 11:14 AM | Plotted: jdeol 04/06/2015

NOTES

1. ALL UNITS ARE IN METRES UNLESS OTHERWISE NOTED.
2. POWER LINE PROJECTED ONTO SECTION, POWER POLE LOCATIONS TO BE DETERMINED IN THE DETAILED DESIGN.



SCALE A — A/3 — PROFILE : JAY ROAD THROUGH ESKER



SCALE B — B/3 — SECTION : JAY ROAD AT ESKER CUT

SCALE A: 0 12 24 36 METRES

SCALE B: 0 8 16 24 METRES

REV	DATE	REVISION DESCRIPTION	DES	CADD	CHK	RVW
0	2015-04-06	ISSUED FOR REVIEW	FE	EA	FE	KM

PROJECT

DOMINION DIAMOND™

JAY PROJECT
NORTHWEST TERRITORIES, CANADA

TITLE

JAY ROAD AT ESKER CROSSING PROFILE AND SECTION

Golder Associates

PROJECT No.	13-1328-0041.3200.35		FILE No.	1419751-3200-35_3
DESIGN	FE	2015-03-25	SCALE	AS SHOWN
CADD	EA	2015-03-25	FIGURE	43-3
CHECK	FE	2015-04-06		
REVIEW	KM	2015-04-06		

N:\Clients\dominion Diamond\jay-cardinal Project\99_projects\1419751\02_PRODUCTION\3200\35\1419751-3200-35_3.dwg | Layout: 4 JAY ROAD AT ESKER CROSSING SECTION | Modified: jdeol 04/06/2015 11:11 AM | Plotted: jdeol 04/06/2015

Through the esker cut, the Jay Road will have the following dimensions:

- operating road width = 25 m;
- pipe bench width (for the three pipelines) = 7.5 m;
- caribou ramp = 5 m;
- overall approximate base width of excavation = 40 m; and,
- estimated side slopes of the excavation 3 horizontal to 1 vertical.

In accordance with Worker's Compensation Board of the NWT and Nunavut (WCB NWT and NU) Mine Health and Safety Regulations (1995), for two-way haul traffic, the minimum operating road width is required to be three times the width of the widest truck that will operate on the road. The maximum operating width of the haul traffic that will operate on the Jay Road is 8.3 m, which corresponds to an operating width of 25 m for two-way traffic.

In particular, due to the short summer construction season, having two-way traffic through the esker crossing is necessary from a traffic management and safety perspective.

However, for comparison purposes, if the road was to be built as a single lane through the esker, the minimum operating road width would be required to be twice the operating width of the widest truck, which corresponds to 16.6 m, and the total base width of the excavation would be 32 m. This would reduce the width of the esker cut by a small amount, but would not be practical or safe from an operating standpoint.

As shown in the cross-section in Figure 43-3, the pipelines through the esker will be covered with granular material and the slope of the road will be constructed at a 5 horizontal to 1 slope to make it more gradual. Dominion Diamond will strategically construct the pipelines to reduce the number of joints or valves through the esker crossing. As part of the detailed design for the Jay power line, power pole locations will be determined. A power pole is shown in, projected, onto the cross section in Figure 43-3, for illustrative purposes only.

References:

WCB NWT and NU (Workers' Compensation Board of the Northwest Territories and Nunavut). 1995. Consolidation of Mine Health and Safety Regulations R-125-95, 1995. Available at: http://www.wscc.nt.ca/YourWSCC/Resources/Documents/Mine%20Health%20and%20Safety/Regs/NUMineRegulations.pdf. Accessed: June 2014

DOMINION DIAMOND

Information Request Number:	DAR-IEMA-IR-44
Source:	Independent Environmental Monitoring Agency: Kevin O'Reilly
Subject:	Traffic Type and Volumes
DAR Section(s):	3.5.1.6 and 12.4.2.3

Preamble:

Vehicular traffic related to the Jay Project is estimated only for the long-haul trucks at 56 round trips per day. No estimates are provided for other vehicle types, as identified by DDEC, including bulk explosive trucks, crew transport vehicles, road maintenance equipment, garbage trucks, low-bed trucks, water trucks, emergency vehicles and light vehicles. There does not appear to be any details provided on lessons learned from current traffic management at Ekati (it is not clear if there is a comprehensive traffic management plan) and how that will be applied or modified for the Jay Project. The analysis of vehicle traffic effects on caribou only included the long-haul truck traffic (DAR s. 12, pg. 12-97). The Agency is not aware of a recent and comprehensive Traffic Management Plan that explains current mitigation efforts and procedures.

Request:

DDEC should provide traffic volumes (numbers of trips per day and timing as it may relate to haul trucks) for all vehicles expected to use the Misery and Jay roads related to the Jay Project. Traffic volumes for bulk explosive trucks, crew transport vehicles, road maintenance equipment, garbage trucks, low-bed trucks, water trucks, emergency vehicles and light vehicles should be included. DDEC revise its impact assessment on caribou to include all of these vehicle types. DDEC should also provide its current Traffic Management Plan and any proposed changes for the Jay Project, to show how it intends to mitigate the effects of such traffic.

Response:

Appendix C (Traffic Associated with the Jay Project) presents a detailed set of estimates for the number of round trips of both long-haul ore trucks and other non-haul vehicles. Based on all types of vehicles and 365 days per year road operation, Table 2 of Appendix C shows estimate ranges of 70 to 90 round trips per day on the Jay Road and 80 to 105 round trips per day on the Misery Road: 8 to 12 minutes and 7 to 9 minutes between vehicles, respectively (Appendix C, Table 3, based on vehicles going either direction).

Mitigation strategies include modification of traffic patterns and temporary road closures to permit caribou to move through the area. If Jay and Misery roads are closed for 15 days per year for caribou passage and weather events, the estimated number of round trips per day of long-haul ore traffic will increase from 56 to 58 (Appendix C, Table 4 and Table 6): 13 minutes and 12.5 minutes, respectively, between long-haul ore trucks (Appendix C, Table 5 and Table 7). The environmental design features and traffic mitigation strategies identified in the Developer's Assessment Report (DAR) are summarized in Appendix C. The mitigation strategies are expected to be effective in permitting caribou passage through the area.

The effectiveness of mitigation will be monitored and the results used as feedback for adaptive management, which may require modification and/or additional mitigation and effects management strategies. An updated Traffic Management Plan for the Ekati Mine is being prepared that documents current practices for caribou safety around roads. The Plan is scheduled for circulation in April 2015.

Monitoring under the Wildlife Effects Monitoring Program demonstrates that caribou cross the roads at the Ekati Mine (i.e., they are not an impermeable barrier), and this is Dominion Diamond's expectation for the Jay Project roads. However, the assessment of the Project's effect on caribou movement in the DAR is based on a conservative assumption that the Jay and Misery roads do act as impermeable barriers to caribou movement. This provides a level of confidence that the assessment of effects in the DAR is appropriately conservative for the environmental assessment and does not underestimate potential effects.

DOMINION DIAMOND

Information Request Number:	DAR-IEMA-IR-45
Source:	Independent Environmental Monitoring Agency: Kevin O'Reilly
Subject:	Dike Design and Performance
DAR Section(s):	3.5.3.1

Preamble (IEMA):

Given the recent examples of dike and dam failures in other mining projects, it is not clear whether DDEC is using best practices by establishing an independent dike review board that would review the design and performance of the Jay Dike and make its reports public along with the DDEC response.

Request (IEMA):

DDEC should commit to the establishment of an independent dike review board that would review the design and performance of the Jay Dike and make its reports public along with the DDEC response.

Response:

Dominion Diamond plans to establish an independent dike review board, as it is considered to be a best applicable practice, to review the detailed design for the Jay Dike, dike construction, and ongoing performance.

Similar review boards have been established and are in place for the Diavik Mine and Meadowbank Mine.

DOMINION DIAMOND

Information Request Number:	DAR-IEMA-IR-46
Source:	Independent Environmental Monitoring Agency: Kevin O'Reilly
Subject:	Jay Dewatering Thresholds
DAR Section(s):	3.5.5

Preamble (IEMA):

DDEC presents figures for dewatering volumes for Jay into various pits during dewatering but does not provide the assumptions behind what the TSS or other thresholds it uses for determining volumes and the rationale for same.

Request (IEMA):

DDEC should clearly indicate what thresholds were used for TSS, phosphorus or other contaminants of potential concern thresholds were used in determining Jay dewatering volumes. DDEC should provide a rationale for the use of any thresholds including how they may or may not relate to water quality objectives.

Response:

The source of the 50 percent (%) water volume estimate from the diked area that can be discharged directly to Lac du Sauvage is an empirical estimate based on similar experience at other northern mines. Threshold values for water quality constituents (including total suspended solids [TSS] or phosphorus) were not used and are not required to develop the water volume estimates for dewatering.

Two similar instances of dewatering a diked area to access the lakebed for mining have occurred at the nearby Diavik Mine in Lac de Gras. For the A154 diked area, 53% of the planned 10.2 million cubic metres (m^3) was discharged directly to Lac de Gras without treatment (DDMI 2002); for the A418 diked area, 76% of the 2.3 million m^3 was discharged directly to Lac de Gras (DDMI 2006). Although the 50% estimate is lower than the proportion dewatered in the two Diavik Mine instances, it is considered a reasonable estimate for the mine water management plan.

The specific TSS threshold for dewatering the diked area of Lac du Sauvage is anticipated to be resolved as part of the regulatory permitting stage of the Project. This is typically specified in a Dewatering Plan required under the Water Licence for approval of the Wek'èezhìı Land and Water Board. Dominion Diamond anticipates that TSS concentrations will govern when direct discharge of the dewatering water into Lac du Sauvage is to be halted and when pumping of the dewatering water to the Misery Pit and Lynx Pit will commence.

For conceptual planning purposes, Dominion Diamond has assumed that the TSS threshold for discharges would be in the range of 25 to 50 milligrams per litre (mg/L), which is based on the current Ekati Mine Water Licence. The Ekati Mine Water Licence provides for a maximum TSS concentration of 25 mg/L in any single grab sample for routine effluent discharges, and for a maximum TSS concentration of 50 mg/L for short term 'construction' events. Dominion Diamond will consider whether the 'construction' limit is the more appropriate for the Lac du Sauvage dewatering program and may propose it in the (future) Dewatering Plan.

The sampling and analysis for TSS will be undertaken frequently at the source of dewatering discharge to Lac du Sauvage as a monitoring component of the Surveillance Network Program. The determination of TSS concentrations will be done on site so as to provide immediate feedback for control of the dewatering program.

References:

DDMI (Diavik Diamond Mines Inc.). 2002. A154 Dewatering Program Report for Diavik Diamond Mines Inc. Submitted to the Wek'éezhii Land and Water Board, Yellowknife, NWT. December 2002.

DDMI. 2006. A418 Dewatering Program Report for Diavik Diamond Mines Inc. Submitted to the Wek'éezhii Land and Water Board, Yellowknife, NWT. January 2006.

DOMINION DIAMOND

Information Request Number:	DAR-IEMA-IR-47
Source:	Independent Environmental Monitoring Agency: Kevin O'Reilly
Subject:	Misery Water Quality for Discharge
DAR Section(s):	Appendix 3A

Preamble (IEMA):

Predictions of Misery Pit water quality are presented at a point in time when discharge is to take place into Lac du Sauvage in Table 7-2. The text discusses how the bottom layer will have elevated levels of TDS and chloride compared to the surface but the Table does not provide this data. It would be helpful to have data for metals due to leaching from pit walls. The text also discusses the potential for some mixing of water within the pit so it would be more helpful to have the actual predictions of discharge from end of pipe at the diffuser into Lac du Sauvage.

Request (IEMA):

DDEC should clarify the presentation of data in Appendix 3A, Table 7-2 to clearly indicate predicted Misery Pit water quality for TDS, chloride and metals at various layers within the pit. The effects of potential mixing and expected end of pipe water quality for the diffuser into Lac du Sauvage should also be presented for TDS, chloride and metals.

Response:

Dominion Diamond Ekati Corporation (Dominoin Diamond) understands the above request is asking for the following:

1) Total dissolved solids (TDS), chloride, and metals concentrations at various layers in the Misery Pit during post-closure, consistent with the post-closure results presented in Table 7-2 of Appendix 3A of the Developer's Assessment Report (DAR); and,

2) End of pipe water quality for the diffuser in Lac du Sauvage for TDS, chloride, and metals and the effects of this discharge on Lac du Sauvage after it is discharged during operations via the diffuser (note: Misery Pit does not discharge to Lac du Sauvage during closure and post-closure).

Responses to these two information requests are provided below.

Request 1

Table 7-2 in Appendix 3A (Mine Water Management Plan) of the DAR provides a summary of the concentrations assumed in the Lac de Gras hydrodynamic model from the Misery Pit during the post-closure period of the Jay Project (the Project); during this post-closure period, surface overflow and seepage from the Misery Pit is expected to flow to Lac de Gras.

In the water quality model, as discussed in Section 8E2.2.2.2.1 of Appendix 8E of the DAR, during closure and post-closure, the Misery Pit was treated as a two-layered system with a freshwater, low TDS, mixolimnion overlying a monimolimnion containing elevated concentrations of TDS. At closure, the upper 50 metres (m) (13.7 million cubic metres [m^3]) of water stored in the Misery Pit will be pumped to the bottom of the Jay Pit. The water removed from the Misery Pit will be replaced with freshwater pumped from Lac du Sauvage, wall rock runoff, natural catchment runoff, and direct precipitation to develop a 60 m freshwater cap. The Misery pit lake is maintained at a maximum storage elevation of 430 metres above sea level (masl) during operations; however, the spillway elevation is 440 masl. Therefore, the total capacity of the freshwater cap (16.8 million m^3) once the pit has been back-flooded at closure is greater than the volume of water pumped from the Misery Pit to the Jay Pit (13.7 million m^3).

The residual volume of water remaining in the Misery Pit following removal of the water stored in the upper 50 m was assumed to be fully mixed during closure and its water quality represents the constituent concentrations of the monimolimnion. Maximum concentrations for select water quality constituents (i.e., TDS, chloride, nitrate, and total phosphorus) for the two layers in the model are included in Table 7-2; the Misery Pit Surface Discharge information (under ice and open water) represents the mixolimnion (upper layer) and the Misery Pit Seepage data represents the monimolimnion (lower layer). Projected mixolimnion and monimolimnion concentrations for all modelled constituents are provided in Table 8E4.1.-1 and Table 8E4.2-1, respectively, in Appendix 8E of the DAR.

Request 2

During operations, excess water stored in the upper layer of the Misery Pit will be pumped to Lac du Sauvage. In the model, the end of pipe concentrations were assumed to be equal to the projected concentrations in the upper layer of the Misery Pit since this is the water that will be discharged. Maximum projected end of pipe concentrations for all modelled parameters are provided in Table 8E4.1-1 of Appendix 8E of the DAR.

To evaluate the effects of mixing of the discharge water in Lac du Sauvage through a diffuser, a Cormix (Cornell Mixing Zone Expert System) model (Doneker and Jirka 2007) was used. This model estimates the mixing of a discharged effluent into a lake environment under a variety of hydrodynamic and seasonal scenarios, based on existing ambient lake data and the proposed discharge location and characteristics, including:

- effluent discharge density;
- receiving environment water density;
- receiving environment water velocities; and,
- diffuser design.

The model was used to evaluated several diffuser design configurations to optimize the mixing of site discharges in Lac du Sauvage. A 10-port diffuser with a five metre port spacing was recommended for the diffuser. Details of this analysis are provided in Attachment 8F1 of Appendix 8F of the DAR. The diffuser design was subsequently included in the Lac du Sauvage hydrodynamic model (Appendix 8F of the DAR). The effects of mixing were evaluated at assessment location LDS-P1, which is located in the same 400 by 400 m grid cell in the Lac du Sauvage hydrodynamic model. The results of the surface water quality effects assessment are presented in Section 8.5.4 of the DAR.

Evaluation of the model results for Lac du Sauvage, and downstream into Lac de Gras, as a result of the Misery Pit discharges to Lac du Sauvage, indicated that the Project will not result in significant adverse effects to surface water quality. It is, however, recognized that water quality modelling is based on several inputs, all of which have inherent uncertainty. Therefore, Dominion Diamond proposes to develop a comprehensive surface water quality monitoring program as part of the water licensing process to monitor onsite water quality and downstream in the receiving environment. If observed water quality trends deviate from modelled predictions, adaptive management strategies will be implemented as required.

References:

Doneker RL, Jirka GH. 2007. CORMIX User Manual. U.S. Environmental Protection Agency: EPA-823-K-07-001, Washington, DC, USA.

DOMINION DIAMOND

Information Request Number: DAR-IEMA-IR-48

Source: Independent Environmental Monitoring Agency: Kevin O'Reilly

Subject: Fish Habitat Enhancement

DAR Section(s): Appendix 3B

Preamble (IEMA):

There is no discussion of fish habitat enhancements in the Sub-Basin B Diversion Channel. Significant efforts and lessons learned from fish habitat enhancements at Ekati in the Panda Diversion Channel and Pigeon Stream Diversion should be used in the Jay Project.

Request (IEMA):

DDEC should describe what fish habitat enhancements it intends to apply to the Sub-Basin B Diversion Channel based on the experience from the Ekati Panda Diversion Channel and Pigeon Stream Diversion.

Response:

The proposed Sub-Basin B Diversion Channel will be designed to convey water during operations from two fish-bearing streams (Stream B0 and Stream Ac35) that would otherwise enter the dewatered area, and also to facilitate passage of fish from Lac du Sauvage to upstream locations. The design features will reduce indirect effects from the isolation of the dewatered area, and direct effects from stream diversions on available habitat for Arctic Grayling. Any temporary losses associated with the diversion of waters from Stream Ac35 and Stream B0 below the diversion channel location are considered in the Conceptual Offsetting Plan (see Appendix 9A of the Developer's Assessment Report), and will be considered in the Final Offsetting Plan to be submitted to Fisheries and Oceans Canada (DFO) during the regulatory phase of the Project. Specific habitat enhancements used at the Ekati Panda Diversion Channel do not apply for the Sub-Basin B Diversion Channel because the goals of the Panda Diversion Channel were set for a permanent channel design as part of a habitat compensation agreement for an authorization from DFO under the Fisheries Act for the Ekati Mine (Fisheries Authorization SCA96021). The Ekati Mine Pigeon Stream Diversion was similarly designed to be a permanent channel providing permanent fish habitat as a compensation requirement of the *Fisheries Act* Authorization (SC99037).

Dominion Diamond Ekati Corporation is confident that the proposed channel design is appropriate for a temporary channel that will be reclaimed at closure when the dike is breached, allowing the natural channels to be reconnected to Lac du Sauvage. Fisheries aspects of the channel will be the subject of detailed discussion with DFO and communities as part of the regulatory permitting of the Jay Project for an Authorization under the *Fisheries Act*.

DOMINION DIAMOND

Information Request Number:	DAR-IEMA-IR-49
Source:	Independent Environmental Monitoring Agency: Kevin O'Reilly
Subject:	Esker Reclamation
DAR Section(s):	Appendix 3B

Preamble:

There is no discussion in the Jay Project Conceptual Closure Report of how the combined road, pipeline and power line crossing of the esker will be reclaimed. Given the importance of eskers as wildlife movement corridors and habitat, it is not clear whether DDEC is committed to replacing the esker material and rejoining the two ends of the cut, revegetation or other special measures.

Request:

DDEC should provide details on its commitments to reclaim the combined road, pipeline and power line crossing of the esker will be reclaimed.

Response:

Esker material disturbed during construction will be stockpiled for use in restoration during the closure phase of the Jay Project. During closure, the pipelines and power lines will be removed and the area where the esker was cut will be rebuilt. During restoration, the esker will be graded to match the surrounding terrain. The surface will be dressed with material that was saved and stockpiled from the esker cut during construction. Any natural channels that are modified near the esker as part of road and pipeline construction will be re-established in the closure phase.

DOMINION DIAMOND

Information Request Number: DAR-IEMA-IR-50

Source: Independent Environmental Monitoring Agency: Kevin O'Reilly

Subject: Fish Habitat Enhancement

DAR Section(s): Appendix 3B

Preamble (IEMA):

In the past, commitments have been made at Ekati to ensure that pits are safe for use by fish with some effort expended toward creating fish habitat through shallow zones and riparian vegetation enhancements. There is very little discussion of fish use or habitat enhancement of any of the water bodies or pits used as part of the Jay Project.

Request (IEMA):

DDEC should provide a detailed explanation of whether the Jay open pit and diked area, Misery Pit, Panda Pit, Koala Pit and Lynx Pit will be safe for fish passage and what efforts will be made towards fish habitat enhancement as part of closure and reclamation.

Response:

As described in the approved Interim Closure and Reclamation Plan (ICRP) for the Ekati Mine, reclamation of open pits at the Ekati Mine, including the Misery, Panda/Koala, and Lynx pits, is not intended to create fish habitat post-closure; however, water quality at these sites will be safe for use by fish, wildlife, and people and outflow channels will be constructed to safely convey surface runoff to the natural receiving environment (BHP Billiton 2011; Dominion Diamond 2014). Reclamation activities are similar for the Misery, Panda/Koala and Lynx pits and details can be located in the ICRP (BHP Billiton 2011, Tables 5.2-4, 5.2-13, 5.2-14, and 5.2-16). Uppermost pit benches may be modified and vegetation may be planted in some areas of open pit perimeters to promote possible, long-term progression towards fish habitat. A research program, established through the ICRP, will result in a final pit closure design for approval by the Wek'èezhìi Land and Water Board under the Final Closure and Reclamation Plan. Water quality monitoring is scheduled at each pit for 10 years post closure to confirm that water quality is acceptable and that the pits are physically safe for people and wildlife.

As described in Section 3.5.8 of the Developer's Assessment Report (DAR), the Jay Project introduces necessary changes to the Ekati Mine ICRP, including amended pit back-flooding approaches for the Misery, and Panda/Koala open pits. The change in the back-flooding approach does not affect the reclamation objectives for these pits as summarized above and described fully in the approved ICRP. Dominion Diamond has proposed that the ICRP should be amended to incorporate the Jay Project as part of the regulatory requirements of the Wek'èezhìı Land and Water Board after approval of the Project.

As described in Section 9.4.3.1.1 of the DAR, the dewatered area of Lac du Sauvage will be back-flooded at closure and approximately 338 hectares (ha) of aquatic habitat will be reconnected to Lac du Sauvage in an altered state. The dike will be breached when water quality in the back-flooded area meets pre-determined acceptability criteria. The physical and chemical environment of the area will be similar to

conditions in Lac du Sauvage and will allow re-establishment of a healthy functioning aquatic ecosystem. The shoreline riparian zone and littoral zones within the diked area will be reclaimed to allow natural regrowth of vegetation, with localized revegetation implemented as necessary (see Appendix 3B of the DAR). Fish will be able to re-enter and move through the back-flooded zone unobstructed once the dike is breached, and habitats within the back-flooded zone will be populated by fish from adjacent habitats in Lac du Sauvage. The outer edges of the dike remnants may provide cover and rearing habitat for some species of fish.

The footprint of the Jay Pit (64.9 ha) is located entirely within the dewatered area of Lac du Sauvage and will not alter the shoreline or littoral habitat area after reclamation. The Jay Pit represents a permanent loss of lake bottom substrate habitat for benthic feeding or bottom dwelling species such as Lake Whitefish and forage species such as Slimy Sculpin, but will include an extended water column as habitat for pelagic species such as Lake Trout and forage species such Cisco. The upper level of the Jay Pit may remain well-oxygenated through the winter due to its depth and may provide additional overwintering refugia for fish and thermal refugia for fish in summer (see Section 9.4.3.1.1 of the DAR).

References:

BHP Billiton Canada Inc. (BHP Billiton). 2011. Ekati Diamond Mine Interim Closure and Reclamation Plan. Prepared for the Wek'èezhìı Land and Water Board. 842 pp.

Dominion Diamond (Dominion Diamond Ekati Corporation). 2014. Ekati Diamond Mine 2014 Closure and Reclamation Progress Report. Prepared for the Wek'èezhìı Land and Water Board. 154 pp.

DOMINION DIAMOND

Information Request Number:	DAR-IEMA-IR-51
Source:	Independent Environmental Monitoring Agency: Kevin O'Reilly
Subject:	Reclamation Schedule
DAR Section(s):	Appendix 3B

Preamble (IEMA):

A more detailed schedule that includes actual year of work would be helpful in understanding how progressive reclamation will be carried out across the Ekati Mine. DDEC provides a reclamation schedule for the Jay Project that contains very few details, unlike the schedule that appears in the approved ICRP as Figure 8.5-1.

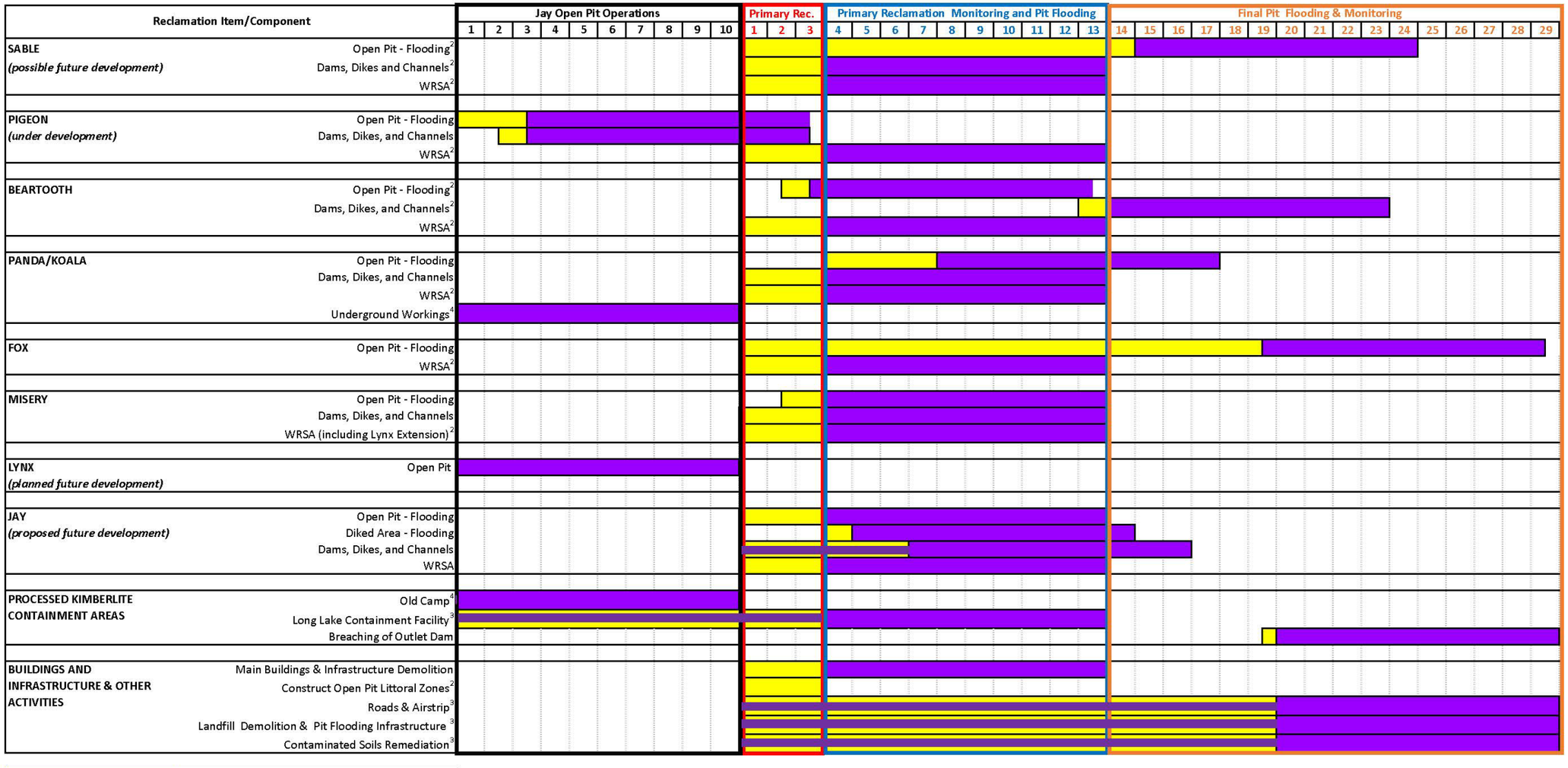
Request (IEMA):

DDEC should provide a reclamation schedule for the Jay Project that shows the same level of detail and integration with the ICRP Reclamation Schedule (Figure 8.5-1).

Response:

A schedule addressing the request above is included as Figure 51-1.

Figure 51-1 Jay Project – Conceptual Reclamation Schedule



Notes:
1. This conceptual schedule illustrates a likely approach to closure and reclamation in the context of an approved Jay Project consistent with the level of planning and design in the Jay Project DAR.
2. This item may be a candidate for progressive reclamation during operation of the Jay Project depending on circumstances.
3. This item is conducted intermittently as areas or materials become available for reclamation.
4. This item would be completed prior to Jay Project operations.

DOMINION DIAMOND

Information Request Number: DAR-IEMA-IR-52

Source: Independent Environmental Monitoring Agency: Kevin O'Reilly

Subject: Significance Determinations

DAR Section(s): 6.3

Preamble (IEMA):

Several of the valued components (Key Line of Inquiry/Subject of Note) analysed indicate they would be significant if the assessment end point is exceeded. "Results from the residual impact classification are then used to determine the environmental significance from the Project (and other developments) on assessment endpoints." (pg. 6-30). For wildlife and vegetation valued components, the following is described as the assessment endpoint: "Self-sustaining and ecologically effective populations (and communities)". Ecological well-being is an important indicator of the significance of environmental effects for these valued components. However, societal values should play an important role in determining significance of environmental effects. For example, whether an environmental effect violates a law, whether it contradicts a management plan, program or policy for the valued component, or whether it conflicts with Aboriginal plans for use of the valued component for traditional purposes. These do not appear to have been considered in determining the significance of environmental effects for wildlife and vegetation valued components. For the record, the Agency believes that violations of laws or regulations caused by the project (alone or cumulatively) would be a strong indicator that the effect is significant. The Agency believes that contradicting an approved management plan, policy or program, or conflicting with Aboriginal plans for use of the valued component for traditional purposes would also be an indicator that the effect is significant.

Request (IEMA):

For each of the valued components for which the endpoint is "self-sustaining and ecologically effective population", we request that DDEC please provide the following: 1. What laws or regulations provide some protection for this valued component? E.g., the Species at Risk Act for listed species, the Wildlife Act of the NWT. 2. What protection is provided in the laws or regulations for this valued component? E.g., Section 32 (1) of the Species at Risk Act: "No person shall kill, harm, harass, capture or take an individual of a wildlife species that is listed as … an endangered species or a threatened species." 3. What management plans or equivalent exist that apply to this valued component? These would be available from such sources as Environment Canada, Environment and Natural resources or the WRRB. 4. In view of the results of parts 1, 2 and 3 above, how might one revise the determination of significance for the effects on these valued components? The Agency requests that GNWT-ENR and Environment Canada responds to questions 1-4 above.

Response:

The Independent Environmental Monitoring Agency (IEMA) has noted in the preamble that the Agency believes that violations of laws or regulations caused by the Project (alone or cumulatively) would be a strong indicator that the effect is significant. Dominion Diamond agrees with this statement, and will continue to adhere to all relevant laws and regulations. Section 1.2.3.3.3 of the Developer's Assessment

Report (DAR) outlines the Sustainable Development Policy of Dominion Diamond, and confirms their commitment to 'protection of the environment, continuous improvement, compliance with laws and regulations, community engagement, and respect'. Sections 1.4.2 and 1.5.2 in the DAR list some of the applicable permits, approvals, guidelines, and policies that will guide the Jay Project. Following the environmental assessment, the regulatory process will establish the details of how the Project will adhere to all laws, and regulations (MVEIRB 2004). For example, the wildlife monitoring plan will lay out the mitigation, policies, procedures, and monitoring that Dominion Diamond will implement to adhere to relevant wildlife provisions in the *Migratory Bird Convention Act*, the *NWT Wildlife Act*, the *Species at Risk (NWT) Act*, the *Mackenzie Valley Land Use Regulations*, as well as relevant corporate commitments and MVEIRB measures. Similarly, it is recognized that the construction and operation of the Project will cause serious harm to fish (as defined in the *Fisheries Act*) in the Lac du Sauvage watershed. Therefore, as part of the permitting phase of the Project, an Application for Authorization under the *Fisheries Act* will be submitted to Fisheries and Oceans Canada (DFO), along with a Final Offsetting Plan.

However, an environmental assessment should use a higher standard than the legislation to determine significance. According to Ehrlich (2012), 'national standards are the bare-bones floor, intended to be adapted to different settings'. A review of this legislation will not affect the determination of significance, because the Jay DAR sets a higher standard for significance than meeting relevant legislation because the assessment is based on effects to populations. While it is important to protect individual plants and animals, populations represent the unit of conservation and management and necessarily are the appropriate ecological level for the assessment.

Further, Dominion Diamond has submitted the DAR, which rates significance in the developer's opinion, as per MVEIRB guidelines (MVEIRB 2004). Community and regulatory engagement, and local and traditional knowledge were key considerations in the selection of valued components, effects pathways, and mitigation. However, as described in MVEIRB (2004), "ultimately, the final determinations of significance rest with the Review Board".

References:

Ehrlich A. 2012. The Significance Spectrum Presented at: International Association for Impact Assessment 32nd International Conference (2012), Porto, Portugal. Written and presented by Alan Ehrlich, Manger of Environmental Impact Assessment, MVEIRB

MVEIRB (Mackenzie Valley Environmental Impact Review Board). 2004. Environmental Impact Assessment Guidelines. MVEIRB. March 2004.

DOMINION DIAMOND

Information Request Number:	DAR-KIA-IR-01
Source:	Kitikmeot Inuit Association: Tannis Bolt
Subject:	Increased Vehicle Use for Jay Pipe
DAR Section(s):	3

Preamble (KIA):

Proponent indicates that, on average, 1,252 people will be needed per year (and 282 per year during reclamation) for this project. In Section 3.5.1.6, the proponent indicates that 56 additional round trips by long-haul trucks will make 8 trips per day in fleets of seven, with additional trips needed for haul trucks of different sizes. However, the project description does not estimate other traffic due to workers going from camp to and from site. With 1,252 additional workers staying at the main Ekati or Misery camps, the addition of worker traffic in smaller trucks has the potential to have a substantial effect on wildlife movement, energetics, and mortality risk when caribou encounter the road during migration and other movements.

Request (KIA):

Please provide complete vehicular estimates, including all staff and contractor traffic and other vehicle types, for each year and season that the project will be in operation, closure, or decommissioning. This information is necessary to adequately anticipate the effects of traffic on caribou and other wildlife within the effects assessment.

Response:

Detailed information of traffic volumes for all vehicle types is provided in Appendix C (Traffic Associated with the Jay Projec).

DOMINION DIAMOND

Information Request Number: DAR-KIA-IR-02

Source: Kitikmeot Inuit Association: Tannis Bolt

Subject: Increased vehicular frequency due to the Jay Pipe

DAR Section(s): 3, 12

Preamble (KIA):

The project description notes that no modifications to the Tibbit to Contwoyto road are anticipated to accomodate this project, but it does not comment on the projected-related increases in all forms of vehicular traffic. This is an important migratory corridor for caribou, and the traffic that will be added from this project should be estimated for proper consideration of effects of the project on wildlife movement, energetics, and mortality.

Request (KIA):

Please provide estimates of all vehicular traffic that will be added to the Tibbit to Contwoyto Road, to accomodate the Jay Pipe Project (Similarly, please add this information after Table 12.3-2 in the Caribou EA Section 12.3.2.2.2, showing the predicted total traffic per season that will be added to existing traffic due to the Jay Pipe project alone). Please include estimates as numbers of vehicles (haul trucks and others) that will be added per year and per season for each phase of the project along with the approximate percentage that they will represent on the road.

Response:

Detailed information of traffic volumes for all vehicle types on all roads is provided in Appendix C (Traffic Associated with the Jay Project).

During construction of the Jay Project (2016 to 2019), the number of northbound loads on the Tibbitt to Contwoyto Winter Road (TWCR) is expected to increase by 200 trucks per winter road season.

Thereafter, no changes are predicted during operation and closure (2020 to 2034) in the annual traffic on the TCWR (Developer’s Assessment Report Section 3.4.2 and Section 16.3). Therefore, up to approximately 4,000 loads per season will continue to supply freight to the Ekati Mine throughout the period of the Jay Project.

DOMINION DIAMOND

Information Request Number:	DAR-KIA-IR-03
Source:	Kitikmeot Inuit Association: Tannis Bolt
Subject:	Dimensions of water management pipelines and power line corridor not provided
DAR Section(s):	3

Preamble (KIA):

The project description states that water management pipelines will be constructed to the open pit and diked area to the water management facilities at Lynx and Misery pits. Please include dimensions of the pipline (height above ground, width), as nearly 25.8 km of pipeline will be needed during the later dewatering stage, and 23.6 km will be needed during the operation phase. Pipelines can, depending on their width and height, affect caribou movement. Lawhead et al. (2006) demonstrated that older oil pipelines, elevated 0.4 to 1.1 m above ground level at Prudhoe Bay Oilfield in Alaska constituted a barrier to caribou in the absence of crossing ramps. This group also suggested that eleated pipelines be separated from roads, as they can cause snow drifts under pipelines next to roads, affecting the ability of caribou to move onto and off of roads quickly to avoid vehicles and predators.

Request (KIA):

Please provide information on the width and height of the anticipated pipeline for evaluation of potential impacts on wildlife moving between these locations. Please provide similar information for the power line.

Response:

There will be three parallel pipelines placed on a bench of granular material and located adjacent to the Jay Road as shown in DAR-MVEIRB-IR-94 Figure 94-1. The pipelines will include 36, 30, and 26 inch diameter pipe. The design includes a continuous bench at a lower level than the road surface so that pipelines will not be elevated higher than the road surface. Design of the Jay power line is underway and the physical configuration is anticipated to be generally consistent with the design of the Misery power line.

Dominion Diamond's community engagement program has indicated that the area crossed by the Jay Road (between the esker and Lac du Sauvage) is of importance for caribou movement. In response to the feedback received through community engagement, Dominion Diamond proposes to construct an increased number of caribou crossings along the main section of the Jay Road (i.e., roughly between King Pond Dam and the approach to the active operations area at Lac du Sauvage). The esker cut will specifically be built as a caribou crossing. The Jay Road will be constructed with frequent and wide caribou crossings that will respect the communities' identification of the importance of this area for caribou movement. In areas designated as caribou crossings, the slopes of the road will be constructed at 5 horizontal : 1 vertical. The slopes will be covered with crushed gravel, 200 mm in diameter or smaller. The pipelines will also be covered with the gravel.

DOMINION DIAMOND

Information Request Number:	DAR- KIA-IR-04
Source:	Kitikmeot Inuit Association: Tannis Bolt
Subject:	Additional Flights for the Jay Pipe Project are not enumerated
DAR Section(s):	3

Preamble (KIA):

The project description states that the project is not anticipated to result in transport activity outside of that typically experienced at Ekati mine because workforce demand is not predicted to increase, and periods of heavy construction activity have been experienced through the life of the Ekati mine. While it may be true that additional flights for the Jay Pipe project will not increase flight densities beyond those maxima experienced at Ekati historically, increasing the frequency of dense air traffic over could impact wildlife. Further, past project licenses were granted for Ekati and Diavik based on the life of those projects. Increasing the frequency of high plane traffic for more years in the future should be evaluated for impacts on wildlife.

Request (KIA):

Please provide an estimate of the number of flights that will be needed to bring the estimated 1,252 workers to and from site and to bring project related supplies to site. Please include an estimate of flights per month stemming from the needs of the Jay Pipe project alone.

Response:

The Jay Project (Project) represents an extension of the existing Ekati Mine. As described in the Project Description, Section 3.4.1.8.2 of the Developer's Assessment Report, the Project is not anticipated to result in air transport activity levels outside that typically experienced at the existing Ekati Mine. It is expected that the existing Ekati workforce will transition to the Project and that the Project will require a similar amount of consumable goods as the existing operation. Periods of heavy construction activity have been experienced throughout the life of the Ekati Mine. As such, there is no change in expected aircraft activity; the number of flights needed to bring workers and consumables to and from the site is not expected to change substantially from present day conditions.

Based the most recent year (2013) of flight data from the Ekati Mine airport, various types of aircraft were used to transport freight and passengers from numerous locations in Alberta, the Northwest Territories, and Nunavut to the Ekati Mine site. In 2013, the Ekati Mine airport experienced 2,255 flights.

Information Request Number:	DAR-KIA-IR-05
Source:	Kitikmeot Inuit Association: Tannis Bolt
Subject:	Proposed project and project footprint is missing from baseline maps
DAR Section(s):	Annex VII: Wildlife Baseline Report, [Maps 1.4-1, 2.1-8, 2.1-12, and 2.1-16].

Preamble (KIA):

The location of the proposed Jay Pipe project is not included on this map showing the wildlife baseline study area.

Request (KIA):

Please include the location of the proposed project on Map 1.4-1.

Response:

Maps provided in the Wildlife Baseline Report (Annex VII of the Developer's Assessment Report [DAR]) do not include the Jay Project (Project) footprint because they represent wildlife baseline conditions before development of the Project. Similar maps, which include the Project footprint are provided in Section 13.2 (Existing Environment) of the DAR. For Maps 1.4-1, 2.1-8, 2.1-12, and 2.1-16, the corresponding maps in the DAR that show the Jay Project include Map 13.1-3, Map 13.2-7, Map 13.2-2, and 13.2-6, respectively.

DOMINION DIAMOND

Information Request Number:	DAR-KIA-IR-06
Source:	Kitikmeot Inuit Association: Tannis Bolt
Subject:	Baseline study area appears too small to capture the potential ZOI on caribou to the east of the project
DAR Section(s):	Annex VII (Map 1.4-1)

Preamble (KIA):

The wildlife baseline study area shown on this map does not appear to extend far enough to the east of the Jay Pipe project location to capture the 11- 14 km zone of influence of the project on caribou that occurred around the Ekati project (Boulanger et al. 2012). It appears that the study area boundary extends to approximately 10 km to the east of the Jay Pipe project, and it appears to be the same study area as used for the farther west Ekati project.

Request (KIA):

Please include rationale for the distance chosen for the baseline study area, particularly to the east of the proposed project.

Response:

As described in Section 1.4 of the Wildlife Baseline Report (Annex VII of the Developer's Assessment Report [DAR]), the wildlife baseline study area (BSA), equivalent to the Ekati 2006 caribou aerial survey study area (Map 1.4-1; Annex VII), was selected to be an appropriate spatial boundary for quantifying baseline conditions on wildlife species with wide distributions. The BSA was selected to capture the zone of influence from the Jay Project (Project), the Ekati and Diavik mines, and reference areas (i.e., areas outside the zone of influence where caribou behaviour and probability of occurrence are not influenced by the Project or the Ekati and Diavik mines).

Monitoring associated with the Ekati and Diavik mines on a variety of wildlife species, including all wildlife Valued Components, has been collected throughout the BSA from 1995 to 2013 (Annex VII, Table 1.5-1). This study area also contributed baseline information on barren-ground caribou including the aerial survey data used by Boulanger et al. (2012). Additional baseline surveys at the Project site and in the surrounding area were completed in 2013 and 2014 (Annex VII of the DAR). The wildlife and caribou information collected in this area represents the best available information on the baseline condition before development of the Project, and therefore, is appropriate for the assessment of potential effects on wildlife from the Jay Project.

The smallest distance between the proposed Jay Project footprint and the BSA boundary (Map 1.4-1), including to the eastern extent, is 24.1 km and larger than the zone of influence estimated by Boulanger et al. (2012). A larger Effects Study Area, including the seasonal ranges of Bathurst caribou, was used to assess the incremental and cumulative effects to barren-ground caribou in the DAR (see Map 12.1-3).

References:

Boulanger J, Poole KG, Gunn A, Wierzchowski J. 2012. Estimating the Zone of Influence of Industrial Developments on Wildlife: a Migratory Caribou *Rangifer tarandus groenlandicus* and Diamond Mine Case Study. Wildlife Biol 18: 164-179.

DOMINION DIAMOND

Information Request Number:	DAR- KIA-IR-07
Source:	Kitikmeot Inuit Association: Tannis Bolt
Subject:	Problematic interpretation of former study by Rescan of road crossing by caribou.
DAR Section(s):	Annex VII (Sections 2, 3, and 12)

Preamble (KIA):

Section 2.1.1.1.6 outlines the goals of previous camera-based monitoring of caribou at Ekati by Rescan (2014b) and notes the 6 main goals aimed at determining how caribou respond to road structures. Section 3.1.2, referencing the same camera-based study, states that "in most cases, deterrence of caribou from roads could not be linked to a specific trigger such as a vehicle" Later, in Section 12.2.2.2, in the last sentence of paragraph 1, the same study is summarized as "the key factor affecting crossings appears to be berm height and not traffic volume or maximum road height (ERM Rescan 2014)". While berm height is likely a factor, we have concerns that the impacts of traffic cannot be determined by this study and that these data are being misinterpreted. We have several issues with the way in which the results of this study by Rescan (2014b) have been interpreted. First, the study design needs to be considered. Monitoring of roads associated with Ekati by Rescan was done by setting up motion-triggered cameras at set intervals along roads to see how caribou reacted to those roads (Rescan 2014b). The goal of correlating traffic frequency at various distances to caribou with their behaviours near or on the road was not a goal of the study. To adequately address the question of whether road traffic impacted caribou crossing and road use, photos from all cameras along the road, even at great distances from a reacting caribou, would need to be checked for the presence of a vehicle with a time stamp similar to, or just prior to, a caribou being captured on camera exhibiting a response like running along the road, off the road, or turning from the road. It is our understanding that this exercise of checking for and correlating vehicular presence at distances far up and down the road from caribou behavioural events captured was not done in the study, and only vehicles captured in the same frame as the caribou were noted. If caribou respond to traffic, they are likely responding to vehicles farther up the road, when noise and vibrations are first detected by the animal, which would require an analysis of vehicles captured on at greater distances on other cameras, by correlating time stamped vehicles with caribou responses. Further, if impacts of traffic on caribou occurred, it would not only cause deflections from the road, as in the 2% of caribou deterred from crossing, but could also cause caribou to run from the road, along the road, or off the road in response to distant traffic approaching. Other caribou that were greatly deterred by road traffic would simply not approach the road, which would not be captured in the study cited.

Request (KIA):

Please review the study in full and revise references and verbage regarding interpretations of the effect of vehicles on caribou behaviour at roads. While we feel that traffic was not analysed in a way that can be connected with any of these behaviours in the Rescan study, please comment on the prevalence of behaviours in the Rescan study that imply a startle response (possibly to traffic), such as running along the road, or off the road, in addition to the 2% of caribou that deflected from the road if this reference is retained. Please discuss results from other studies that have explored the impacts of roads, and traffic, on caribou to contextualize these results. Please consider collecting additional information along Misery road on the impacts of vehicles on caribou behaviours at roads (e.g., running, deterrence), along with information about the distance at which caribou respond to vehicles of various sizes. We suspect that

caribou have stronger behavioural responses to vehicles than to tundra road verges, and implementing an additional road monitoring program, or sorting the existing data in another way that can answer this question properly would be necessary prior to concluding that, as the proponent does in Section 12.2.2.2, "the key factor affecting crossings appears to be berm height and not traffic volume or maximum road height (ERM Rescan 2014)"

Response:

The conclusions of the remote camera study presented in ERM Rescan (2014a) are based on three years of data, representing over 22,000 camera-days of effort. Over this time, 587 caribou groups were photographed, and 2,379 individual caribou were observed in motion-triggered photos. Dominion Diamond has put substantial effort into this program and has compiled a unique data set, and it is particularly relevant to the Jay Project Developer's Assessment Report (DAR) as it was collected in the same tundra environment, with the same caribou population.

The results of this study indicate that caribou were typically calm near roads, as documented by cameras both on (within 50 metres [m]) and off the road (more than 50 m from the road). Caribou showing stressed behaviours (i.e. caribou that were alert, deflected, or running) on roads included 6 percent (%) of the observations, while 35% displayed calm behaviours (bedded, foraging, and investigating the camera, averages adjusted by effort). Considering absolute numbers, the most common behaviours at the group level at roads were foraging (135 observations), crossing or crossed the road running (15 observations), walking across/along roads (169 observations), and alert (88 observations) (ERM Rescan 2014a).

However, there are practical limitations to the data provided by remote cameras; they are stationary and cannot follow a caribou group, they have a limited field of view and range, and local topography leads to differences in the area sampled by each. Given these limitations and the difficulty in determining the behaviour of caribou that are not very close to the camera, the analysis of caribou responses to vehicles included only caribou groups captured by motion-trigger photos, and timed photos in the same field of view as the motion-triggered photos. An attempt to correlate caribou responses in photos triggered by caribou within 30 m of the camera to traffic observed in surrounding cameras would require a large increase in the level of effort, as the timed photographs are collected every 10 minutes (likely far too large a time scale to capture the vehicles causing the caribou reaction).

The concerns raised by the Kitikmeot Inuit Association are better addressed by the ground-based focal behaviour observations undertaken at the Ekati Mine. During this ground-based monitoring, observers completed extended observations of individual caribou to record their behaviour and response to stressors (ERM Rescan 2014b). A total of 62 individual caribou were observed from 2011 through 2013. Analysis of these data indicated that light vehicles and medium vehicles were significantly associated with increased alertness in caribou, but not heavy vehicles (possibly due to a low sample size for this category). The results showed that the duration of caribou alert response to stressors was short. Considering all stressors (vehicles, aircraft, people), the average duration of behavioural change was 35 ± 10 (standard error [SE]) seconds for male caribou and 16 ± 3 (SE) seconds for females before they returned to a non-stress behaviour, such as feeding or resting.

Considering the results of these two intensive studies on the Misery Road, Dominion Diamond feels that the data have been correctly interpreted and the conclusions presented in the DAR are a good estimate of the effects of traffic and the Misery Road on caribou behaviour.

Dominion Diamond has also conducted site visits with Inuit from Kugluktuk to view caribou behaviour and highly values these field-based engagement activities. As well, Dominion Diamond has undertaken other engagement activities with Inuit of Kugluktuk that have included workshops and meetings to discuss plans for caribou mitigation for the Jay Project. There have been a number of 'caribou and mines' workshops in recent years led by the Government of the Northwest Territories that have been attended by Inuit from Kugluktuk.

Dominion Diamond would be pleased to discuss suggestions for operational caribou monitoring at the Ekati Mine through these engagement activities.

References:

ERM Rescan (ERM Rescan Environmental Services Ltd.). 2014a. Ekati Diamond Mine: 2013 WEMP Addendum — Wildlife Camera Monitoring Summary Report. Prepared for Dominion Diamond Ekati Corporation by ERM Rescan: Yellowknife, Northwest Territories.

ERM Rescan. 2014b. Ekati Diamond Mine: 2013 Wildlife Effects Monitoring Program. Prepared for Dominion Diamond Ekati Corporation. Appendix 5.1 Caribou Behaviour Direct Monitoring Program. March 2014.

DOMINION DIAMOND

Information Request Number:	DAR- KIA-IR-08
Source:	Kitikmeot Inuit Association: Tannis Bolt
Subject:	Paucity of Grizzly Bear data collection effort to the Northeast of the proposed Jay Pipe project
DAR Section(s):	Annex VII (Section 2)

Preamble (KIA):

In all years except for 2013, there exists a paucity of grizzly bear data collection efforts to the northeast of the proposed Jay Pipe project, as no grizzly bear habitat study plots were completed in that area from 2000 to 2008 (Maps 2.1-3 and 2.1-4) and hair snagging stations in 2012 (Map 2.1-5) were located to the north-northeast (NNE) of the proposed project.

Request (KIA):

Please comment on whether at least one additional year of baseline data collection be done using the grizzly bear hair snagging grid used in 2013 (Map 2.1-6).

Response:

The regional grizzly bear hair snagging program and study area were developed with and reviewed by regulators, communities, mine operators, and monitoring agencies (Handley 2010; GNWT 2013) and are representative of the North Slave Region. The regional grizzly bear hair snagging program was completed in 2012 and 2013 collaboratively by the Ekati and Diavik mines in the northern study area depicted in Map 13.4-14 of the DAR (see also ERM Rescan 2014). De Beers Canada Inc. completed a hair snagging program in 2013 and 2014 in the southern study area (Jessen et al. 2014). A follow-up hair snagging program will be conducted in 2017. The frequency and location (i.e., study area) of future grizzly bear monitoring in the Lac de Gras area will be determined through discussion among the Government of the Northwest Territories, mine operating companies, community organizations, and monitoring agencies.

References:

ERM Rescan (ERM Rescan Environmental Consultants Ltd.). 2014. Ekati and Diavik Diamond Mines: 2014 Final Lac de Gras Regional Grizzly Bear DNA Report. Prepared for Dominion Diamond Ekati Corporation and Diavik Diamond Mines (2012) Inc. by ERM Consultants Canada Ltd. Yellowknife, NWT, Canada.

Jessen, T, Dieppstraten R, Musiani M, Massolo A, Galpern P, McDermid G. 2014. Summary Report 2014: Joint Regional Grizzly Bear DNA Project, Snap Lake Mine and Gahcho Kué Project. University of Calgary, AB, Canada.

GNWT (Government of the Northwest Territories). 2013. Final Minutes of the Wildlife Monitoring Workshop, March, 2013. Prepared by the Department of the Environment, Government of the Northwest Territories. Yellowknife, NWT, Canada.

Handley J. 2010. Diamond Mine Wildlife Monitoring Workshop Report. Prepared for Environment and Natural Resources. Yellowknife, NWT, Canada.

DOMINION DIAMOND

Information Request Number:	DAR- KIA-IR-09
Source:	Kitikmeot Inuit Association: Tannis Bolt
Subject:	Spatial context of data collection for other projects not provided relative to the location of the proposed project.
DAR Section(s):	Annex VII (Maps 2.1-7, 2.1-10, 2.1-15 and 2.1-4)

Preamble (KIA):

Throughout the wildlife baseline section, wildlife data collection efforts done at project sites such as Snap Lake and Gacho Kue, but they are not place in spatial context of other efforts done closer to the proposed project to evaluate spatial relevance and methodological similarity among sites.

Request (KIA):

On the maps indicated, please provide an inset showing the relative locations of the Snap Lake grizzly hair collection stations and survey efforts relative to the proposed project, or include all projects onto one map.

Response:

Map 13.2-14 in Section 13.2.1.1.6 of the Developer's Assessment Report shows the entire sampling grid for the regional grizzly bear hair snagging program, including the locations of the Snap Lake, Ekati, and Diavik mines and the Gahcho Kué Project relative to the Jay Project. Section 13.2.1.1.6 also summarizes this program. A single hair snagging device was located approximately centre of each grid-cell. Surveys were completed in the BHP Billiton/Rio Tinto study area around the Ekati and Diavik mines in 2012 and 2013 and for the De Beers Canada Inc. study area around the Snap Lake mine and the Gahcho Kué Project, in 2013 and 2014. Survey effort for the program included six visits to each hair snagging device to collect hair. Visits occurred approximately every 10 days from late June to September, annually.

DOMINION DIAMOND

Information Request Number:	DAR- KIA-IR-10
Source:	Kitikmeot Inuit Association: Tannis Bolt
Subject:	Wolverine hair sampling methods
DAR Section(s):	Annex VII: (Map 2.1-9)

Preamble (KIA):

This map shows a large, contiguous area monitored for wolverine hair samples between 2005-2013. From the text and maps, it is difficult to tell whether methodologies used for the Diavik grids (2005 to 2006 and 2010 to 2011), the Ekati grid (2005 to 2006 and 2010 to 2011) and the Daring Lake grid (2005 to 2006, and 2010 to 2011) were similar, and can thus be combined into a meta-dataset.

Request (KIA):

Please clarify whether methodologies, grid sizes, and temporal sampling periods were the same among sites and time periods. Where differences in methodologies occurred, please identify them.

Response:

Section 13.2.1.1.5 of the Developer's Assessment Report and Section 2.1.5 of the Wildlife Baseline Report (Annex VII), describe the details of the monitoring and research that have been completed in the North Slave Region for wolverine. All of the regional wolverine hair snagging programs use standardized methods outlined in Government of Northwest Territories (GNWT) guidelines for this type of monitoring (GNWT 2013a). The Daring Lake, Diavik Mine, and Ekati Mine hair snagging programs used a 3 kilometre (km) by 3 km grid-cell design, as did the Gahcho Kué Project (Kennady Lake) in 2005 and 2006. The programs at the Snap Lake Mine and Gahcho Kué Project completed in 2013 and 2014 used a 5 km x 5 km grid-cell. Grid-cell and study area size were increased at the Gahcho Kué Project to detect a minimum of 20 individuals as discussed during Wildlife Monitoring Workshops in Yellowknife (GNWT 2013b). In 2011, post locations were modified in the field to accommodate reduced accessibility. These monitoring programs have been combined into a meta-data set and analyzed by the GNWT (GNWT 2014). The hair snagging programs at the Ekati Mine are scheduled to be completed in 2015.

References:

GNWT (Government of the Northwest Territories). 2013a. Draft Monitoring Protocol: Wolverine Hair Snagging. Prepared by the Department of Natural Resources, the Government of the Northwest Territories, Yellowknife, NWT, Canada.

GNWT. 2013b. Final Minutes of the Wildlife Monitoring Workshop, March, 2013. Prepared by the Department of Natural Resources, the Government of the Northwest Territories, Yellowknife, NWT, Canada.

DOMINION DIAMOND

Information Request Number: DAR- KIA-IR-100

Source: Kitikmeot Inuit Association: Tannis Bolt

Subject: Phytoplankton community composition

DAR Section(s): Section 9 (Page 9-187)

Preamble (KIA):

The proponent states: "The predicted TDS concentrations in Lac du Sauvage and Lac de Gras are well below any potential thresholds for effects to aquatic health (Section 8.5.5) and also appear to be below concentrations that would be expected to result in shifts in community composition." While toxicity testing information is available in section 8.5.5, information relating to the threshold concentrations triggering community composition shifts were not found.

Request (KIA):

Please indicate what TDS concentrations would potentially cause a shift in phytoplankton community composition, using examples from cited scientific literature.

Response:

The relationship between phytoplankton and total dissolved solids (TDS) is not clearly defined in the scientific literature, although phytoplankton are thought to be tolerant to a wide range of TDS concentrations (Prepas 1983; Vyverman et al. 1996; Wilson et al. 1994; Wilson et al. 1996). Vyverman et al. (1996) found that diatom richness was not substantially affected by calcium concentrations ranging from 8 to 203 microequivalent per litre (µeq/L; 160 to 4,060 micrograms per litre [mg/L]). Prepas (1983) found that TDS had no predictable relationship with phytoplankton biomass based on 25 lakes in central Alberta in which TDS ranged from 128 to 1,545 mg/L. The range of TDS values evaluated by Prepas (1983) were much higher than the highest TDS concentrations predicted to occur during Project operations (80 mg/L in Lac du Sauvage and 30 mg/L in Lac du Gras). Therefore, changes to TDS concentrations from the Project are not expected to contribute to changes to the phytoplankton community in Lac du Sauvage or Lac de Gras.

References:

Prepas EE. 1983. Total dissolved solids as a predictor of lake biomass and productivity. Can J Fish Aquat Sci. 40: 92-95.

Vyverman W, Vyverman R, Rajendran VS, and Tyler P. 1996. Distribution of benthic diatom assemblages in Tasmanian highland lakes and their possible use as indicators of environmental changes. Can J Fish Aquat Sci. 53: 493-508.

Wilson SE, Cumming BF, Smol JP.1994. Diatom-salinity relationships in 111 lakes from the Interior Plateau of British Columbia, Canada: the development of diatom-based models for paleosalinity reconstructions. J Paleolimno 12: 197-221.

Wilson SE, Cumming BF, Smol FP. 1996. Assessing the reliability of salinity inference models from diatom assemblages: an examination of a 219-lake data set from western North America. Can J Fish Aquat Sci. 53: 1580-1594.

DOMINION DIAMOND

Information Request Number:	DAR- KIA-IR-101
Source:	Kitikmeot Inuit Association: Tannis Bolt
Subject:	Chronic effects on fish
DAR Section(s):	Section 9.4.3.2.3

Preamble (KIA):

While it is clearly stated that water quality predictions are not likely to be acutely toxic, it is not clear whether potential long-term chronic effects on fish health or aquatic biota were considered in an aquatic risk assessment.

Request (KIA):

Please determine and describe whether or not water quality predictions may induce chronic effects on fish or aquatic biota in the study area.

Response:

Predicted changes in water quality are not expected to result in adverse chronic effects on fish or aquatic biota in the study area.

The potential for chronic effects on fish or aquatic biota due to predicted changes in water quality in Lac du Sauvage and Lac de Gras was assessed in Section 8.5.5.3 of the Developer's Assessment Report (DAR). Updated predicted changes in water quality for Lac de Gras, made after the submission of the DAR (Golder 2015a) were also reviewed in support of this response, and are not expected to change predictions made in the aquatic health assessment section of the DAR (Section 8.5.5.3).

For this assessment, potential effects on aquatic health in Lac du Sauvage and Lac de Gras through predicted changes to water quality were evaluated through three exposure pathways:

- direct effects resulting from direct exposure to constituents of potential concern (COPC) in the water column;
- indirect effects resulting from direct exposure of food chain components to COPC in the water column; and,
- indirect effects resulting from potential accumulation of constituents within fish tissue via uptake from both water and diet.

Potential effects related to direct waterborne exposure including to food chain components were assessed using maximum modelled water concentrations across all Jay Project (Project) phases (i.e., construction, operations, closure, and post-closure). The assessment of indirect effects on fish tissue chemistry was done by using measured baseline water quality (Base Case; reference [pre-development] and 2014 baseline condition), modelled water quality, and measured fish tissue chemistry (DAR Annex

XIV, Appendix A) in order to predict tissue concentrations of substances within fish. Tissue chemistry results for Lake Trout collected in 2014 from Lac du Sauvage (Golder 2015b) were also reviewed and found to be similar to the results presented in the DAR; therefore, the predictions made in the DAR are not expected to change as a result of the new tissue chemistry data. Predicted tissue concentrations were compared to toxicological benchmarks to evaluate the potential for aquatic health effects related to tissue chemistry. The methods and results of both evaluations are summarized below; further details are provided in Section 8.5.5.3 of the DAR.

Waterborne Exposure

Maximum modelled water quality concentrations were screened to identify COPCs in water, which are constituents for which the modelled concentrations were higher than those observed under existing conditions and also higher than relevant federal and provincial water quality guidelines (WQGs) for the protection of aquatic life or site-specific water quality objectives (SSWQOs).

The WQGs and SSWQOs used in the aquatic health assessment included:

- SSWQOs developed for the Ekati Mine for chloride (Elphick et al. 2011), sulphate (Rescan 2012a), potassium (Rescan 2012b), molybdenum (Rescan 2012c), nitrate (Rescan 2012d), and vanadium (Rescan 2012e);
- SSWQO for strontium developed for the Snap Lake Mine (Golder 2013; McPherson et al. 2014);
- SSWQO for total dissolved solids (TDS[1]) as approved for the Diavik Mine in August 2013 (Wek'èezhìi Land and Water Board [WLWB] 2013);
- Canadian Water Quality Guidelines for the Protection of Aquatic Life (Canadian Council of Ministers of the Environment [CCME] 1999); and,
- British Columbia Ministry of Environment Water Quality Guidelines for the Protection of Aquatic Life (BC MOE 2014).

These WQGs and SSWQOs are conservative in regards to protecting aquatic life; they represent substance concentrations below which no adverse effects on survival, growth, or reproduction of aquatic life are expected to occur as a result of long-term exposure. Thus, modelled concentrations below WQGs and SSWQOs are expected to result in negligible potential for adverse effects on aquatic biota.

There were no constituents that had maximum modelled concentrations over the life of the Project (i.e., during all Project phases) that were higher than those observed under existing conditions and higher than relevant WQGs or SSWQOs.

Therefore, although changes in concentrations of some metals, major ions, and TDS were predicted as a result of the Project, these changes are not predicted to result in adverse effects on aquatic health through waterborne exposure.

Indirect Exposure Through Changes in Fish Tissue Chemistry

[1] In August 2013, WLWB approved a TDS benchmark of 500 milligrams per litre in Lac de Gras for the Diavik Mine (WLWB 2013); this value is considered an SSWQO for the purposes of this assessment.

Potential changes to fish tissue concentrations, which may occur through accumulation of constituents within fish tissue via uptake from both water and diet, in Lac du Sauvage and Lac de Gras were estimated by multiplying maximum modelled concentrations in water over the life of the Project by constituent-specific bioaccumulation factors (BAFs). Potential changes due to specific constituents were considered only if the following criteria were met:

- maximum modelled concentrations of the constituent in water exceeded existing concentrations in the direct waterborne assessment;
- site-specific BAFs could be derived for the constituent[2]; and,
- toxicological benchmarks for the constituent could be defined[3].

Of the constituents that could be assessed for this indirect exposure pathway (i.e., aluminum, arsenic, cadmium, chromium, nickel, selenium, and vanadium), all predicted tissue concentrations were below their respective tissue benchmarks, with the exception of aluminum in Lac du Sauvage and aluminum and vanadium in Lac de Gras. However, adverse effects to fish health due to elevated concentrations of aluminum and vanadium in fish tissue were evaluated as not likely to occur. The assessment methods included conservative assumptions, and therefore, predicted concentrations in tissue are likely overestimated (Section 8.5.5.3.2). For example, for aluminum, a relatively high BAF was considered even though the current scientific understanding of aluminum is that it does not bioconcentrate, and that tissue concentrations are poor predictors of toxicity (Wilson 2012). For vanadium, the bioaccumulation factor used to predict tissue concentration was the maximum upper-bound estimate of the range of site-specific BAFs developed for the Project. If the minimum upper-bound estimate were used, then the predicted tissue concentrations would have been four times lower, and below the tissue benchmark.

In conclusion, based on the aquatic health assessment described in Section 8.5.5.3, predicted changes in water quality are not expected to result in adverse chronic effects on fish or aquatic biota in the study area.

References:

BC MOE (British Columbia Ministry of Environment). 2014. Water Quality Guideline (Criteria) Reports. Available online: http://st-ts.ccme.ca/. Accessed August 7, 2014.

CCME (Canadian Council of Ministers of the Environment). 1999, with updates to 2014. Canadian Water Quality Guidelines for the Protection of Aquatic Life: Summary Table. In: Canadian Environmental Quality Guidelines, 1999. Canadian Council of Ministers of the Environment, Winnipeg MB, Canada. Available online: http://st-ts.ccme.ca/en/index.html. Accessed August 7, 2014.

Elphick JRF, Bergh KD, Bailey HC. 2011. Chronic toxicity of chloride to freshwater species: effects of hardness and implications for water quality guidelines. Environ. Toxicol. Chem 30: 230-246.

[2] Site-specific BAFs were derived for constituents for which there were available matching water and fish tissue data for the lakes of interest.

[3] Studies of tissue concentrations of constituents linked to toxicity endpoints are limited in the toxicological literature; therefore, tissue-based toxicity benchmarks could not be derived for all possible constituents.

Golder (Golder Associates Ltd.). 2013. Development of Strontium Benchmark for Aquatic Life for the Snap Lake Mine. Prepared for De Beers Canada Inc. Yellowknife, NWT, Canada.

Golder. 2015a. Jay Project – Lac de Gras Hydrodynamic Model Updates. Technical Memorandum. Prepared for Dominion Diamond Ekati Corporation. Yellowknife, NWT, Canada.

Golder. 2015b. 2014 Fish Tissue Chemistry Memorandum. Technical Memorandum. Prepared for Dominion Diamond Ekati Corporation. Yellowknife, NWT, Canada. (In-Preparation).

McPherson C, Lawrence G, Elphick J, Chapman PM. 2014. Development of a strontium chronic effects benchmark for aquatic life in freshwater. Environ. Toxicol. Chem. 33: 2472-2478.

Rescan (Rescan Environmental Ltd.). 2012a. EKATI Diamond Mine: Site-specific Water Quality Objective for Sulphate. Prepared for BHP Billiton Canada Inc. Yellowknife, NWT, Canada.

Rescan. 2012b. EKATI Diamond Mine: Site-Specific Water Quality Objective for Potassium. Prepared for BHP Billiton Canada Inc. Yellowknife, NWT, Canada.

Rescan. 2012c. EKATI Diamond Mine: Site Specific Water Quality Objective for Molybdenum, 2011. Prepared for BHP Billiton Canada Inc. Yellowknife, NWT, Canada.

Rescan. 2012d. EKATI Diamond Mine: Site-Specific Water Quality Objective for Nitrate, 2012. Prepared for BHP Billiton Canada Inc. Yellowknife, NWT, Canada.

Rescan. 2012e. EKATI Diamond Mine: Site-specific Water Quality Objective for Vanadium. Prepared for BHP Billiton Canada Inc. Yellowknife, NWT, Canada.

WLWB (Wek'èezhìi Land and Water Board). 2013. AEMP Design Version 3.1. File W2007L2-0003. Letter to Diavik Diamond Mine Inc., Yellowknife, NWT, Canada.

Wilson RW. 2012. Aluminum. Chapter 2 in Wood CM, Farrell AP, Brauner CJ (eds). Homeostasis and Toxicology of Essential Metals. Fish Physiology, Volume 31A. Elsevier Academic Press, New York, NY, USA.

DOMINION DIAMOND

Information Request Number:	DAR- KIA-IR-102
Source:	Kitikmeot Inuit Association: Tannis Bolt
Subject:	Potential parameters of concern to fish - Aluminum
DAR Section(s):	Section 9.4.3.2.3

Preamble (KIA):

Aluminum and vanadium were identified as being potential parameters of concern to fish: "Potential indirect effects to fish related to accumulation of substances within fish tissue via uptake from both water and diet were identified for aluminum (during operations and into closure) and vanadium (during operations and into closure); however, adverse effects to the health of fish VCs are unlikely. The assessment methods included very conservative assumptions, and therefore, predicted concentrations in tissue are likely overestimated (Section 8.5.5.3.2). For example, for aluminum, a relatively high bioaccumulation factor was considered even though the current scientific understanding of aluminum is that it does not bioconcentrate, and that tissue concentrations are poor predictors of toxicity (Wilson 2012). For vanadium, the bioaccumulation factor used to predict tissue concentration was the maximum upper-bound estimate of the range of site-specific bioaccumulation factors (BAFs) developed for the Jay Project (Project). If the minimum upper-bound estimate was used, then the predicted tissue concentrations would have been four times lower, and below the tissue benchmark."

Request (KIA):

Please indicate whether or not aluminum is below the tissue benchmark if the bioaccumulation factor is removed.

Response:

The bioaccumulation factor (BAF) cannot be removed for this assessment, as a BAF is necessary to calculate predicted tissue concentrations; predicted tissue concentrations are calculated by multiplying the BAF by the modelled water concentration. However, for the Developer’s Assessment Report (DAR), the BAF and the water quality modelling used to predict fish tissue concentrations were conservative, resulting in likely overestimated aluminum tissue concentrations. As part of this response, less conservative BAFs are used to predict aluminum tissue concentrations to reduce conservatism as requested by the reviewer, without removing the BAF.

Detailed descriptions of the methods and results for predicting tissue concentrations of aluminum and other metals using BAFs in the DAR are described in the Indirect Exposure – Changes to Fish Tissue Chemistry section (DAR Section 8.5.5.3.1). Conservative assumptions used to predict metal concentrations in fish included:

- metals uptake is linearly proportional to water concentration, although non-linearity in bioaccumulation has commonly been observed for metals due to exposure-dependent bioaccumulation relationships; bioaccumulation rates of metals tend to decrease as exposure concentrations increase (e.g., McGeer et al. 2003);

- selecting the highest BAF derived from the most reliable data;
- calculating predicted tissue concentrations using maximum modelled water concentrations for each Jay Project (Project) phase, which have conservatism built in (DAR Section 8.5.4 and Appendix 8F); and,
- comparing predicted tissue concentrations to conservative tissue-based benchmarks, which were derived using laboratory toxicity testing as reported in the toxicological literature. In this condition, the metals tested were likely more bioavailable than they would potentially be under site conditions. In the DAR assessment, the total metal concentrations were used, a proportion of which is expected not to be bioavailable.

Concentrations of metals in fish tissue were predicted by multiplying the maximum predicted metal concentrations in water for each Project phase by the corresponding BAF. Site-specific BAFs for aluminum were derived for each lake, fish species, and year using water quality concentrations and fish tissue concentrations measured during previous sampling programs at the Ekati and Diavik mines (DAR Annex XIV, Appendix A). The lake-, species-, and year-specific BAFs were calculated using the following formula:

$$BAF(lake, species, year) = \frac{C_{fish}}{C_{water}}$$

where:

- $BAF_{(lake,\ species,\ year)}$ is the median BAF for a specific lake, fish species, and year;
- C_{fish} is the concentration of constituent "x" in fish (milligrams per kilogram wet weight [mg/kg ww]); and,
- C_{water} is the concentration of constituent "x" in water (milligrams per litre [mg/L]).

Based on the quality of data available from the previous programs, BAFs were categorized as most reliable, less reliable, or unreliable (DAR Section 8.5.5.3.1). The BAF used in the assessment was preferentially selected from the category of most reliable BAFs. To be conservative, if more than one BAF was categorized as most reliable, the BAF with the highest value was chosen. For aluminum, several site-specific BAFs were categorized as most reliable; for this assessment, the most reliable BAFs ranged from 67 to 730, with a median value of 467. In comparison, Cleveland et al. (1991) calculated a BAF of 36 in a study using pH 7.2, which is similar to that observed in the receiving environment of the Project[1]; this BAF is less than half the minimum BAF calculated for this assessment.

In the DAR, using the highest reliable BAF (730), predicted concentrations of aluminum in fish tissue exceeded the tissue-based benchmark (20 mg/kg ww) indicating potential adverse effects to fish due to elevated water concentrations. Given the conservatism in the method used to predict tissue concentrations, tissue concentrations are likely overestimated. There is also conservatism in the tissue-

[1] The median existing pH condition in Lac du Sauvage during under-ice conditions and open-water conditions was 6.7 (DAR Section 8.2, Table 8.2-49). The median baseline pH in Lac de Gras during under-ice conditions ranged from 6.6 to 7.0 (DAR Section 8.2, Table 8.2-51) and during open-water conditions ranged from pH 6.8 to 7.0 (DAR Section 8.2, Table 8.2-52).

based benchmark as the study used to derive the benchmark investigated aluminum toxicity at a much lower pH (4.8; Peterson et al. 1989), where aluminum is more bioavailable and more toxic (Wilson 2012), than is observed in Lac du Sauvage or Lac de Gras. If a lower, less conservative BAF were used, predicted tissue concentrations of aluminum would be below the tissue benchmark.

To demonstrate this point, predicted aluminum tissue concentrations for Lac du Sauvage and Lac de Gras are recalculated below using the methods described above, and using the maximum, median, and minimum most reliable site-specific BAFs, and the BAF calculated by Cleveland et al. (1991). Water quality predictions for Lac de Gras were updated after the DAR was submitted and are used in this response (Golder 2015). Tables 102-1 and 102-2 present predicted fish tissue concentrations of aluminum calculated using the maximum, median, and minimum site-specific BAFs, and the BAF calculated by Cleveland et al. (1991) for Lac du Sauvage and Lac de Gras, respectively.

Maximum predicted aluminum concentrations exceed the tissue-based benchmark during the operations and closure phases in Lac du Sauvage, when using the maximum and median BAFs (Table 102-1)[2]. Maximum predicted aluminum concentrations exceed the tissue-based benchmark during under-ice conditions in the early operations phase in Lac de Gras, when using the maximum BAF (Table 102-2)[3]. When using the minimum site-specific BAF, or the BAF calculated by Cleveland et al. (1991), the maximum predicted aluminum concentration does not exceed the tissue benchmark for any Project phase in Lac du Sauvage and Lac de Gras. The use of the minimum site-specific BAF results in predicted aluminum concentrations approximately 5 and 10 times below the tissue-based benchmark in Lac du Sauvage and Lac de Gras, respectively (Table 102-1 and 102-2). If predicted tissue concentrations do not exceed the tissue benchmark, adverse effects to fish from aluminum are not expected to occur.

As described in Section 8.5.5.3.2 of the DAR, it is unlikely that predicted water concentrations of aluminum in Lac du Sauvage and Lac de Gras during the life of the Project and into operations, calculated using the highest BAF, will result in adverse effects on fish through changes in fish tissue chemistry. This conclusion is based on the following:

- The maximum BAF used to predict aluminum tissue concentrations was conservative. If a less conservative BAF is used, which is consistent with BAFs reported in the scientific literature, the maximum predicted aluminum concentrations would not exceed the tissue-based benchmark (Tables 102-1 and 102-2).
- Aluminum does not bioconcentrate or biomagnify in aquatic organisms (Rosseland et al. 1990); in fact, aluminum potentially undergoes trophic dilution up the food chain (Wilson 2012).
- Aluminum toxicity in fish occurs mainly through waterborne exposure. In water-only exposure, aluminum quickly accumulates in the muscle, and then declines (Cleveland et al. 1991). Dietary studies in fish (Poston 1991; Handy 1993) indicate that bioaccumulation and toxicity via aluminum in the diet is not likely (Wilson 2012).

[2] The predicted aluminum tissue concentrations in Table 102-1 differ slightly from those in Table 8.5-30 of the DAR (Section 8.5.5.3.2) due to the rounding of numbers. There are no differences to the overall results of the assessment presented in the DAR.

[3] The predicted aluminum tissue concentrations in Table 102-2 differ from those in Table 8.5-31 of the DAR (Section 8.5.5.3.2), because the water quality predictions for Lac de Gras used for the calculations were updated after the DAR was submitted (Appendix A, Table A-2; Golder 2015).

- Fish tissue concentrations are higher in low pH exposure (e.g., pH 5.3 and 6.1) compared to neutral pH exposure (pH 7.2) (Cleveland et al. 1991). This is likely due to the higher bioavailability of aluminum in low pH waters, as aluminum is largely insoluble at circumneutral pH (Wilson 2012). Significant toxicity is also observed in the low pH exposures, compared to no toxicity at the pH 7.2 exposure (Cleveland et al. 1991). Most studies investigated aluminum toxicity at low pH ranges that are not representative of the pH ranges observed in the study area or expected as a result of the Project, including the study used to derive the aluminum tissue-based benchmark (pH 4.8; Peterson et al. 1989).

In summary, if a lower BAF is used, which is consistent with BAFs reported in the scientific literature, predicted aluminum tissue concentrations do not exceed the tissue-based benchmark during any Project phase in Lac du Sauvage or Lac de Gras. Thus, adverse effects to fish at the maximum predicted aluminum concentration are not expected using the minimum BAF, which is expected given adverse effects to fish were not expected using the maximum BAF in the DAR.

Table 102-1 Predicted Aluminum Concentrations in Fish Tissue Using a Range of Bioaccumulation Factors, Lac du Sauvage

Bioaccumulation Factor		Maximum Predicted Aluminum Concentrations in Water (µg/L)								Predicted Aluminum Concentrations in Fish Tissue (mg/kg ww)							
		Early Operations (2019 - 2023)		Operations (2024 - 2029)		Closure (2030 - 2033)		Post-Closure (2034 - 2060)		Early Operations (2019 - 2023)		Operations (2024 - 2029)		Closure (2030 - 2033)		Post-Closure (2034 - 2060)	
		Under Ice	Open Water	Under Ice	Open Water	Under Ice	Open Water	Under Ice	Open Water	Under Ice	Open Water	Under Ice	Open Water	Under Ice	Open Water	Under Ice	Open Water
Maximum	730	4.4	8.8	63	62	62	53	13	16	n/a	n/a	**46**	**45**	**45**	**39**	n/a	n/a
Median	467									n/a	n/a	**29**	**29**	**29**	**25**	n/a	n/a
Minimum	67									n/a	n/a	4.2	4.2	4.2	3.6	n/a	n/a
Cleveland et al. (1991)	36									n/a	n/a	2.3	2.2	2.2	1.9	n/a	n/a

Notes: **Bolded** predicted aluminum concentrations in fish tissue indicate an exceedance of the tissue benchmark of 20 mg/kg ww. Maximum predicted aluminum concentrations in water are those presented in the Jay Project Developer's Assessment Report (DAR Section 8.5.4.2.2, Table 8.5-24).

µg/L = micrograms per litre; mg/kg ww = milligrams per kilogram wet weight; n/a = aluminum not retained as constituent of potential concern for this Project phase or seasonal condition (DAR Section 8.5.5.3.2).

Table 102-2 Predicted Aluminum Concentrations in Fish Tissue Using a Range of Bioaccumulation Factors, Lac de Gras

Bioaccumulation Factor		Maximum Predicted Aluminum Concentrations in Water (µg/L)								Predicted Aluminum Concentrations in Fish Tissue (mg/kg ww)							
		Early Operations (2019 - 2023)		Operations (2024 - 2029)		Closure (2030 - 2033)		Post-Closure (2034 - 2060)		Early Operations (2019 - 2023)		Operations (2024 - 2029)		Closure (2030 - 2033)		Post-Closure (2034 - 2060)	
		Under Ice	Open Water	Under Ice	Open Water	Under Ice	Open Water	Under Ice	Open Water	Under Ice	Open Water	Under Ice	Open Water	Under Ice	Open Water	Under Ice	Open Water
Maximum	730	29	28	27	25	23	24	21	19	**21**	20	20	18	17	18	15	13
Median	467									14	13	13	12	11	11	9.8	8.4
Minimum	67									1.9	1.9	1.8	1.7	1.5	1.6	1.4	1.2
Cleveland et al. (1991)	36									1.0	1.0	1.0	0.9	0.8	0.9	0.8	0.6

Notes: **Bolded** predicted aluminum concentrations in fish tissue indicate an exceedance of the tissue benchmark of 20 mg/kg ww. Maximum predicted aluminum concentrations in water are those presented in the Jay Project Lac De Gras Hydrodynamic Model Updates memorandum (Appendix A, Table A-2; Golder 2015).

µg/L = micrograms per litre; mg/kg ww = milligrams per kilogram wet weight.

References:

Cleveland L, Little EE, Ingersoll CG, Wiedmeyer RH, Hunn JB. 1991. Sensitivity of brook trout to low pH, low calcium and elevated aluminum concentrations during laboratory pulse exposures. Aquat. Toxicol. 19: 303-318.

Golder (Golder Associates Ltd.). 2015. Jay Project – Lac de Gras Hydrodynamic Model Updates. Technical Memorandum. Prepared for Dominion Diamond Ekati Corporation. Yellowknife, NWT, Canada.

Handy RD. 1993. The accumulation of dietary aluminum by rainbow trout, *Oncorhynchus mykiss*, at high exposure concentrations. J. Fish Biol. 42: 603-606.

McGeer JC, Brix KV, Skeaff JM, DeForest DK, Brigham SI, Adams WJ, Green A. 2003. Inverse relationship between bioconcentration factor and exposure concentration for metals: Implications for hazard assessment of metals in the aquatic environment. Environ. Toxicol. Chem. 22: 1017 1037.

Peterson RH, Bourbonniere RA, Lacroix GL, Martin-Robichaud DJ, Takats P, Brun G. 1989. Responses of Atlantic salmon (*Salmo salar*) alevins to dissolved organic carbon and dissolved aluminum at low pH. Water Air Soil Pollut. 46: 399-413.

Poston HA. 1991. Effects of dietary aluminum on growth and composition of young Atlantic salmon. Prog. Fish Cult. 53: 7-10.

Rosseland BO, Eldhuset TD, Staurnes M. 1990. Environmental effects of aluminum. Environ. Geochem. Health. 12: 17-27.

Wilson RW. 2012. Aluminum. Chapter 2 in Wood CM, Farrell AP, Brauner CJ (eds). Homeostasis and Toxicology of Essential Metals. Fish Physiology, Volume 31A. Elsevier Academic Press, New York, NY, USA.

DOMINION DIAMOND

Information Request Number:	DAR- KIA-IR-103
Source:	Kitikmeot Inuit Association: Tannis Bolt
Subject:	Fish sampling
DAR Section(s):	Appendix 9A (Page 9A-14)

Preamble (KIA):

The proponent states: "Some shoreline habitat of small waterbodies (less than 1 ha in size) in the headwaters of sub-basin B will be affected by proposed road developments; these include Lakes B6, B11 and B12. Reconnaissance surveys completed in August 2014 suggest that affected small waterbodies in the headwaters are shallow and less than 2 m in depth, and therefore, unlikely to support a resident fish population." Lakes B6, B11 and B12 are not indicated on any map, and details of the reconnaissance survey was not located.

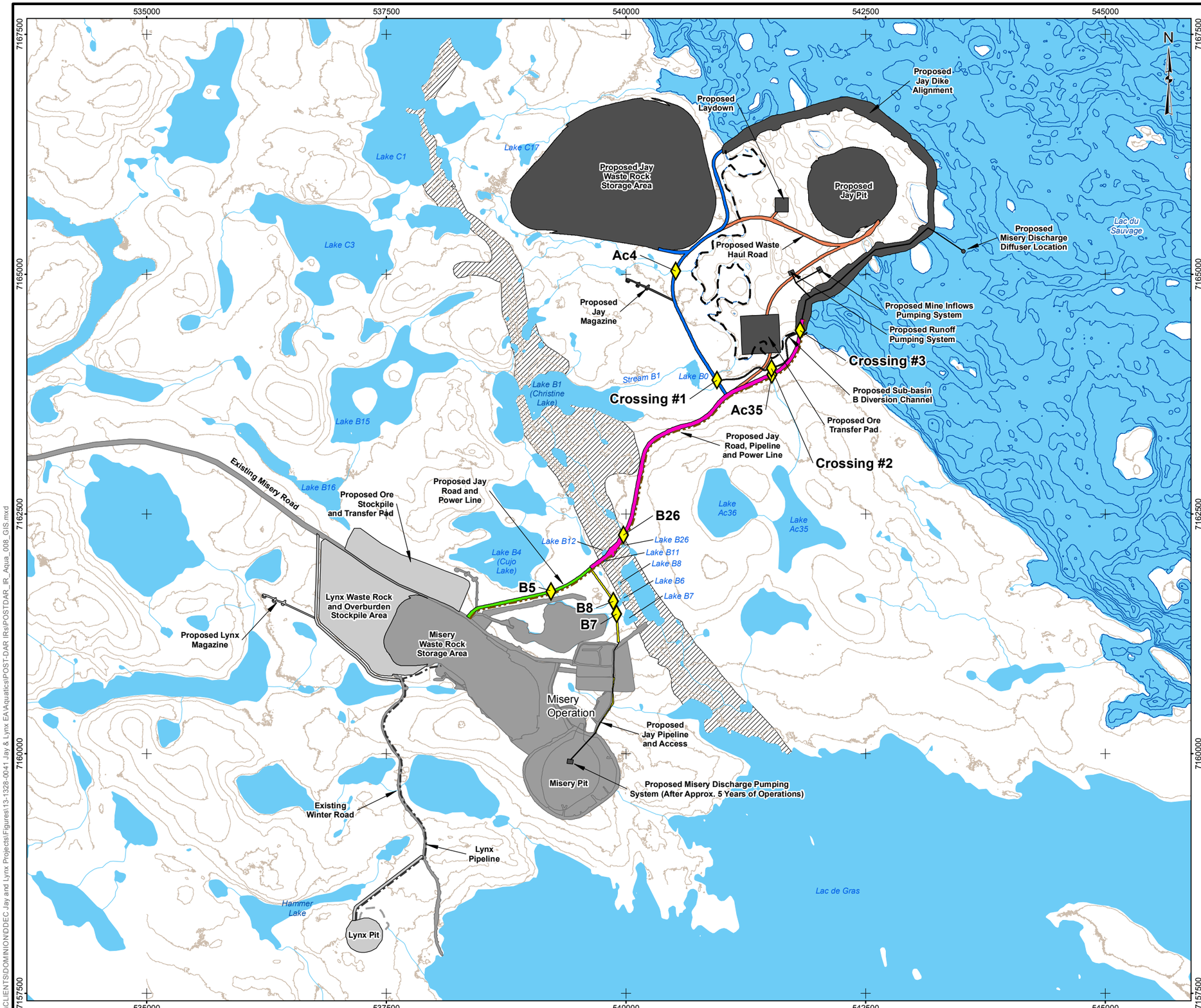
Request (KIA):

Please add lake labels to MAP 9A3.1-1 and provide details of the reconnaissance survey, including any habitat assessment information, photos, or fish sampling information.

Response:

The lakes referred to in the preamble (B6, B11, and B12) were determined as having similar habitat characteristics based on their similar size and close proximity to each other in the same sub-basin. The three lakes are small ponds (all less than 1 hectare [ha] in size) and occupy the headwaters of sub-basin B where the contributing drainage areas for each pond are also small (all less than 20 ha). These features, combined with the lack of connectivity to surrounding waterbodies (i.e., no defined stream connection) suggest that the affected ponds do not support resident fish populations due to the high probability that these ponds freeze to the bottom in winter. The locations of Lakes B6, B11, and B12 are illustrated in a revised map based on Map 9A3.1-1, as requested (see Map 103-1). The orthophoto image (Map 103-2) also shows that the ponds are small, isolated, and likely shallow.

Although Lake B6 was mentioned in the Conceptual Offsetting Plan (Appendix 9A) in the Developer's Assessment Report (DAR), Dominion Diamond Ekati Corporation would like to clarify that Lake B6 falls within the boundaries of the sub-basin of the King Pond Settling Facility area. The hydrology of this area has been altered and isolated from downstream habitats due to existing and approved infrastructure and further changes due to the Jay Project will not occur. Lake B6 is a shallow waterbody that likely freezes to the bottom during winter, with no connectivity to other fish-bearing waterbodies or watercourses (Map 103-2) and would not likely support a resident fish population.



LEGEND

- EKATI MINE FOOTPRINT (MISERY OPERATION)
- BATHYMETRY CONTOUR (5 m INTERVAL)
- ELEVATION CONTOUR (10 m INTERVAL)
- ESKER
- WATERCOURSE
- WATERBODY
- WATERCOURSE CROSSING

JAY PROJECT FOOTPRINT

- EXISTING SHORELINE OF DEWATERED AREA
- POWER LINE
- PROPOSED JAY PROJECT INFRASTRUCTURE
- PROPOSED JAY ROAD NORTH (HAUL ROAD)
- PROPOSED JAY ROAD (HAUL ROAD AND POWER LINE)
- PROPOSED JAY ROAD (HAUL ROAD, PIPELINE AND POWER LINE)
- PROPOSED JAY PIPELINE ROAD (ACCESS ROAD AND PIPELINE)
- PROPOSED OPERATION ROADS

LYNX PROJECT FOOTPRINT

- EXISTING SHORELINE OF DEWATERED LYNX LAKE
- LYNX PIPELINE
- LYNX PROJECT INFRASTRUCTURE

NOTES

ROAD, PIPELINES, AND POWER LINE ARRANGEMENT TO BE DETAILED AS PART OF FURTHER PRE-FEASIBILITY DESIGN. APPROXIMATE CORRIDOR WIDTHS ARE SHOWN.

REFERENCE

JAY PROJECT CONCEPTUAL ENGINEERING REPORT, EKATI MINE, DOC#: 1313280041-E14037-R-REV0-4060, DATED: MAY 13, 2014
JAY PROJECT DESIGN BASIS MEMORANDUM FOR PRE-FEASIBILITY DESIGN OF PROJECT ROADS AND PIPELINE BENCHES, DOC#: 1313280041-E14031-TM-REVD-2020, DATED: AUGUST 1, 2014
LIDAR AND BATHYMETRIC DATA OBTAINED FROM AURORA, 2013
WATER OBTAINED FROM CANVEC © NATURAL RESOURCES CANADA, 2012
DATUM: NAD83 PROJECTION: UTM ZONE 12N

DOCUMENT

DAR-KIA-IR-103

1 0 1
SCALE 1:40,000 KILOMETRES

PROJECT
DOMINION DIAMOND™
JAY PROJECT
NORTHWEST TERRITORIES, CANADA

TITLE
AQUATIC FOOTPRINT FOR THE JAY PROJECT DURING OPERATIONS

Golder Associates

PROJECT		1419751	FILE No. POSTDAR_IR_Aqua_008_GIS	
DESIGN	CS	25/03/15	SCALE AS SHOWN	REV 0
GIS	ANK	02/04/15		
CHECK	CS/KC	02/04/15	MAP 103-1	
REVIEW	KM	02/04/15		

G:\CLIENTS\DOMINION\DDEC_Jay and Lynx Projects\Figures\13-1328-0041 Jay & Lynx EA\Aquatics\POST-DAR IR\s\POSTDAR_IR_Aqua_008_GIS.mxd



LEGEND

- EKATI MINE FOOTPRINT (MISERY OPERATION)

JAY PROJECT FOOTPRINT

- POWER LINE
- PROPOSED JAY PROJECT INFRASTRUCTURE
- PROPOSED JAY ROAD (HAUL ROAD AND POWER LINE)
- PROPOSED JAY ROAD (HAUL ROAD, PIPELINE AND POWER LINE)
- PROPOSED JAY PIPELINE ROAD (ACCESS ROAD AND PIPELINE)

LYNX PROJECT FOOTPRINT

- EXISTING SHORELINE OF DEWATERED LYNX LAKE
- LYNX PIPELINE
- LYNX PROJECT INFRASTRUCTURE
- WATERCOURSE CROSSING

NOTES

ROAD, PIPELINES, AND POWER LINE ARRANGEMENT TO BE DETAILED AS PART OF FURTHER PRE-FEASIBILITY DESIGN. APPROXIMATE CORRIDOR WIDTHS ARE SHOWN.

REFERENCE

JAY PROJECT CONCEPTUAL ENGINEERING REPORT, EKATI MINE, DOC#: 1313280041-E14037-R-REV0-4060, DATED: MAY 13, 2014
JAY PROJECT DESIGN BASIS MEMORANDUM FOR PRE-FEASIBILITY DESIGN OF PROJECT ROADS AND PIPELINE BENCHES, DOC#: 1313280041-E14031-TM-REVD-2020, DATED: AUGUST 1, 2014
ORTHOIMAGERY OBTAINED FROM AURORA, 2013
DATUM: NAD83 PROJECTION: UTM ZONE 12N

DOCUMENT

DAR-KIA-IR-103

250 0 250
SCALE 1:12,000 METRES

PROJECT
DOMINION DIAMOND
JAY PROJECT
NORTHWEST TERRITORIES, CANADA

TITLE
ROAD INFRASTRUCTURE IN THE HEADWATERS OF SUB-BASIN B DURING OPERATIONS

Golder Associates

PROJECT		1419751	FILE No. POSTDAR_IR_Aqua_010_GIS	
DESIGN	CS	23/05/15	SCALE AS SHOWN	REV 0
GIS	ANK	02/04/15	MAP 103-2	
CHECK	CS/KC	02/04/15		
REVIEW	KM	02/04/15		

G:\CLIENTS\DOMINION\DDEC Jay and Lynx Projects\Figures\13-1328-0041 Jay & Lynx EA\Aquatics\POST-DAR IRs\POSTDAR_IR_Aqua_010_GIS.mxd

The field studies referenced in the preamble for lakes B11 and B12 are summarized in the 2014 Supplemental Fish and Fish Habitat Baseline Report (Dominion Diamond 2015). The field studies confirmed predictions from the desktop assessment of habitat. A helicopter reconnaissance of lakes B11 and B12 on August 27, 2014 visually confirmed that the two lakes have similar habitat features (Photo 103-1). A fisheries technician then documented habitat features for Lake B12, which confirmed the habitat as representative of similar small ponds in the area (Photo 103-2 and 103-3).

The shoreline of Lake B12 consisted of boulders with cobble and organics interspersed. Areas of organics and gravel were present along the north shore. Two large areas with boulders extended along the entirety of the west and east shore. Riparian vegetation consisted of grasses with shrubs along the north and south shores. The littoral zone was predominantly boulder with organics interspersed throughout. The maximum depth was approximately 1 metre (m). Aquatic vegetation was absent within Lake B12; boulders and overhanging riparian vegetation were present along the shoreline. Due to the shallow depths, it is likely the lake would freeze to the bottom in the winter and would not support a resident fish population.

Photo 103-1 Aerial View of Lake B11 (Left) and Lake B12 (Right), Facing Northwest, August 27, 2014

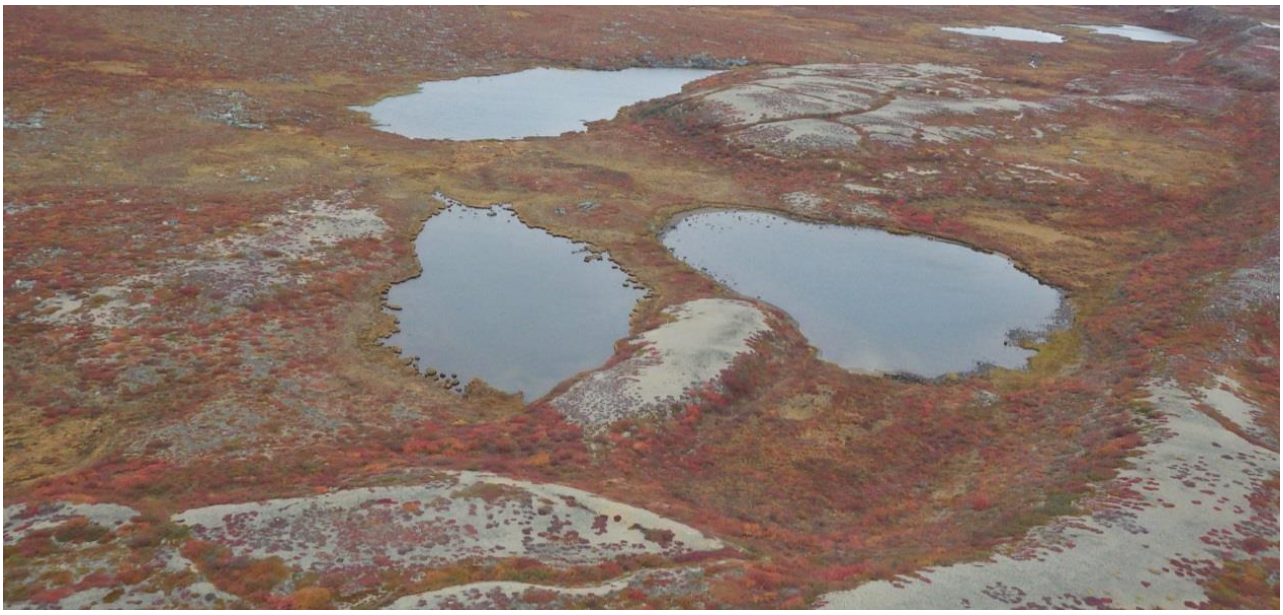


Photo 103-2 **Lake B12 Facing East at Shoreline Comprised of Gravel, Boulder, Grasses, and Shrubs, August 27, 2014**



Photo 103-3 **View of Substrate Comprised of Gravel, Boulder, and Silt in Lake B12, August 27, 2014**



References:

Dominion Diamond (Dominion Diamond Ekati Corporation). 2015. 2014 Water and Sediment Quality Supplemental Baseline Report for the Jay Project. Prepared by Golder Associates Ltd., April 2015. Yellowknife, NWT, Canada.

DOMINION DIAMOND

Information Request Number:	DAR- KIA-IR-104
Source:	Kitikmeot Inuit Association: Tannis Bolt
Subject:	Baseline Updates
DAR Section(s):	9 (Page 9-19)

Preamble (KIA):

A 2014 report was not available at the time of this review: "A sampling program in 2014 was also carried out in Lac du Sauvage, Lac de Gras, and several Lac du Sauvage area lakes and streams to collect additional baseline data on fish and fish habitat to support the analysis of mine-related effects, and to aid in developing a monitoring program in Lac du Sauvage for the proposed Jay Project. The results of these field programs will be reported in supplemental baseline reports to be issued in 2015."

Request (KIA):

Please provide the 2014 report for review by the KIA when available.

Response:

The results of the 2014 field programs are provided in the Fish and Fish Habitat Supplemental Baseline Report (Dominion Diamond 2015). The report will be provided to the Mackenzie Valley Environmental Impact Review Board for inclusion on the public registry when finalized.

References:

Dominion Diamond (Dominion Diamond Ekati Corporation). 2015. 2014 Fish and Fish Habitat Supplemental Baseline Report for the Jay Project. Prepared by Golder Associates Ltd., April 2015. Yellowknife, NWT, Canada.

DOMINION DIAMOND

Information Request Number:	DAR- KIA-IR-105
Source:	Kitikmeot Inuit Association: Tannis Bolt
Subject:	Fish and Fish Habitat - Closure
DAR Section(s):	9 (Page 9-171 to 9-172 and Map 9.4-3)

Preamble (KIA):

The dike will be partially breached at closure to allow fish re-entry into the de-watered area. It is not clear to the reviewer the rationale for maintaining the majority of the dike, which appears to have little value to aquatic life and may cause habitat fragmentation. In addition, the proponent indicates that fish densities will be re-established within one generation time of fish VCs following back-flooding and breaching of the Jay Pit. Examples of biological re-colonization in settings similar to what is being proposed would be helpful, if available.

Request (KIA):

Please describe the rationale for leaving the majority of the dike upon closure, and evaluate the potential effects on fish and and aquatic biota due to the altered and potentially fragmented habitat. If similar examples of biological re-colonization exist from other systems, please provide this information.

Response:

The Ekati Mine is required under its Water Licence and Environmental Agreement to have a closure plan. Version 2.4 of the Ekati Mine Interim Closure and reclamation Plan (ICRP) was approved by the Wek'eezhii Land and Water Board (WLWB) in November 2011 (BHP Billiton 2011). The Water Licence requires that a Final Closure and Reclamation Plan be prepared two years before mine closure. The ICRP describes the Ekati Mine reclamation goal, reclamation objectives, reclamation methods, and required reclamation research that encompass the entire Ekati Mine and all reclamation requirements. The reclamation goal is to return the Ekati Mine site to viable, and wherever practicable, self-sustaining ecosystems that are compatible with a healthy environment, human activities, and the surrounding environment. Reclamation of the Jay Project will be designed to fit into this established framework, as per Section 3.5.8 of the Developer's Assessment Report (DAR).

The rationale for leaving a majority of the dike in place at closure includes environmental and economic considerations. A closure plan that meets environmental objectives while minimizing cost is preferred.

The environmental objective of breaching the dike is to return connectivity of the diked area to Lac du Sauvage while minimizing the environmental disturbance of closure activities. Removal of large volumes of dike material (i.e., substantially beyond what has been proposed in the Concpetual Closure Plan) in order to remove a larger portion of the dike could result in environmental risks and effects in the lake related to the "in-lake" work. Also, it is possible that the outer dike walls will have become established as suitable aquatic habitat within Lac du Sauvage upon back-flooding, and removal of additional material may result in the removal of functional aquatic habitat for fish that would potentially delay recovery and recolonization of the back-flooded area.

There are no detrimental environmental effects that have been identified for leaving the dike in place provided that adequate circulation of lake water and connectivity for fish is occurring. The dike will be constructed using granite rock that is non-potentially acid generating and therefore is geochemically stable. The diked area breaches will be designed and constructed in a manner such that adequate connectivity and water circulation between the diked area and Lac du Sauvage will be established. Design specifics on breached areas (e.g., depth and final location of breaches) would be developed as part of the final closure plan (for more information see the response to DAR-GNWT-IR-51). Maintaining surface water circulation is expected to be sufficient to establish habitat connectivity and avoid habitat fragmentation, as no physical or chemical barrier would be present that would prevent colonization of aquatic life.

The approved closure plans for the Diavik and Meadowbank mines include breaching of several dikes in lakes in a similar manner to the conceptual closure plan for the Jay Dike (DDMI 2010; Meadowbank 2007). Examples from other regions across the world provide evidence of rapid recolonization of aquatic ecosystems after isolation or dewatering. Van de Meutter (2006) investigated the recolonization of macroinvertebrates in six shallow connected lakes in northern Belgium after the lakes were drained. Recolonization occurred within the first year after refilling. The rapid recolonization was attributed to the connectivity of the lakes within the watershed, which will be consistent with the connectivity of the diked area of Lac du Sauvage with the main basin of Lac du Sauvage. It is also generally accepted that when new reservoirs are created, rapid colonization of the reservoir by fish species occurs, typically from the fish fauna of the connecting or impounded habitat (Scharf 2008). Other examples of rapid recolonization of invertebrates and fish communities after dewatering or drawdown in the southern United States are available (Paller 1997; Adam and Warren 2005; Griswold et al. 1982).

References:

Adams, S.B. and Warren, M.L. 2005. Recolonization by warmwater fishes and crayfishes after severe drought in upper coastal plain hill streams. Transactions of the American Fisheries Society 134: 1173-1192.

BHP Billiton. 2011. Ekati Diamond Mine, Environmental Agreement and Water Licences Annual Report 2010. April 2011.

DDMI (Diavik Diamond Mines Inc.) 2010. Revised Interim Closure and Reclamation Plan Version 3.1. Prepared for the Wek'èezhíi Land and Water Board. 201pp.

Griswold, B.L., Edwards, C.J., and Wood, L.C. 1982. Recolonization of macroinvertebrates and fish in a channelized stream after drought. Ohio Journal of Science 82: 96-102.

Meadowbank (Meadowbank Mining Corporation). 2007. Meadowbank Gold Project: Preliminary Closure and Reclamation Plan. 77pp.

Paller, M.H. 1997. Recovery of a reservoir fish community from drawdown related impacts. North American Journal of Fisheries Management 17: 726-733.

Scharf, W. 2008. Development of the fish stock and its manageability in the deep, stratifying Wupper Reservoir. Limnologica 38: 248-257.

Van de Meutter, F., Stoks, R., and de Meester, L. 2006. Rapid response of macroinvertebrates to drainage management of shallow connected lakes. Journal of Applied Ecology 43: 51-60.

DOMINION DIAMOND

Information Request Number:	DAR-KIA-IR-106
Source:	Kitikmeot Inuit Association: Tannis Bolt
Subject:	Fish and Fish Habitat
DAR Section(s):	9 (Page 9-177, Page 9-192, Page 9-193)

Preamble (KIA):

An increase in nutrients and chlorophyll a may produce negative effects on spawning habitat quality in Lac du Sauvage. In particular, chlorophyll a values are expected to peak in the eutrophic range near the end of operations (14 µg/L). It is unclear to the reviewer what the spatial distribution of water quality effects will be within Lac du Sauvage.

Request (KIA):

Please indicate the area that will experience eutrophic conditions, including which spawning shoals are within this area, and how long chlorophyll a is expected to be elevated.

Response:

Indirect effects to fish and other aquatic life valued components (VCs) through changes in water quality in Lac du Sauvage and Lac de Gras during the operational period and closure are evaluated and described in the Developer's Assessment Report (DAR). The following pathway is assessed in DAR Section 9.4.3.2.2: *Operational activities and discharge may change surface water quality and affect fish and other aquatic life in Lac du Sauvage and Lac de Gras*. Water quality modelling in the DAR considered representative sites from each basin of Lac du Sauvage for predicting concentrations (i.e., Aa-1, Ab-1, Ac-1, Ad-1, Ae-1, and Af-1; Map 106-1); therefore, potentially affected shoals can only be identified at a basin scale.

As stated in the DAR (Section 9.4.3.2.2), nutrient concentrations and phytoplankton biomass are predicted to increase in Lac du Sauvage during the period of Misery Pit water discharge (i.e., late operations, 2024 to 2029), peak at the end of late operations, and decrease through closure (also see DAR Appendix 8F). Evaluation of trophic status in the DAR considered predicted concentrations of total phosphorus (TP) and nitrogen, as well as phytoplankton biomass (as chlorophyll *a*), using the approach described in Section 9.4.2.2 of the DAR.

The water quality models used to generate these predictions include conservatism directed towards overestimating projected water quality constituent concentrations in Lac du Sauvage and Lac de Gras to provide a level of confidence that environmental effects in the DAR have not been underestimated. Dominion Diamond has also conducted additional water quality modelling to provide reasonably expected predictions (see Appendix B, Compendium of Supplemental Water Quality Modelling). Water quality modelling results for the "reasonable estimate case" indicate that TP and chlorophyll *a* concentrations in Lac du Sauvage will likely be lower than values presented in the DAR.

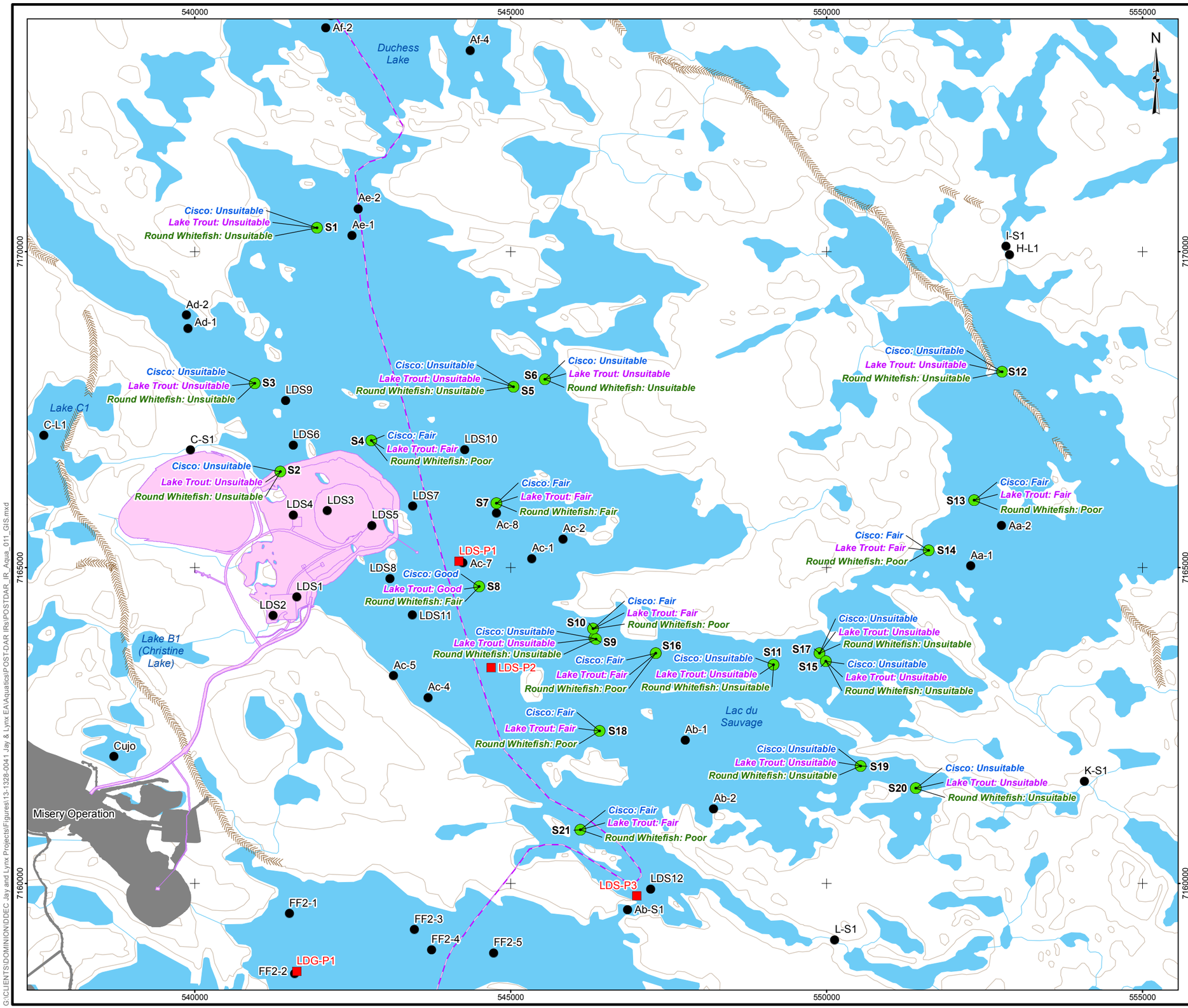
Based on CCME (2004), phosphorus loading during the last five years of mine operation may temporarily alter the trophic classification of some areas of Lac du Sauvage from an oligotrophic system (less than 10 micrograms per litre [µg/L] TP), to a mesotrophic system (10 to 20 µg/L TP), with a peak depth-averaged TP concentrations (12 µg/L) closer to the lower boundary of the mesotrophic range. However, baseline data for Lac du Sauvage show that TP concentrations are naturally elevated on occasion above the oligotrophic/mesotrophic classification threshold (10 µg/L TP; see reply to DAR-EC-IR-19). The extent and duration of this change is expected to vary both spatially and temporally, with peaks in TP concentrations occurring during the ice-covered season (see Figure 8F4-7 in the DAR). In general, the main basin of Lac du Sauvage will be the most affected (Ab and Ac; Map 106-1), becoming mesotrophic over a four-year period peaking at 12 µg/L TP in 2029 before declining to baseline values. The northern basins will be affected to a lesser extent (Ad and Ae), becoming mesotrophic over a one to two year period, peaking at 10.5 and 11 µg/L TP in 2029 respectively. Under the “reasonable estimate case”, the maximum depth-averaged TP concentration is predicted to be 10 µg/L.

Based on the water quality predictions in the DAR, it is expected that there will be a general increase in productivity in the main basin of Lac du Sauvage in late operations (Ab and Ac basins; Map 106-1), and particularly in the last two years, but large shifts in composition of plankton and benthic invertebrate communities are not expected (Section 9.4.4). Water quality models predict that phytoplankton biomass (measured as chlorophyll *a*) is anticipated to rise during late operations (2024 to 2029), primarily in the main basin of Lac du Sauvage, before declining to baseline concentrations. As with phosphorus, the extent of these changes is expected to vary both spatially and temporally, with peaks occurring during the open water season (Map 106-1; also see Figure 8F4-6 in the DAR). Because of the conservatism built into the water quality modelling, the predicted chlorophyll *a* concentrations are more likely to represent maximum concentrations than average concentrations; the value cited in the preamble is also the maximum predicted chlorophyll *a* concentration. See Appendix B (Compendium of Supplemental Water Quality Modelling) for the predictions of the “reasonable estimate case” for chlorophyll *a*.

Based on the classification system put forward by Wetzel (2001) for maximum chlorophyll *a* concentrations, the changes in trophic status of Lac du Sauvage parallel those based on TP. Maximum chlorophyll a concentrations in in the main and northern basins are predicted to change from within the range of oligotrophic (1.3 to 10.6 µg/L) to mesotrophic (4.9 to 49.5 µg/L) during the open water months between 2026 and 2031. Peak concentrations are predicted to vary in Lac du Sauvage based on proximity to the diffuser and direction of flow, ranging from 13 to 15 µg/L in 2029 (Ab, Ac, Ad, and Ae basins; Map 106-1). See responses to DAR-IEMA-IR-15, DAR-EC-19, DAR-MVEIRB-IR-26, and DAR-MVEIRB-IR-60 for additional discussion on predicted nutrient concentrations and interpretation of trophic status. Under the “reasonable estimate case”, the maximum depth-averaged chlorophyll *a* concentration is predicted to be 7.5 µg/L, which is about half of the predicted concentration in the DAR, and is within the oligotrophic to mesotrophic range.

Based on water quality models, shoals in the main and north basins of Lac du Sauvage (Map 106-1) may potentially be affected by increases in phosphorus and the associated increase in primary productivity. Shoals identified in the baseline study area (DAR Annex XIV) that may be affected by a temporary increase in productivity include S1-S10, S16, S18, and S21 in the main and north basins of Lac du Sauvage (Map 106-1). However, most of these shoals were considered to be unsuitable or only of fair quality for spawning, with most high quality spawning shoals occurring in Lac de Gras (Section 9.4.4 of the DAR), where predicted changes in nutrient and chlorophyll *a* concentrations are lower. In addition,

wind and wave action in Lac du Sauvage is anticipated to limit algal growth on spawning shoals to a similar extent as observed under baseline conditions. Any changes in primary production are expected to be temporary and to reverse following mine closure.



LEGEND

- EKATI MINE FOOTPRINT
- PROPOSED JAY FOOTPRINT
- TIBBITT TO CONTWOYTO WINTER ROAD
- NORTHERN PORTION OF TIBBITT TO CONTWOYTO WINTER ROAD
- ELEVATION CONTOUR (20 m INTERVAL)
- ESKER
- WATERCOURSE
- WATERBODY
- BASELINE STATION
- ASSESSMENT LOCATION
- SPAWNING HABITAT

SPAWNING SHOALS (S)

CISCO: SUITABILITY

LAKE TROUT: SUITABILITY

ROUND WHITEFISH: SUITABILITY

NOTES

1. AA, AB, AC, AD, AE, AND AF NODES WERE USED AS CALIBRATION LOCATIONS IN LAC DU SAUVAGE; LDS-P1, LDS-P2, AND LDS-P3 ARE THE PRIMARY LOCATIONS USED IN THE WATER QUALITY ASSESSMENT
2. WATER QUALITY MODELING WITHIN A BASIN WAS ALSO SUMMARIZED USING PREDICTED CONCENTRATIONS FROM REPRESENTATIVE NODES FOR EACH BASIN OF LAC DU SAUVAGE (I.E., AA-1, AB-1, AC-1, AD-1, AE-1, AND AF-1)
3. AA-1, AB-1, AC-1, AD-1, AE-1, AND AF-1 REPRESENT WATER QUALITY NODES USED IN TIME SERIES PREDICTIONS OF CHLOROPHYLL A AND TOTAL PHOSPHORUS CONCENTRATIONS IN LAC DU SAUVAGE (SEE FIGURE 8.5-1 OF THE DAR),
4. SEE SECTION 8.5.4.1.2 OF THE DAR FOR SPECIFICS ON METHODOLOGY OF WATER QUALITY MODELING.

REFERENCE

GOLDER. 1997. TECHNICAL MEMORANDUM #12-2, SHOAL HABITAT SURVEY, LAC DE GRAS AND LAC DU SAUVAGE, SUMMER 1996. ENVIRONMENTAL BASELINE PROGRAM. SUBMITTED TO DIAVIK DIAMOND MINES INC. YELLOWKNIFE, NWT, CANADA. DOC NO. TM12-2.

NATIONAL TOPOGRAPHIC BASE DATA (NTDB) 1:250,000
CANVEC © NATURAL RESOURCES CANADA, 2012
NATURAL RESOURCES CANADA, CENTRE FOR TOPOGRAPHIC INFORMATION, 2012
DATUM: NAD83 PROJECTION: UTM ZONE 12N

DOCUMENT

DAR-KIA-IR-106

1.5 0 1.5
SCALE 1:60,000 KILOMETRES

PROJECT
DOMINION DIAMOND
JAY PROJECT
NORTHWEST TERRITORIES, CANADA

TITLE
MAP OF SPAWNING SHOALS AND WATER QUALITY NODES USED IN TIME SERIES PREDICTIONS FOR LAC DU SAUVAGE

Golder Associates

PROJECT		1419751	FILE No. POSTDAR_IR_Aqua_011_GIS	
DESIGN	CS	27/03/15	SCALE AS SHOWN	REV 0
GIS	LMS	02/04/15	MAP 106-1	
CHECK	CS	02/04/15		
REVIEW	ZK/KM	02/04/15		

G:\CLIENTS\DOMINION\DDEC_Jay and Lynx Projects\Figures\13-1328-0041 Jay & Lynx EAAquatics\POST-DAR IRs\POSTDAR_IR_Aqua_011_GIS.mxd

References:

CCME (Canadian Council Of Ministers of the Environment). 2004. Canadian Water Quality Guidelines for the Protection of Aquatic Life: Phosphorus: Canadian Guidance Framework for the Management of Freshwater Systems. Canadian Environmental Quality Guidelines, 2004. Winnipeg, MB, Canada.

Wetzel RG. 2001. Limnology 3rd Edition. Elsevier Science Academic Press, New York. 1,006 pp.

DOMINION DIAMOND

Information Request Number:	DAR- KIA-IR-107
Source:	Kitikmeot Inuit Association: Tannis Bolt
Subject:	Aquatic Effects Monitoring Program
DAR Section(s):	Section 9 (page 9-6, Table 9.1-2), Appendix 9C

Preamble (KIA):

Proposed fisheries measurement indicators include fish survival, reproduction, abundance and distribution. Thus, it is very useful to have baseline measurements of these parameters in order to asses any potential effects from mining

Request (KIA):

Future stages of the Aquatic Effects Monitoring Plan should be reviewed by the KIA in order to determine (1) the proposed metrics for assessing fish survival, reproduction, abundance and distribution and (2) the available baseline data associated with these parameters.

Response:

As described in the Appendix 9C (Conceptual Aquatic Effects Monitoring Program [AEMP] of the Developer's Assessment Report, an AEMP will be required of the Jay Project (Project) through the water licence and will involve programs focused on the receiving environment. Given the Project is an extension of the existing Ekati Mine, it is anticipated that the proposed fisheries metrics will be aligned with the existing Ekati Mine AEMP (ERM Rescan 2013). There will be an opportunity for community engagement and comment on the conceptual design of the AEMP related to the Jay Project during the water licensing phase of the Project.

References:

ERM Rescan (ERM Rescan Environmental Ltd.). 2013. Ekati Diamond Mine Aquatic Effects Monitoring Program Plan for 2013 to 2015. Prepared for Dominion Ekati Corporation by Rescan Environmental Services Ltd. Yellowknife, Northwest Territories.

DOMINION DIAMOND

Information Request Number: DAR-KIA-IR-108

Source: Kitikmeot Inuit Association: Tannis Bolt

Subject: Narrows

DAR Section(s): 9 (Page 9-152)

Preamble (KIA):

During back-flooding, pumping rates will be reduced to mitigate low flow periods. However, it is not clear what the minimum lake levels will be for triggering reduced pumping rates.

Request (KIA):

Please provide an estimation of when pumping rates will be reduced to mitigate low water levels, and the minimum acceptable depths and widths at sensitive areas such as the Narrows connecting Lac du Sauvage and Lac de Gras.

Response:

Specific trigger levels for reducing pumping rates during low flow periods have not yet been identified. A Jay Pit and diked area back-flooding pumping plan will be developed prior to closure. It is expected that this plan will be submitted for approval under the water licence process and will be required prior to back-flooding (currently scheduled to commence in 2030). As part of the back-flooding pumping plan, Dominion Diamond will implement mitigation, as required, through an adaptive management plan, including the reduction of pumping rates to protect fish habitat in the Lac du Sauvage Narrows.

Additional information will be collected during operations as part of the Aquatic Effects Monitoring Program to further characterize baseline conditions at the Narrows, including depths and widths under naturally occurring low-flow conditions in the winter. The current understanding of the Lac du Sauvage Narrows is that flowing water and partial open-water can be expected during the winter months, as described in the response to DAR-MVEIRB-IR-64. The adaptive management plan for the potential reduction in pumping rates during closure, as mitigation to avoid adverse effects to fish habitat at the Lac du Sauvage Narrows, will be developed as part of the back-flooding pumping plan.

DOMINION DIAMOND

Information Request Number:	DAR- KIA-IR-109
Source:	Kitikmeot Inuit Association: Tannis Bolt
Subject:	Conceptual Offsetting Plan
DAR Section(s):	Appendix 9A

Preamble (KIA):

The offsetting plan provided appeared to be overly simplified for this stage in the proposal process. The level of detail provided was not adequate for determining if the proposed activities would successfully achieve DFO's guiding principles under the Fisheries Act. For example, the method that will be used for quantifying fisheries productivity losses and gains was not described in any detail. This aspect is generally key to Fisheries Offsetting Plans, and without it we cannot evaluate how fisheries productivity will be maintained or enhanced.

Request (KIA):

Please provide a transparent and comprehensive description of how fisheries productivity losses and gains will be quantified and compared due to project activities and proposed offsetting.

Response:

The requirement under the Terms of Reference (MVEIRB 2014) for the Jay Project (Project) was to provide a “conceptual fish off-setting plan in consultation with potentially affected communities and Fisheries and Oceans Canada” as part of the Developer’s Assessment Report (DAR). The purpose of the conceptual offsetting plan submitted with the DAR (Appendix 9B) was to summarize anticipated Project effects to fish and fish habitat that would require offsetting under the *Fisheries Act,* and to present preliminary options for offsetting that could be considered. Many of the options presented in the conceptual plan were identified through community engagement workshops with the goal to benefit local fisheries. The level of detail presented in the conceptual offsetting plan demonstrates that a range of viable offsetting options are available at a scale appropriate for the project losses, which Dominion Diamond Ekati Corporation believes they have demonstrated in sufficient detail to support the environmental assessment review process through the Mackenzie Valley Environmental Impact Review Board (MVEIRB).

A *Fisheries Act* Authorization will be required for the Project, which follows a separate regulatory permitting process with Fisheries and Oceans Canada (DFO). A final offsetting plan will be submitted as part of the application for a *Fisheries Act* Authorization in order for DFO to deem the application complete. The details provided in the final offsetting plan will include a full accounting of fisheries productivity losses and gains, alignment with fisheries management objectives, involvement of local communities, details of any complementary measures that will be advanced, as well as assessment of the technical feasibility of the selected offsetting option(s). The specific metrics to quantify fisheries productivity losses and gains have not been finalized, but will be developed through ongoing discussions with DFO and provided with the final offsetting plan.

The offsetting plan for the Project will continue to be advanced by Dominion Diamond in parallel to the MVEIRB process and up until the *Fisheries Act* application is submitted. There will continue to be opportunities for additional engagement with communities and DFO to provide input and review of the details of the final offsetting plan prior to final submission.

References:

MVEIRB (Mackenzie Valley Environmental Impact Review Board). 2014. Revised Terms of Reference EA 1314-01 Jay Project Dominion Diamond Ekati Corporation. July 17, 2014. Yellowknife, NWT, Canada.

DOMINION DIAMOND

Information Request Number:	DAR- KIA-IR-11
Source:	Kitikmeot Inuit Association: Tannis Bolt
Subject:	Insufficient caribou baseline effort
DAR Section(s):	Annex VII (Section 2)

Preamble (KIA):

A one-day survey was done on August 12, 2013, to identify caribou travel surrounding the Jay project area (east-centred from the project) by helicopter.

Request (KIA):

Please comment on the rationale for conducting this survey on August 12, 2013 when caribou are expected in the area, as indicated in this same baseline report, from May 1-31 (during northern migration), June 16- Jul 1 (post-calving), from July 2- August 3, and between September 1 to October 31 (fall migration). Will additional surveys be conducted for this area during the aforementioned periods of expected caribou presence, prior to project development?

Response:

As described in Section 2.3.1 of the Wildlife Baseline Report (Annex VII), the aerial survey completed on August 12, 2013, identified locations of historical caribou trails, which does not require the presence of caribou. A representative photo of a caribou trail taken near the narrows of Lac de Gras and Lac du Sauvage is shown in Photo 11-1. The locations of these caribou trails are presented in the Developer's Assessment Report (DAR; Map 12.2-5), and provide a high-level overview of migration routes in the Lac de Gras region. In 2014, additional ground-based caribou trail surveys were completed on July 12 and 13. These surveys resulted in maps of digitized caribou trails and were reported in Appendix I of the Sable Addendum (Dominion Diamond 2014).

Section 12.1.4.2 of the DAR indicates that caribou may be present in the baseline study area from May 1 to May 31 (during northern migration), June 16 to July 1 (post-calving aggregation), July 2 to August 31 (summer dispersal), and September 1 to October 31 (fall migration). Caribou are, and will continue to be, monitored when present at the Ekati Mine site.

Photo 11-1 Caribou Trail from Ground Level



References:

Dominion Diamond (Dominion Diamond Ekati Corporation). 2014. Jay Project Developer's Assessment Report Sable Addendum. Prepared by Golder Associates Ltd., December 2014. Yellowknife, NWT, Canada.

DOMINION DIAMOND

Information Request Number:	DAR- KIA-IR-110
Source:	Kitikmeot Inuit Association: Tannis Bolt
Subject:	Conceptual Offsetting Plan
DAR Section(s):	Appendix 9A (Section 9A5.3)

Preamble (KIA):

The three candidate offsetting options were described very generally making it difficult to assess their potential for success. In addition, it was unclear if whether the options would be beneficial to local or regional fisheries.

Request (KIA):

Please provide specific details for proposed offsetting options such as: baseline conditions, proposed timeline of activities, alignment with local and regional fisheries objectives, potential benefits for local communities, technical and economic feasibility, design drawings (if appropriate), and potential impacts to existing resident fish in the case of stocking/introductions

Response:

Please see the response to DAR-KIA-IR-109.

DOMINION DIAMOND

Information Request Number:	DAR- KIA-IR-111
Source:	Kitikmeot Inuit Association: Tannis Bolt
Subject:	Conceptual Offsetting Plan
DAR Section(s):	Appendix 9A (Section 9A5.5)

Preamble (KIA):

Complementary measures are proposed as a potential offsetting tool. The low level of detail provided for this option makes it difficult to assess how proposed research or data collection programs will benefit communities and advance knowledge relating to fisheries management objectives.

Request (KIA):

Please provide research proposal information including study objectives, hypotheses, basic methods, opportunities for community involvement, alignment with fisheries management objectives, and technical and economic feasibility

Response:

Please see the response to DAR-KIA-IR-109.

DOMINION DIAMOND

Information Request Number:	DAR- KIA-IR-12
Source:	Kitikmeot Inuit Association: Tannis Bolt
Subject:	Baseline report reads like a literature review of previous data collection
DAR Section(s):	Annex VII (Section 3)

Preamble (KIA):

While Annex VII is presented as the baseline report supporting the proposed Jay Pipe Project, many sections deal almost exclusively with discussions of past data and trends from data collection efforts at Diavik, Ekati, Daring Lake, and Snap Lake. These data are useful as informing the impact assessment, and should be included in the environmental setting of such a document, rather than as a baseline. The baseline report should focus on baseline data for wildlife collected within the potential Zone of Influence (ZOI) for the Jay pipe project itself, in a way that will facilitate predictions and a Before-After-Control-Impact analysis against monitoring data, if the project is built. For example, Section 3.10.1 includes a discussion of past data and trends from Diavik and Ekati on raptors, but does not indicate whether any suitable raptor cliffs with nesting activities have been identified within 5 to 10 km of the proposed project, even though other project areas did not include surveys of habitat sufficiently far east to the east of the Jay Pipe project to be considered as covering the potential ZOI for that project.

Request (KIA):

Please provide at least 2 years of systematic baseline data for each of the indicated wildlife VECs within the Zone of Influence of the proposed Jay Pipe project, which can be combined and compared against later monitoring data for that same area.

Response:

Since 1998, the Ekati Mine Wildlife Effects Monitoring Program (Ekati WEMP), and since 1995, the Diavik Mine Wildlife Monitoring Program have collected information for all wildlife (and caribou) valued components assessed in the Developer's Assessment Report (DAR), including data collection from within and around the area of the Jay Project (i.e., within the Zone of Influence). Additional environmental baseline data on caribou, upland birds, carnivores, raptors, and waterbirds at the Jay Project site in 2013 and 2014 are available in Appendix VII of the Jay Project DAR and the Sable Addendum (Dominion Diamond 2014). The temporal and spatial extent of wildlife and caribou data collected at and in the area surrounding the Project is sufficient for the purpose of describing baseline conditions and assessing effects of the Project on caribou and wildlife. Monitoring for the Ekati WEMP and baseline studies for the Jay Project will continue in 2015. The Ekati WEMP will be expanded to include caribou and wildlife monitoring at the Jay Project upon Project approval.

References:

Dominion Diamond (Dominion Diamond Ekati Corporation). 2014. Jay Project Developer's Assessment Report Sable Addendum. Prepared by Golder Associates Ltd., December 2014.

DOMINION DIAMOND

Information Request Number:	DAR- KIA-IR-13
Source:	Kitikmeot Inuit Association: Tannis Bolt
Subject:	Contributions to harvest-related declines in Bathurst caribou.
DAR Section(s):	Annex VII (Section 3)

Preamble (KIA):

The wildlife baseline identifies that the decline of the Bathurst caribou her since 2006 was likely driven by decreasing adult female and calf survival rates and possibly due to decreased fecundity (Boulanger et al. 2011). The effect of a constant hunter harvest (estimated at a rate of 7,484 bulls and 8,380 cows per year between 1988 to 1993) during the decline was also identified as a potential cause for the decline by Boulanger et al. (2011).

Request (KIA):

Please provide estimates of harvest rates during this time period occurring in the NWT and in Nunavut separately, to identify contributions to this cumulative, transboundary effect. Please comment on the impacts of road creation during this time period on harvest rates, and whether road construction is thought to have facilitated an increase in harvest due to a greater ease of travel.

Response:

Harvest data are not available at the level of detail requested. In both Nunavut and the Northwest Territories, harvesters possessing a General Hunting Licence (GHL), including all Aboriginal harvesters, are not required to report their caribou harvest. Resident hunters voluntarily report harvest, but not the location or herd from which the caribou were harvested (for example, see D'Hont 2000). Non-resident hunters (i.e., sport hunters) form a relatively small component of the harvest. Recent efforts to monitor GHL harvest numbers and location are reported in Adamczewski et al. (2009).

The available harvest estimates and details of recent hunting bans beginning in 2010 are presented in Section 12.2.2.4 and Table 12.2-5 of the Developer's Assessment Report. Harvest data were not collected prior to the Tibbitt to Contwoyto Winter Road (first constructed in 1982), but monitoring by the Department of Environment and Natural Resources (ENR), Government of the Northwest Territories, indicated a harvest on the Tibbitt to Contwoyto Winter Road in 2004, 2005, and 2006 of 538, 494, and 255 caribou, respectively (Ziemann 2007). Considering all the available data, ENR has stated that the largest effect of the mining industry on caribou has likely been the hunter access created by roads (Adamczewski et al. 2009).

References:

Adamczewski J, Boulanger J, Croft B, Cluff D, Elkin B, Nishi J, Kelly A, D'Hont A, Nicolson C. 2009. Decline In The Bathurst Caribou Herd 2006-2009: A Technical Evaluation Of Field Data And Modeling.

D'Hont A. 2000. NWT Resident Hunter Harvest Survey Results For Licence Year 1993/94. ENR Manuscript Report No. 131.

Zeimann J. 2007. Tibbitt to Contwoyto Winter Road Monitoring Station Report. ENR Manuscript Report No. 173.

DOMINION DIAMOND

Information Request Number:	DAR-KIA-IR-14
Source:	Kitikmeot Inuit Association: Tannis Bolt
Subject:	Sensitivity of Grizzly Bears to harvest versus project-related mortalities.
DAR Section(s):	Annex VII: Wildlife Baseline Report, Sections 3 and 4

Preamble (KIA):

Section 3.4.3 states that there is a 40% chance of a 25% decrease in the population of barren ground grizzly bears with an additional 6 bears harvested per year. The first paragraph of page 3-11 section states that the barren-ground grizzly bear is considered a sensitive species in the NWT to increased harvest rates. It does not comment on whether this species is sensitive to increases in problem grizzly bear killed following incidents occurring at mine sites and exploration camps. Current levels of harvesting were noted as approximately 13.4 grizzly bears per year. At least four grizzly bears were destroyed due to interactions with Ekati, Diavik, and Snap Lake (Section 3.11.2.1) and any more "incidents" involving grizzly bears were reported (> 20; Table 3.11-2). Therefore, it is possible that many of these grizzlies that were recorded in incidents, but were not killed at site later destroyed after interacting with other projects and hamlets when they displayed problematic behaviours, leading to a need to destroy the animal for human protection.

Request (KIA):

Please clarify whether grizzly bear populations are also sensitive to increases in mortalities due to problem grizzly bear kills due to incidents occurring at mine sites and exploration camps (e.g., obtaining rewards by accessing a portion of the camp). Please comment on the number of problem bears killed per year due to their problem status within the Slave Geological Province of NWT and NU versus the number estimated purely for harvest. As an example of scale, 34% of grizzlies killed in the Kitikmeot in the past 24 years have been problem bears, and many of these animals move between the NWT and Nunavut.

Response:

Table 13.2-2 in the Developer’s Assessment Report (DAR; Section 13.2.2.7.1) details all of the grizzly bear incidents and mortalities that have occurred at the Diavik, Ekati, Snap Lake, and Jericho mines from 1996 to 2013. Overall, direct mortality of grizzly bears at active mine sites is infrequent, and would have a negligible effect on the population (Section 13.3.2.2.2 of the DAR).

Data from the Government of Northwest Territories (GNWT) indicated there were 56 known grizzly bear mortalities in the North Slave Region from 1996 to 2010 (Table 14-1). The data provided did not indicate the type of establishment where the mortality occurred. As such, the activity was estimated based on what types of development activities are present near the location recorded by the GNWT. In cases where there are several possibilities (such as Lac de Gras, which includes mines, exploration camps, a winter road camp and a hunting lodge), the activity was left blank.

Of the 56 documented mortalities, five mortalities have been at mines, and none since 2005. At least two mortalities have been at exploration camps, but an accurate estimate cannot be extrapolated from the information provided. Five of the grizzly bear harvested since 2006 have been at communities.

The data provided by the GNWT does not indicate whether the grizzly bear mortalities were due to harvesting or problem bears. Aboriginal harvesters are not required to report their harvest. Harvesting of grizzly bears from the Slave Geological Province by non-Aboriginal people is not permitted in the NWT (GNWT-ENR 2014). It is predicted that most of the mortalities in Table 14-1 are likely to be problem bears, and have adversely influenced population demographic rates.

In response to this Information Request, data describing grizzly bear mortalities from Nunavut were requested from Malik Awan, Wildlife Biologist for Carnivores, Government of Nunavut by email on March 2, 2015; a response has not yet been received.

Dominion Diamond Ekati Corporation has invested substantial effort into the grizzly bear hair snagging program, which is also contributed to by Diavik Diamond Mines (2012) Inc. and De Beers Canada Inc. The program has contributed important information to the understanding of grizzly bears at a regional scale. Results indicate that the Slave Geological Province grizzly bear population is stable or increasing (ERM Rescan 2014a). Waste management and mitigation at the Ekati Mine has been effective at minimizing the amount of food and shelter available to wildlife (ERM Rescan 2014b).

Table 14-1 Grizzly Bear Mortalities in the North Slave Region, 1996 to 2010

Date	Location	Activity	Gender	Age Group
9/11/1996	Mackay Lake Lodge	Hunting Lodge	M	Subadult
9/15/1996	Desteffany Lake	-	M	Adult
6/15/1997	Gameti	Community	U	Subadult
8/22/1997	Peterson's Point Lake Lodge	Hunting Lodge	M	Subadult
9/11/1997	Dacho kue Adventures, Artillery Lake	Hunting Lodge	M	Subadult
9/7/1997	Artillery Lake	-	M	Subadult
10/8/1997	-	-	M	Subadult
6/24/1998	Nuna Logists Road Camp Lockhart Lake	Winter Road Camp	M	Subadult
8/27/1998	Mackay Lake Lodge	Hunting Lodge	F	Adult
9/5/1998	Mackay Lake Lodge	Hunting Lodge	M	Adult
9/12/1998	Camp Ekwo , Humpy Lake.	Hunting Lodge	M	Subadult
9/8/2000	Courageous Lake	-	F	Adult
10/19/2000	Ekati Mine	Mine	M	Yearling
5/3/2001	Wekweti	Community	n/a	n/a
7/26/2001	Campsell River	-	n/a	n/a
8/28/2001	Lake Providence	-	F	Subadult
9/8/2001	Humpy Lake/Little Martin Lake	Hunting Lodge	n/a	n/a
8/11/2003	Desteffany Lake	-	n/a	Adult
8/26/2003	Mackay Lake Lodge	Hunting Lodge	U	Unknown
10/1/2003	Treeline Camp	Exploration Camp	U	Unknown
5/23/2004	Wekweti	Community	U	Unknown
7/4/2004	Colomac Mine	Remediation Project	M	Subadult
7/6/2004	Colomac Mine	Remediation Project	M	Adult
7/6/2004	Diavik Diamond Mines	Mine[(a)]	M	Adult

Table 14-1 Grizzly Bear Mortalities in the North Slave Region, 1996 to 2010

Date	Location	Activity	Gender	Age Group
7/15/2004	Diavik	Mine[(a)]	M	Adult
9/2/2004	Mackay Lake Lodge	Hunting Lodge	M	Unknown
9/2/2004	Mackay Lake Lodge	Hunting Lodge	M	Unknown
9/8/2004	Grizzle Bear Lake	-	U	Unknown
9/12/2004	Humpy Lake	Hunting Lodge	M	Adult
9/23/2004	Warburton Bay	-	M	Unknown
9/23/2004	Colomac Mine	Remediation Project	M	Adult
9/23/2004	Wekweti	Community	M	Adult
10/13/2004	Hill Top Camp	Exploration Camp	M	Adult
10/21/2004	Wekweti	Community	U	Unknown
11/7/2004	Ekati Mine	Mine	M	Adult
11/15/2004	Wekweti	Community	U	Unknown
11/18/2004	SE Kam Lake	Community	M	Adult
4/25/2005	Credit Lake	-	M	Adult
7/15/2005	Mackay Lake Lodge	Hunting Lodge	U	Adult
7/16/2005	Peregrine Camp	Exploration Camp	U	Unknown
7/17/2005	Lac De Gras	-	U	Adult
7/18/2005	Courageous Lake	-	U	Adult
8/5/2005	Ekati	Mine	M	Adult
12/20/2005	Kam Lk / Correctional Center	Community	M	Adult
8/22/2006	Warburton Bay	-	F	Yearling
9/4/2006	Lake Providence	-	F	Adult
9/5/2006	Lac De Gras	-	F	Adult
9/12/2006	Warburton Bay	-	F	Adult
9/15/2006	Rawalpindi Lake	-	U	2 Year Old
10/12/2006	Wekweti	Community	M	Subadult
9/18/2007	Wekweti, 1 km from town	Community	M	Adult
9/3/2007	Hoarfrost	-	M	Subadult
11/5/2007	Reliance	-	M	Adult
6/25/2008	Wekweti	Community	M	Adult
8/28/2009	Wekweti	Community	F	Adult
9/22/2010	Wekweti	Community	M	Adult

Source: GNWT-ENR (2015).

a) Only one mortality was recorded by the Diavik Mine (DDMI 2005).

M = male; F = female; U = unknown; n/a = not recorded; - = represents cases where there are several possibilities (such as Lac de Gras, which includes mines, exploration camps, a winter road camp and a hunting lodge).

References:

DDMI (Diavik Diamond Mines Inc.). 2005. 2004 Wildlife Monitoring Report.

GNWT-ENR (Environment and Natural Resources, Government of the Northwest Territories). 2014. Northwest Territories Summary of Hunting Regulations. December 1, 2014 to June 30, 2015.

GNWT-ENR. 2015. Number of grizzly bear mortalities and relocations within the North Slave Region. Provided to Golder Associates Ltd. under an ENR Data Sharing Agreement. March 11, 2015.

ERM Rescan (ERM Rescan Environmental Services Ltd.). 2014a. Ekati and Diavik Diamond Mines: 2014 Final Lac de Gras Regional Grizzly Bear DNA Report. Prepared for Dominion Diamond Ekati Corporation and Diavik Diamond Mines (2012) Inc. by ERM Consultants Canada Ltd.: Yellowknife, Northwest Territories.

ERM Rescan. 2014b. Ekati 2013 Wildlife Effects Monitoring Program Report. Prepared for Dominion Diamond Ekati Corporation by ERM Consultants Canada Ltd. Yellowknife, Northwest Territories.

DOMINION DIAMOND

Information Request Number: DAR- KIA-IR-15 and DAR- KIA-IR-17

Source: Kitikmeot Inuit Association: Tannis Bolt

Subject: Different survey methods for caribou not presented.

DAR Section(s): Annex VII (Section 12)

Preamble (KIA):

This report states that maps of previous study areas for surveying caribou are provided in Annex VII. However, these could not be found in Annex VII, which only provides aerial transect survey maps for Ekati and Diavik in 2009 and 2012, and for the Gahcho Kue project from 1999 to 2005. Inclusion of all maps will allow the reader to see the difference in survey widths, transect lengths, and areas surveyed over time, which will affect their ultimate confidence in the EA assessment for caribou.

Request (KIA):

Please provide additional survey maps for noted surveys in this section, namely: 1) 1995-1997 Diavik Surveys, 2) 1998-2001 Ekati Surveys, 3) 2002 surveys for Ekati and SE shore of Lac de Gras, 4) 2006 Ekati Survey, 5) 2006 Diavik Survey, and 6) 2007 Diavik Survey.

Response:

Map 12.2-4 in Section 12.2 (Existing Environment) of the Developer's Assessment Report (DAR) shows the survey designs requested and cumulative results of group size and distribution recorded during all aerial surveys. Within the Ekati Mine study area, transect width varied among years resulting in 50 percent (%) coverage (line of sight was 1 kilometre [km] on either side of helicopter) of the study area in 1998, and from April through July of 1999. Since August 1999, survey width was 1.2 km (line of sight was 600 metres on either side of helicopter) for the baseline study area and remained at this distance for all future surveys. From 1998 to 2006, transect spacing was 4 km, and in 2007, was expanded to 8 km spacing when the study area increased. The changes in the aerial survey design that have occurred are described in Table 12.2-1 of the DAR. The information provided in Table 12.2-1 of the DAR has been replicated in Table 15-1 below.

Table 15-1 Caribou Aerial Survey Frequencies and Study Areas for the Ekati and Diavik Mines, 1995 to 2012

Year	Survey Timing and Frequency	Study Area	Coverage	Number of Transects	Number of Segments
1995 to 1997	• Weekly from mid-April to mid-October in the regional study area • Frequency of surveys in the regional study area varied depending on caribou abundance, distribution, and presence of large herds	Diavik – 1,200 km^2	Varied	Varied	Varied

Table 15-1 Caribou Aerial Survey Frequencies and Study Areas for the Ekati and Diavik Mines, 1995 to 2012

Year	Survey Timing and Frequency	Study Area	Coverage	Number of Transects	Number of Segments
1998 to 2001	• Weekly from mid-April to mid-October	Ekati – 1,600 km^2	Ekati 1998 to 1999: 50%; 1999 to 2001: 30%	10	393
2002 to 2005	• Weekly from mid-April to mid-October • Every second transect from mid-June to mid-July	Ekati and Diavik (combined) – 2,800 km^2	30%	13	675
2006	• Weekly from mid-April to mid-October	Ekati – 5,425 km^2 Diavik – 1,870 km^2	Ekati 15% Diavik 31%	18	968
2007 and 2008	• No northern migration surveys • Weekly surveys from mid-July to mid-October	Ekati – 5,425 km^2 Diavik – 2,867 km^2	Ekati 15% Diavik 31%	19	1,138
2009 and 2012	• No northern migration surveys • Weekly surveys from mid-July to mid-October	Ekati and Diavik (combined) – 5,933 km^2	15%	12	696

km^2 = square kilometre;% = percent.

Information Request Number:	DAR- KIA-IR-16
Source:	Kitikmeot Inuit Association: Tannis Bolt
Subject:	Barren-ground Caribou - Survey lines missing
DAR Section(s):	EA Section 12, Annex VII: Wildlife Baseline Report, S 2

Preamble (KIA):

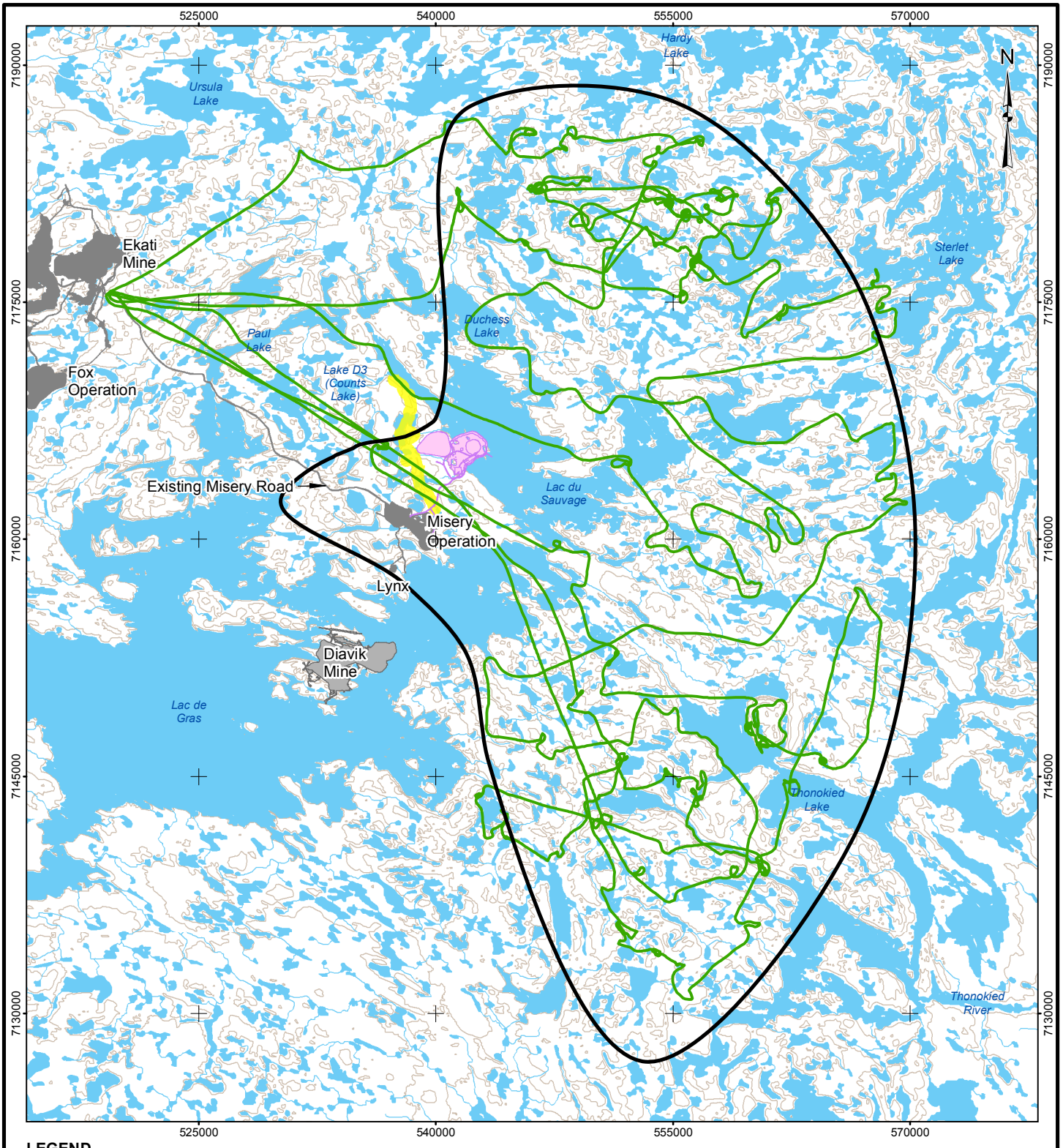
No survey effort flight lines included on map

Request (KIA):

Please include flight lines on Map 12.2-3 and Map 2.3-1to help determine reconnaissance survey effort and area covered

Response:

The Global Positioning System (GPS) track file showing the survey route is presented in Map 16-1. The survey was completed by helicopter on August 12, 2013, at an altitude of 400 metres above ground level. Historical caribou trails detected within 300 m of either side of the aircraft were recorded directly on a map. The survey included a total length of 724.2 kilometres, which represents approximately 29 percent coverage of the reconnaissance area.



LEGEND

- EKATI MINE FOOTPRINT
- DIAVIK MINE FOOTPRINT
- PROPOSED JAY FOOTPRINT
- ELEVATION CONTOUR (20 m INTERVAL)
- WATERCOURSE
- WATERBODY
- FLIGHT PATH
- ESKER SURVEY
- RECONNAISSANCE SURVEY AREA

6 0 6

SCALE 1:350,000 KM

NOTE

LOCATION OF PATHWAYS, OBSTACLES AND ESKERS SURVEYED DURING THE CARNIVORE DEN SURVEYS

REFERENCE

CANVEC © NATURAL RESOURCES CANADA, 2012
NATURAL RESOURCES CANADA, CENTRE FOR TOPOGRAPHIC INFORMATION, 2012
DATUM: NAD83 PROJECTION: UTM ZONE 12N

DOCUMENT

DAR-KIA-IR-16

PROJECT

DOMINION DIAMOND

JAY PROJECT
NORTHWEST TERRITORIES, CANADA

TITLE

RECONNAISSANCE SURVEY AREA FOR HISTORICAL CARIBOU TRAILS, 2013

Golder Associates

PROJECT		1419751	FILE No. POSTDAR_IR_Wild_028_GIS	
DESIGN	DC	30/03/15	SCALE AS SHOWN	REV. 0
GIS	ANK	02/04/15	MAP 16-1	
CHECK	DC	02/04/15		
REVIEW	JR	02/04/15		

G:\CLIENTS\DOMINION\DDEC Jay and Lynx Projects\Figures\13-1328-0041 Jay & Lynx EA\Wildlife\POST-DAR IRs\POSTDAR_IR_Wild_028_GIS.mxd

DOMINION DIAMOND

Information Request Number:	DAR-KIA-IR-18
Source:	Kitikmeot Inuit Association: Tannis Bolt
Subject:	Dewatering pipeline not considered.
DAR Section(s):	Section 12 (Table 12.3-1)

Preamble (KIA):

In the table scoping potential pathways for effects on caribou, the water diversion pipeline is not included. We noted in an earlier IR that these structures were not adequately described (IR #3). Based on dimensions provided in response to that IR, along with the proximity of the linear stuctures to the road, the impact of these structures may need to be considered in the pathway analysis for impacts on movement of barren-ground caribou. Lawhead et al. (2006) demonstrated that older pipelines, elevated 0.4 to 1.1 m above ground level at Prudhoe Bay Oilfield in Alaska constituted a barrier to caribou in the absence of crossing ramps. This group also suggested that elevated pipelines be separated from roads, as they can cause snow drifts under pipelines next to roads, affecting the ability of caribou to move onto and off of roads quickly to avoid vehicles and predators.

Request (KIA):

Please consider impacts of these structures on caribou once adequate information is provided on their dimensions, height and alignment.

Response:

As described in the response to DAR-KIA-IR-03, there will be three parallel pipelines placed on a bench of granular material and located adjacent to the Jay Road as shown in DAR-MVEIRB-IR-94 Figure 94-1. The pipelines will include 36, 30, and 26 inch diameter pipe. The design includes a continuous bench so that pipelines will not be elevated above ground.

In the Developer’s Assessment Report, Dominion Diamond proposed to construct caribou crossings at appropriate discrete locations along the Jay Road. After receiving input from Aboriginal communities during our engagement process and during site visits, Dominion Diamond has changed its approach to caribou crossings along the Jay Road to reflect that feedback, as described below.

Because of the importance of the esker for caribou movement as identified through community engagement, the portion of the Jay Road that cuts through the esker will be constructed as a caribou crossing. The pipelines will be covered over with crushed rock along this section of road, except where there are valves or joints that require visual inspection for safe operation. Dominion Diamond will strategically construct the pipelines to reduce the number of joints or valves through the esker crossing.

Dominion Diamond’s community engagement program has indicated that the area to be crossed by the Jay Road is important for caribou movement. In response to the feedback received through community engagement, Dominion Diamond proposes to construct an increased number of caribou crossings along the main section of the Jay Road (i.e., roughly between King Pond Dam and the approach to the active operations area at Lac du Sauvage). This main section of the Jay Road will be constructed with frequent

and wide caribou crossings that will respect the communities' identification of the importance of this area for caribou movement. Caribou crossings will not be built in areas where raised safety berms are required by the Mines Inspector, or at locations where there are necessary joints and valves in the pipelines that require visual inspection for safe operation. The pipelines will be strategically designed to reduce the number of locations that cannot be constructed as caribou crossings due to joints and valves. This approach also makes beneficial use of 'lessons-learned' from the original Misery Road, where caribou crossings were only installed after construction of the road.

Caribou crossings will be constructed using crushed rock (200 millimetres or less in size) so that the side slopes of the road are flatter and easier walking for caribou than the large roadfill rock. In the caribou crossing areas, the pipelines will also be covered with crushed rock. Once the road is constructed, monitoring, including by Aboriginal community members, will be implemented to assess the effectiveness of the constructed caribou crossings.

DOMINION DIAMOND

Information Request Number: DAR- KIA-IR-19

Source: Kitikmeot Inuit Association: Tannis Bolt

Subject: Waste Rock Storage Area

DAR Section(s): 12.3.2.2.1

Preamble (KIA):

In explaining why there is no residual effect predicted for caribou due to ingestion of seepage and surface runoff from waste rock storage areas (WRSAs) and kimberlite stockpiles, or due to ingestion of water, soil and vegetation that has been chemically altered, the proponent provides assurance that Ekati Mine WRSA practices to facilitate permafrost development and maintenance will be used. More details are required on these practices in the context of the proposed site and with considerations of updated climate change models released by the IPCC.

Request (KIA):

As WRSA practices were approved for the Ekati project based on earlier climate change models and predictions, please comment on whether WRSA practices proposed for Ekati will retain effective for the Jay Pipe location given updated climate change models and predictions provided by the Intergovernmental Panel on Climate Change (IPCC) since the time of permitting the Ekati project. What adaptive management approaches will be available into perpetuity by the proponent if the WRSA begins to thaw, to prevent seepage and impacts on water quality and caribou into perpetuity? Would the proponent consider monitoring farther into the future following project closure to provide opportunities for adaptive management, as compared to the time period committed to following the Ekati closure?

Response:

The Jay waste rock storage area (WRSA) does not need to be frozen to maintain physical stability or for geochemical management; however, a frozen condition within the WRSA is beneficial and will be promoted. The Jay WRSA is anticipated to freeze by permafrost aggradation into the pile. Permafrost aggradation in to the WRSA can be promoted by minimizing oxidation of waste rock through geochemical management and by scheduling the timing of waste rock placement in key areas.

Recent (2014) thermal modelling for the design of the Pigeon WRSA at the Ekati Mine ([WROMP] Vers. 4.1) was provided to the Wek'èezhìi Land and Water Board as part of the Water Licence requirements for the Pigeon WRSA Design. This thermal modelling is also relevant for the design of the Jay WRSA. The thermal modelling validated that a 5 metre (m) thick cover of granite provides adequate thermal protection to maintain frozen conditions within the material below the cover under a 100-year climate change scenario. Even with an increased active layer thickness, there remains a very low likelihood of long term seepage from the WRSA with water quality that requires active management.

Thermistors will be installed in the Jay WRSA to monitor temperatures in the pile foundation and within the pile itself.

Operational mixing (co-deposition) of potentially acid generating (PAG) and non-PAG mine rock (on top of a basal layer of granite) will be used to mitigate the acid generation potential of PAG rock in the Jay WRSA. Co-deposition of PAG and non-PAG rock during waste rock deposition minimizes the potential for formation of zones of PAG rock with a greater susceptibility for acid generation. Mixing of waste rock from the Jay Pit on an “as-mined” basis during operations is possible because of the simultaneous production of both metasediment and granite, with a predominance of granite, throughout the mine life.

According to the guidance in the Mine Environment Neutral Drainage prediction manual (MEND 2009), waste rock with a greater than two times more neutralization potential (NP) than acid potential (AP) is generally regarded to be non-PAG. The mine plan was used to calculate the NP/AP ratio of the waste rock material mined from the Jay Pit on a quarterly basis. The purpose of this evaluation was to confirm that an NP/AP ratio greater than 2 can be achieved based on the amount of each rock type (metasediment, granite, and overburden) mined each quarter. An NP/AP ratio of at least 2 was achieved over the life of mine.

The assumption that the Jay WRSA would not become acid generating was carried forward into the Developer’s Assessment Report (DAR) water quality predictions. Constant values were assigned to Jay WRSA seepage and runoff during spring melt (i.e., freshet) and the summer period, since these are the only periods when drainage from the facility is expected to occur. Seepage water quality monitoring results from 2001 to 2004 collected from the Misery WRSA during the months of June through September were used to represent the seepage and runoff quality from the Jay WRSA. Use of these data is considered conservative since the Misery WRSA contains a higher proportion of PAG material compared to other WRSAs located at the Ekati Mine operations. The rock types stored in the existing Ekati Mine WRSAs are the same as proposed for the Jay WRSA; however, there is variability in their composition ratios and placement methods. Details of the model inputs used to represent the quality of the Jay WRSA runoff quality are provided in Section 8E3.4 of Appendix 8E of the DAR.

Flow estimates from the Jay WRSA used in the site water balance model did not consider the development of permafrost in the pile, and application of the WRSA chemical profile to this flow provides a conservative estimate of the load from this facility. Under the assumption that the WRSA will not become acid generating, the model case provided in the DAR conceptually represents a model case for no development of permafrost in the Jay WRSA (i.e., the climate change scenario requested as part of this information request). Projected water quality constituent concentrations in Lac du Sauvage and Lac de Gras, accounting for operational, closure, and post-closure discharges from the Project that includes runoff from the Jay WRSA, indicate the Project is not expected to have a significant adverse effect to surface water quality.

Following the existing Ekati Mine WROMP Vers. 4.1, seepage surveys of all WRSAs at the Ekati Mine are conducted twice a year (during spring freshet, and again in late summer or fall before freeze-up), in accordance with the requirement of the Water Licence. The testing of seepage chemistry is designed to detect changes that may affect the receiving environment. The Jay WRSA will be added to the Ekati WROMP and will be included in these seepage surveys. Seepage monitoring will continue through the operation stage of the project, and for 10 years following the completion of mining until closure objectives are met. The objectives of seepage monitoring include identifying increasing trends in constituent concentrations and elevated concentrations of specific elements.

Ekati has an adaptive management process in place for the existing WRSAs that is described in Section 7.7 of the WROMP Vers. 4.1. This adaptive management process will also apply to the Jay WRSA. The adaptive management strategy outlined in the WROMP for the Ekati Mine includes the following components:

- Identification of issue, verification of trigger and development of a response plan.
- Additional studies to determine the extent of the impact of seepage (if any), and modification of the WROMP and seepage management program.
- Implementation of modified programs, and design / construction of mitigation structures and facilities (if required).

At the time of closure of the Jay WRSA, water quality monitoring will have been completed for approximately 10 years at the Jay WRSA and for up to 25 years at the other Ekati WRSAs. This historic monitoring will provide valuable data and potential insight in to water quality trends, if they occur. The rock types stored in the Ekati WRSAs are the same as the Jay WRSA, just variation in ratios and placement methods.

Dominion Diamond submitted a health risk assessment study for humans and wildlife (including caribou) on February 2, 2015 (Dominion Diamond 2015). The results of this study support the predictions in the DAR, which indicate health risks to caribou from the Project (including the ingestion of seepage and surface runoff from WRSAs) are anticipated to be negligible.

References:

Dominion Diamond (Dominion Diamond Ekati Corporation). 2014. Ekati Diamond Mine Waste Rock and Ore Storage Management Plan. Version 4.1, May 2014.

Dominion Diamond. 2015. Human and Wildlife Health Risk Assessment Report for the Jay Project. Prepared by Golder Associates Ltd., February 2015. Yellowknife, NWT, Canada.

MEND (Mine Environment Neutral Drainage). 2009. Prediction Manual for Drainage Chemistry from Sulphidic Geologic Materials. MEND Report 1.20.1. December 2009.

DOMINION DIAMOND

Information Request Number:	DAR- KIA-IR-20
Source:	Kitikmeot Inuit Association: Tannis Bolt
Subject:	Barren-Ground Caribou - Mitigation for impacts on caribou due to blasting
DAR Section(s):	12.3.2.2.2

Preamble (KIA):

Physical hazards leading to increased risk of injury or mortality to individual caribou lists the following mitigation for blasting in the pit and quarry: "Blasting in the pit and quarry, if necessary, will be carefully planned and controlled to minimize fly rock that might injure caribou." This commitment doesn't provide a minimum distance that caribou need to be away from the blasted area to initiate blasting.

Request (KIA):

Please provide details or a commitment on the minimum distance that caribou will need to be to initiate a blast at the quarry or pit. Please provide provisions for ceasing all blasting activity when a large group is moving through the area, and provide details on distance and group size that would require a stop order on blasting activities.

Response:

The same protocols are used for caribou safety during blasting as for humans. Blasts will not take place if there are people or caribou within the blast exclusion area. The blast exclusion area is determined by the blast supervisor prior to blasting based on the requirements of the Northwest Territories *Mine Health and Safety Act* and other related Acts and Regulations. Blasting will continue to be conducted in accordance with the requirements of the relevant Acts and Regulations, procedures in place at the Ekati Mine, and supervised by the Ekati Mine blasting team. This will ensure the safety of caribou as it does people.

DOMINION DIAMOND

Information Request Number:	DAR- KIA-IR-21
Source:	Kitikmeot Inuit Association: Tannis Bolt
Subject:	Vegetation
DAR Section(s):	12.3.2.2.2

Preamble (KIA):

This section [12.3.2.2.2] states that "Dewatering of diked area of Lac du Sauvage may result in newly established vegetation on exposed lakebed sediments that could change caribou habitat quality" by providing new habitat. We have concerns that this new habitat will draw caribou to it, but be of poor quality due to its proximity to roads and other dust-generating activities and given the previous statement in Section 12.3.2.2.2, p. 12-57 that "Roads that are used to access the Project and the dewatered diked area in Lac du Sauvage are the main source of dust (PM and TSP) due to the re-suspension of soil and sediment particles (Section 11.3.2.2.2). Accumulation of dust (i.e., TSP deposition) may result in a local direct change on the quantity, distribution, and quality of vegetation near the Project."

Request (KIA):

Please comment on the predicted quality of new vegetation that could become established in the diked areas of Lac du Sauvage, given it's location, and the potential chemicals that will be contained in dust that may deposit on vegetation in this area.

Response:

It is expected that the species composition of established vegetation will be influenced by the amount of dust deposition occurring in this area. Odland and del Moral (2002) found that vegetation, primarily annuals, rapidly established in areas of drawdown and they found that this rapid establishment was a result of the persistent seed bank present in the soil. Species commonly observed to colonize disturbed and dewatered areas often include the genera *Carex* (sedges), *Puccinellia* (alkali-grass), *Arctagrostis* (polar grass), *Calamagrostis* (reed grass), *Epilobium* (fireweed or willow herb), and *Polytrichum* (hair cap moss) (Ovenden 1986; Kershaw and Kershaw 1987; Odland and del Moral 2002; Hugron et al. 2011). However, the species that will establish will be influenced by the condition of the surface (e.g., moisture status, resistance to wind erosion) and proximity to the former shoreline (Ovenden 1986).

Species such as *Sphagnum* mosses and most species of lichen are sensitive to dust deposition, and decrease in proximity to dust sources. More tolerant mosses, such as haircap moss (*Polytrichum* species [spp.]) and Bryum moss (*Bryum* spp.), tend to increase with dust (Farmer 1993). Species such as cotto]ngrass (*Eriophorum* spp.) are more tolerant of dust and are found to be more abundant next to roads, and some shrub species such as willow (*Salix* spp.) increase in cover with dust deposition (Auerbach et al. 1997).

Results from the 2011 air quality monitoring report indicate that dustfall levels dropped off at distances of 300 and 1,000 metres (m) downwind of Fox Road, with average concentration values of 1.64 and 0.31 milligrams per square decimetre per day (mg/dm^2/d), respectively (BHP Billiton 2012). The average of all

background samples from approximately 36 and 21 kilometres (km) away from the Ekati main camp was 0.20 mg/dm^2/d. The chemical analyses on dust included metals (aluminum, antimony, arsenic, barium, beryllium, bismuth, boron, cadmium, calcium, chromium, cobalt, copper, lead, lithium, magnesium, manganese, mercury, molybdenum, nickel, potassium, selenium, silver, sodium, strontium, thallium, tin, uranium, vanadium, zinc), and anions and nutrients (ammonia, chloride, nitrate, and sulfate). Dust analytical results show that concentrations of analytes are below detection limits or are present in trace amounts (BHP Billiton 2012). Similar observations would be expected for the Jay Project (Project). Sources of dust deposition modelled in the Application Case include blasting activities, the processing plant, activities at the open pit and other ancillary facilities, the exposed lake bed sediments, the air strip, and vehicle traffic along the mine roads (Section 7.4 of the Developer's Assessment Report [DAR]). The results of the air quality modelling (presented in the response to DAR-LKDFN-IR-10) predicted that the estimated maximum dust deposition rate will only exceed the most stringent dustfall guideline (1.7 mg/dm²/d) between British Columbia and Alberta within 500 m outside of the Project footprint. The highest deposition rates predicted would be mostly associated with the Jay Pit and haul roads. The dust deposition rates were predicted to decrease with increasing distance from the primarily emission sources of dust (e.g., Jay Pit and haul roads), with the predicted deposition rates at or below 10% of the dustfall guideline within 3 km from the Project perimeter.

With respect to caribou habitat, the quoted passage from Section 12 3.2.2.2 of the DAR should read: "*Dewatering of diked area of Lac du Sauvage may result in newly established vegetation on exposed lakebed sediments and could change caribou habitat* quantity" (emphasis added). The establishment of vegetation on exposed lake sediments within the diked area of Lac du Sauvage has the potential to be used by caribou that may access the diked area. However, it is expected that caribou would likely avoid the area during open-pit operations because of the close proximity to mine operations and due to limited accessibility into this area. The proposed Jay Dike is expected to limit caribou access to the exposed lakebed sediments and there will be a high amount of traffic and other sensory disturbance associated with the Jay Pit, which is likely to limit caribou attraction to the dewatered portion of Lac du Sauvage. The Jay Dike and pit area will be part of routine site surveillance monitoring for the Ekati Wildlife Effects Monitoring Program. If caribou do enter the diked area, Dominion Diamond Ekati Corporation will implement deterrent procedures (e.g., walking towards caribou) to keep animals and people safe. As a result, any newly established vegetation communities are expected to have a negligible effect on caribou.

References:

Auerbach NA, Walker MD, Walker DA. 1997. Effects of roadside disturbance on substrate and vegetation properties in Arctic tundra. Ecol Appl 7: 218-235.

BHP Billiton (BHP Billiton Canada Inc.). 2012. EKATI Diamond Mine: 2011 Air Quality Monitoring Program. Prepared by Rescan Environmental Services Ltd., Yellowknife, NWT, Canada.

Farmer AM. 1993. The effects of dust on vegetation – a review. Environ Pollut 79:63-75.

Hugron S, Andersen R, Poulin M, Rochefort L. 2011. Natural plant colonization of borrow pits in boreal forest highlands of eastern Canada. Botany 89:451-465.

Kershaw GP, Kershaw LJ. 1987. Successful plant colonizers on disturbances in tundra areas of northwestern Canada. Arct Alpine Res 19:451-460.

Odland A, del Moral R. 2002. Thirteen years of wetland vegetation succession following a permanent drawdown, Myrkdalen Lake, Norway. Plant Ecol 162:185-198.

Ovenden L. 1986. Vegetation colonizing the bed of a recently drained thermokarst lake (Illisarvik), Northwest Territories. Can J Bot 64:2688-2692.

DOMINION DIAMOND

Information Request Number: DAR-KIA-IR-22

Source: Kitikmeot Inuit Association: Tannis Bolt

Subject: Barren-Ground Caribou

DAR Section(s): 12.4.1.2

Preamble (KIA):

This section is confusing to read, as it does not clearly delineate the three models being tested until the very end: of the methods section. Presentation of the three metrics being evaluated in the determination of impacts on caribou habitat (below) should be presented earlier, and writing should clearly delineate what each calculated, and how that pertains to changes in historic habitat availability prior to the project, the application case (Effects Assessment of the project alone) versus the cumulative effects assessment. Further, as some of the greatest changes in values are reported as occurring between the reference case and the reasonably foreseeable development case (not surprising) inclusion of the reference case and focus on it in the discussion appears to reduce the focus on the actual effects being evaluated: the Effects of the Jay Pipe Project (EA) and cumulative impacts of the Jay Pipe Project + ongoing and reasonably foreseeable developments (CEA), though it is interesting to know what historic conditions were like prior to 2014. Metrics Evaluated 100 × (2014 baseline condition value - reference conditions value) / reference conditions value. 100 × (Application Case value - 2014 baseline condition value) / 2014 baseline condition value. 100 × (RFD Case value - Application Case value) / Application Case value.

Request (KIA):

Please re-organize the methodology and results of this section for ease of reader understanding such that methods are clearly articulated for each of the three metrics outlined at the end of the section on page 12-78. We suggest that organizing the methods and results under headers that pertain to each metric being evaluated (Historic Changes, Changes due to Project (EA), and Cumulative Effects (Project + current and future projects), or at least that clearly subdivide the EA (incremental) from the CEA (cumulative), and including a separate heading for sections that deals with reference conditions, will help to organize these sections more logically. Please also clarify and contextualize the purpose of looking at the reference model relative to 2014 conditions and comparing it to future conditions, as this comparison deal with losses prior to project development, which is not typically included in an EA or CEA documents. EA and CEA analyses normally start at the present (baseline) and look for predicted effects between present and future conditions.

Response:

The organizational approach for results provided in the Developer’s Assessment Report (DAR) allows the full temporal scope of cumulative effects for each development case (Baseline, Application, and Reasonably Foreseeable Development cases) relative to the Reference Condition (little to no development on the landscape). The organization of the methods and results of the DAR are consistent with recent environmental assessments for the Gahcho Kué (De Beers 2010) and NICO projects (Fortune 2011) completed in the Northwest Territories. The approach taken in the DAR was appropriate to meet the Terms of Reference. Providing reference or pre-development conditions is essential to determining

and understanding the cumulative effects of previous and existing projects, as required in the Terms of Reference (Section 4.1: MVEIRB 2014). Calculating changes from previous and existing developments (i.e., reference to 2014 Base Case conditions) is necessary for assessing and evaluating the significance of incremental effects from the Project, and the cumulative effects from the Project and previous, existing, and reasonably foreseeable developments.

References:

De Beers Canada Inc. 2010. Gahcho Kué Project Environmental Impact Statement. Prepared by Golder Associates Ltd.

Fortune (Fortune Minerals Ltd.). 2011. NICO Developer's Assessment Report. Prepared by Golder Associates Ltd.

MVEIRB (Mackenzie Valley Environmental Impact Review Board). 2014. Revised Terms of Reference (EA1314-01) Jay Project, Dominion Diamond Ekati Corporation. July 17, 2014. Yellowknife, NWT, Canada.

DOMINION DIAMOND

Information Request Number: DAR-KIA-IR-23

Source: Kitikmeot Inuit Association: Tannis Bolt

Subject: Barren-Ground Caribou

DAR Section(s): 12.4.2.2.2

Preamble (KIA):

Results in this table suggest that there has been, an extremely small amount of functional (direct and indirect) loss of spring/calving habitat between the reference period and 2014 (<1%), during a period of dramatic declines in Bathurst caribou numbers. It appears that functional losses to post-calving, autumn, and winter habitats accompanied caribou declines to date, if functional habitat loss is thought to play a role.

Request (KIA):

Based on the results of losses of habitat to date (reference range to 2014) along with the stark decline in Bathurst population numbers, please comment on whether post-calving, autumn, and winter habitats are thought to be potentially limiting (in part) to the size of the Bathurst herd.

Response:

The possible limiting effects of habitat loss on the Bathurst caribou population were incorporated into population modelling that was completed in response to Mackenzie Valley Environmental Review Board (MVEIRB) Jay Project Adequacy Review Item 8.8. The response was presented in a submission to the MVEIRB on February 2, 2015 as DAR-MVEIRB-15.

The conclusion reached was that habitat loss from human development did not have an effect on current vital rates and abundance of the Bathurst herd. This is consistent with the ecological literature that limiting effects of habitat losses on any population are expected to be observed when populations are near their peak abundances rather than at low density (McLoughlin et al. 2006).

References:

McLoughlin PD, Boyce MS, Coulson T, Clutton-Brock T. 2006 Lifetime reproductive success and density-dependent, multi-variable resource selection. Proc R Soc. B 273:1449–1454

DOMINION DIAMOND

Information Request Number:	DAR-KIA-IR-24
Source:	Kitikmeot Inuit Association: Tannis Bolt
Subject:	Barren-Ground Caribou
DAR Section(s):	12.4.2.2.2

Preamble (KIA):

The last paragraph on this page states that: "From 2011 to 2012, motion detection wildlife cameras were used to investigate caribou interactions with the Misery Road and other mine site roads (ERM Rescan 2014a). The overall rate of deflections was observed at approximately 2% of road interactions, meaning that 98% of the caribou-road interactions photographed did not show clear observations to suggest that the Misery Road impeded movement. Deflections did not appear to be affected by changing traffic levels on the Misery Road over the duration of the study (ERM Rescan 2014a). However, the effective range of the cameras is likely limited to less than 500 m, meaning that caribou reactions to the road beyond this distance would be difficult to discern from the data" Please see comments for IR #7.

Request (KIA):

As mentioned in IR #7, we feel that, without analysing cameras triggered at various distances from caribou behaviours captured at or near roads, no reasonable conclusions can be made from the study by ERM Rescan (2014) (Earlier cited as Rescan (2014b)) about the effect of changing traffic levels on deflections. We suggest that all statements pertaining to effects of traffic on caribou road crossing derived from this study be revisited and modified or removed as they overextend the results to answer questions that the data cannot answer.

Response:

It is recognized by Dominion Diamond Ekati Corporation (Dominion Diamond) that the cameras recording caribou interaction along roads at the Ekati Mine do not reflect deflection rates that may be occurring at before caribou reach the road. However, the results from these cameras and from the snow trail surveys do indicate that these roads do not act as a complete barrier to caribou movements as assumed in the Developer's Assessment Report (DAR).

However, the ground-based focal and scanning behaviour studies at the Ekati Mine address the concerns raised by the Kitikmeot Inuit Association (KIA) (please also see response to DAR-KIA-IR-07). During these studies, observers undertook extended observations of both caribou groups and individuals to record their behaviour and response to stressors (ERM Rescan 2014). This dataset includes 62 focal watches of individual caribou from 2011 through 2013, and 171 groups from 2010 to 2013. Analysis of these data indicated that light vehicles and medium vehicles were significantly associated with increased alertness in caribou, but not heavy vehicles (possibly due to a low sample size for this category). However, the duration of this alert response was short. Considering all stressors (vehicles, aircraft, people), the average time spent alert before returning to the behaviour before the stressor was 35 seconds for bulls and 16 seconds for cows.

Considering the results of these two intensive studies on the Misery Road, Dominion Diamond feels that the data have been correctly interpreted and the conclusions presented in the DAR are a good estimate of the effects of traffic and the Misery Road on caribou behaviour.

References:

ERM Rescan (ERM Rescan Environmental Services Ltd.). 2014. Ekati Diamond Mine: 2013 Wildlife Effects Monitoring Program. Prepared for Dominion Diamond Ekati Corporation. Appendix 5.1 Caribou Behaviour Direct Monitoring Program. Yellowknife, NWT.

DOMINION DIAMOND

Information Request Number:	DAR- KIA-IR-25
Source:	Kitikmeot Inuit Association: Tannis Bolt
Subject:	Barren-Ground Caribou
DAR Section(s):	12.4.2.2.2

Preamble (KIA):

Section 12.4.2.2.2 states that traffic volumes were assumed to 56 trips per day by road trains (consisting of one truck pulling 3 trailers), with approximately 12.3 minutes separating each road train, for the effects assessment on caribou. However, Section 3.5.1.6 in the project description assumes that 56 trips per day will be made by long-haul trucks with a fleet of seven trucks, making 8 trips per day. Other traffic not included in this estimate, as indicated in the project description, section 3.5.1.6, included bulk explosives trucks, crew transport vehicles, road maintenance equipment, garbage trucks, low-bed trucks to transport larger equipment, water trucks, emergency vehicles and light vehicles. Caribou likely respond to these vehicle types as well, a they may comprise a very large number of vehicles, likely far greater than comprised in the 56 trips mentioned.

Request (KIA):

Please clarify the apparent discrepancy between the description of the 56 round trips made in the Project Description, and that made in the Caribou Assessment. Please provide estimates of the total number of vehicles, of all types anticipated to use Misery and Jay Roads, including all traffic types, and consider these total numbers in assessing the impacts of road traffic on caribou movement. Please include an assessment of road traffic added to Tibbitt to Contwoyto Lake for the proposed Jay Pipe project on caribou.

Response:

The 56 round trips by road trains referred to in the Developer’s Assessment Report (DAR) Section 12.4.2.2.2 and the 56 round trips by long-haul trucks referred to in DAR Section 3.5.1.6 are references to the same round trips by the same vehicles. As noted in the preamble, there will be other traffic on the Jay and Misery roads and it is agreed that caribou will likely respond to all vehicles, not just the long-haul ore trucks. Long-haul ore trucks will make up the majority of traffic on the Jay and Misery roads.

Appendix C (Traffic Associated with the Jay Project) presents a detailed set of estimates for the number of round trips of both long-haul ore trucks and other non-haul vehicles. Based on all types of vehicles and 365 days per year road operation, Appendix C, Table 2 shows estimates of 79 round trips per day on the Jay Road and 94 round trips per day on the Misery Road, i.e., 9.1 minutes and 7.7 minutes between vehicles, respectively (Appendix C, Table 3, based on vehicles going either direction).

Mitigation strategies include modification of traffic patterns and temporary road closures to permit caribou to move through the area. If Jay and Misery roads are closed for 15 days per year for caribou passage and weather events, the estimated number of round trips per day of road operation are estimated to increase to 82 on the Jay Road and 96 on the Misery Road (Appendix C, Table 4); 8.8 minutes and 7.5

minutes, respectively, between vehicles (Appendix C, Table 5). The environmental design features and traffic mitigation strategies identified in the DAR are summarized in Appendix C. The mitigation strategies are expected to be effective in permitting caribou passage through the area. The effectiveness of mitigation will be monitored and the results used as feedback for adaptive management, which may require modification and/or additional mitigation and effects management strategies. The Wildlife and Wildlife Habitat Protection Plan and Wildlife Effects Monitoring Program will be submitted during the Jay Project permitting phase.

Despite the expectation of effective mitigation, in the assessment of residual effects of the Jay Project and the cumulative effects of all previous, existing, and reasonably foreseeable developments, all caribou were assumed to be deflected by development and required to travel around the Ekati Mine and Jay Project, and associated roads, pits, and other infrastructure. That is, the maximum effects of the Misery and Jay roads were analyzed in the DAR. Hence, an increase in traffic volume does not affect the assessment of the Project-specific and cumulative effects on caribou.

With respect to the Tibbitt to Contwoyto Winter Road (TCWR), the Ekati Mine will remain operating at the same production rate of 4.35 million tonnes per year of ore, so vehicular estimates on the TCWR are expected to remain similar to existing numbers. During the construction phase of the Jay Project, the number of northbound loads is expected to increase by 200 trucks per winter road season. The historic number of operating days and traffic volumes for the TCWR appear in Appendix C, Table 1.

DOMINION DIAMOND

Information Request Number:	DAR- KIA-IR-26
Source:	Kitikmeot Inuit Association: Tannis Bolt
Subject:	Power line as an attractant to predators
DAR Section(s):	12.4.2.2.2

Preamble (KIA):

The potential effects of power lines are discussed on pages 12-97 to 12-98. The potential for grizzly bears to be attracted to power lines, as they may be considered attractive as scratching opportunities, is not considered in relation to how this could impact caribou through predation.

Request (KIA):

Please comment on attraction of grizzly bears to power line poles.

Response:

Grizzly bears are not expected to use the power lines for scratch posts. The existing transmission line poles along the Long Lake and Grizzly Lake roads have not been an area of interest to grizzly bears based on 16 years of monitoring at the Ekati Mine. The power lines will be situated parallel to the Misery Road, and will have a gravel base. Further, grizzly bears will often scratch on large erratic boulders, which are common in the Ekati Mine area. Consequently, no changes to caribou predation from grizzly bears is expected as a result of the proposed transmission line.

DOMINION DIAMOND

Information Request Number: DAR-KIA-IR-27

Source: Kitikmeot Inuit Association: Tannis Bolt

Subject: Barren-Ground Caribou

DAR Section(s): 12 (Figure 12.4-5)

Preamble (KIA):

The dashed line of 385 encounters estimated to result in no partuition during a severe insect year is poorly explained.

Request (KIA):

Please provide more information on how the encounter rate of 385 encounters per year was estimated as resulting in no partuition during a severe insect year. Please provide an explanation about how insect-related encounters are comparable to encounters with various forms of human stressors, such as airplanes, explosions, and vehicles, which may produce different levels of stress due to the lack of evolution for coping with such encounters. Other than the argument by Bergerud et al. (2008), that sensory disturbances from development have substantially fewer effects on caribou compared to the stress the animals sometimes face by oestrid flies, are there any other studies that substantiate that claim objectively? What data did Bergerud et al. (2008) base his comparative argument on? Are there any studies that argue the opposite?

Response:

The number of disturbance events (i.e., zone of influence encounters) required to achieve a value of 0.0 probability of parturition (no calving) was calculated from the body mass loss energetic equation, after accounting for the body mass loss due to severe insect harassment (Section 12.4.2.3, page 12-108 of the Developer's Assessment Report [DAR]). For review, the body mass loss equation provided in the DAR is:

$$\text{Proportional Decrease in Parturition Rate} = \frac{\left((IHI - 15) \times 0.185\ kg\right) + (DE \times 0.55 \times 0.069\ kg)}{20\ kg}$$

Where:

i) *IHI* is measured as oesterid harassment days;

ii) 0.185 kg is the *decline* in body mass per oesterid harassment day;

iii) *DE* is number of disturbance events, defined as one zone of influence encounter (or one day within a ZOI);

iv) 0.55 is the frequency that caribou respond to a disturbance event (based on behavioural observations at the Ekati Mine [Rescan 2010]);

v) 0.069 kg is the decline in body mass loss per disturbance response; and,

vi) 20 kg is 20% of the autumn body mass (100 kg) of a healthy caribou cow.

The DAR assumed that 20 kilograms (kg) of body mass loss by autumn would result in no parturition or no calf the following spring. The value of severe insect harassment used in the DAR was 44 Potential Insect Harassment Days (Weladjii et al. 2003), which represents the annual maximum value calculated from weather data at the Snap Lake and Diavik mines. The decrease in body mass resulting from this value is 5.365 kg ([44 – 15]*0.185 kg), leaving an additional 14.635 kg of loss before no parturition occurs. A single disturbance event results in a body mass loss of 0.038 kg (1 x 0.55 x 0.069 kg). Using division to determine the number of disturbance events results in 385 disturbance events (14.635 kg ÷ 0.038 kg). The number was reduced to 331 disturbance events in the Addendum to the DAR (Dominion Diamond 2014) resulting from inclusion of additional reasonably foreseeable future developments.

The costs used in the caribou energy model were derived from the scientific literature (Boertje 1985; Bradshaw et al. 1998) and include costs associated with insect harassment (Weladjii et al. 2003) as well as from anthropogenic disturbance (Bradshaw et al. 1998). Bradshaw et al. (1998) used propane cannons to simulate disturbance to boreal caribou from blasting. There are no scientific results of energetic costs specific to aircraft or traffic but can be expected to be infrequent and of short duration (aircraft) or have a much smaller zone of influence (roads) than the 15 kilometres (km) assumed in the DAR. The DAR also assumed an equal cost for caribou within a 15 km zone of influence regardless of how far away from the development footprint the animal was located. A number of additional ecological conservatisms were used in the energetic analysis, which are stated throughout the DAR, summarized in Table 12.5-1, and further explained in the response to DAR-MVEIRB-IR-99. The approach taken in the assessment used the best information available on energetic costs to caribou, was conservative and managed uncertainty so that effects would not be underestimated to provide confidence in impact predictions.

References:

Boertje RD. 1985. An Energy Model for Adult Female Caribou of the Denali Herd, Alaska. J Range Manage 38: 468-173.

Bradshaw CJA, Boutin S, Hebert DM. 1998. Energetic implications of disturbance caused by petroleum exploration to woodland caribou. Can J Zoolog-Can J Zool 76:1319-1324.

Dominion Diamond (Dominion Diamond Ekati Corporation). 2014. Jay Project Developer’s Assessment Report Sable Addendum. Prepared by Golder Associates Ltd., December 2014.

Rescan (Rescan Environmental Services Ltd.). 2010. Ekati Diamond Mine 2010 Wildlife Effects Monitoring Program. Yellowknife, NWT, Canada.

Weladji RB, Holand O, Almoy A. 2003. Use of climatic data to assess the effect of insect harassment on the autumn weight of reindeer (*Rangifer tarandus*) calves. J Zoolog 260:79-85.

DOMINION DIAMOND

Information Request Number:	DAR- KIA-IR-28
Source:	Kitikmeot Inuit Association: Tannis Bolt
Subject:	Barren-Ground Caribou - Minor not defined for low magnitude
DAR Section(s):	12.6.1.1 (Table 12.6-1)

Preamble (KIA):

For magnitude ratings, low magnitude is defined as the amount of change to measurement indicator results in no measurable effect on population abundance and distribution, or results in a minor measurable residual effect on the population.

Request (KIA):

Please define "minor". This is an important definition as magnitude is the main criterion on which significance is based.

Response:

A minor residual effect is a change in a measurement endpoint that is measurable but will have a negligible residual effect on the population, relative to the Base Case. A minor (small measurable) change would also not be expected to contribute to effects of other existing, approved, or reasonably foreseeable projects to cause a significant effect (Section 12.3.1 of the Developer’s Assessment Report).

DOMINION DIAMOND

Information Request Number:	DAR- KIA-IR-29
Source:	Kitikmeot Inuit Association: Tannis Bolt
Subject:	Barren-Ground Caribou - Resilience limits not defined for moderate and high magnitude
DAR Section(s):	12.6.1.1, Table 12.6-1

Preamble (KIA):

For magnitude ratings, moderate is defined as "Amount of change to measurement indicator results in a clearly defined change to population abundance and distribution, but the residual effects are well within the predicted resilience limits and adaptive capacity of the VC " and high is defined as "Amount of change to the measurement indicator is sufficiently large that the resulting range of residual effects are near or exceeding the predicted resilience limits and adaptive capacity of the VC".

Request (KIA):

Please define "resilience limits" for Bathurst caribou.

Response:

As detailed in Section 12.6.1.1 of the Developer's Assessment Report (DAR), ecosystems and populations often have inertia and will continue to function after disturbance up to the point where the disturbance becomes severe enough that the system or population changes. Ecological resilience is the capacity of the system to absorb disturbance, and reorganize and retain the same structure, function, and feedback responses (Holling 1973; Gunderson 2000; Curtin and Parker 2014; Standish et al. 2014). Population resilience can share similar features as ecological resilience, with adaptability influencing the ability of the population to absorb or recover from change. For the purpose of the DAR, a resilience limit would be the point (or threshold) below which a population can no longer absorb or recover from change on its own (Standish et al. 2014). Data for relating changes in measurement indicators to resilience or ecological thresholds are not available for Bathurst caribou and other wildlife valued components examined in the DAR, which is not uncommon (Standish et al. 2014). Consequently, the assessment of the magnitude of the changes in measurement indicators on caribou included the known or inferred ability of the population to absorb or recover from disturbance (Section 12.6.1.1, page 12-126).

Resilience is largely a function of demographic and behavioural life history traits (Standish et al. 2014) such as fecundity, age at reproduction, inter-birth interval, age-specific survival rates, lifespan of individuals, habitat selection, and seasonal ranges and migratory behaviour. The capacity or ability of individuals in a population to change and accommodate disturbance is also related to resilience. For example, certain wildlife species that avoid human features in relatively undisturbed landscapes can change their behaviour to accommodate disturbance where it is more prevalent (Martin et al. 2010; Knopff et al. 2014). Other populations may be able to increase reproduction to compensate for harvest mortality. As well, habitat landscapes that are less modified positively contribute to species resilience because habitat heterogeneity and connectivity is maintained (Lundberg and Moberg 2003; Heller and Zavaleta 2009; Standish et al. 2014). For example, the location of regional self-sustaining populations of

woodland caribou occur in areas where large amounts of the landscape remains intact (EC 2012). Habitat quantity and fragmentation were included as measurement indicators in the DAR and were considered in the determination of significance.

References:

EC (Environment Canada). 2012. Recovery Strategy for the Woodland Caribou (*Rangifer tarandus caribou*), Boreal population, in Canada. Species at Risk Act Recovery Strategy Series. Environment Canada, Ottawa. xi + 138 pp.

Curtin CG, Parker JP. 2014. Foundations of resilience thinking. Cons Biol 28: 912-923.

Gunderson LH. 2000. Ecological resilience – in theory and application. Ann Revi Ecol Systematics 31:425-439.

Heller NE, Zavaleta ES. 2009. Biodiversity management in the face of climate change: a review of 22 years of recommendations. Biol Conserv 142: 14-32.

Holling CS. 1973. Resilience and stability of ecological systems. Ann Rev Ecol Systematics 4:1-23.

Knopff AA, Knopff KH, Boyce MS, St. Clair CC. 2014. Flexible habitat selection by cougars in response to anthropogenic development. Biol Conserv. 178:136-145.

Lundberg J, Moberg F. 2003. Mobile link organisms and ecosystem functioning: implications for for ecosystem resilience and management. Ecosystems 6:87-98.

Martin J, Basille M, Van Moorter B, Kindberg J, Allainé S, Swenson JE. 2010. Coping with human disturbance: spatial and temporal tactics of the brown bear (*Ursus arctos*). Can J of Zool 88: 875-883.

Standish RJ, Hobbs RJ, Mayfield MM, Bestelmeyer BT, Suding KN, Battaglia LL, Eviner V, Hawkes CV, Termperton VM, Cramer VA, Harris JA, Funk JL, Thomas PA. 2014. Resilience in ecology: Abstraction, distraction, or where the action is? Biol Conserv 177: 43-51.

DOMINION DIAMOND

Information Request Number:	DAR- KIA-IR-30
Source:	Kitikmeot Inuit Association: Tannis Bolt
Subject:	Barren-Ground Caribou
DAR Section(s):	12.6.1.1 (Table 12.6-1)

Preamble (KIA):

For duration, short-term is defined as: Residual effect from change to measurement indicator is reversible at end of construction of a project, medium-term is defined as: Residual effect from change to measurement indicator is reversible at end of operations of a project and long-term is defined as: Residual effect from change to measurement indicator is reversible within a defined length of time past closure of a project. Some impacts may create a lagged effect on wildlife, such as creating an energetic deficit that affects reproduction for a year or two following the effect, or causing a decline that requires a lag period for the population to recover. Duration can also be viewed as relative to the lifespan and reproductive frequency of a species, and application of set definitions across many different species can have different outcomes (e.g. a short term effect on a species that only lives for 4 years is relatively long for that species).

Request (KIA):

As it is not easily discerned from the explanation in Section 12.6.1.2, is it possible to select short-term as a duration value and to conclude that an effect is significant? Based on studies in the literature, would a caribou population that was impacted over a short or moderate term duration be expected to bounce back immediately after that stressor or impact is removed? How is this lag time accounted for in the assessment?

Response:

In the Developer's Assessment Report (DAR), the duration of residual effects is defined as the duration of the effect on the caribou population; it is not the duration of a specific stressor. Thus, although local changes in population abundance and distribution are not expected to be reversible immediately upon removal of disturbance from the Jay Project, this is accounted for in the residual impact classification. As defined in Section 12.6.1.2, duration includes reversibility, and a reversible effect from development is one that does not result in a permanent adverse effect on population processes (e.g., survival and reproduction) and properties (e.g., stability and resilience). The duration of an effect influences the classification of magnitude, which in turn is the primary criterion used to determine environmental significance.

Residual effects from habitat loss and fragmentation, sensory disturbance, and barriers to caribou movement are not predicted to be of short-term (i.e., reversible at the end of construction) or medium-term (i.e. reversible at the end of operation) duration. Although some stressors may occur primarily during construction (e.g., dust deposition from initial blasting of the Jay Pit), disturbance from the Jay Project is predicted to have continuous, long-term effects on the Bathurst herd, including potential time lags in the response of wildlife to Project effects once they are removed. That is, effects from habitat loss and

fragmentation, sensory disturbance, and barriers to caribou movement associated with the Project on the caribou population will occur continuously from the beginning of Project construction through some time after Project closure.

The duration of effects on wildlife after the closure of human developments is unknown (Vistnes and Nelleman 2008). However, learned avoidance behaviour during the construction and operation of the Jay Project that influences energetic balance may require several years to change once disturbance stressors are removed. It is anticipated that sensory disturbance effects (which includes changes in habitat quality and energetics) from the Project, may decrease gradually and be reversed 5 to 10 years after Project closure.

To be conservative, the DAR did not predict short-term effects from the Project on caribou and other wildlife species. Instead, effects were predicted to be long-term to account for potential time lags in the response of wildlife to Project effects, as well as the prediction that effects from the Project will continue from Project construction through to a period beyond Project closure.

References:

Vistnes I, Nelleman C. 2008. The Matter of Spatial and Temporal Scales: a Review of Reindeer and Caribou Response to Human Activity. Polar Biol 31:399-407.

DOMINION DIAMOND

Information Request Number:	DAR- KIA-IR-31
Source:	Kitikmeot Inuit Association: Tannis Bolt
Subject:	Barren-Ground Caribou
DAR Section(s):	12.6.1.1, Table 12.6-1

Preamble (KIA):

Not significant is defined as: "impacts are measurable at the individual level, and strong enough to be detectable at the population level, but are not likely to decrease resilience and increase the risk to a self-sustaining and ecologically effective caribou population."

Request (KIA):

If impacts can be detected at the population level, for populations like the Bathurst herd, which has been in strong decline, how is this considered not significant? We would suggest that the definition, particularly for Bathurst caribou, be one that considers any impact detectable at the population level due to this project as significant. Please see IR #41, for a request for a-prior power analyses for grizzly bear, wolverine and barren-ground caribou, to determine the minimum losses of each species that would be required to detect a population change due to the project, giving underlying levels of variation around baseline population estimates.

Response:

Please see response to DAR-KIA-IR-41.

DOMINION DIAMOND

Information Request Number:	DAR- KIA-IR-32
Source:	Kitikmeot Inuit Association: Tannis Bolt
Subject:	Barren-Ground Caribou
DAR Section(s):	12.6.2, Table 12.6-2

Preamble (KIA):

The ratings in Table 12.6-2 for impacts of increased traffic on Misery and Jay Roads are based on traffic underestimates (IR# 25), lack of consideration of a potential impact between the dewatering pipeline and the road (IR#3) and faulty interpretation of a former study (IR # 7 and #24).

Request (KIA):

Please revisit the impact classification for impacts of increased traffic on Misery and Jay Roads on caribou after updating information based on IR 3, 7 and 24.

Response:

Individual responses to the Information Requests listed in the preamble are provided (please see responses to DAR-KIA-IR-25, DAR-KIA-IR-3, DAR-KIA-IF-7, and DAR-KIA-IR-24). Traffic estimates inclusive of light vehicles for the Jay and Misery Rods during operation of the Jay Project are provided in Appendix C (Traffic Appendix). Environmental design features and traffic mitigation strategies have evolved over 15-years of operations at the Ekati Mine. That experience and Dominion Diamond's engagement program are incorporated into the design of the Jay Road.

Despite the expectation of effective mitigation, in the assessment of residual effects of the Jay Project and the cumulative effects of all previous, existing, and reasonably foreseeable developments, all caribou were conservatively assumed to be deflected (i.e., an absolute barrier to movement) by development and required to travel around the Ekati Mine and Jay Project, and associated roads, pits, and other infrastructure. That is, the maximum potential effect of the Misery and Jay roads were assumed. Hence, the impact classification remains the same as determined in the Jay Project Developer's Assessment Report.

DOMINION DIAMOND

Information Request Number:	DAR- KIA-IR-33
Source:	Kitikmeot Inuit Association: Tannis Bolt
Subject:	Wildlife and Wildlife Habitat - Breeding bird surveys and tundra breeding bird plots
DAR Section(s):	13.2.1.1.1

Preamble (KIA):

All assumptions about breeding birds are derived from previous data collected for the Ekati, Gahcho Kue and Snap Lake projects. Only breeding bird surveys, done within Ekati and along Misery road, were done recently (2003 to 2013), and tundra breeding bird surveys were stopped in 2008. The breeding bird surveys conducted along Misery road were obviously conducted to enable before-after comparisons of the impact of Misery road on breeding birds. These data were not coupled with control points, and are considered unsuitable for a BACI study even for this purpose. However, none of the studies previously done for other projects have surveys points within the proposed project area. While other data may give some idea about the species present in the area, the actual site itself must be sufficiently surveyed during baseline years, along with control plots to: a. enable the detection of potential high quality or critical habitat for breeding birds or breeding bird SAR associated with the specific footprint of the project, and b. to enable a BACI study that is able to measure the impact of the proposed Jay Pipe project on breeding bird populations.

Request (KIA):

Please provide information on whether the proponent will be conducting baseline surveys for this project. We recommend conducting baseline surveys for breeding birds at an appropriate time, and over a two year period, within the proposed project footprint, as well as in comparable habitats paired to survey points outside of the likely ZOI for birds.

Response:

Baseline surveys for upland breeding birds were completed to document breeding territories of all species (including bird species at risk) within the Jay Project development area in 2013 and 2014 (see Dominion Diamond [2014] and response to DAR-EC-IR-29). During these surveys, three people walking abreast within the proposed Project footprint covered a swath of approximately 100 metres, documenting all upland birds encountered and relevant incidental observations. These surveys indicated that species composition is typical of the region.

There have been extensive upland breeding bird surveys in the area around Ekati as part of this mine's Wildlife Effects Monitoring Program from 1996 to 2008 (summarized in the Wildlife Baseline Report, Annex VII, Section 3.8 page 3-16), but these surveys were unable to discern Mine-related effects to species richness, diversity, or density (Smith et al. 2005; Rescan 2010). Further, intensive studies of Lapland longspur did not identify changes in nesting success of nests near roads (Male and Nol 2005). As such, upland breeding bird monitoring for the Ekati Mine was discontinued in 2008, with the agreement of Environment Canada and the Independent Environmental Monitoring Agency; therefore,

more intensive upland bird surveys were not undertaken for the Jay Project. Currently, Ekati contributes to a national monitoring initiative through the North American Breeding Bird Survey (ERM Rescan 2014).

References:

Dominion Diamond (Dominion Diamond Ekati Corporation). 2014. Jay Project Developer's Assessment Report Sable Addendum. Prepared by Golder Associates Ltd., December 2014.

ERM Rescan (ERM Rescan Environmental Ltd.). 2014. Ekati Diamond Mine: 2013 Wildlife Effects Monitoring Program. Prepared for Dominion Diamond Ekati Corporation by ERM Rescan: Yellowknife, NWT, Canada.

Male, SK, Nol E. 2005. Impacts of roads associated with the Ekati Diamond Mine™, Northwest Territories, Canada, on reproductive success and breeding habitat of Lapland longspurs. Can J Zool 83: 1285-1296.

Rescan (Rescan Environmental Services Ltd.). 2010. Ekati Diamond Mine 13-Year Breeding Bird Monitoring Program Summary. Prepared for BHP Billiton Canada Inc.

Smith AC, Virgl JA, Panayi D, Armstrong AR. 2005. Effects of a diamond mine on tundra-breeding birds. Arctic 58: 295-304.

DOMINION DIAMOND

Information Request Number:	DAR- KIA-IR-34
Source:	Kitikmeot Inuit Association: Tannis Bolt
Subject:	Wildlife and Wildlife Habitat
DAR Section(s):	13.2.1.1, 13.2.1.1.2, Maps 13.2-6, 13.2-17

Preamble (KIA):

Most assumptions about waterbirds are largely derived from previous data collected for the Diavik, Gahcho Kue, and Snap Lake projects, the closest of which, Diavik, is more than 12 km south of the proposed site. A one-day survey of Lac du Savage was also done on August 8, 2013, but rough water rendered the survey inaccurate, and a second survey had to be done from the shoreline on August 12, 2013 (no map provided of search area). While other data may give some idea about the species present in the area, the actual site itself must be sufficiently surveyed during baseline years, along with control plots to: a. enable the detection of potential high quality or critical habitat for waterbirds or waterbird SAR associated with the specific footprint or shoreline of the project, and b. to enable a BACI study that is able to measure the impact of the proposed Jay Pipe project on waterbird populations.

Request (KIA):

Please provide a map showing the shoreline area surveyed for waterbirds on August 12, 2013. Please provide information on whether the proponent will be conducting another aerial waterbird baseline surveys for this project. We recommend conducting at least two proper aerial baseline surveys for waterbirds at appropriate times of the year within the proposed project footprint and surrounding lake, as well as in comparable habitats paired to survey points outside of the likely ZOI for birds, particularly as this project proposes to dewater some of the lake and to modify the shoreline and as Lac du Gras and its shoreline is consider high quality habitat for waterbirds (Appendix 13C, Maps 13C-2 and 13V-5; RSF Maps).

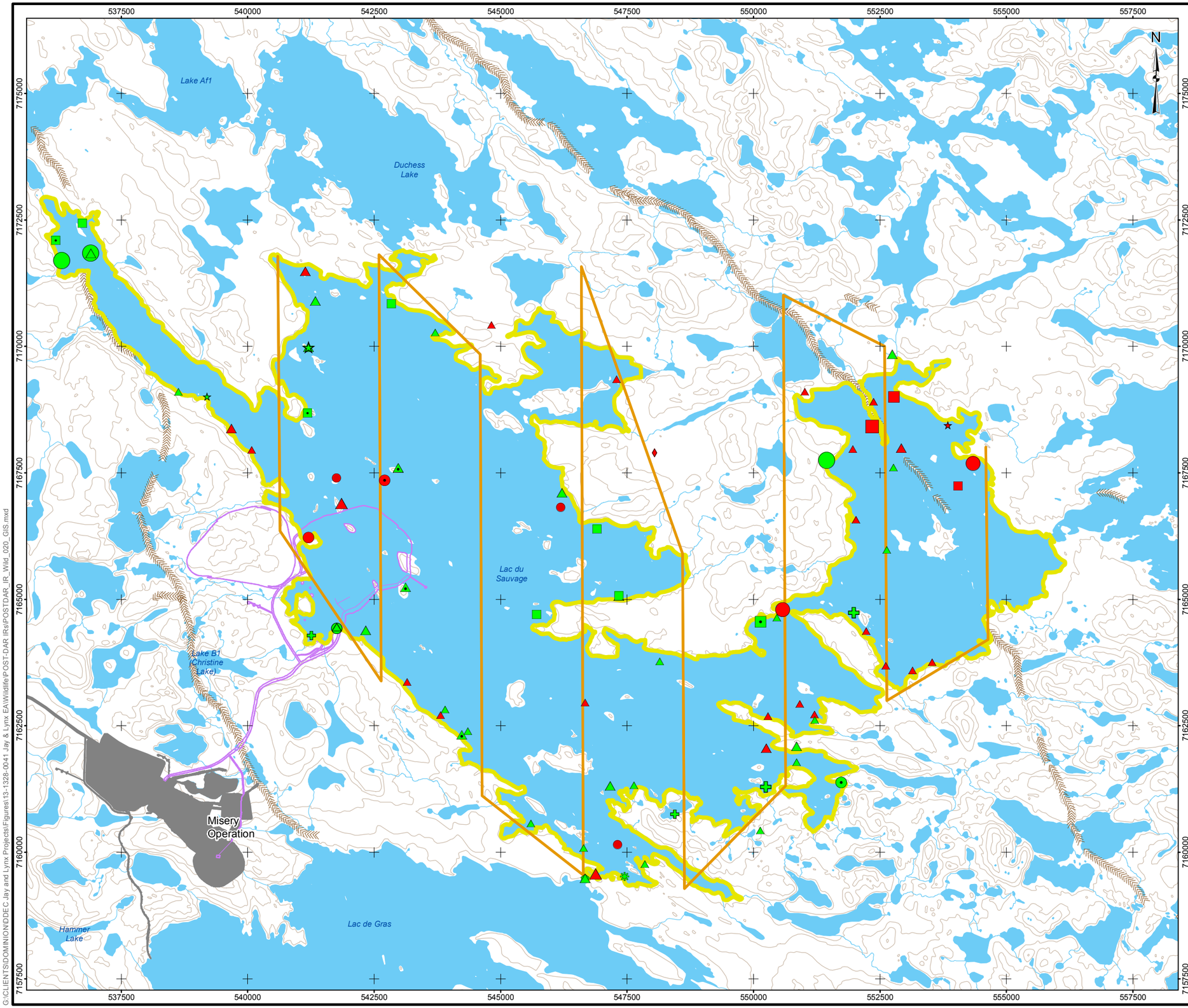
Response:

Waterbird surveys were completed in 2013 and in 2014 (Dominion Diamond 2014). Map 34-1 is provided below to show the aerial transect survey and shoreline survey for both the 2013 and 2014 waterbird aerial surveys. The 2013 aerial surveys were completed on August 8 and August 12. The 2014 aerial survey was completed on July 11. The Ekati Mine Wildlife Effects Monitoring Program (ERM Rescan 2014) will be expanded to include monitoring at the Jay Project. Specific monitoring at the Jay Project will be proposed and discussed during the permitting phase.

References:

Dominion Diamond (Dominion Diamond Ekati Corporation). 2014. Jay Project Developer's Assessment Report Sable Addendum. Prepared by Golder Associates Ltd., December 2014.

ERM Rescan (ERM Rescan Environmental Services Ltd.). 2014. Ekati Diamond Mine: 2013 Wildlife Effects Monitoring Program. Prepared for Dominion Diamond Ekati Corporation by ERM Rescan. Yellowknife, NWT, Canada.



LEGEND

- EKATI MINE FOOTPRINT (MISERY OPERATION)
- PROPOSED JAY FOOTPRINT
- ELEVATION CONTOUR (10 m INTERVAL)
- ESKER
- WATERCOURSE
- WATERBODY

2013 WATERBIRD OBSERVATIONS

- BALD EAGLE, 1
- COMMON LOON, 1
- COMMON LOON, 2-5
- COMMON MERGANSER, 2-5
- COMMON MERGANSER, >25
- GOLDEN EAGLE, 1
- GULL SPP., 1
- GULL SPP., 2-5
- LONG-TAILED DUCK, 2-5
- PARASITIC JAEGER, 1
- PARASITIC JAEGER, 2-5
- TERN SPP., 1
- UNKNOWN DIVER, 1
- UNKNOWN LOON, 1
- YELLOW-BILLED LOON, 1
- YELLOW-BILLED LOON, 6-10

2014 WATERBIRD OBSERVATIONS

- COMMON MERGANSER, 1
- COMMMON MERGANSER, 2-5
- COMMON MERGANSER, 11-25
- GULL SPP., 1
- GULL SPP., 2-5
- GULL SPP., 6-10
- LONG-TAILED DUCK, 2-5
- NORTHERN HARRIER, 1
- TERN SPP., 1
- TERN SPP., 2-5
- TERN SPP., 6-10
- YELLOW-BILLED LOON, 1
- AERIAL TRANSECT
- AERIAL SHORELINE SURVEY

REFERENCE

CANVEC © NATURAL RESOURCES CANADA, 2012
NATURAL RESOURCES CANADA, CENTRE FOR TOPOGRAPHIC INFORMATION, 2012
DATUM: NAD83 PROJECTION: UTM ZONE 12N

DOCUMENT

DAR-EC-IR-25

1.5 0 1.5
SCALE 1:75,000 KILOMETRES

PROJECT
DOMINION DIAMOND
JAY PROJECT
NORTHWEST TERRITORIES, CANADA

TITLE
WATERBIRD AERIAL SURVEY RESULTS, 2013 AND 2014

Golder Associates

PROJECT		13-1328-0041	FILE No. POSTDAR_IR_Wild_020_GIS
DESIGN	DC	01/03/15	SCALE AS SHOWN REV 0
GIS	EN	13/03/15	MAP 35-1
CHECK	DC	13/03/15	
REVIEW	BS	13/03/15	

G:\CLIENT\SDOMINION\DDEC-Jay and Lynx Projects\Figures\13-1328-0041 Jay & Lynx EA\Wildlife\POST-DAR IRs\POSTDAR_IR_Wild_020_GIS.mxd

DOMINION DIAMOND

Information Request Number:	DAR-KIA-IR-35
Source:	Kitikmeot Inuit Association: Tannis Bolt
Subject:	Wildlife and Wildlife Habitat
DAR Section(s):	13.2.1.1.4

Preamble (KIA):

All information about wolf den sites comes from surveys done for Ekati, Snap Lake, Diavik Gahcho Kue, and Snap Lake. While the BSA that include the project was surveyed for Ekati, den locations and occupancy change over time, and the last survey done for Ekati and Diavik in 2013 (last survey in Gahcho Kue was in 2007, and in Snap lake was in 2010).

Request (KIA):

Will another den presence and occupancy survey be done prior to construction? If a den or dens are found within the intended construction area, how will impacts be mitigated? How will impacts to the three dens identified in 2013 within 50-100 m of the proposed project be mitigated?

Response:

Additional carnivore den surveys were completed in the summer of 2014 on select eskers near the Jay Project (Appendix I; Dominion Diamond 2014). No dens were discovered during the 2014 field survey. In 2013, a longer section of the esker was covered and findings included a single active wolf den with two adults and two pups present, and two inactive wolf dens (Section 3.6.2 of the Wildlife Baseline Report; Annex VII of the Developer's Assessment Report [DAR]).

Wildlife monitoring in the vicinity of the entire Ekati Mine (including the proposed Jay Project) is undertaken annually and continually through the Wildlife Effects Monitoring Program. Mitigation to reduce effects to wolves and wolf dens is presented in Table 13.3-1 of the DAR. Active dens have been found near mine infrastructure in the past (BHP Billiton 2004). In these situations, the protocol is to report the observations to the Department of Environment and Natural Resources, Government of the Northwest Territories (GNWT), who may suggest specific mitigation.

As stated in the DAR, the close proximity of the den to the proposed Jay waste rock storage area may lead to abandonment of this den during construction and operation. As there are many other dens in the in the area surrounding the Ekati mine and Jay Project and wolves typically move between unoccupied dens (Walton et al. 2001; Frame et al. 2007), effects to regional wolf productivity are not anticipated. In 2009, at a Wildlife Monitoring Workshop hosted by the GNWT and attended by regulators, community organizations, mine agencies, and mining companies, it was agreed that the mines are successful at mitigating conflicts with wolves and are not causing any measurable degradation to wolf den habitat or productivity (Marshall 2009).

References:

BHP Billiton (BHP Billiton Canada Inc.). 2004. Ekati Diamond Mine 2003 Wildlife Effects Monitoring Program. Prepared by Golder Associates Ltd. Yellowknife, NWT.

Dominion Diamond (Dominion Diamond Ekati Corporation). 2014. Jay Project Developer's Assessment Report Sable Addendum. Prepared by Golder Associates Ltd., December 2014.

Frame PF, Cluff DF, David SH. 2007. Response of wolves to experimental disturbance homesites. J Wildlife Manage 71:316–320.

Marshall R. 2009. Diamond Mine Wildlife Monitoring Workshop Report. Prepared for Environment and Natural Resources. Yellowknife, NWT, Canada.

Walton LR, Cluff HD, Paquet PC, Ramsay MA. 2001. Movement patterns of barren-ground wolves in the central Canadian Arctic. J Mammal 82: 867-876.

DOMINION DIAMOND

Information Request Number: DAR- KIA-IR-36

Source: Kitikmeot Inuit Association: Tannis Bolt

Subject: Wildlife and Wildlife Habitat

DAR Section(s): 13.3.2.2.2

Preamble (KIA):

Power line mortalities of raptors due to electrocutions are noted as occurring at Ekati mine. The most effective mitigation method to protect against raptor electrocution is not listed in mitigation methods on p. 13-83 to 13-84., which is to include design-level spacing between phase conductors to allow for the largest wingspan of expected raptors in the region (likely golden eagle) without wings touching and creating a circuit. Design-level mitigation avoids the need for conductor caps, which may not weather well in the north.

Request (KIA):

Will the distribution line be a single phase single circuit, three-phase single-circuit, three phase compact single-circuit, crossarm construction three-phase single circuit, underbuild construction, or three-phase double circuit? Please provide information on whether there will be integration of design-level phase conductor spacing suggestions appropriate for the design type used as outlined in design level mitigation found on pages 61-102 of the APLIC (2006) manual on suggested practices for avian protection on power lines, to provide protection for raptors with wide wingspans (e.g., golden eagle) between phase conductors.

Response:

The conceptual design for the Jay power line is three-phase single-circuit with cross arm construction on either single or double poles. This approach is consistent with the existing design of the Misery power line (under construction) as approved by the Wek'èezhìi Land and Water Board.

Electrocution of raptors from the Project power line was assessed as a secondary pathway in Section 13.2.2.2.2 of the Developer's Assessment Report. Mitigation to deter raptors from perching on power line poles includes cone-shaped caps for the top of poles and perch preventers between phase conductors located on cross arms. This mitigation is anticipated to minimize the potential for electrocution risk to raptors. Avian Power Line Interaction Committee guidelines (APLIC 2006) will be reviewed as part of the final design for the Jay power line and practicable measures that could reduce risk to raptors will be considered.

References:

APLIC (Avian Power Line Interaction Committee). 2006. Suggested Practices for Avian Protection on Power Lines: the State of the Art in 2006. Prepared by Avian Power Line Interaction Committee. Edison Electric Institute, APLIC, and the California Energy Commission. Washington, DC and Sacramento, CA.

DOMINION DIAMOND

Information Request Number:	DAR- KIA-IR-37
Source:	Kitikmeot Inuit Association: Tannis Bolt
Subject:	Wildlife and Wildlife Habitat
DAR Section(s):	12, 13.3.2.2.2, 13.2.2.3

Preamble (KIA):

These sections, and similar/parallel sections like them in the caribou EA (Section 12) are long and skip between topic, species, infrastructure discussed, etc. It is difficult to follow as it is generally not well-organized into topics or by wildlife species/group. Clear subheadings would help greatly with organization.

Request (KIA):

Please include clear subheadings in these sections, and other similar sections for caribou, to indicate for topic divisions. The bulleted sentences do not serve this purpose well, as the reader sees them initially as unrelated bulleted ideas immediately after a paragraph with unrelated information, which is confusing.

Response:

The organization of the Developer's Assessment Report (DAR) is consistent with organization of recent environmental assessments for the Gahcho Kué (De Beers 2010) and NICO (Fortune 2011) projects completed in the Northwest Territories. The organizational approach taken in the DAR was appropriate to meet the Terms of Reference (MVEIRB 2014) and for a clear understanding of the topics. Please also see the response to DAR-KIA-IR-22.

References:

De Beers. (De Beers Canada Inc.). 2010. Gahcho Kué Project Environmental Impact Statement. Prepared by Golder Associates Ltd.

Fortune (Fortune Minerals Ltd.). 2011. NICO Developer's Assessment Report. Prepared by Golder Associates Ltd.

MVEIRB (Mackenzie Valley Environmental Impact Review Board). 2014. Revised Terms of Reference. Jay Project. Dominion Diamond Ekati Corporation. July 17, 2014.

DOMINION DIAMOND

Information Request Number:	DAR- KIA-IR-38
Source:	Kitikmeot Inuit Association: Tannis Bolt
Subject:	Caribou, Wildlife and Wildlife Habitat
DAR Section(s):	13.2.2.3, 13.3.2.2.3

Preamble (KIA):

Traffic along Misery Road and Jay Roads likely underestimated, as are predicted impact due to traffic (movement, mortality, and sensory disturbance) on birds, grizzly bears, wolves, and wolverines. See IR #25, which outlines similar concerns for caribou.

Request (KIA):

See IR # 25, which outlines similar concerns for caribou. Please update traffic estimates and reconsider assessment and results section portions that discuss effects of traffic against thresholds from literature.

Response:

Detailed information of traffic volumes for all vehicle types is provided in Appendix C (Traffic Associated with the Jay Project). The environmental design features and traffic mitigation identified in the Developer's Assessment Report (DAR) are also summarized in Appendix C.

The 56 round trips by road trains referred to in the DAR Section 12.4.2.2.2 and the 56 round trips by long-haul trucks referred to in DAR Section 3.5.1.6 are references to the same round trips by the same vehicles. As noted in the preamble, there will be other traffic on the Jay and Misery roads and caribou will likely respond to all vehicles, not just the long-haul ore trucks. Long-haul ore trucks will make up the majority of traffic on the Jay and Misery roads.

Appendix C (Traffic Appendix) presents a detailed set of estimates for the number of round trips of both long-haul ore trucks and other non-haul vehicles. Based on all types of vehicles and 365 days per year road operation, Appendix C Table 2 shows estimates of 79 round trips per day on the Jay Road and 94 round trips per day on the Misery Road: 9.1 minutes and 7.7 minutes between vehicles, respectively (Appendix C Table 3, based on vehicles going either direction).

The residual effect of mortality from vehicle-wildlife collisions was assessed as a secondary pathway in the DAR. As indicated in Section 13.2.2.7.2, one wolf and two wolverine mortalities due to collision with vehicles (annual rates of 0.04 and 0.07, respectively) have occurred during 28 mine operational years at the Ekati, Diavik, Snap Lake, and Jericho mines. Information on traffic volume at these mines is not available; however, even if these annual rates doubled, vehicle collision mortalities would be predicted to occur approximately once every 10 operational years for wolf and every 6 years for wolverine. Vehicle collision mortalities have been more common with birds; however, migratory bird species are exposed to Project-related traffic for approximately four to five months annually. Giving wildlife the right-of-way and low speed limits has been effective at limiting mortalities from traffic and impacts to regional wildlife populations.

As indicated in Section 13.2.2.2., Alexander et al. (2005) found that crossing rates of roads by carnivores (including wolf) in Banff National Park decreased significantly when traffic volumes were greater than 300 vehicles per day. The traffic volume estimates in Appendix C are well below this observed threshold. Sensory disturbance from increased traffic may decrease the use of habitat near these roads by birds, grizzly bear, wolf, and wolverine as predicted in the DAR. The DAR used conservative assumptions for sensory disturbance to predict maximum effects such as including buffer areas in the estimate of direct disturbance associated with physical footprints of development. The buffer area also increases the area affected by direct and sensory (indirect) disturbance because zones of influence begin at the perimeter of development footprints. Traffic volumes for the Project are not anticipated to be high enough to result in large changes in movement rates. Project traffic will also be adaptively managed to allow caribou, an important source of prey for carnivores, to move through the area (see response to DAR-KIA-IR-25). The combined light and heavy vehicle estimates of traffic volume do not change the impact classifications and determination of significance in the DAR.

Road mitigation is expected to be effective in maintaining grizzly bear, wolf, wolverine, and caribou movements through the area. The effectiveness of mitigation will be monitored and the results used as feedback for adaptive management, which may require modification and/or additional mitigation and effects management strategies.

References:

Alexander SM, Waters NM, Paquet PC. 2005. Traffic volume and highway permeability for a mammalian community in the Canadian Rocky Mountains. Can Geog 49: 321-331.

DOMINION DIAMOND

Information Request Number:	DAR- KIA-IR-39
Source:	Kitikmeot Inuit Association: Tannis Bolt
Subject:	Wildlife and Wildlife Habitat
DAR Section(s):	13.4.6.2.2

Preamble (KIA):

Page 13-132 states that "Sensory disturbance from this increased traffic may increase avoidance of these roads by grizzly bears. However, traffic volumes are not anticipated to be high enough to affect grizzly bear crossing rates of these roads." However, many types of vehicles were excluded from the vehicle estimate, including bulk explosives trucks, crew transport vehicles, road maintenance equipment, garbage trucks, low-bed trucks to transport larger equipment, water trucks, emergency vehicles and light vehicles.

Request (KIA):

After consideration of additional vehicles that were excluded from the initial traffic estimate, please provide estimates of cars that will be using the road as vehicles per 12 hour day, and vehicles per hour. Will the number of vehicles ever exceed 10 vehicles per hour? How many vehicles will this project add the Tibbitt to Contwoyto Road, and what will be the estimated vehicles per hour experienced along this road?

Response:

Detailed information of traffic volumes for all vehicle types is provided in Appendix C (Traffic Associated with the Jay Project). The appendix includes daily traffic volumes and times between vehicles for vehicles of different types and on the different segments of road. Also included are historic traffic volumes on the Tibbitt to Contwoyto Winter Road (TCWR), along with expected changes to TCWR traffic associated with different phases of the Jay Project.

Please see DAR-KIA-IR-38 for an evaluation of the increased traffic volume on effects to wildlife.

DOMINION DIAMOND

Information Request Number:	DAR- KIA-IR-40
Source:	Kitikmeot Inuit Association: Tannis Bolt
Subject:	Wildlife and Wildlife Habitat - Minor not defined for low magnitude
DAR Section(s):	13.6.1.1 (Table 13.6-1)

Preamble (KIA):

For magnitude ratings, low magnitude is defined as the amount of change to measurement indicator results in no measurable effect on population abundance and distribution, or results in a minor measurable residual effect on the population.

Request (KIA):

Please define "minor". This is an important definition as magnitude is the main criterion on which significance is based.

Response:

A minor residual effect is a change in a measurement endpoint that is measurable but will have a negligible residual effect on the population, relative to the Base Case. A minor (small measurable) change would also not be expected to contribute to effects of other existing, approved, or reasonably foreseeable projects to cause a significant effect (Section 13.3.1 of the Developer’s Assessment Report).

DOMINION DIAMOND

Information Request Number:	DAR- KIA-IR-31 and DAR- KIA-IR-41
Source:	Kitikmeot Inuit Association: Tannis Bolt
Subject:	Definition of significance allows for population-level effects.
DAR Section(s):	Wildlife and wildlife habitat, Section 13.6.1.2

Preamble (KIA):

Not significant is defined as: "impacts are measurable at the individual level, and strong enough to be detectable at the population level, but are not likely to decrease resilience and increase the risk to a self-sustaining and ecologically effective population." However, given the population estimates for species like grizzly bear, a change in > 6 bears would need to occur to detect a change at the population-level. In fact, it is likely that a greater change would be required to detect a population-level change significantly, accounting for uncertainty around population estimates. If impacts can be detected at the population level, especially for populations like grizzly bears, which have a high variation around baseline population estimates, they will have to change substantially. We suggest that accepting this definition, particularly for grizzly bear, would be disastrous considering statistical power and the difficulty of detecting population-level changes with high levels of baseline and monitoring population variance around estimates, and since it is known that a small change in losses of grizzly bears will have strong population-level manifestations.

Request (KIA):

DAR- KIA-IR-31

If impacts can be detected at the population level, for populations like the Bathurst herd, which has been in strong decline, how is this considered not significant ? We would suggest that the definition, particularly for Bathurst caribou, be one that considers any impact detectable at the population level due to this project as significant. Please see IR #41, for a request for a-prior power analyses for grizzly bear, wolverine and barren-ground caribou, to determine the minimum losses of each species that would be required to detect a population change due to the project, giving underlying levels of variation around baseline population estimates.

DAR-KIA-IR-41

Please provide an a-priori statistical power analysis based on grizzly bear baseline population estimates from DNA hair sample data collected from grids to show how many grizzly bears would have to be lost in a two year sampling period following project development before even the smallest a population-level change (very small effect size) could be detected as significant, using a typical alpha level of 0.05, and assuming a similar level of variation during monitoring as seen during baseline population estimates. Please do this power analysis based on effect sizes that wildlife specialists who wrote this report would categorize as ok for these species, and still "non-significant" such as a small change in population of less than 0.03%. Once this exercise is done, please consider whether the loss of this number of grizzly bears can be considered non-significant. Please provide a similar a-prior power analysis for wolverine and for barren-ground caribou. We suspect that the results of this exercise will be that a surprisingly large number of animals will need to be lost before a small effect size can be seen, due to the influence of large

variation in estimates. Please consider these results in the definition of significance for these three species.

Response:

This response addresses Information Requests in DAR-KIA-IR-31 and DAR-KIA-IR-41. In requesting the selection of ecological effect sizes associated with acceptable ecological change to wildlife population sizes, the information requested in KIA-IR-31 and KIA-IR-41 is effectively asking for Dominion Diamond to quantify ecological thresholds or screening values of mine-related mortality for consideration in determination of significance.

Quantitative ecological thresholds, critical values, or screening values that relate the changes in measurement indicators to effects on assessment endpoints are not available for barren-ground caribou, grizzly bear, wolverine, or other wildlife valued components (VCs) considered in the Developer's Assessment Report (DAR). Because thresholds and critical values are not available, the DAR provided a reasoned qualitative narrative founded on ecological principles supported by science, and when possible by Traditional Knowledge, to describe what would constitute significant effects to barren-ground caribou and other wildlife VCs (Section 12.6 and Section 13.6). This approach is consistent with the requirements of the Terms of Reference (TOR; MVEIRB 2014). Section 4.2 (pp. 17) of the TOR states:

> *"If a determination is made that significant adverse impacts are not likely, the developer will provide a narrative statement that identifies what, in its opinion, the threshold for significance would be. It is acknowledged that quantitative thresholds for all components may not be feasible."*

The determinations of non-significance presented in the DAR are based on detailed and comprehensive assessments of all potential impacts from the Project and other developments on barren-ground caribou, grizzly bear, and wolverine populations. To evaluate the impacts of future developments, these were forward-looking assessments based on empirical information and ecological science, including modelling and simulation. The size of the population of each of these species, at any point in time, reflects its response to all factors encountered throughout annual ranges, not only to the effects of development. The impacts of the Jay Project and the cumulative effects of development were not measured or predicted by monitoring changes in the population size of any of the three VCs. Because of the variation in population monitoring noted by the KIA, using population size as the assessment endpoint would generate a large degree of uncertainty in the determination of significance.

Instead, measurement indicators were selected (DAR Tables 12.1-1 and 13.1-3) that collectively represent important properties of the environment and ecology of VCs. Changes in each of the measurement indicators were assessed in the DAR for effects on grizzly bear and wolverine populations, and the Bathurst caribou herd. Incremental and cumulative effects from the Jay Project and previous and existing developments (Application Case) and future developments (including the Project; Reasonably Foreseeable Development [RFD] Case) were assessed. The measurement indicators for each species were:

- habitat quantity;
- habitat arrangement and connectivity (fragmentation);
- habitat quality (occupancy, movement, and behaviour);

- survival and reproduction; and
- abundance and distribution.

Although not explicitly stated in the DAR, detectable and measurable changes in abundance and distribution at the population level are not quantified, but are inferred from the independent or combined results of the numerical and qualitative analyses of changes in habitat, movement and behaviour, and survival and reproduction.

For example, direct mine-related mortalities were assessed as a secondary pathway on barren-ground caribou and wildlife VCs in Sections 12.3.2.2 and 13.3.2.2 of the DAR, respectively. Monitoring results from previous and existing mines in the North Slave Region indicate that the mines are not regularly killing barren-ground caribou, grizzly bear, wolverine or other wildlife VCs, which supports the assessment. Results from monitoring indicate that there have been four mine-related grizzly bear mortalities in 58 mining-activity years among the Ekati, Diavik, Snap Lake, and Jericho mines for an annual rate of 0.07 grizzly bear mortalities per mine-year (Table 13.2-2). This translates into one mine-related grizzly bear mortality every 14 to 15 years. This effect is detectable and measurable at mines but the effect is so small that it is unlikely to be detectable relative to natural factors and harvest that also influence annual survival rates of the regional grizzly bear population. Determining the number of mine-related grizzly bear (and barren-ground caribou, wolverines, or other wildlife VCs) mortalities required to detect a change in population size is not relevant to mitigation and monitoring at mine sites. From the perspective of mine operators, one mine-related caribou, grizzly bear, or wolverine mortality is not acceptable.

For the Bathurst caribou herd, the Jay Project resulted in detectable negative changes on each measurement indicator. There were also negative cumulative changes detected for each measurement indicator in the Application and RFD cases. For example, the DAR predicted that the cumulative direct disturbance from the Project and all previous, existing, and reasonably foreseeable future developments (i.e., RFD Case) to be less than 0.6 percent (%) of the total area in each seasonal range. Analyses in the DAR were based on number of conservative assumptions to maximize predicted effects. Habitat loss from development disturbance is a statistically detectable effect but indicates that 99% of habitat in seasonal ranges remain unchanged from reference conditions and are available for continued use by caribou. This small change is not likely to be ecologically measurable.

Another example includes the post-DAR submission population modelling completed in response to Adequacy Item 8.8 (DAR-MVEIRB-15). The population model incorporated ecologically conservative changes in the measurement indicators (i.e., maximum effects of direct and indirect habitat loss and decreased calf production). The results demonstrate that human activities in the RFD Case do not prevent positive population growth in the Bathurst herd, even though this scenario was statistically significant from a reference scenario. The reasoned narrative approach used in the DAR arrives at a similar conclusion; that the effect sizes (i.e., magnitude of changes to measurement indicators) predicted are within the adaptive capacity and resilience of barren-ground caribou (and other wildlife VCs).

With respect to conducting power analysis for each species, it is acknowledged that *a-priori* power analysis is an important tool when planning and assessing the ability of a study to detect a change of a given magnitude. The relevance of power analysis is in the ability to guide the design of monitoring

programs able to detect ecological effects of a size specified *a-priori*; and to permit observers to make meaningful conclusions about the subject of an analysis when an ecological effect of that size is not detected. Ideally, the ecological effect size corresponds to a meaningful ecological threshold or screening value (i.e., a protective value before reaching the threshold) and these have not been established for caribou and other wildlife VCs examined in the DAR. However, the measurement indicators listed above were linked to monitoring programs and assessment methods that resulted in detection of quantifiable changes in habitat quantity and quality, and survival and reproduction, and inferred changes in population abundance and distribution.

The regional hair snagging monitoring programs for grizzly bear and wolverine referenced by the KIA were not intended to identify incremental effects from individual mines but to provide information to the Government of the Northwest Territories for the assessment and management cumulative effects. These monitoring programs were designed to examine the relative contribution of mine-related and natural factors on the abundance and distribution of VCs at a local scale through standardized monitoring by mine operators. Review of the earlier localized monitoring programs during ongoing engagement with regulators, communities, and mine monitoring agencies determined that the incremental effects from any one mine to the abundance and distribution of VCs were negligible (Marshal 2009; Handley 2010). The focus shifted to understanding regional cumulative effects.

Methods associated with each measurement indicator have sufficient power to detect the changes reported in the DAR. Collectively, those changes indicate that the Project and other developments do not significantly contribute to adverse cumulative effects on the abundance and distribution of the Bathurst caribou herd, and grizzly bear and wolverine populations.

References:

Handley J. 2010. Diamond Mine Wildlife Monitoring Workshop Report. Prepared for Environment and Natural Resources. Yellowknife, NWT, Canada.

Marshall R. 2009. Diamond Mine Wildlife Monitoring Workshop Report. Prepared for Environment and Natural Resources by Rob Marshall and Associates. Yellowknife, NWT, Canada.

MVEIRB (Mackenzie Valley Environmental Impact Review Board). 2014. Revised Terms of Reference (EA1314-01) Jay Project Dominion Diamond Ekati Corporation. July 17, 2014.

DOMINION DIAMOND

Information Request Number: DAR-KIA-IR-42

Source: Kitikmeot Inuit Association: Tannis Bolt

Subject: Dietary composition assumptions not supported by data or citations.

DAR Section(s): Human and Wildlife Health Risk Assessment Report (Appendix D, Table D-28).

Preamble (KIA):

Table D-28 presents the assumed dietary composition, as percentages of various prey items, for caribou, muskrat, grizzly bear, Rusty blackbird, green-winged teal, common merganser, and bald eagle. These compositions have implications for model outcomes, but no citations or justifications are provided for the percentages give

Request (KIA):

Please provide citations and rationale for the presumed dietary compositions given for each species in this table.

Response:

Descriptions of dietary compositions for each receptor along with corresponding references were provided in Table 4.3-1 in the Human and Wildlife Health Risk Assessment Report (Dominion Diamond 2015). An excerpt pertaining to each receptor's diet is shown in Table 42-1, provided below with corresponding references. Reasonable assumptions were made to estimate the percentage of each type of food component for each receptor listed in Table D-28 of Appendix D. Precise estimates of the proportions of each food item consumed by each receptor are generally not available, especially pertaining to habitats and feeding ecology in the study area for the Jay Project.

Table 42-1 Diet Selection Rationale for Wildlife Health Risk Assessment Receptors

Receptor	Rationale for Diet Selection (excerpt from Table 4.3-1)
Caribou	The caribou diet consists of lichens, flowers, grasses, and leaves of shrubs depending on seasonal availability, but lichens are the caribou's primary food source for much of the year (EC and CWF 2013a). Caribou may also utilize lick sites as a source of salt and have been observed to "binge" on tailings at other mine sites in the Northwest Territories (MacDonald and Gunn 2004). However, this pathway was considered to have no linkage for this Project because fine processed kimberlite will not be accessible by caribou.
Muskrat	Muskrats typically live in freshwater marshes, marshy areas of lakes, and slow-moving streams due to their preference for eating cattails, horsetails, or pondweeds and other plants and contain ideal building materials for their home (EC and CWF 2013b).
Grizzly bear	As large omnivores, plants, such as grasses, sedges, and berries, are a main staple of a grizzly bear's diet; however, they will also hunt large herbivores such as caribou, moose, muskoxen and sheep, small mammals such as lemmings and ground squirrels, and fish (GNWT 2015; NWT Infobase 2015).
Rusty blackbird	As opportunistic feeders, rusty blackbirds will feed on crops (corn, oats, wheat) and weed seeds, grape, blackberry, elderberry, oak, and beech in the winter and during migration (Avery 2013). Throughout the year, they will eat invertebrates such as aquatic beetles, grasshoppers, spiders, snails and crawfish, and small vertebrates such as salamanders and small fish (Avery 2013).
Green-	Green-winged teals prefer shallow, marshy habitats, tidal creeks, and mudflats with abundant vegetation as that is

winged teal	their preferred food source (Johnson 1995).
Common merganser	Adult mergansers mainly eat fish during the winter season, whereas during the breeding season, frogs, small mammals, other birds, and plants are consumed. Nestlings will eat aquatic invertebrates such as insects, mollusks, crustaceans, and worms (Mallory and Metz 1999).
Bald eagle	Fish is a main constituent of a bald eagle's diet, but rather than fishing themselves, bald eagles will harass other birds and mammals for their catch (Buehler 2000). Bald eagles are also known to consume birds, reptiles, amphibians, crabs, rabbits, and muskrats (Buehler 2000).

References:

Avery ML. 2013. Rusty Blackbird (*Euphagus carolinus*). The Birds of North America Online (A. Poole, Ed.). Ithaca: Cornell Lab of Ornithology. Available online at: http://bna.birds.cornell.edu/bna/species/200. Accessed January 2015.

Buehler DA. 2000. Bald Eagle (*Haliaeetus leucocephalus*). In The Birds of North America, No. 564 (A. Poole and F. Gill, eds.). The Birds of North America Online, Ithaca, New York. Available online at: http://www.allaboutbirds.org/guide/bald_eagle/lifehistory. Accessed October 2014.

Dominion Diamond (Dominion Diamond Ekati Corporation). 2015. Human and Wildlife Health Risk Assessment Report for the Jay Project. Prepared by Golder Associates Ltd., February 2015. Yellowknife, NWT, Canada.

EC and CWF (Environment Canada and Canadian Wildlife Federation). 2013a. Hinterland Who's Who: Caribou. Available online at: http://www.hww.ca/en/species/mammals/caribou.html. Accessed January 2015.

EC and CWF. 2013b. Hinterland Who's Who: Muskrat. Available online at: http://www.hww.ca/en/species/mammals/muskrat.html. Accessed January 2015.

Government of NWT (Northwest Territories). 2015. NWT Species Monitoring - Infobase. Available online: http://nwtspeciesatrisk.ca. Accessed January 2015.

Johnson K. 1995. Green-winged Teal (*Anas crecca*). In The Birds of North America, No. 193 (A. Poole and F. Gill, eds.). The Academy of Natural Sciences, Philadelphia, and The American Ornithologists' Union, Washington, D.C. Available online at: http://www.allaboutbirds.org/guide/Green-winged_Teal/lifehistory. Accessed: October 2014.

MacDonald C, Gunn A. 2004. Analysis of the ash weight and elemental composition in caribou (*Rangifer tarandus*) faecal pellets collected at Colomac and other sites in the NWT. Manuscript Report No. 159. Department of Resources, Wildlife and Economic Development. Government of Northwest Territories. Yellowknife, NWT.

Mallory M, Metz K. 1999. Common Merganser (*Mergus merganser*). In The Birds of North America Online, No. 442 (A. Poole and F. Gill, eds.). Cornell Lab of Ornithology, Ithaca, New York. Available online at: http://www.allaboutbirds.org/guide/Common_merganser/lifehistory. Accessed November 2014.

NWT Infobase. 2015. NWT Species Monitoring - Infobase. Available online: http://nwtspeciesatrisk.ca. Accessed January 2015.

DOMINION DIAMOND

Information Request Number: DAR-KIA-IR-43

Source: Kitikmeot Inuit Association: Tannis Bolt

Subject: Soil/Sediment consumption not supported by data or citations.

DAR Section(s): Human and Wildlife Health Risk Assessment Report (Appendix D, Table D-28).

Preamble (KIA):

Table D-28 presents the assumed consumption rates of soil and sediments for caribou, muskrat, grizzly bear, Rusty blackbird, green-winged teal, common merganser, and bald eagle. These rates have implications for model outcomes, but no citations or justifications are provided for the percentages give.

Request (KIA):

Please provide citations and rationale for the presumed dietary compositions given for each species in this table.

Response:

The citations for the soil ingestion rates were provided in the footnotes to Table D-28 in Appendix D of the Human and Wildlife Health Risk Assessment Report (Dominion Diamond 2015). Most of the rates were based on Beyer et al. (1994) and additional clarification was provided in the footnotes only when a species-specific value was not provided by Beyer et al. (1994). Other sources including United States Environmental Protection Agency (US EPA 1999) were also considered.

For clarification, the rationale for selecting the fraction of the diet assumed to be due to soil/sediment ingestion and references for each receptor are included in Table 43-1.

Table 43-1 Soil and Sediment Ingestion Rationale for Wildlife Health Risk Assessment Receptors

Receptor	Soil/Sediment Ingestion (fraction of diet)	Reference
Caribou	0.02	Beyer et al. (1994); Table 1, based on elk
Muskrat	0.033	US EPA (1999); Table A12-5
Grizzly bear	0.02	Default value[(a)]
Semi-palmated sandpiper	0.3	Beyer et al. (1994); Table 1
Rusty blackbird	0.10	Beyer et al. (1994); Table 1, considered value for semi-palmated sandpiper and adjusting for differences in feeding methods and preferences
Green-winged teal	0.02	Beyer et al. (1994); Table 1, based on blue-winged teal
Common merganser	0.033[(b)] (0.026)	Beyer et al. (1994); Table 1, based on a mallard
Bald eagle	0	Assumed based on dietary preferences (i.e. bald eagles typically do not forage on, or in, soils and sediments).

a) Soil and sediment ingestion rates are not available for the grizzly bear so the black bear was identified as a potential surrogate. However, Environment Canada (2012) did not specify a soil ingestion rate for black bear and an applicable soil ingestion rate for the black bear could not be found in other relevant guidance or the literature. As a result, a soil ingestion rate of 0.02 was assumed based on feeding preferences. Soil ingestion by the grizzly bear is discussed in more detail in the response to DAR-KIA-IR-44.

b) The previous sediment ingestion rate was incorrectly shown as 0.026. It has been increased to 0.033 for the common merganser, which slightly increased the Base Case hazard quotients by less than 0.01 and Application Case hazard quotients by less than 0.01 for all constituents of potential concern (COPCs) evaluated. Hazard quotients were well below one (1) for all COPCs evaluated, both the Base and Application Cases, and both sediment ingestion rates.

Table 43-2 below shows that the hazard quotients for chronic exposure increased slightly with higher soil ingestion rates for the common merganser (only for chromium under the Application Case) and did not change for all other constituents of potential concern (COPCs) evaluated under the Base and Application Cases. Hazard quotients were all less than the acceptable risk of one (1), which means conclusions remain unchanged in the Wildlife Health Risk assessment even with the higher assumed soil ingestion rates.

Table 43-2 Hazard Quotient and Soil Ingestion Rate Comparison for the Common Merganser

Scenario	Soil Ingestion Rate (proportion; dry weight basis)	Hazard Quotients for the Common Merganser Based on Varying Amounts of Soil Ingestion			
		Arsenic	Chromium	Methyl mercury	Selenium
Base Case	0.026	0.02	0.04	0.11	0.08
	0.033	0.02	0.04	0.11	0.08
Application Case	0.026	0.02	0.04	0.14	0.23
	0.033	0.02	0.05	0.14	0.23

Using the fractions presented in Table D-28 (and clarified above in Table 43-2), the soil/sediment consumption rate (kilograms per day [kg/day] in dry weight [dwt]) was calculated based on the food ingestion rate for all receptors (in wet weight [wwt]), soil/sediment ingestion rates (as a fraction), and the fraction of moisture in the diet (to convert to dry weight). The calculations are also shown in Appendix H, Tables H3.1-3 to H3.1-18 of the Human and Wildlife Health Risk Assessment Report (Dominion Diamond 2015). An example calculation for the muskrat is shown below:

Food ingestion rate (kg/day wwt) = 0.0828

Sediment ingestion rate (fraction) = 0.033

Fraction of moisture in diet = 0.103

Sediment ingestion rate (kg/day dwt) = 0.0828 kg/day wwt x 0.033 x (1-0.103) = **0.00245**

References:

Beyer WN, Connor EE, Gerould S. 1994. Estimates of soil ingestion by wildlife. J Wildl Manage 58, 375-382.

Dominion Diamond (Dominion Diamond Ekati Corporation). 2015. Human and Wildlife Health Risk Assessment Report for the Jay Project. Prepared by Golder Associates Ltd., February 2015. Yellowknife, NWT, Canada.

Environment Canada. 2012. Ecological Risk Assessment Guidance, Module C: Standardization of Wildlife Receptor Characteristics. Federal Contaminated Site Action Plan (FCSAP). Prepared by: Azimuth Consulting Group Inc. March 2012.

US EPA (United States Environmental Protection Agency). 1999. Screening Level Ecological Risk Assessment Protocol for Hazardous Waste Combustion Facilities. Peer Review Draft. Appendix C: Media-to-Receptor Bioconcentration Factors (BCFs).Solid Waste and Emergency Response. EPA530-D-99-001A. August 1999.

DOMINION DIAMOND

Information Request Number: DAR- KIA-IR-44

Source: Kitikmeot Inuit Association: Tannis Bolt

Subject: Soil/sediment ingestion (fraction of diet) was assumed to be 0.02 based on diet for grizzly bear.

DAR Section(s): Human and Wildlife Health Risk Assessment Report (Appendix D, Table D-28).

Preamble (KIA):

Table D-28 presents the assumed soil/sediment ingestion rate based on diet, which appears to also be assumed.

Request (KIA):

The assumption that such a small fraction of the ingested diet is comprised of soil seems unsubstantiated, as it is estimated based on diet, which also appears to be based on estimates of composition with no study supporting it. Please run models using a range of soil/sediment ingestion fractions, and assumed dietary compositions to see how these assumptions affect outputs.

Response:

One of the receptors in the Wildlife Health Risk Assessment is the grizzly bear. A similar species, the black bear, was used to identify a soil ingestion rate. However, Environment Canada (2012) did not identify a soil ingestion rate for the black bear; a default value of 0.02 was assumed based on the grizzly bear diet. However, a follow up review suggests that higher soil ingestion rates are possible based on studies of grizzly bears in Yellowstone Park (Mattson et al. 1999). The wildlife risk assessment model was re-run based on three soil ingestion rates (2 percent [%], 5%, and 10%) for the grizzly bear to address uncertainty regarding the soil ingestion rate for the grizzly bear. The maximum value of 10% was based on the upper extent of the range of the proportion soil in feces observed by Mattson et al. (1999).

Model outputs for the grizzly bear based on three soil ingestion rates (2%, 5%, and 10%) are shown in Table 44-1 below, with only slight changes in hazard quotients and all hazard quotients remaining below one (1). Therefore, conclusions regarding the grizzly bear would remain unchanged in the Wildlife Risk Assessment (Dominion Diamond 2015), even utilizing the higher soil ingestion rate; health risks to the grizzly bear from emissions of the constituents of potential concern from the Project are anticipated to be negligible.

Table 44-1 Hazard Quotient Model Output for Grizzly Bear

Scenario	Soil Ingestion Rate (proportion; dry weight basis)	Hazard Quotients for the Grizzly Bear Based on Varying Soil Ingestion Rates			
		Arsenic	Chromium	Methyl mercury	Selenium
Base Case	0.02	<0.01	0.02	0.08	0.02
	0.05	0.01	0.03	0.08	0.02
	0.10	0.02	0.05	0.09	0.02
Application Case	0.02	0.01	0.04	0.12	0.04
	0.05	0.01	0.05	0.13	0.04
	0.10	0.02	0.07	0.14	0.04

Note:
< = less than.

References:

Dominion Diamond (Dominion Diamond Ekati Corporation). 2015. Human and Wildlife Health Risk Assessment Report for the Jay Project. Prepared by Golder Associates Ltd., February 2015. Yellowknife, NWT, Canada.

Environment Canada. 2012. Ecological Risk Assessment Guidance, Module C: Standardization of Wildlife Receptor Characteristics. Federal Contaminated Site Action Plan (FCSAP). Prepared by: Azimuth Consulting Group Inc. March 2012.

Mattson DJ, Green GI, Swalley R. 1999. Geophagy by Yellowstone Grizzly Bears. *Ursus* 11:109-116. Available online at: http://www.bearbiology.com/fileadmin/tpl/Downloads/URSUS/Vol_11/Mattson_Green_Vol_11.pdf Accessed March 2015.

DOMINION DIAMOND

Information Request Number:	DAR- KIA-IR-45
Source:	Kitikmeot Inuit Association: Tannis Bolt
Subject:	Soil ingestion rates based on elk.
DAR Section(s):	Human and Wildlife Health Risk Assessment Report (Appendix D, Table D-28).

Preamble (KIA):

Soil ingestion rates are based on data for elk, from Beyer et al (1994). Elk range in forest, forest-edge habitat, and grasslands and open parkland with grassy understory, feeding on grasses, plants, leaves and bark. Elk typically clip off vegetation above the level of the ground, and hence consume little soil. Caribou, on the other hand, rely greatly on lichen for more than 50% of their diet, which requires grazing extremly close to the ground, and peeling lichen off substrate, often pulling or scraping soils along with it. Caribou may continue to consume lichen through the winter by accessing snow swept areas, or cratering through the snow with their noses and hooves to access it, while elk often switch to more accessible plants leaves and bark during the winter, when deep snow covers the grass. This means that caribou likely consume more soils and sediments through an additional season compared to elk as well. Therefore, the assumption that caribou ingest similar fractions of soils and sediments as elk (0.02) seems to underestimate soil ingested based on caribou feeding behaviours.

Request (KIA):

Please increase the soil/sediment ingestion value for caribou to produce conservative models that do not underestimate effects, recognizing that caribou are likely to ingest more soils and sediments than elk based on their diet and feeding behaviours. Consulting elk and caribou biologists may help in adjusting consumption based on species differences.

Response:

In response to this suggestion, Dominion Diamond has determined a more accurate soil ingestion rate for caribou by considering relevant studies on caribou in Northwest Territories (NWT).

MacDonald and Gunn (2004) collected caribou fecal pellets around three mine sites in the NWT (Colomac, Ekati, and Diavik) in 2003 and determined the acid insoluble ash content in the pellets. The majority (approximately 76 percent [%]) of ash weight (as a fraction of dry matter) in the pellets was less than 10%, with a maximum ash weight of 66.4%. Ash content of the dry fecal material was used to estimate the fraction of soil in the diet (equation 1 in MacDonald and Gunn [2004]). The mean soil ingestion rate by caribou in the study was estimated to be 3.4% (somewhat higher than the value assumed in the Wildlife Health Assessment [2%] [Dominion Diamond 2015]) of the diet, up to a maximum of 52% (corresponding to 66.4% of ash weight). However, the maximum value of 52% corresponding to “binge” ingestion behaviour and mineral lick sites, and therefore, was not representative of chronic exposure to substances in soils over the long term.

To examine the influence of soil ingestion on the hazard quotients for caribou, hazard quotients were calculated under three soil ingestion rates: 2%, 3.4%, and 10% for the Base Case and Application Case (Table 45-1). 10% was considered to be the upper range of the long term average soil consumption by caribou to represent the tendency for caribou to occasionally consume higher amounts of soil when foraging for lichen.

Hazard quotients for chronic exposure changed only slightly with higher soil ingestion rates and were less than the acceptable risk of one (1) for both Cases and all the soil ingestion rates evaluated. Therefore, even with higher assumed soil ingestion rates, the conclusions remain unchanged for the Wildlife Health Risk Assessment; health risks to caribou due to exposure to the emissions of constituents of potential concern from the Project are anticipated to be negligible.

Table 45-1 Hazard Quotient Model Output for Caribou

Scenario	Soil Ingestion Rate (proportion; dry weight basis)	Hazard Quotients for the Caribou Based on Varying Amounts of Soil Ingestion			
		Arsenic	Chromium	Methyl mercury	Selenium
Base Case	0.02	0.01	0.05	0.05	0.02
	0.034	0.01	0.05	0.05	0.02
	0.10	0.02	0.08	0.05	0.02
Application Case	0.02	0.02	0.13	0.09	0.03
	0.034	0.02	0.14	0.10	0.03
	0.10	0.03	0.17	0.10	0.03

References:

Dominion Diamond (Dominion Diamond Ekati Corporation). 2015. Human and Wildlife Health Risk Assessment Report for the Jay Project. Prepared by Golder Associates Ltd., February 2015. Yellowknife, NWT, Canada.

Macdonald C, Gunn A. 2004. Analysis of the Ash Weight and Elemental Composition in Caribou (*Rangifer Tarandus*) Faecal Pellets Collected at Colomac and Other Sites in the NWT. Government of the Northwest Territories, Yellowknife, NWT. Manuscript Report No. 159.

DOMINION DIAMOND

Information Request Number:	DAR- KIA-IR-46
Source:	Kitikmeot Inuit Association: Tannis Bolt
Subject:	No reference for mean body weight of Rusy Blackbird used in models cited
DAR Section(s):	Human and Wildlife Health Risk Assessment Report (Appendix D, Table D-28).

Preamble (KIA):

A body weight of 0.0546 is used for Rusty blackbird in risk assessment models. No citation for this value is provided in Table D-28.

Request (KIA):

Please provide a reference for this body weight.

Response:

The reference for the rusty blackbird body weight is provided below. A body weight of 0.0546 kilograms (the lowest mean body weight of female rusty blackbirds) is provided in Table 1 of Avery (2013).

References:

Avery ML. 2013. Rusty Blackbird (*Euphagus carolinus*). In The Birds of North America Online (A. Poole and F. Gill, eds.). Ithaca: Cornell Lab of Ornithology. Available online at: http://bna.birds.cornell.edu/bna/species/200/articles/measurements

DOMINION DIAMOND

Information Request Number:	DAR- KIA-IR-47
Source:	Kitikmeot Inuit Association: Tannis Bolt
Subject:	Maps missing or wonky labels
DAR Section(s):	Vegetation Section 11.2.2.2.1 (Map ?, page 11-14; Map 11.2-3; page 11-16) Section 11.4.2.2.1 (Map ?, page 11-47; Map ?, page 11-51; Map 11.4-4, page 11-56)

Preamble (KIA):

The map on page 11-14 is blank. Map 11.2-3 on page 11-16 is labelled with square wingding symbols only, with wingdings symbols in the legend. The map on page 11-47 is blank. The map on page 11-51 is blank. Map 11.4-4 on page 11-56 is labelled with windings.

Request (KIA):

Please add and correct the maps in this section.

Response:

Dominion Diamond has checked the maps referenced in the preamble in the Jay Project Developer's Assessment Report (DAR):

- Map 11.2-2 Ecological Landscape Classification in the Effects Study Area on page 11-14 has been checked and is present.
- Map 11.2-3 Locations of Listed Plant Species Observations on page 11-16 has been checked and appears to be printed correctly.
- Map 11.4-2 Ecological Landscape Classification for the reference condition on page 11-47 has been checked and is present.
- Map 11.4-3 Ecological Landscape Classification Map Unit Distribution for the Application Case on page 11-51 has been checked and is present.
- Map 11.4-4 Locations of Listed Plant Species Observations for the Application Case on page 11-55 has been checked and appears to be printed correctly.

These maps were included in the hard copies, CDs, and the files that were submitted to the Mackenzie Valley Environmental Impact Review Board (MVEIRB) public registry at the following link: http://www.reviewboard.ca/upload/project_document/EA1314-01_S_11_Vegetation.PDF.

DOMINION DIAMOND

Information Request Number:	DAR- KIA-IR-48
Source:	Kitikmeot Inuit Association: Tannis Bolt
Subject:	Many sections - general comment Use of "Kitikmeot Inuit Association" in TOC and headings to refer to the TK of Inuit of the Kitikmeot region
DAR Section(s):	

Preamble (KIA):

"Kitikmeot Inuit Association" is used improperly to refer to the knowledge of Inuit. KIA is the political association that represents the people, it is not the owner of their data. The proper term is "Inuit of the Kitikmeot Region" or "Kitikmiut"

Request (KIA):

Edit

Response:

Dominion Diamond appreciates and acknowledges the error identified by the Kitikmeot Inuit Association (KIA) for the public record.

DOMINION DIAMOND

Information Request Number:	DAR- KIA-IR-49
Source:	Kitikmeot Inuit Association: Tannis Bolt
Subject:	"The Copper Inuit from the north also hunted, trapped, and travelled as far south as the Lac de Gras area. The big game animals harvested included barren ground (Rangifer tarandus groenlandicus) and woodland caribou (Rangifer tarandus caribou)
DAR Section(s):	3

Preamble (KIA):

Woodland caribou did not occur in the Lac de Gras area, and neither did moose, or wood bison. It is correct however, that Inuit did hunt in the Lac de Gras area, and even further south.

Request (KIA):

More attention to accuracy required.

Response:

Dominion Diamond appreciates and acknowledges the error as identified by the Kitikmeot Inuit Association (KIA); however, the quote in the 'Subject' line above is not located in the Developer's Assessment Report (DAR) Section 3. A similar statement is found in the Traditional Land Use and Traditional Knowledge Baseline Report for the Jay Project (Annex XVII of the DAR).

Annex XVII states: "The Copper Inuit (now represented by the KIA) hunted, trapped, and travelled as far south as Lac de Gras... The big game animals harvested included the barren-ground caribou, moose, wolf, wolverine, fox, and, less commonly, muskox." Dominion Diamond acknowledges that moose may be listed in error as they are found almost exclusively south of the treeline. The Naonaiyaotit Traditional Knowledge Project, however, does contain a chapter on Omingmak (Muskox) and Tuktukvak (Moose) in which it states:

> *"[S]ome consultants had experience with moose. Inuit had seen more moose around the coastline near Kugluktuk and in the Kingaok area. Areas indicated as frequented by moose were adjacent to the treeline, the Coppermine River area especially Big Bend, Bloody Falls, Kugluktuk, Rae and Richardson Rivers and Tree River. One moose had been killed near Tahikyoak (Contwoyto Lake)"* (Banci et. al 2006: Volume II Report 3: 34).

References:

Banci V, Hanks CC, Spicker R, Atatahak G (Eds) 2006. Walking in the Path of the Caribou. Knowledge of the Copper Inuit. Naonaiyaotit Traditional Knowledge Project. Report Series (Placenames atlas and 13 reports); Kitikmeot Inuit Association, Cambridge Bay and Kugluktuk NU. Published by Rescan Environmental Services Ltd., Vancouver BC, Canada.

DOMINION DIAMOND

Information Request Number:	DAR- KIA-IR-50
Source:	Kitikmeot Inuit Association: Tannis Bolt
Subject:	Following the destruction of the plains buffalo and a decline in the number of caribou around the 1880s, the Inuit, Dené, and Métis shifted focus to the trade of musk ox, which were hunted to the northeast of Great Slave Lake... Until the 1950s, the Inuit at an outpost at
DAR Section(s):	3

Preamble (KIA):

The correct term is Plains Bison, not plains buffalo. Further, Inuit never hunted bison nor muskox near Great Slave Lake. The second sentence is incorrect. A few Inuit families continued to live year-round and seasonally at Pellatt Lake and Contwoyto Lake until recent times. This wasn't an outpost, they lived at traditional camp locations. Inlanders always travelled to the coast to visit and trade with other Inuit, and during the fur-trade, also did so to trade pelts and obtain supplies. Rescan 2006 is not the proper citation.

Request (KIA):

More attention to accuracy required as well as proper citation of copied material.

Response:

Dominion Diamond appreciates and acknowledges the error as identified by the Kitikmeot Inuit Association (KIA); however, the quote in the ‘Subject’ line above is not located in the Developer’s Assessment Report (DAR) Section 3. A similar statement is found in the Traditional Land Use and Traditional Knowledge Baseline Report for the Jay Project (Annex XVII of the DAR).

Annex XVII states: “Around the 1880s, following the destruction of the plains buffalo and a decline in caribou, the Inuit, Dene, and Métis shifted focus to the trade of muskoxen, which were hunted to the northeast of Great Slave Lake. The trade of muskoxen ended around 1902, after which fur trapping became a main part of the economy for the Inuit, Dene, and Métis (Helm 1981). Throughout the 1950s, the Inuit had an outpost at Pellatt Lake where they fished and hunted caribou, providing food and clothing to coastal populations. Use of the BSA [baseline study area] has declined since the closing of fur trade posts but land use activities continue near Lac de Gras and MacKay Lake (Rescan 2006).”

No external references are provided in the Rescan (2006) report to cite an original source. Banci et al. (2006), however, supports the Rescan (2006) statement by acknowledging that, in 1958, in an effort to conserve the caribou and improve the welfare of the Kitikmeot Inuit, the Canadian Government supported the development of a domestic fishing camp (The Outpost Camp Program), first at Tahikyoak (Contwoyto Lake) then at Nonatoklik (Pellatt Lake). The Pellatt Lake camp had six frame cabins and continued with government support. Throughout the mid-1900s, camps of Inuit families could be found throughout the Kitikmeot region from Berkeley Point in the north to Nonatoklik (Pellatt Lake) in the south (Banci at al. 2006: Volume 1:10).

References:

Banci V, Hanks CC, Spicker R Atatahak G (Eds). 2006. Walking in the Path of the Caribou. Knowledge of the Copper Inuit. Naonaiyaotit Traditional Knowledge Project. Report Series (Placenames atlas and 13 reports); Kitikmeot Inuit Association, Cambridge Bay and Kugluktuk NU. Published by Rescan Environmental Services Ltd., Vancouver BC, Canada.

Helm J. 1981. Dogrib. In Sturtevant W, Helm J (Eds), Handbook of North American Indians: Vol. 6 Subarctic, Smithsonian Institute, Washington, DC, USA, pp 290-309.

Rescan (Rescan Environmental Services Ltd.). 2006. Summary Report Archaeological and Heritage Site Management 1994 to 2006. Rescan Environmental Services Ltd., Yellowknife, NWT, Canada.

DOMINION DIAMOND

Information Request Number:	DAR- KIA-IR-51
Source:	Kitikmeot Inuit Association: Tannis Bolt
Subject:	"Elders discouraged the use of eskers for camping and recommended places behind high points that provided protection from the wind."
DAR Section(s):	3.2.3

Preamble (KIA):

Which elders, and what is the citation? Inuit elders used eskers for camping during buggy seasons.

Request (KIA):

More attention to accuracy required as well as proper citation of copied material.

Response:

Dominion Diamond Ekati Corporation appreciates and acknowledges the error as identified by the KIA; however, the quote in the 'Subject' line above is not located in Developer's Assessment Report (DAR) Section 3. A similar statement is found in the Traditional Land Use and Traditional Knowledge Baseline Report for the Jay Project (Annex XVII of the DAR).

Annex XVII states: "Elders also discourage the use of eskers for camping and recommend places behind high points that provided protection from the wind. Instead, camps were set up on nearby islands and on the surrounding mainland (Weledeh Yellowknives Dene 1997)." The full reference is provided below.

References:

Weledeh Yellowknives Dene. 1997. Weledeh Yellowknives Dene: A Traditional Knowledge Study of Ek'ati. Yellowknives Dene First Nation Council, Dettah, NWT, Canada.

DOMINION DIAMOND

Information Request Number:	DAR- KIA-IR-52
Source:	Kitikmeot Inuit Association: Tannis Bolt
Subject:	"Copper Inuit, who lived near Lac de Gras, harvested caribou, seal, grizzly bear (Ursus arctos ssp.), fish, waterfowl, wolves (Canis lupus), wolverine (Gulo gulo), musk ox, and moose from around the Coppermine River and Contwoyto Lake in the spr
DAR Section(s):	3.2.3

Preamble (KIA):

Given that DDC has access to Inuit traditional knowledge, the first source for Inuit information should be the TK provided by Inuit themselves, not a report written by outsiders. Further, Sadownik and Harris is a literature review, and not a proper source.

Request (KIA):

Respectful consideration of TK

Response:

Dominion Diamond Ekati Corporation (Dominion Diamond) appreciates and acknowledges the error as identified by the Kitikmeot Inuit Association (KIA); however, the quote in the 'Subject' line above is not located in Developer's Assessment Report (DAR) Section 3. A similar statement is found in the Traditional Land Use and Traditional Knowledge Baseline Report for the Jay Project (Annex XVII of the DAR).

Annex XVII states: "The Kitikmeot Inuit, who lived in the barrenlands, harvested caribou, grizzly bears, fish, waterfowl, wolves, wolverines, muskoxen, and moose from around the Coppermine River, Tahikyoak (Contwoyto Lake) and Tahikpak (Lac de Gras) region in the spring and summer. Fishing was the main source of sustenance in the spring (Sadownik and Harris 1995)."

Dominion Diamond acknowledges the fact that the Sadownik and Harris (1995) source is a literature review. A list of original references used by Sadownik and Harris is provided with the original literature review. The original source of the information above was not accessed by Dominion Diamond but can be cited as:

Farquharson DR. 1976. Inuit Land Use in the West-Central Arctic. In Milton Freeman (ed.) Inuit Land Use and Occupancy Project, Volume One: Land Use and Occupancy Ottawa: Ministry of Supply and Services. Pp 33-62.

The Sadownik and Harris (1995) source was a supporting document for the Traditional Knowledge (TK) Baseline (DAR Annex XVII). This report is an important source of information in the context of the Ekati Mine as it was developed for the initial environmental assessment of the NWT Diamond Project (Ekati Mine). It provides a useful summary of Traditional Land Use and TK information from sources that are not readily available and reduces the need to duplicate the efforts of past assessments.

References:

Farquharson DR. 1976. Inuit Land Use in the West-Central Arctic. In Milton Freeman (ed.) Inuit Land Use and Occupancy Project, Volume One: Land Use and Occupancy Ottawa: Ministry of Supply and Services. pp 33-62.

Sadownik L, Harris H. 1995. Dene and Inuit Traditional Knowledge: A Literature Review. Canadian Circumpolar Institute, University of Alberta, Appendix 1-A2 in NWT Diamonds Project: Environmental Impact Statement Project Description, Volume I. Edmonton, AB, Canada.

DOMINION DIAMOND

Information Request Number: DAR- KIA-IR-53

Source: Kitikmeot Inuit Association: Tannis Bolt

Subject: Citation of NTKP Reports

DAR Section(s): Annex XVI

Preamble (KIA):

Improper citation of Inuit TK. (Banci and Hanks 2006) Banci and Hanks are the editors, not the authors. Further, two other authors are omitted. The proper citation is: Banci, V., C.C. Hanks, R. Spicker and G. Atatahak (editors) 2006. Walking in the Path of the Caribou. Knowledge of the Copper Inuit. Naonaiyaotit Traditional Knowledge Project. Report Series (Placenames atlas and 13 reports); Kitikmeot Inuit Association, Cambridge Bay and Kugluktuk NU. Published by Rescan Environmental Services Ltd., Vancouver BC.

Request (KIA):

Provide proper citations. Note that as the original report series does have "Copper Inuit" in the title, it should be included in the citation.

Response:

Dominion Diamond Ekati Corporation appreciates and acknowledges the error as identified by the Kitikmeot Inuit Association and offers the following correction for the public record:

Banci V, Hanks C, Spicker R, Atatahak G. 2006. Walking in the Path of the Caribou: Knowledge of the Copper Inuit, Naonaiyaotit Traditional Knowledge Project Report Series, Vol. I Pitkohit: Heritage and Culture. Kitikmeot Inuit Association, Cambridge Bay and Kugluktuk, NU, Canada.

Should read:

Banci V, Hanks CC, Spicker R, Atatahak G (Eds). 2006. Walking in the Path of the Caribou. Knowledge of the Copper Inuit. Naonaiyaotit Traditional Knowledge Project. Report Series (Placenames atlas and 13 reports); Kitikmeot Inuit Association, Cambridge Bay and Kugluktuk NU. Published by Rescan Environmental Services Ltd., Vancouver BC, Canada.

As cited in Annex XVII, citations throughout the Developer’s Assessment Report reading (Banci and Hanks 2006) should read (Banci et. al 2006).

References:

Banci V, Hanks CC, Spicker R, Atatahak G (Eds). 2006. Walking in the Path of the Caribou. Knowledge of the Copper Inuit. Naonaiyaotit Traditional Knowledge Project. Report Series (Placenames atlas and 13 reports); Kitikmeot Inuit Association, Cambridge Bay and Kugluktuk NU. Published by Rescan Environmental Services Ltd., Vancouver BC, Canada.

DOMINION DIAMOND

Information Request Number:	DAR- KIA-IR-54
Source:	Kitikmeot Inuit Association: Tannis Bolt
Subject:	"The First Nations and Métis groups included throughout each engagement period are: … Kitikmeot Inuit Association and Hamlet of Kugluktuk…"
DAR Section(s):	4

Preamble (KIA):

Inuit are neither First Nations or Metis.

Request (KIA):

Change to Aboriginal groups or include Inuit in list.

Response:

Dominion Diamond Ekati Corporation appreciates and acknowledges the error identified by the Kitikmeot Inuit Association for the public record.

Information Request Number:	DAR- KIA-IR-55
Source:	Kitikmeot Inuit Association: Tannis Bolt
Subject:	Many places throughout Spelling of name of Inuit TK database
DAR Section(s):	

Preamble (KIA):

Proper spelling is: Naonaiyaotit Traditional Knowledge Project (NTKP)

Request (KIA):

Edit where it occurs

Response:

Dominion Diamond Ekati Corporation appreciates and acknowledges the error identified by the Kitikmeot Inuit Association for the public record.

DOMINION DIAMOND

Information Request Number:	DAR- KIA-IR-56
Source:	Kitikmeot Inuit Association: Tannis Bolt
Subject:	"Representatives from the Kitikmeot Inuit Association who were involved in the Naonayaotit Traditional Knowledge Study were reluctant to talk about spiritual places or supernatural events. However, in Banci et al. (2006), all places on the land are said to be sp
DAR Section(s):	15

Preamble (KIA):

Improper citation of Inuit TK. (Banci and Hanks 2006 - see proper citation above). As noted above, Sadownik and Harris is inappropriate citation. Further, as explained in the report series, the authors of the NTKP are not "representatives from the Kitikmeot Inuit Association". There are many appropriate terms including authors, consultants, TK holders, but not KIA reps.

Request (KIA):

Edit

Response:

Dominion Diamond Ekati Corporation appreciates and acknowledges the corrections identified by the Kitikmeot Inuit Association (KIA) for the public record.

Please see the responses to DAR-KIA-IR-052 and DAR-KIA-IR-053 regarding the Sadownik and Harris (1995) and Banci et al. (2006) references. A list of original references used by Sadownik and Harris is provided with the original literature review (Sadownik and Harris 1995).

References:

Banci V, CC Hanks, R Spicker and G Atatahak (Eds) 2006. Walking in the Path of the Caribou. Knowledge of the Copper Inuit. Naonaiyaotit Traditional Knowledge Project. Report Series (Placenames atlas and 13 reports); Kitikmeot Inuit Association, Cambridge Bay and Kugluktuk NU. Published by Rescan Environmental Services Ltd., Vancouver BC, Canada.

Sadownik L, Harris H. 1995. Dene and Inuit Traditional Knowledge: A Literature Review. Canadian Circumpolar Institute, University of Alberta, Appendix 1-A2 in NWT Diamonds Project: Environmental Impact Statement Project Description, Volume I. Edmonton, AB, Canada.

Information Request Number:	DAR- KIA-IR-57
Source:	Kitikmeot Inuit Association: Tannis Bolt
Subject:	Note that this also is found in other report sections. "... It also includes the Inuit of the Kitikmeot Region, including the communities/settlements of Kugluktuk, Bathurst Inlet, and Umingmaktok."
DAR Section(s):	5, 5.1

Preamble (KIA):

The Inuit name for Bathurst Inlet is Kingaok, and Omingmaktok is the proper Kitikmiut spelling

Request (KIA):

Edit

Response:

Dominion Diamond Ekati Corporation appreciates and acknowledges the corrections identified by the Kitikmeot Inuit Association for the public record.

DOMINION DIAMOND

Information Request Number: DAR-KIA-IR-58

Source: Kitikmeot Inuit Association: Tannis Bolt

Subject: Traditional Knowledge

DAR Section(s): 15

Preamble (KIA):

"The Inuit identified Lac de Gras (Tahikpak) as a good spring hunting area. Caribou could always be found on the islands, especially in the summer, at Tahikpak (Lac de Gras), Tahikyoak (Contwoyto Lake), and Nonatoklik (Pellatt Lake) (Banci et al. 2006)."

The sentence in red is patently untrue, has it been taken out of context?

Request (KIA):

Edit

Response:

Dominion Diamond appreciates and acknowledges the error as identified by the Kitikmeot Inuit Association (KIA) and offers the following correction for the public record:

The sentence, from Section 15 of the Developer's Assessment Report (DAR), "the Inuit have indicated that they do not hunt caribou at the Narrows because they do not hunt caribou along their traditional migration paths" was incorrectly interpreted from Banci et al. (2006: 178). The sentence should read: "The Inuit have indicated that caribou were not butchered along traditional migration paths, including the *nadlok* (the Narrows) at Ekati."

As other potentially-affected Aboriginal groups had indicated that they harvest caribou at the Narrows, the effects on caribou harvesting at the Narrows were considered as part of the assessment on effects on wildlife harvesting in Section 15.4.1.2.1 in the DAR. Upon review of the edit as indicated by the KIA, there are no changes to the effects assessment in Section 15 of the DAR.

References:

Banci V, Hanks C, Spicker R, Atatahak G. 2006. Walking in the Path of the Caribou: Knowledge of the Copper Inuit Placenames Atlas. Naonaiyaotit Traditional Knowledge Project, Kitikmeot Inuit Association, Cambridge Bay and Kugluktuk, NU, Canada.

DOMINION DIAMOND

Information Request Number:	DAR-KIA-IR-59
Source:	Kitikmeot Inuit Association: Tannis Bolt
Subject:	Traditional Knowledge
DAR Section(s):	15

Preamble (KIA):

First paragraph "In 1958, in an effort to conserve the caribou and improve the welfare of the Kitikmeot Inuit, the Canadian government supported the development of a domestic fishing camp, the first one at Tahikyoak (Contwoyto Lake) and then one at Nonatoklik (P…"

What is the source for this? Although the gist of this paragraph is true, it missed the point that Inuit always lived at Contwoyto and Pellatt Lake, thus they were logical places for government to provide support. Note Pellat is incorrect spelling

Request (KIA):

Edit.

Response:

Dominion Diamond appreciates and acknowledges the comments provided by the Kitikmeot Inuit Association (KIA) for the public record.

It was not the intent of Dominion Diamond to suggest that Pellatt Lake was only used by the Inuit for a brief period of time. The spelling of Pellatt Lake as Pellat Lake in some instances in Section 15 of the Developer's Assessment Report (DAR) was in error. Additional and more detailed information about the traditional use of Pellatt Lake is provided in the Traditional Land Use and Traditional Knowledge Baseline Report for the Jay Project (Annex XVII of the DAR).

DOMINION DIAMOND

Information Request Number:	DAR- KIA-IR-60
Source:	Kitikmeot Inuit Association: Tannis Bolt
Subject:	General Comment
DAR Section(s):	Annex XVII

Preamble (KIA):

A report of 113 pages to present the traditional knowledge of five groups for all topics seems on the slim side. For Inuit, some sections are better written than other. Further, given that this is a TK report citing information from outsiders (Sadownik and Harris 1995) is neither necessary, nor respectful. This information has already been provided by Inuit themselves and is available to DDC in the NTKP reports. Care needs to be taken to be respectful of the knowledge and language, i.e., inokhok not inukshuk. Both spellings are used in this report. Lastly, it would have been useful to provide actual maps of TK (travel routes, migration corridors, etc.) for all peoples involved, rather than the general maps provided. The map of the Kitikmeot region does not nothing to explain the TK of Inuit.

Request (KIA):

Consider and revise.

Response:

Dominion Diamond Ekati Corporation appreciates and acknowledges the comments identified by the Kitikmeot Inuit Association (KIA) for the public record.

The Naonaiyaotit Traditional Knowledge Project (NTKP) was heavily relied upon in the development of the KIA section of Annex XVII (Traditional Knowledge [TK] Baseline). The Sadownik and Harris source was a supporting document for the TK Baseline. This report is an important source of information in the context of the Ekati Mine since it was developed for the initial environmental assessment of the Northwest Territories Diamond Project (Ekati Mine). It provides a useful summary of Traditional Land Use and TK information from sources that are not readily available and reduces the need to duplicate the efforts of past assessments.

DOMINION DIAMOND

Information Request Number:	DAR- KIA-IR-61
Source:	Kitikmeot Inuit Association: Tannis Bolt
Subject:	"Around the 1880s, following the destruction of the plains buffalo and a decline in caribou, the Inuit, Dene, and Métis shifted focus to the trade of muskoxen, which w
DAR Section(s):	ANNEX XVII

Preamble (KIA):

The correct term is Plains Bison, not plains buffalo. Further, Inuit never hunted bison nor muskox near Great Slave Lake. The second sentence is incorrect. A few Inuit families continued to live year-round and seasonally at Pellatt Lake and Contwoyto Lake until recent times. This wasn't an outpost, they lived at traditional camp locations. Inlanders always travelled to the coast to visit and trade with other Inuit, and during the fur-trade, also did so to trade pelts and obtain supplies. Rescan 2006 is not the proper citation.

Request (KIA):

Edit

Response:

Dominion Diamond appreciates and provides the following corrections for the public record.

Around the 1880s, following the destruction of the plains bison and a decline in caribou, the Inuit, Dene, and Métis shifted focus to the trade of muskoxen. The trade of muskoxen ended around 1902, after which fur trapping became a main part of the economy for the Inuit, Dene, and Métis (Helm 1981). Throughout the 1950s, Inuit families lived at Pellatt Lake, where they fished and hunted caribou, providing food and clothing to coastal populations. Use of the BSA [baseline study area] has declined since the closing of fur trade posts but land use activities continue near Lac de Gras and MacKay Lake (Rescan 2006)."

No external references are provided in the Rescan (2006) report to cite an original source. Banci et al. (2006) supports the Rescan (2006) statement by acknowledging that in 1958, in an effort to conserve the caribou and improve the welfare of the Inuit of the Kitikmeot region, the Canadian government supported the development of a domestic fishing camp (the Outpost Camp Program), first at Tahikyoak (Contwoyto Lake) then at Nonatoklik (Pellatt Lake). The Pellatt Lake camp had six frame cabins and continued with government support. Throughout the mid-1900s, camps of Inuit families could be found throughout the Kitikmeot region from Berkeley Point in the north to Nonatoklik (Pellatt Lake) in the south (Banci at al. 2006: Volume 1:10).

References:

Banci V, Hanks CC, Spicker R, Atatahak G. (Eds). 2006. Walking in the Path of the Caribou. Knowledge of the Copper Inuit. Naonaiyaotit Traditional Knowledge Project. Report Series (Placenames atlas and 13 reports); Kitikmeot Inuit Association, Cambridge Bay and Kugluktuk NU. Published by Rescan Environmental Services Ltd., Vancouver, BC, Canada

Helm J. 1981. Dogrib. In Sturtevant W, Helm J (Eds), Handbook of North American Indians: Vol. 6 Subarctic, Smithsonian Institute, Washington, DC, USA, pp 290-309.

Rescan (Rescan Environmental Services Ltd.). 2006. Summary Report Archaeological and Heritage Site Management 1994 to 2006. Rescan Environmental Services Ltd., Yellowknife, NWT, Canada.

DOMINION DIAMOND

Information Request Number:	DAR- KIA-IR-62
Source:	Kitikmeot Inuit Association: Tannis Bolt
Subject:	"The YKDFN share the TG view. The knowledge of the people is a reflection of their identity, culture, lands, and resources, and cannot be artificially separated (Weledeh Yellowknives Dene 1997). Th
DAR Section(s):	Annex XVII

Preamble (KIA):

Where is the Inuit citation for this term? Author should strive to show TK through the eyes of the TK holder, not an outsider.

Request (KIA):

Edit.

Response:

Dominion Diamond appreciates and acknowledges the recommendations identified by the KIA for the public record. The reference for the term “avatik” from the report is provided below.

“The YKDFN share the TG view. The knowledge of the people is a reflection of their identity, culture, lands, and resources, and cannot be artificially separated (Weledeh Yellowknives Dene 1997). The Inuit have a similar concept known as “*avatik*,” a term that emphasizes the connections or linkages within a larger concept (Gombay 1995).” The full Gombay (1995) reference is provided below.

The original agreements between researchers and communities for obtaining and sharing traditional land use and traditional knowledge (TK) information in sources referenced throughout the Developer’s Assessment Report Annex XVII (Traditional Land Use and Traditional Knowledge Baseline Report for the Jay Project) are not known to Dominion Diamond Ekati Corporation. Therefore, the names of specific individuals, when provided, have not been repeated in the TK Baseline. In some cases, accessing the original sources can provide the name of the local reference for the information cited.

References:

Gombay N. 1995. Bowheads and Bureaucrats indigenous Knowledge and Natural Resource Management in Nunavut. Unpublished thesis, Environment and Resource Studies, University of Waterloo, Waterloo, ON, Canada.

DOMINION DIAMOND

Information Request Number:	DAR-KIA-IR-63
Source:	Kitikmeot Inuit Association: Tannis Bolt
Subject:	Traditional Knowledge
DAR Section(s):	Annex XVI (Section 3.8)

Preamble (KIA):

"...Elders interviewed for the Naonayaotit Traditional Knowledge Project (Banci et al. 2006)…"

General comment: As described above, "Kitikmeot Inuit" are "Kitikmiut" It is a subtle point, but the author treats Inuit TK like a scientific study. Elders were not interviewed for the NTKP. The meaning of Naonaiyaotit is the collective Traditional Knowledge of Inuit elders and land-users. The NTKP is their knowledge. To properly reflect this ownership, it would be best to have a statement at the beginning of this section that unless otherwise indicated, all TK presented is from the NTKP (Banci et al. 2006) instead of citing Banci et al, which are the editors, not the owners of the information.

Request (KIA):

Edit

Response:

Dominion Diamond Ekati Corporation appreciates and acknowledges the corrections identified by the Kitikmeot Inuit Association for the public record. The correct reference for the Naonaiyaotit Traditional Knowledge Project is provided below.

References:

Banci V, CC Hanks, R Spicker and G Atatahak (Eds) 2006. Walking in the Path of the Caribou. Knowledge of the Copper Inuit. Naonaiyaotit Traditional Knowledge Project. Report Series (Placenames atlas and 13 reports); Kitikmeot Inuit Association, Cambridge Bay and Kugluktuk NU. Published by Rescan Environmental Services Ltd., Vancouver BC, Canada.

DOMINION DIAMOND

Information Request Number: DAR-KIA-IR-64

Source: Kitikmeot Inuit Association: Tannis Bolt

Subject: Traditional Knowledge

DAR Section(s): ANNEX XVII , 15

Preamble (KIA):

"In 1958, in an effort to conserve the caribou and improve the welfare of the Kitikmeot Inuit, the Canadian Government supported the development of a domesti…"

What is the reference for this? Although the gist of this paragraph is true, it missed the point that Inuit always lived at Contwoyto and Pellatt Lake, thus they were logical places for government to provide support.

Request (KIA):

Edit

Response:

Dominion Diamond appreciates and acknowledges the comments identified by the Kitikmeot Inuit Association (KIA) for the public record.

As indicated in the response to DAR-KIA-IR-059, it was not the intent of Dominion Diamond to suggest that Pellatt Lake was only used by the Inuit for a brief period of time.

The reference for the quotation included in the subject line is:

Banci V, Hanks CC, R Spicker R, Atatahak G (Eds) 2006. Walking in the Path of the Caribou. Knowledge of the Copper Inuit. Naonaiyaotit Traditional Knowledge Project. Report Series (Placenames atlas and 13 reports); Kitikmeot Inuit Association, Cambridge Bay and Kugluktuk NU. Published by Rescan Environmental Services Ltd., Vancouver BC.

References:

Banci V, Hanks CC, R Spicker R, Atatahak G (Eds) 2006. Walking in the Path of the Caribou. Knowledge of the Copper Inuit. Naonaiyaotit Traditional Knowledge Project. Report Series (Placenames atlas and 13 reports); Kitikmeot Inuit Association, Cambridge Bay and Kugluktuk NU. Published by Rescan Environmental Services Ltd., Vancouver BC.

Information Request Number:	DAR- KIA-IR-65
Source:	Kitikmeot Inuit Association: Tannis Bolt
Subject:	"In response to concerns about the Ekati project, Inuit participants have provided feedback to Ekati staff to help minimize the Project's impacts on caribou and other wildlife. In 2006, the Kugluk
DAR Section(s):	ANNEX XVII

Preamble (KIA):

The Caribou and Roads project was more than a response to concerns. It was a project designed to integrate traditional knowledge within the environmental management program of Ekati. The recommendations regarding inokhok were made regarding specific problem areas where caribou and mining activity were in conflict. This is not explained well in this paragraph.

Request (KIA):

Edit

Response:

Dominion Diamond Ekati Corporation appreciates and acknowledges the comments provided by the Kitikmeot Inuit Association for the public record.

DOMINION DIAMOND

Information Request Number:	DAR- KIA-IR-66
Source:	Kitikmeot Inuit Association: Tannis Bolt
Subject:	Grass
DAR Section(s):	ANNEX XVII, 3.8.3.4.1

Preamble (KIA):

Cottongrass is technically not a grass but a sedge. Further, this text is a continuation of the previous section "Plants" and better belongs there.

Request (KIA):

Edit

Response:

Dominion Diamond Ekati Corporation appreciates and acknowledges the corrections identified by the Kitikmeot Inuit Association for the public record.

DOMINION DIAMOND

Information Request Number:	DAR- KIA-IR-67
Source:	Kitikmeot Inuit Association: Tannis Bolt
Subject:	"Traditional knowledge study led to the installation of Inuksuit as deterrents to caribou approaching the Ekati Mine. An Elders Advisory Committee was established to study other means of preventing disturbance to caribou."
DAR Section(s):	1 (Table 1.2-1)

Preamble (KIA):

As explained in the Caribou and Roads report, the elders ask that the Inuinnaktun dialect be used for terms. Thus, it is inokhuit (inokhok), not inuksuit (inukshuk). Further. The Inuit Elders Advisory Group was established to provide advice on all environmental management programs, not just caribou.

Request (KIA):

Edit

Response:

Dominion Diamond Ekati Corporation appreciates and acknowledges the corrections identified by the Kitikmeot Inuit Association for the public record.

Information Request Number:	DAR- KIA-IR-68
Source:	Kitikmeot Inuit Association: Tannis Bolt
Subject:	Vegetation
DAR Section(s):	11.3, 11.2.2.3, Table 11.2-5

Preamble (KIA):

Why are only the Tlicho names used for plants? Given that the area is shared by different cultural groups, if Aboriginal names are given for plants, animals, places, etc., they should include the names of all groups, including Inuit.

Request (KIA):

Edit

Response:

Dominion Diamond acknowledges this feedback and is in the process of providing the listed plant names in the relevant Aboriginal languages.

The translation work is underway but could not be completed in time for this written response. A revised table of plant names will be circulated through the Mackenzie Valley Environmental Impact Review Board public registry when available, which is anticipated in April 2015.

Information Request Number: DAR- KIA-IR-69

Source: Kitikmeot Inuit Association: Tannis Bolt

Subject: Wildlife and Wildlife Habitat

DAR Section(s): 13

Preamble (KIA):

Naonaiyaotit Traditional Knowledge Project (NTKP), not: Naonayaotit Traditional Knowledge Study Also note proper spelling, as indicated above.

Request (KIA):

Edit

Response:

Dominion Diamond Ekati Corporation appreciates and acknowledges the corrections identified by the Kitikmeot Inuit Association for the public record.

Information Request Number:	DAR- KIA-IR-70
Source:	Kitikmeot Inuit Association: Tannis Bolt
Subject:	Wildlife and Wildlife Habitat and Local and Traditional Knowledge
DAR Section(s):	13, 13.2.3, 12, 12.2.3

Preamble (KIA):

We acknowledge that it is a difficult task to integrate scientific and TK, especially from five groups. However, in order to effectively use TK to inform an environmental assessment, this integration is essential, and is not done at all in this DAR. In fact, the way the information is organized leads to attaching more importance to the group that has the most data. This is unfair to all given that the Ekati area was equally shared by all the groups. Further, much of the TK reported in the topic-specific sections is not actually TK, but an expression of the concerns people have stated.

Request (KIA):

Consider and revise.

Response:

Dominion Diamond Ekati Corporation (Dominion Diamond) integrated available local and traditional knowledge (TK) into the Developer's Assessment Report (DAR) including:

- Section 12 (e.g., subsections 12.1.3 [Valued Components, Assessment Endpoints, and Measurement Indicators], 12.2 [Existing Environment], 12.3 [Pathway Analysis], 12.4.2 [Effects on the Abundance and Distribution of Caribou], 12.5 [Prediction Confidence and Uncertainty], 12.6 [Residual Impacts Classification and Significance]; and,
- Section 13 (e.g., subsections 13.1.3 [Valued Components, Assessment Endpoints, and Measurement Indicators], 13.2 [Existing Environment], 13.3 [Pathway Analysis], 12.6 [Residual Impacts Classification and Significance]).

Available TK from reports helped to provide context for the environmental assessment of wildlife valued components (VCs), was part of the quantitative analysis of caribou energetics, and the qualitative analysis of the impacts of natural factors such as climate change. Mitigation identified by TK was included in the DAR with examples provided in the response to DAR-YKDFN-IR-31.

A similar approach to that used in Section 12 and 13 was used to assess the effects of the Jay Project on other VCs throughout the DAR. A summary of how local and TK information was integrated into the DAR is provided in Table 5.3-2 of the DAR.

Community/cultural representation of TK in the DAR is dependent on the nature of the information that is publicly available and the willingness of communities to share TK and traditional land use information with Dominion Diamond (and previously BHP Billiton Ltd.) throughout the course of Project consultations, site

visits, funded TK projects, and monitoring programs. Some of the information shared by communities includes concerns about impacts of the Project (and other developments in general), and traditional land use, important habitat types to caribou and wildlife, caribou migration routes, and changes in species abundance and distribution. Community concerns are a reflection of the VCs most relevant to the communities and the potential Project impacts of greatest concern. These concerns helped to inform the monitoring, management, mitigation, and Project design presented in the DAR, prior to Project development.

The DAR provides a snapshot of available TK and traditional land use information. The anticipated impacts of the Jay Project and determination of significance of those impacts are presented in the context of available TK and traditional land use information. In an effort to continually supplement the existing body of knowledge, Dominion Diamond continues to support long-term monitoring programs and community-based TK projects. One goal of these programs is to support the ongoing collection, documentation, recording, and verification of TK throughout the life of the Ekati Mine. These activities will provide opportunities to integrate TK into the Jay Project (and Ekati Mine) on a continual basis.

DOMINION DIAMOND

Information Request Number: DAR- KIA-IR-71

Source: Kitikmeot Inuit Association: Tannis Bolt

Subject: Barren-Ground Caribou

DAR Section(s): 12

Preamble (KIA):

p. 12-38 Inokhuit not Inuksuit p. 12-39 "In 1961, a Royal Canadian Mounted Police report stated that Kitikmeot Inuit Association (KIA) living inland supplied…" - Nunamiut, Inuit, or Kitikmiut, not KIA

Request (KIA):

Edit

Response:

Dominion Diamond appreciates and acknowledges the corrections identified by the Kitikmeot Inuit Association (KIA) for the public record.

Annex XVII (Traditional Land Use and Traditional Knowledge Baseline Report of the Developer's Assessment Report [DAR]) reads: Tent rings, caches, hunting blinds, and inokhuit (stone landmarks or cairns) are the most common features remaining of their occupation.

Annex XVII (Traditional Land Use and Traditional Knowledge Baseline Report of the Developer's Assessment Report [DAR]) reads: "In 1961, a Royal Canadian Mounted Police (RCMP) report stated that the inland Kitikmeot Inuit supplied as much as 95% of the clothing skins for Inuit on the Arctic coast from Coppermine, Bathurst Inlet, Read Island, and Holman on Victoria Island (Abrahamson et al. 1964)."

References:

Abrahamson G, Gillespie PJ, McIntosh DJ, Usher PJ, Williamson HA. 1964. The Copper Eskimos: An economic survey, 1963. Industrial Division, Department of Northern Affairs and Natural Resources, Ottawa, ON, Canada.

Information Request Number:	DAR- KIA-IR-72
Source:	Kitikmeot Inuit Association: Tannis Bolt
Subject:	"...During a tour of the Ekati Mine about traditional knowledge and wildlife monitoring, Vivian Banci (Banci et al. 2006) recalls the advice of two Elders from Kugluktuk..."
DAR Section(s):	12, 12.2.3.7, Annex XVII

Preamble (KIA):

Incorrect description, this wasn't a tour, it was a project designed to integrate Inuit TK with environmental management, which came to be known as the Caribou and Roads Program.

Request (KIA):

Edit

Response:

Dominion Diamond Ekati Corporation appreciates and acknowledges the corrections identified by the Kitikmeot Inuit Association for the public record.

DOMINION DIAMOND

Information Request Number:	DAR- KIA-IR-73
Source:	Kitikmeot Inuit Association: Tannis Bolt
Subject:	"… Caribou mitigation in the vicinity of open pits has included the installation of 'snow' fence in the Beartooth and Pigeon areas…."
DAR Section(s):	12, 12.3.2.1.4

Preamble (KIA):

Fails to acknowledge that this recommendation and erection of these fences came from and was carried out by the Inuit Advisory Group – it was an example of how Ekati attempted to integrate TK into environmental management

Request (KIA):

Edit.

Response:

Dominion Diamond appreciates and acknowledges the comments provided by the Kitikmeot Inuit Association (KIA) for the public record.

Acknowledgement of the Advisory Group is provided in Annex XVII (Traditional Land Use and Traditional Knowledge Baseline Report for the Developer's Assessment Report [DAR]) which states: "In response to concerns about the Ekati project, Inuit participants have provided feedback to Ekati staff to help minimize the Project's impacts on caribou and other wildlife. In 2006, the Kugluktuk Elders Advisory Group recommended that more inokhok (stone marker) be built and made more visible by adding flagging tape, by making them larger, or by painting "hats" on them. They also suggested that inokhok be rebuilt and moved each year. They discussed creating wolf and inokhok silhouettes out of wood to help deter caribou from entering certain areas of the mine and recommended that such deterrents remain until after mine closure. They further recommended that BHP Billiton erect a fence to deflect and protect caribou from mining at the Beartooth Pit (Banci et al. 2007). With the success of this fence, in 2010, the airport electrical fence was removed and replaced with the same type of fencing as at Beartooth. New fences were also installed to deflect animals at the Pigeon Pit and Misery Camps (BHP Billiton 2011). In 2011, Inuit participants in the WEMP [Wildlife Effects Monitoring Program] suggested that caribou crossings at the roads should be larger to facilitate caribou movement, especially if in the presence of predators."

References:

Banci V, Hanak J, Ovilok J, Engoaloak H. 2007. Caribou and Roads: Implementing Traditional Knowledge in Wildlife Monitoring at the Ekati Diamond Mine 2006 Annual Report. Yellowknife, NWT, Canada.

BHP Billiton (BHP Billiton Canada Inc.). 2011. 2011 WEMP Kugluktuk Community Engagement Program: June 1-8, 2011. BHP Billiton, Yellowknife, NWT, Canada.

DOMINION DIAMOND

Information Request Number:	DAR- KIA-IR-74
Source:	Kitikmeot Inuit Association: Tannis Bolt
Subject:	Vegetation – Cumulative effects summary
DAR Section(s):	17.7.3 (Page 17-20)

Preamble (KIA):

This statement refers to the cumulative effect from loss of traditional plant habitat. It may be true that the effects will not be significant, however, it is not because species are common and "well distributed". The importance of a particular area to Aboriginal people is due to many factors which operate at different spatial scales, from regional to site-specific. Just because a resource also occurs elsewhere, it does not mean that its value is equivalent to the value of a resource that will be destroyed or altered due to development.

Request (KIA):

Consider comment with respect to this section and others.

Response:

The vegetation assessment of traditional use plants considers the plant communities that can support sufficient populations of traditional use species, but it does not consider the importance of a particular area (i.e., the societal values placed on a specific plant or locations that contain the traditional use species). The assessment determines the change to the abundance and distribution of habitat for traditional use plants from the Jay Project (Project) and other developments. It considers the distribution of the species and determines if some habitat that can support these species is removed, if it will affect the entire population of the specific traditional use species.

Societal values concerning changes in plant populations or communities are important and were considered in the Developer's Assessment Report (DAR) Section 15 to understand the full suite of potential effects of the Project (i.e., both human and ecological dimensions). Consequently, changes in measurement indicators from the vegetation assessment (DAR Section 11) were carried forward so that effects on societal values could be appropriately captured in the sections dealing specifically with those values (DAR Section 15).

As described in Section 11 of the DAR, to support the assessment of effects on traditional use plants, the Ecological Landscape Classification (ELC) map units within the vegetation effects study area (ESA) were ranked according to the habitat's probability to contain traditional use species, using available data on the number of traditional plant species that occur in each ELC type and professional judgement. The area of ELC units and the direct loss of units caused by the Project footprint and previous and existing developments were quantified in a Geographic Information System platform to predict changes of traditional use plant habitat potential within the ESA. The residual effects on traditional use plants were assessed using predicted changes to traditional use plant habitat potential (i.e., loss). The changes from

the Project and other developments on vegetation were estimated by calculating the relative difference or net change in map units, and were then carried forward to Section 15.

The Cultural Aspects assessment (DAR Section 15) included a cumulative assessment on the continued opportunities to participate in traditional plant harvesting (Section 15.4.1.2.3). This assessment considered the changes in the availability of traditional used plant species (represented by the change in traditional plant potential) in combination with additional measurement indicators such as:

- disturbance to preferred plant harvesting areas;
- physical access to preferred land use areas;
- sensory disturbances (i.e., viewscape, light, and noise);
- social and economic factors affecting participation in Traditional Land Use;
- Aboriginal land users' intangible relationship with the land; and,
- concerns regarding ecological and human health.

No specific preferred plant harvesting locations were identified in the vegetation ESA based upon the literature review conducted for the Traditional Land Use and Traditional Knowledge Baseline Report (Annex XVII of the DAR). Therefore, direct disturbance to preferred plant harvesting is represented by the direct disturbance to traditionally used plant species.

After consideration of the factors listed above, effects on traditional plant harvesting were assessed in the DAR (Section 15.4.1.3) as negative in direction, low in magnitude, regional in extent, long-term in duration, continuous, and irreversible. Cumulative effects were not expected to significantly affect the assessment endpoint of maintaining continued opportunities to participate in traditional plant harvesting.

DOMINION DIAMOND

Information Request Number:	DAR-KIA-IR-75
Source:	Kitikmeot Inuit Association: Tannis Bolt
Subject:	Cumulative Effects
DAR Section(s):	17.11

Preamble (KIA):

General Comment: This discussion conveys a lack of understanding of how Inuit and other Aboriginal groups view cumulative effects. Elders frequently talk about how each new development, no matter how small adds another stressor to the environment that ends up becoming apparent in a myriad of ways, since everything is connected. The conclusions as to the significance of cumulative effects do not talk about how Aboriginal people view cumulative effects. These views must be presented. Further, although there is an acknowledge of the effect of climate change for fish, there is no real consideration of climate change as a cumulative and synergistic impact, a factor that elders always express.

Request (KIA):

Consider comment and rewrite to reflect how Aboriginal people view cumulative effects.

Response:

Section 17 of the Developer's Assessment Report (DAR) provides a summary of results from cumulative effects analysis of valued components (VCs). The comprehensive and detailed analyses of cumulative effects of development on VCs are provided in the relevant sections of the DAR.

The approach to cumulative effects assessment for the DAR is provided in Section 6.5.2 of the DAR. The cumulative effects assessments considered existing and approved projects on the landscape (e.g., the existing Ekati and Diavik mines), the Jay Project, as well as potential future projects (reasonably foreseeable developments), as appropriate for the VC. Where possible, the cumulative effects were compared to reference conditions (i.e., little or no human development, or "pre-mining").

For certain VCs) there is little or no potential for cumulative effects because there is little or no overlap with other projects (e.g., surficial geology, soils, and terrain). The purpose of the terrain assessment, for example, was to describe the existing geotechnical stability of the area proposed for mine rock management, and the geotechnical stability of all engineered structures under a range of climate, seismic, and precipitation scenarios.

Other VCs can be influenced by a number of developments, particularly VCs that are distributed or that travel over large areas (e.g., caribou, surface water quality, and fish). The cumulative effects analysis for fish and other aquatic life, for example, considers previous and existing developments as well as natural factors, such as climate change and population processes. Socio-economic components also consider the potential cumulative effects of the Project and other developments and human activities.

Dominion Diamond has conducted substantial community engagement for the Jay Project and carried out an extensive review of existing and publicly available traditional knowledge (TK) sources relevant to the Ekati Mine and the surrounding area. A summary of information relevant to cumulative effects, including how Aboriginal people view cumulative effects, as represented in TK and traditional land use sources referenced for the Jay Project DAR, are provided below for the public record.

The Deninu K'ue Ethno-history Report (DKFN 2012), prepared for De Beers Canada for the Gahcho Kué Project, indicates that:

> *Since time immemorial, the [Deninu K'ue First Nation] have relied and continue to rely on the barren-ground caribou hunt as both a source of cultural continuity and as a means of survival. [Development in the barrenlands are] an impediment to caribou migration and… destructive to local ecology in numerous ways… [Each new project] is the next event in a long history of the casual destruction of Indian cultures* (DKFN 2012: 356).

The Naonaiyaotit Traditional Knowledge Project (Banci et al. 2006), provides information and observations on the effects of climate change and concerns about cumulative effects:

> *A lot of Inuit are saying that the climate and weather are changing, not like long ago. Sometimes we can predict the daily weather but it's not the same each day. Sometimes you know when it's going to be nice and sometimes when it's going to be stormy you can tell. Sometimes it changes really quickly, so it's hard to predict the weather* (in Banci et al. 2006: Volume I: 145).

> *I remember the land used to have a lot of snow, and would get very cold. Now it takes a long time for the ocean to freeze. It takes a long time for summer to turn into fall. The climate is changing. The water is drying up quicker, making the rivers shallower* (in Banci et al. 2006: Volume III: 37).

Some KIA consultants, local participants in the Naonaiyaotit Traditional Knowledge Project identified how the effects of development are contributing to the impacts of a changing climate:

> *The climate is changing. When it snows or rains where white men work, (the winds and clouds carry) the dust from vehicles. In the cities there is a lot of pollution, and it all becomes part of (the precipitation) when it snows or rains. The pollution goes into the lakes. They (water bodies) are constantly changing. The lakes are getting shallower. The rivers get shallow right away, because the weather is getting hotter. The climate is getting much hotter because there is too much pollution in the sky* (in Banci et al. 2006: Volume III: 37).

The cumulative effects on the quality of water in the Coppermine River were identified as a major concern for the community of Kugluktuk since it is the community's source of water and an important traditional use area. The location of both Ekati and Diavik mines upstream of the Coppermine River at Lac de Gras, and the potential impact of pollution because of tourism and exploration on and adjacent to the river were identified as posing potential cumulative impacts on the Coppermine River:

> *The changes compared to when we first came here are amazing. It's getting worse and worse every year. There have been too many people going back and forth looking for minerals. Then they used the Coppermine River for tourists. Long ago they just left their garbage on the land…* (in Banci et al. 2006: Volume IV: 23).

> *There is no one technique that you use to know what is safe to drink or not safe especially now-a-days that there are a couple of mines. There are a whole bunch of mines around my place now. You have to be extra careful now-a-days especially with those trucks with chemicals on them traveling on the lakes (on the winter road). (You have to be careful), especially with all this mining activity around the area. Where there is a mine by the rivers and lakes, they all connect to my lake (Pellatt Lake). (The water) comes from the lake that they are working right now (Lac de Gras). Some of the rivers don't freeze year around so they have to be extra careful* (in Banci et al. 2006: Volume IV: 24).

> *The climate is changing and the weather is different now. Even the lakes have changed. Long ago when you made tea using water from the river or lakes it used to be good. Now the water doesn't make very good tea anymore. The Coppermine River is starting to change too. Inuit people have begun to talk about the changes now. Even to drink out of the river is not very good because the water is changing…* (in Banci et al. 2006: Volume III: 41).

The cumulative impacts of contaminated vegetation, increased traffic (trucks, ATVs, helicopters, snowmobiles) and the presence of development on caribou were also a concern:

> *The caribou not only get tamer, they seem to get used to more noise. (Mining activity might be harmful to the caribou) when they are drilling or where they put their landfill because whatever they put in their garbage might make the caribou sick. (The best ways to protect the caribou would be for the mines to) put fences around their property or a little bit further out so that the caribou don't have to go close to the mining camp. They might lick something and get sick so they should put a fence around their property. The airplanes shouldn't harass wildlife by flying around them. They should stop blasting during the caribou migration and when the birds are migrating through. They should stop drilling in April, May and June. I wish there were more caribou like long ago but I know they have changed their migration routes. Maybe one of these years they will come back this way (Kingaok) again… careful* (in Banci et al. 2006: Volume IV: 26).

The Yellowknives Dene First Nation (YKDFN) assert, in the Traditional Knowledge Study of Ek'ati (Weledeh Yellowknives Dene 1997) that:

> *Scientists doing fieldwork on behalf of mining companies for brief periods of time in the barrens cannot report environmental patterns on the scale known by indigenous Elders who have used the land all their lives* (Weledeh Yellowknives Dene 1997: v).

Prior to the development of Ekati, the YKDFN noticed the impacts of development in Weledeh (Yellowknife):

> *Explosions of dynamite by prospectors, air traffic, the development of mines and towns, the building of commercial fish plants, a prison, and roads, and the use of the land and waters for recreation. These developments contributed to the gradual withdrawal of moose and other animals, and to caribou changing their migration route through the area* (Weledeh Yellowknives Dene 1997: 20).

In Can't Live Without Work (Stevenson 1999), the North Slave Métis Alliance (NSMA) have indicated that:

> *Increasingly, resource developments in the North Slave region are beginning to affect Aboriginal (and Treaty) rights, communities, resources, economies, and cultures. Ad hoc and accommodative approaches to environmental and socioeconomic assessments are insensitive to the cumulative and longer-term impacts that a succession of resource development projects would have on Aboriginal communities. These problems, in combination with degraded economic and social conditions, make Aboriginal communities especially vulnerable to long-term and cumulative impacts of resource extraction development and exploitation* (Stevenson 1999: 13).

The NSMA also compared the potential cumulative effects of diamond mine development to those cumulative effects experienced as the City of Yellowknife grew:

> *I believe over time, that eventually the caribou will slowly start avoiding the area, and it will I guess, over time, change their migration route, similar to ...the all weather road right into Yellowknife. The caribou used to come down into the North Arm. The caribou used to come right down into Yellowknife. ...The caribou are staying further and further away from the community each year that time has gone on* (in Stevenson 1999: 118).

The potential cumulative impacts on socio-economics, particularly the perceived negative social implications of new wealth, challenges with money management, skills development and the impact of in-migration on regional infrastructure and harvesting have been identified by the NSMA in an Interim Report: North Slave Métis Alliance Site-Visit Summary for the Gahcho Kué Project (NSMA 2012).

Cumulative effects on wildlife, especially caribou, are well documented in Can't Live Without Work (Stevenson 1999):

> *I guess during their spring migration, they'll be going either further east or further west.... Time will tell, but you can see indications of where the caribou have gone already... Well, they're going to, I guess, compound the existing impacts that are already*

> *happening. Like BHP was a large impact and now Diavik is coming along, and Windspear and Monopros are going to be similar to that, so it's going to be a pretty… impressive impact on that herd* (in Stevenson 1999: 119).
>
> *If habitat is lost or degraded, caribou could suffer a decline in their health and/or population size, and could tend to overuse other areas of their habitat* (in Stevenson 1999: 119).
>
> *[T]here's not only the mines that are affecting the caribou, there's outfitters, resident hunters and Aboriginal hunters. Altogether the cumulative impact isn't known of the herd... At some point all the activities together will probably reduce the population of that herd dramatically* (in Stevenson 1999: 123).
>
> *[Y]ou start linking what's happening here, what has happened here and potentially happening over there, and further down stream. You know the old thin edge of the wedge thing* (in Stevenson 1999: 135).

The above examples provide an example of how communities view cumulative effects as layers of stressors within a connected environmental system. These stressors are recognized in a variety of ways (i.e., changing water quality, changing weather).

The information provided above, while providing context in which the results of the DAR assessment results should be viewed, does not change the assessment results of the DAR. Dominion Diamond has and will continue to solicit and use Traditional Knowledge in the Jay Project.

References:

Banci V, Hanks CC, Spicker R, Atatahak G (Eds). 2006. Walking in the Path of the Caribou. Knowledge of the Copper Inuit. Naonaiyaotit Traditional Knowledge Project. Report Series (Placenames atlas and 13 reports); Kitikmeot Inuit Association, Cambridge Bay and Kugluktuk NU. Published by Rescan Environmental Services Ltd., Vancouver BC, Canada.

DKFN (Deninu K'ue First Nation). 2012. The Deninu K'ue Ethno-history Report. Prepared for De Beers Canada for the Gahcho Kué Project. Deninu K'ue First Nation, Fort Resolution, NWT, Canada.

NSMA (North Slave Métis Alliance). 2012. Interim Report: North Slave Métis Alliance Site-Visit Summary for the Gahcho Kué Project for De Beers Canada Inc. North Slave Métis Alliance, Yellowknife, NWT, Canada.

Stevenson M. 1999. Can't Live Without Work. North Slave Métis Alliance, Yellowknife, NWT, Canada.

Weledeh Yellowknives Dene. 1997. Weledeh Yellowknives Dene: A Traditional Knowledge Study of Ek'ati. Yellowknives Dene First Nation Council, Dettah, NWT, Canada.

DOMINION DIAMOND

Information Request Number: DAR-KIA-IR-76

Source: Kitikmeot Inuit Association: Tannis Bolt

Subject: General Comment

DAR Section(s): 14

Preamble (KIA):

Since the initiation of the EA in 1995, Ekati has provided much support to Kitikmiut to document and preserve their TK. Further, efforts were made to actually integrate TK into environmental management programs. Many efforts were also made with the other Aboriginal groups. Although much of this TK is reported in the DAR, the integration of this valuable knowledge with science has not been done well, and not done at all with the assistance of the holders of TK. The traditional knowledge of all the groups has been presented through the eyes of scientists, and not with the assistance of those who know the land.

Request (KIA):

Comment for consideration to DDC and Board.

Response:

Dominion Diamond Ekati Corporation (Dominion Diamond) acknowledges and appreciates the reviewer's comment, and will consider its implications in future Project-related activities. Dominion Diamond is committed to engaging communities (including the Impact Benefit Agreement communities in the Kitikmeot region) on an ongoing basis in the collection and preservation of Traditional Knowledge.

DOMINION DIAMOND

Information Request Number:	DAR- KIA-IR-77
Source:	Kitikmeot Inuit Association: Tannis Bolt
Subject:	Local and Traditional Knowledge
DAR Section(s):	8.2.6

Preamble (KIA):

Traditional Knowledge is specific to the people who hold it. It is not appropriate to present TK of five different groups in this kind of general summary. It would be the same as summarizing a variety of scientific studies and providing no citation or credit to the people who did the work. It takes more effort to write it properly, however, it is critical for the respectful consideration of TK.

Request (KIA):

Consider and revise.

Response:

Below is the summary of local and traditional knowledge relevant to the water quantity and quality key line of inquiry (Section 8) in the Developer's Assessment Report (DAR) for the Jay Project (Project) with the Traditional Knowledge (TK) information indicated to which Aboriginal group(s) it refers to and full citations provided.

Surface water has been used as part of the traditional lifestyle for the groups of Aboriginal peoples within the Project study area. The Yellowknives Dene First Nation (YKDFN) use water for transportation, drinking, fishing, cleaning, and preparation of hides and other materials. Open water allows transportation by canoes and other watercraft, and waterbodies provide landmarks for navigation and geographic boundaries.

The surface water near the Ekati Mine has been described as clear and pure by the YKDFN. Water near the Ekati Mine site is also considered high quality for drinking by Weledeh Yellowknives elders (Weledeh Yellowknives Dene 1997). A Tłı̨chǫ Elder who participated in the Traditional Knowledge camp for the Diavik Aquatic Effects Monitoring Program (AEMP) indicated that historically, drinking water was collected from the surface, rather than at depth (DDMI 2013). As part of the AEMP, a community-based monitoring program was held on the shores of Lac de Gras where Elders, youth, including representatives of the North Slave Métis Alliance (NSMA), Inuit of the Kitikmeot region, YKDFN, and Tłı̨chǫ, and scientists observed, tested, and evaluated water collected from various locations and depths in Lac de Gras (DDMI 2013). Water was observed and evaluated for the following:

- quality through observation of health of submerged vegetation, birds, wildlife, and fish;
- presence or absence of surface foam;
- presence or absence of vegetation (the type that is expected in high-quality water); and,
- water clarity, movement, temperature, and taste (lake water was used to make tea).

From a combination of the observations and tea-taste test, the community group concluded that water from Lac de Gras is of good quality and tastes good.

Results from TK and scientific studies conclude that the quality of water in Lac de Gras is good (DDMI 2013).

Elders of YKDFN and Łutselk'e Dene First Nation (LKDFN) have indicated that the narrows between Lac du Sauvage and Lac de Gras, and other areas of swift currents, remain open through the winter (Weledeh Yellowknives Dene 1997). These open areas can be important sources for drinking water, fish movement, and fish harvesting during the winter months. Based upon consideration of this TK information, the water quality and fish and fish habitat (Section 9 of the DAR) assessments noted that the outlet of Lac de Gras may provide similar connectivity for water movement and fish during the winter months. During the summer months, drinking water could be collected from flowing creeks or from beneath rocks and large boulders if surface flow was not present. The presence of water beneath large boulders is an illustration of the active layer, i.e., a seasonally thawed near-surface zone available during the summer months.

Since the introduction of the Ekati Mine, YKDFN and LKDFN Elders have insisted that waters from the area flow south towards the East Arm of Great Slave Lake (Weledeh Yellowknives Dene 1997).

Elders from YKDFN have requested that studies be conducted to evaluate groundwater flow paths in the Ekati claim block (Weledeh Yellowknives Dene 1997). A field study of surface water flow direction involving Department of Indian Affairs and Northern Development (DIAND) scientists and representatives from LKDFN and YKDFN concluded that "there is no surface outflow from Lac de Gras into the Aylmer Lake– Lockhart River system" (DIAND 1998).

Changes in climate, notably a warmer and drier climate, have also been noted by multiple Aboriginal groups through increased frequency of forest fires in the summer, and softer snows, thinner, crustier ice, and increased occurrence of freezing rain in the winter (Banci et al. 2006; Jacobsen 2011) . Periodic occurrences of lower water levels have also been observed in the Project area.

During community engagement meetings for the Project, concerns were expressed about the potential effects of the Jay Project on water quality. These concerns included dust generation and deposition, leakage or release of contaminants from tailings ponds, spills and leaks to downstream environments, quality of water that may affect fish health, quality of water in pits, reconnection of pits to downstream environments, and linkage of effects to water quality on the quality of plants and health of animals such as caribou. These were all important pathways considered in evaluating the potential effects of the Project on water quality. Several groups identified these concerns. Generally, these concerns were identified from internal notes taken at the following community meetings:

- YKDFN and LKDFN: March 11, 4014.
- NSMA: March 13, June 26, 2014.
- Tłįchǫ community: March 12, June 24, 2014.
- Kitikmeot Inuit Association (KIA) Community Engagement Workshop: March 13, 2014.

- Lutsel K'e: June 17, July 17, 2014.
- YKDFN: June 24, 2014.
- Kugluktuk: June 27, 2014.

Suggestions on design and mitigation to eliminate or reduce effects have been proposed by potentially affected Aboriginal groups:

- appropriate containment for chemicals or other contaminants;
- monitoring and mitigation for dust generation and deposition;
- monitoring and management of spills and leaks, with appropriate clean-up and remediation (e.g., BHP 1995);
- monitoring of water quality in pit lakes, with remediation if required to protect downstream environments (e.g., IEMA 2011); and,
- use of small, isolated, and less valued lakes, rather than larger lakes ("…Lac de Gras is a crown jewel…" [Stevenson 1999: 133]), for disposal of wastewater and sewage.

Scientific monitoring programs will be developed, but traditional monitoring for changes in water quality can include ongoing observations of plants that grow near the edge of the water, smell of the water, quality of the fish (e.g., visible sores on their bodies, softness of the flesh), and fish ecology and health (Weledeh Yellowknives Dene 1997; Stevenson 1999).

References:

Banci V, Hanks CC, Spicker R, Atatahak G. (Eds). 2006. Walking in the Path of the Caribou. Knowledge of the Copper Inuit. Naonaiyaotit Traditional Knowledge Project. Report Series (Placenames atlas and 13 reports); Kitikmeot Inuit Association, Cambridge Bay and Kugluktuk NU. Published by Rescan Environmental Services Ltd., Vancouver, BC, Canada

BHP (Broken Hill Proprietary Company). 1995. NWT Diamonds Project: Environmental Impact Statement Project Description, Volume I. Yellowknife, NWT, Canada.

DDMI (Diavik Diamond Mines Inc.). 2013. Diavik Diamond Mine Aquatic Effects Monitoring Program 2012 Annual Report. Appendix XIV Traditional Knowledge Studies. Submitted to Wek'èezhìi Land and Water Board. Yellowknife, NWT, Canada.

DIAND (Department of Indian Affairs and Northern Development). 1998. Lac de Gras Drainage Basin Study. Prepared by Bob Reid, DIAND Water Resources, Fred Sangris, Yellowknives Dene First Nation and Lawrence Catholique, Lutsel K'e Dene First Nation, June 1998, 16 p.

IEMA (Independent Environmental Monitoring Agency). 2011. Summary of Discussion from the Annual General Meeting of the Society of the Independent Environmental Monitoring Agency. Independent Environmental Monitoring Agency, Yellowknife, NWT, Canada.

Jacobsen P. 2011. Tłįchǫ Elders' Knowledge of Climate Change and Forest Fires: Implications for Barren-Ground Caribou Hunting. University of Northern British Columbia, Prince George, BC, Canada.

Stevenson, M. 1999. Can't Live Without Work. North Slave Métis Alliance, Yellowknife, NWT, Canada.

Weledeh Yellowknives Dene. 1997. Weledeh Yellowknives Dene: A Traditional Knowledge Study of Ek'ati. Yellowknives Dene First Nation Council, Dettah, NWT, Canada.

DOMINION DIAMOND

Information Request Number: DAR- KIA-IR-78

Source: Kitikmeot Inuit Association: Tannis Bolt

Subject: Local and Traditional Knowledge

DAR Section(s): 7.2.4

Preamble (KIA):

Same comment as for **Section** 8 (DAR- KIA-IR-77)

Request (KIA):

Consider and revise.

Response:

Below is the edited summary of local and traditional knowledge relevant to the air quality key line of inquiry. The summary has been edited to provide additional information regarding which Aboriginal group(s) the traditional knowledge information refers to, and to provide additional citations to source documents.

Local and traditional knowledge relating to air quality, reported in the Traditional Land Use and Traditional Knowledge Baseline Report (Annex XVII of the Developer's Assessment Report), is summarized in this subsection. Multiple Aboriginal groups, including the Yellowknives Dene First Nation (YKDFN), North Slave Métis Alliance, Tłı̨chǫ, and Inuit of the Kitikmeot Region, indicated concern or provided information regarding the potential effects of dust from the Jay Project. The YKDFN indicated that they expect plants and water east of the mining developments near Ekati to experience high volumes of dust during the life of the mines. The YKDFN expressed concerns about the impacts of dust on migrating and birthing animals and birds, as well for the health and survival of wildlife, fish and vegetation. They recommended the use of fences or other deterrents to protect the animal from the effects of dust, while still maintaining enough land area for safe migration (Weledeh Yellowknives Dene 1997).

The Métis noted concern regarding the potential for dust to disturb migration patterns of animals, including caribou and small furbearers (Stevenson 1999). The Métis and Tłı̨chǫ also indicated the potential for dust to affect fish in the water around Lac de Gras (Stevenson 1999; TG 2012). The YKDFN have highlighted that dust effects on water will result in accumulative effects on animals and vegetation that rely upon these sources of water (Weledeh Yellowknives Dene 1997). The Inuit of the Kitikmeot Region similarly noted that the effects of dust could rise through the food chain (BHP 1995). The Inuit of the Kitikmeot Region have also indicated a concern regarding the effects of dust on animals, particularly regarding observations about the amount of sand found in the stomachs of ducks.

References:

BHP (Broken Hill Proprietary Company). 1995. Métis Elder Perceptions of the Project: Individual Responses. Traditional Knowledge and Environmental Impact Assessment Study Agreement interview compilation results, Appendix 1-A7. NWT Diamonds Project: Environmental Impact Statement Project Description, Volume I, Yellowknife, NWT, Canada.

Stevenson, M. 1999. Can't Live Without Work. North Slave Métis Alliance, Yellowknife, NWT, Canada.

TG (Tłı̨chǫ Government). 2012. Tłı̨chǫ Knowledge for De Beers Canada Proposed Gahcho Kué Diamond Project. Tłı̨chǫ Knowledge Research and Monitoring Program. Behchokǫ̀, NWT, Canada.

Weledeh Yellowknives Dene. 1997. Weledeh Yellowknives Dene: A Traditional Knowledge Study of Ek'ati. Yellowknives Dene First Nation Council, Dettah, NWT, Canada.

DOMINION DIAMOND

Information Request Number:	DAR- KIA-IR-79
Source:	Kitikmeot Inuit Association: Tannis Bolt
Subject:	Local and Traditional Knowledge
DAR Section(s):	9.2.7

Preamble (KIA):

Same comment as for Section 8 (DAR- KIA-IR-77)

Request (KIA):

Consider and revise.

Response:

Below is the edited summary of local and traditional knowledge (TK) relevant to the fish and fish habitat key line of inquiry (Section 9 of the Developer's Assessment Report [DAR]). The summary has been edited to provide additional information regarding which Aboriginal group(s) TK information refers to and to provide additional citations to source documents.

The proposed Jay Project is located within lands that have been used by members of the present-day Inuit, Dene, and Métis communities in Northwest Territories (NWT) and Nunavut, as described in detail in Annex XVII (Traditional Land Use and Traditional Knowledge Baseline Report).

In the Lac de Gras area, the Yellowknives Dene First Nation (YKDFN) often camped near areas where caribou, fish, and water were available such as on small bays along the shore, on protected islands, and areas where channels with swift currents kept the water open in winter, including the Lac du Sauvage-Lac de Gras Narrows (Weledeh Yellowknives Dene 1997). The Narrows (a relatively short stream connection between Lac du Sauvage and Lac de Gras) was identified as a preferred fishing location by the YKDFN and Métis (Weledeh Yellowknives 1997; BHP 1995a). The YKDFN noted that winter fishing occurs here because of the swift currents that keep that channel open (Weledeh Yellowknives Dene 1997). Traditional knowledge also identifies this area as potential fish spawning habitat. Other potential spawning locations include locations above and below the Narrows, and adjacent to the western shoreline of Lac du Sauvage (Weledeh Yellowknives Dene 1997) (i.e., in internal basin Ac described in Annex XIV and Section 9 of the DAR).

Fishing was a secondary but important activity (after hunting caribou) (LKDFN et al. 2001; DKFN 2012) that was practiced at Lac de Gras and the surrounding area. The YKDFN reported that Lac de Gras is known as a good source of large, fat fish (Weledeh Yellowknives Dene 1997). For YKDFN, fish were the main commodity in summer for people and dogs. Fish were also routinely dried and saved for use during the fall and winter hunts (DKFN 2012). The YKDFN have reported that, in winter, fishers used nets made of willow and babiche under the ice (Weledeh Yellowknives Dene 1997).

Several concerns and comments about the effects of mining near Lac de Gras on local aquatic resources have been indicated by potentially affected Aboriginal groups, for example:

- The Tłı̨chǫ have expressed their concern with the destruction of the lands and waters and the effects the mine will have on their ability to fish at Ek'atì area (DCI 1995).
- The YKDFN have noted that protecting the sediment, vegetation, and migration routes for the resident species is important to maintain the fish health and productivity in the area (Weledeh Yellowknives Dene 1997).

The YKDFN have noted concerns about the effects on fish populations of spilled oil and winter roads (Weledeh Yellowknives Dene 1997).

The potential effects on fish, in particular, have been identified as including the overall sustainability of fish populations and the long-term impacts on fish health as a result of lost habitat and changes in migration patterns, including:

- The Métis have expressed concern about the effects that mining will have on fish and fish habitat in Lac de Gras (BHP 1995b). The Métis have also identified blasting, dust, sedimentation during runoff, and increased metals and nutrients as having potential effects for fish in the waters around Lac de Gras.

The Inuit have expressed similar concerns about the effect of contaminants from the tailings pond, leaks, spills, and dust. They want to ensure that the quality of the water and the health of the fish throughout the Coppermine River watershed are protected. Fish remain a main staple for the Inuit and a decrease in the health and populations of fish would be detrimental (BHP 1995b). The Northwest Territory Métis Nation similarly would like to ensure that fish populations remain healthy to continue to support their traditional subsistence fishery (NWTMN 2014).

References:

BHP (Broken Hill Proprietary Company). 1995a. NWT Diamonds Project: Environmental Impact Statement Project Description, Volume I. Yellowknife, NWT, Canada.

BHP. 1995b. Métis Elder Perceptions of the Project: Individual Responses. Traditional Knowledge and Environmental Impact Assessment Study Agreement interview compilation results, Appendix 1-A7. NWT Diamonds Project: Environmental Impact Statement Project Description, Volume I, Yellowknife, NWT, Canada.

DCI (Dene Cultural Institute). 1995. Tłı̨chǫ Ndè: The Importance of Knowing, Dene Cultural Institute for the Dogrib Treaty 11 Council and BHP Diamonds, Appendix 1-A1 in NWT Diamonds Project: Environmental Impact Statement Project Description, Volume I, Behchokǫ̀, NWT, Canada.

DKFN (Deninu K'ue First Nation). 2012. The Deninu K'ue Ethno-history Report. Prepared for De Beers Canada for the Gahcho Kué Project. NWT, Canada.

LKDFN (Lutsel K'e Dene First Nations), Parlee B, Basil M, Casaway N. 2001. Traditional Ecological Knowledge in the Kaché Tué Study Region. West Kitikmeot Slave Study. Yellowknife, NWT, Canada.

NWTMN (Northwest Territories Métis Nation). 2014. Joint Review Panel Submission – BC Hydro Proposed Site C. Speaking Notes of Ron Yaworsky and Earl Evans, Peace Ricer, AB Hearing Session on January 9, 2014. NWTMN, Fort Smith, NWT, Canada.

Weledeh Yellowknives Dene. 1997. Weledeh Yellowknives Dene: A Traditional Knowledge Study of Ek'ati. Yellowknives Dene First Nation Council, Dettah, NWT, Canada.

DOMINION DIAMOND

Information Request Number:	DAR- KIA-IR-80
Source:	Kitikmeot Inuit Association: Tannis Bolt
Subject:	Aboriginal people's view in respect to the effects of climate change on soils and permafrost
DAR Section(s):	10

Preamble (KIA):

It is surprising there is no mention of TK in this section, especially given the knowledge and importance of Aboriginal peoples regarding soils and permafrost. Elders of all groups have expressed many concerns about the melting of permafrost with climate change and its impact on their traditional activities, as well as the environment.

Request (KIA):

Consider comment and rewrite to reflect how Aboriginal people view the effects of climate change on soils and permafrost.

Response:

The purpose of Section 10 of the Developer's Assessment Report (DAR), as outlined in the Terms of Reference, was to describe the existing geotechnical stability of the area proposed for mine rock management and to describe the geotechnical stability of all engineered structures, including site access roads. The geotechnical stability of all engineered structures was also assessed against a range of climate, seismic, and precipitation scenarios. The section also includes plans to mitigate and monitor against impacts to terrain. The DAR Section 11, Appendix 11A included a detailed assessment of effects that the Jay Project (Project) may have on soils and eskers, and included an evaluation of the effects to permafrost from the Project. This information was summarized in Section 10 where required. A summary of local and traditional knowledge on eskers is included in Section 11A1.2.2.4 of Appendix 11A.

In addition, Dominion Diamond carried out an extensive review of existing and publicly available traditional knowledge (TK) sources relevant to the Ekati Mine and the surrounding area. Selected information related to permafrost and climate change includes the following:

> *Resolution Indians would leave food to freeze in the permafrost and return later on their seasonal round. In this sense they were able to 'bank' the meat that they caught* (DKFN 2012:18).
>
> *During the summer and fall, meat was buried or cached in rocks. The meat was covered with wet clay-type ground, and then buried where permafrost would help preserve it. Entire caribou heads were buried in clay-type ground. Rock markers were used to indicate the locations of these caches. In summer, caribou meat was stored in a lake to keep it from drying. This meat was later boiled or, if wormy, given to dogs. In more recent times, consultants talked about the use of 'icehouses' to preserve meat. These were holes dug into the permafrost. The meat was placed in the hole and covered with dirt and moss* (Banci et. al. 2006: Volume I: 198).

> *If we need a fridge, we dig under the moss to the permafrost and put our berries there to keep cool and come back and get them. We can also mix up the berries with the permafrost to make ice cream or yogurt for children and old people* (Thorpe Consulting Services 2013: 62).
>
> *Permafrost underlies all of the barrens at Ek'ati. The Dene refrigerator for storing food only works when it is not exposed or disturbed. Mining companies are planning to drain five lakes where kimberlite pipes are to become open-pit mines, and several smaller ones in order to dump waste rock into them. These changes to water are likely to alter groundwater patterns. Changes to groundwater, if they are not properly monitored may bring changes to the permafrost it moves around. Elders are very concerned about effects on groundwater and permafrost from the dynamite and heavy vehicles used in mining operations: there has been no activity of this sort or scale here. Weledeh Yellowknives land users know that permafrost can heave dramatically in winter, thrusting ridges high into the air, like the one at La Pointe de Misere* (Weledeh Yellowknives Dene 1997: 92).
>
> *Although the Barren Lands may appear to be barren due to the absence of trees, they are in fact comprised of a pattern of habitats, including sprawling shrub lands, wet sedge meadows, and cold clear lakes. Permafrost is continuous throughout this area, often lying just a few centimetres below the surface… The permafrost acts as a dam stopping the downward flow of water, thereby keeping the soils either waterlogged or frozen year-round. The permafrost also acts as a barrier to root growth, which inhibits the further maturation of plants* (DKFN 2012: 49).
>
> *The permafrost layer is continuous. Thin soils in upland areas support dwarf-heath and scattered low-shrub tundra, while low-land and depressional areas near lakes and streams are characterized by sedge tussock and low-tall shrub tundra . . .* (Jones et al. cited in DKFN 2012: 49).
>
> *[E]skers have a high frost content, which means that any major disruption to them can cause permafrost melt and slumping* (NWTMN 2012: 3).

The information provided in the DAR regarding available traditional knowledge related to permafrost and climate change in the Ekati area was part of the assessment provided in the DAR Section 10.

References:

Banci V, Hanks CC, Spicker R Atatahak G (Eds). 2006. Walking in the Path of the Caribou. Knowledge of the Copper Inuit. Naonaiyaotit Traditional Knowledge Project. Report Series (Placenames atlas and 13 reports); Kitikmeot Inuit Association, Cambridge Bay and Kugluktuk NU. Published by Rescan Environmental Services Ltd., Vancouver, BC, Canada.

DKFN (Deninu K'ue First Nation). 2012. The Deninu K'ue Ethno-history Report. Prepared for De Beers Canada for the Gahcho Kué Project. NWT, Canada.

NWTMN (Northwest Territories Métis Nation). 2012. Gahcho Kue Mine Project Values, Interests, and Issues Identified at NWT Métis Nation Community TK Study Sessions. NWTMN, Fort Smith, NWT, Canada.

Thorpe Consulting Services. 2013. At Night we Slept on Diamonds: Report of the traditional knowledge camp for the Diavik Aquatic Effects Monitoring Program. Thorpe Consulting Services Ltd., Yellowknife, NT, Canada.

Weledeh Yellowknives Dene. 1997. Weledeh Yellowknives Dene: A Traditional Knowledge Study of Ek'ati. Yellowknives Dene First Nation Council, Dettah, NWT, Canada.

DOMINION DIAMOND

Information Request Number:	DAR- KIA-IR-81
Source:	Kitikmeot Inuit Association: Tannis Bolt
Subject:	Non-traditional land use: Human environment Baseline
DAR Section(s):	3.8.1 (3-117-118)

Preamble (KIA):

More information required regarding non-traditional land uses specifically in the Kitikmeot Regional area as it pertains to Nunavut LSA communities. This is a term in the TOR (#2, p.22) that is not available in baseline and needed to be able to determine potential effects on trans-boundary land uses in the Kitikmeot region.

Request (KIA):

Add more baseline information regarding non-traditional land uses specifically in the Kitikmeot Regional area as it pertains to Nunavut LSA communities that will affect the Kitikmeot. E.g. Snowmobiling, air travel, low level flights from planes and helicopter; hunting/fishing etc.

Response:

Non-traditional land uses in the local study area (LSA) communities located in the Kitikmeot region (i.e., Kingaok (Bathurst Inlet), Kugluktuk, and Omingmaktok (Umingmaktok) include hunting and fishing activities, as well as recreational activities. Canada North Outfitting offers guided hunting trips hunting of barren-ground grizzly bear (in the month of May) and barren-ground muskox (mid-March to mid-April) staged out of Omingmaktok (Umingmaktok; Canada North Outfitting 2015a,b). These hunting outfitters use snowmobiles to conduct hunts around Omingmaktok (Umingmaktok).

The Bathurst Inlet Lodge is an eco-tourism wilderness lodge that offers wilderness activities such as hiking, boat tours, daily interpretive programs, and wildlife and nature viewing (Spectacular NWT 2015). A tourist destination, the lodge can accommodate up to 25 people and is open from June to early August. In 1984, Inuit residents of Kingaok (Bathurst Inlet) became full partners of the Bathurst Inlet Lodge (Bathurst Inlet Lodge 2013).

In Kugluktuk, recreational activities include hiking, camping, hunting, fishing, and snowmobile riding (Nunavut Tourism 2013). Lodges such as Plummer's Arctic Lodges (Plummer's Arctic Lodges 2011) offer fishing trips around Kugluktuk. Service providers such as Canoe North Adventures and Black Feather, offer guided canoe trips down the Coppermine River that conclude in Kugluktuk (Canoe North Adventures 2015; Black Feather 2015). Guided canoeing activities on the Coppermine River begin approximately 400 kilometres upstream of Kugluktuk, near the confluence of the Coppermine River and Fairy Lake River, downstream from Point Lake. In addition, Kugluktuk is the departure or arrival point for Arctic cruises travelling the Northwest Passage (Polar Cruises 2015; World Expeditions 2015; The Great Canadian Adventure Company 2015).

Given its distance from the Kitikmeot LSA communities, the Project is not expected to interact with non-traditional land use in the Kitikmeot region.

References:

Bathurst Inlet Lodge 2013. Our History. Available at: http://bathurstarctic.com/history/. Accessed March 4, 2015.

Black Feather. 2015. Coppermine River. Available at: http://www.blackfeather.com/canoe/canoe_coppermine.htm. Accessed March 4, 2015.

Canoe North Adventures. 2015. Coppermine River. Available at: http://canoenorthadventures.com/adventures/upcoming/coppermine-river/. Accessed March 4, 2015.

Canada North Outfitting. 2015a. Barren-Ground Grizzly. Available at: http://www.canadanorthoutfitting.com/barren_ground_grizzly.shtml. Accessed March 4, 2015.

Canada North Outfitting. 2015b. Barren-Ground Muskox. Available at: http://www.canadanorthoutfitting.com/barren_ground_muskox.shtml. Accessed March 4, 2015.

Nunavut Tourism. 2013. Kugluktuk. Available at: http://www.nunavuttourism.com/regions-communities/kugluktuk. Accessed March 2015.

Polar Cruises. 2015. Into the Northwest Passage. Available at: http://www.polarcruises.com/arctic/ships/expedition-ships/ocean-endeavour-arctic/northwest-passage. Accessed March 5, 2015.

Plummer's Arctic Lodges. 2011. Tree River. Available at: http://www.plummerslodges.com/lodges/tree-river. Accessed March 4, 2015.

Spectacular NWT. 2015. Bathurst Inlet Lodge. Available at: http://spectacularnwt.com/operators/bathurst-inlet-lodge-ltd/264. Accessed March 5, 2015.

The Great Canadian Adventure Company. 2015. Arctic cruise through the Northwest Passage from Greenland to Nunavut. Available at: http://adventures.com/Adventure/Tour/10/Arctic-cruise-through-the-Northwest-Passage-travelling-from-Greenland-to-Nunavut. Accessed March 5, 2015.

World Expeditions. 2015. Northwest Passage West to East. Available at: http://www.worldexpeditions.com/ca/index.php?id=514270. Accessed March 4, 2015.

DOMINION DIAMOND

Information Request Number:	DAR- KIA-IR-82
Source:	Kitikmeot Inuit Association: Tannis Bolt
Subject:	Non-traditional land use: Lac du Sauvage - Human environment baseline
DAR Section(s):	s.3.8.3 (p.121-122)

Preamble (KIA):

A description regarding the current use of Lac du Sauvage for traditional, commercical or recreational pursuits (including those related to trans-boundary LSA communities in Kitikmeot) is required as per term #8, p.23 in the TOR

Request (KIA):

Add a description regarding the current use of Lac du Sauvage for traditional, commercical or recreational pursuits (including those related to trans-boundary LSA communities in Kitikmeot). Confirm that non-traditional activities and land uses will not be affected by the Project.

Response:

A description regarding the current traditional use of Lac du Sauvage can be found in the Cultural Assessment, Section 15.4 (Residual Effects) of the Developer's Assessment Report (DAR). The response to DAR-DFO-IR-02 also provides a discussion on current traditional use in the Ekati Mine area. A summary of this information is provided below.

Lac du Sauvage and Lac de Gras remain part of the traditional landscape of the Subarctic Dene, Inuit, and Métis people and continues to be an important part of their traditional territories embodying many social and cultural memories and connections. Based on recent conversations summarized in the response to DAR-DFO-IR-02, traditional land use and harvesting in the vicinity of Lac du Sauvage and Lac de Gras may have changed; however, the lakes and surrounding watershed remain a significant part of traditional territories and the expectation is that they will be available for resuming traditional land use activities in the future.

A description regarding the current commercial and recreational use of Lac du Sauvage can be found in the Socio-Economic Baseline Report, Annex XV, Section 3.8 (Non-Traditional Land Use) of the DAR. In general, non-traditional land use in the vicinity of Lac du Sauvage is limited. Hunting occurs in Wildlife Management Units R and U in the non-traditional land use local study area (LSA). No known hunting lodges exist in the non-traditional land use LSA. Recreational fishing occurs in waterbodies around Lac du Sauvage. There are several fishing lodges in the LSA, but it is not known if they use Lac du Sauvage as a location for fishing. There are no known commercial fishery operations in the non-traditional land use LSA.

The Project's potential effects on non-traditional land use in the area around Lac du Sauvage are described in the Socio-Economic Assessment of the DAR, Section 14.8 (Non-Traditional Land Use). Non-

traditional land use activities in the area around Lac du Sauvage are not predicted to be affected by the Jay Project and given its distance from the Kitikmeot LSA communities, the Project is not expected to interact with non-traditional land use in the Kitikmeot region.

DOMINION DIAMOND

Information Request Number:	DAR- KIA-IR-83
Source:	Kitikmeot Inuit Association: Tannis Bolt
Subject:	Effects on Economy
DAR Section(s):	14.3.3

Preamble (KIA):

Unclear what economic effects are anticipated for Nunavut LSA communities (i.e. through the Kitikmeot Corporation or other LSA businesses and contractors that can either service the mine's expansion and/or be affected by its activities)

Request (KIA):

Identify and discuss economic effects anticipated for Nunavut LSA and Inuit communities: Identify specific employment opportunities for Kitikmeot residents; specific economic opportunities for Kitikmeot LSA residents; businesses and contractors and/ or other LSA businesses and contractors that can either service the mine's expansion and/or be affected by its activities.). Need to be explicit about direct and indirect economic effects for Kitikmeot and Inuit residents and businesses, including capital expenditures.

Response:

The Hamlet of Kugluktuk, Bathurst Inlet, and Umingmaktok are identified as Nunavut communities within the socio-economic local study area. Bathurst Inlet and Umingmaktok are seasonally populated, and do not have an annual resident labour force from which employment could be drawn. Dominion Diamond has an Impact Benefit Agreement (IBA) with the Hamlet of Kugluktuk and the Kitikmeot Inuit Association (KIA). The specific Project-related employment and economic opportunities for Kugluktuk, including businesses and contractors, are identified in the IBA, the contents of which are confidential. However, as the Jay Project is an extension of the existing Ekati Mine, Dominion Diamond Ekati Corporation will continue to work with the Hamlet of Kugluktuk and the KIA through its business arm, Kitikmeot Corporation to maximize the specific Project-related employment and economic opportunities for the community.

DOMINION DIAMOND

Information Request Number:	DAR- KIA-IR-84
Source:	Kitikmeot Inuit Association: Tannis Bolt
Subject:	Local Business Capacity
DAR Section(s):	14.3.1.6 (p.14-55)

Preamble (KIA):

Business capacity for Kitikmeot LSA communities and Kitikmeot region in general is not discussed; this is required to demonstrate how the Proponent will engage with the Kitikmeot LSA communities to enhance potential business capacity and opportunities as per Section 8.1 of the TOR. The Kitikmeot Corporation is mentioned (p.60) yet no discussion about how the Proponent will enlist the organization in a business capacity.

Request (KIA):

Complete a local business use analysis and identify impacts on local businesses in the Kitikmeot. Evaluate the effects of business capacity for Kitikmeot LSA communities and Kitikmeot region; demonstrate how the Proponent will engage with the Kitikmeot LSA communities to enhance potential business capacity and opportunities.

Response:

The Hamlet of Kugluktuk, Bathurst Inlet, and Umingmaktok are the only Kitikmeot communities within the socio-economic local study area. Bathurst Inlet and Umingmaktok do not have a business contracting base that could service the mining industry. Dominion Diamond Ekati Corporation (Dominion Diamond) has an Impact Benefit Agreement (IBA) with the Hamlet of Kugluktuk and Kitikmeot Inuit Association (KIA). While the specific use of businesses from this IBA community is considered confidential, as the Jay Project is an extension of the existing Ekati Mine, Dominion Diamond will continue to work with the Hamlet of Kugluktuk and the KIA through its business arm, Kitikmeot Corporation to maximize the specific Project-related economic opportunities for the community.

In order to evaluate the business capacity of the Kitikmeot region, a business capacity assessment would be required. This would involve creating an inventory of businesses, identify all applicable service offerings, and analyzing their capacity as a ratio of available resources to the backlog (i.e., predicted future workload). A business capacity assessment for the Kitikmeot region is beyond the scope of the Jay Project Developer's Assessment Report.

Dominion Diamond is committed to engaging with all IBA communities with respect to contracting with community businesses, wherever practicable, for the Jay Project. Through ongoing engagement with IBA communities, Dominion Diamond will seek to identify business opportunities and strategies to maximize the use of local businesses.

DOMINION DIAMOND

Information Request Number:	DAR- KIA-IR-85
Source:	Kitikmeot Inuit Association: Tannis Bolt
Subject:	Employment Effects
DAR Section(s):	14.4.3.1. (Page 14-75)

Preamble (KIA):

No discussion of trans-boundary employment effects (outside the RSA of NWT); required to reflect employment effects (e.g. estimate of percentage of hires out of direct, indirect employment and contractor positions the mine's expansion will create during construction and operations) for Nunavut LSA communities and Kitikmeot region (and IBA community) as per the TOR

Request (KIA):

Include discussion of trans-boundary employment effects to reflect employment effects (e.g. estimate of percentage of hires out of direct, indirect employment and contractor positions the mine's expansion will create during construction and operations) for Kitikmeot LSA /IBA communities and Kitikmeot region.

Response:

The Hamlet of Kugluktuk, Bathurst Inlet, and Umingmaktok are the only Kitikmeot communities within the socio-economic local study area. Bathurst Inlet and Umingmaktok are seasonally populated, and do not have an annual resident labour force from which employment could be drawn. Dominion Diamond Ekatiu Corporation (Dominion Diamond) has an Impact Benefit Agreement (IBA) with the Hamlet of Kugluktuk and the Kitikmeot Inuit Association (KIA). The specific Project-related employment and economic opportunities for Kugluktuk, including businesses and contractors, are identified in the IBA, the contents of which are confidential. Therefore, Project employment opportunities specific to Kugluktuk are not broken out in this response. However, as the Jay Project is an extension of the existing Ekati Mine, Dominion Diamond will continue to work with the Hamlet of Kugluktuk and the KIA through its business arm, Kitikmeot Corporation to maximize the specific Project-related employment and economic opportunities for the community.

DOMINION DIAMOND

Information Request Number:	DAR-KIA-IR-86
Source:	Kitikmeot Inuit Association: Tannis Bolt
Subject:	Labour Force Training
DAR Section(s):	14.5.1.3 (Page 14-82 to 14-83)

Preamble (KIA):

Clarification/confirmation of how the Proponent's efforts to partner with the Mine Training Society and other training institutions (e.g. Community Learning Centres and HRDC) will extend to trans-boundary LSA / IBA communities in Kitikmeot region re: skills and capacity building as it relates to fostering an increase in socio-economic benefits within the LSA communities beyond NWT

Request (KIA):

Describe how the Proponent's efforts to partner with the Mine Training Society and other training institutions (e.g. Community Learning Centres and HRDC) will extend to trans-boundary LSA / IBA communities in Kitikmeot region re: skills and cacapity building as it relates to fostering an increase in socio-economic benefits within the LSA communities beyond NWT

Response:

The extension of the Dominion Diamond Ekati Corporation (Dominion Diamond) involvement with educational institutions to non-Northwest Territories communities applies only to the Hamlet of Kugluktuk, with which Dominion Diamond holds an Impact Benefit Agreement (IBA). Dominion Diamond intends to continue its involvement with and contributions to the Mine Training Society (MTS) and other training institutions. Dominion Diamond will continue to work with the MTS in the delivery of mining-related programming (e.g., recent [March 2015] Mining Boot Camp program delivered in Kugluktuk) to the Hamlet of Kugluktuk. Through ongoing engagement with IBA communities, including the Hamlet of Kugluktuk, Dominion Diamond will work to identify opportunities to provide education and training to residents of IBA communities, where practicable.

DOMINION DIAMOND

Information Request Number:	DAR- KIA-IR-87
Source:	Kitikmeot Inuit Association: Tannis Bolt
Subject:	Education
DAR Section(s):	14.5.1.4 (Pages 14-83 and 14-84)

Preamble (KIA):

Information requested about the awareness building and education initiatives that will take place in non-NWT LSA/IBA communities in the Kitikmeot Region.

Request (KIA):

Describe education and skills building initiatives in non-NWT/IBA-LSA communities in Kitikmeot.

Response:

Nunavut Arctic College, which has a campus in Cambridge Bay, provides post-secondary education for non-Northwest Territories (NWT) / Impact Benefit Agreement – local study area communities in Kitikmeot. Educational programs offered at the Kitikmeot Campus in the 2014 to 2015 school year include adult basic education, college foundations, office administration, and camp cooking (Nunavut Arctic College 2014). Other educational initiatives include the Actua program, a science, technology, engineering and math education outreach program for youth in the Kitikmeot region (Actua 2013). Actua delivers community-based, hands-on and culturally relevant programming in science and technology to communities such as Kugluktuk.

The Northwest Territories Mine Training Society (NWT MTS) provides education and skills building initiatives in the NWT and Kitikmeot, and is supported in partnership by Dominion Diamond Ekati Corporation, other mining companies, the Governments of Canada and the NWT, Aurora College, and Aboriginal groups. Kugluktuk is one of 11 communities in either the NWT or the Kitikmeot region that receives training programs from the Mine Training Society's two-year mining sector-skills training program (CBC 2013). The Mining the Future Program, a $5.8 million program funded by the federal government, provides training on-site at the Diavik, Snap Lake, and Ekati mines. Successful applicants will be placed in a range of jobs by six local employers (De Beers Canada Inc., Rio Tinto Diavik Diamond Mines Inc., Avalon Rare Metals Inc., Procon Mining and Tunneling, We La Dai Corporation Ltd., and Bouwa Whee Catering) (CBC 2013). By the conclusion of the program in March 31, 2015, the program is expected to have 400 participants, trained 260 people, and found employment for 250 (Mining and Exploration 2013).

In 2012, the Kitikmeot Inuit Association (KIA) formed a partnership with the NWT MTS to organize and deliver mine-training in the Kitikmeot Region (KIA 2012). The KIA made $300,000 in funding available for Inuit employment training in the northern mining sector. In conjunction with the Nunavut Arctic College and the federal Aboriginal Skills and Employment Strategy, the NWT MTS offer training opportunities such as a six-week course on underground mining in Kugluktuk in January 2013 (Nunatsiaq Online 2015). Other training courses offered by the NWT MTS are the Mine Safety Boot Camps where students learn various health and safety certifications that meet the mining industry's safety requirements in the

NWT, Nunavut, Alberta and federally-controlled jurisdictions. A Mine Safety Boot Camp was recently held in Kugluktuk on March 9, 2015 (NWT MTS 2015; WSCC 2015).

Other training initiatives include the remote delivery of a field assistant training program in Kugluktuk that took place September 10 to 30, 2014, in partnership with the KIA, NWT MTS, and the Canadian High Arctic Research Station (Northwest Community College 2014). This 21-day program prepared seven graduates for field work in mineral exploration, environmental services, and natural resources fields. Another skills building initiative is the Nunavut Community Aquatic Monitoring Program (N-Camp), developed by the Government of Nunavut's Fisheries and Sealing division. This pilot program trained and certified Nunavummiut in sampling for fisheries development and aquatic research projects (Canada's Arctic Journal: Above and Beyond 2015). Training was completed in Kugluktuk in September 2014, and will allow the community to complete many of its fisheries development and aquatic health projects (Northern News Service Online 2014).

References:

Actua. 2013. Mining companies join forces to promote youth science education in Nunavut's Kitikmeot Region: Joint industry initiative provides $165,000 to deliver science workshops and camps. Available at: http://www.actua.ca/storage/Actua%20Sabina%20MMG%20and%20Xstrata%20Press%20ReleaseVER4.pdf. Accessed March 11, 2015.

Canada's Arctic Journal: Above and Beyond. 2015. Available at: http://www.ncamp.ca/sites/default/files/files/Jan-Feb%202015Setting_Our_Nets.pdf. Accessed March 9, 2015.

CBC (Canadian Broadcast Corporation). 2013. Harper Trumpets N.W.T. mining program. Available at: http://www.cbc.ca/news/canada/north/harper-trumpets-n-w-t-mining-jobs-program-1.1365166. Accessed March 9, 2015.

KIA (Kitikmeot Inuit Association). 2012. Kitikmeot Inuit Association Makes $300,000 in Funding Available for Inuit Employment Training in the Northern Mining Sector. Available at: http://kitia.ca/en/about-kia/bulletins/kia-mto-press-release. Accessed March 6, 2015.

NWT MTS (Northwest Territories Mine Training Society) 2015. Programs. Available at: http://minetraining.ca/programs. Accessed March 9, 2015.

Mining and Exploration. 2013. Yellowknife's Mine Training Society gets $5.8 million in funding. Available at: http://www.miningandexploration.ca/mines/article/mine_training_society_welcomed_the_prime_minister_and_received_5.8_million/. Accessed March 9, 2015.

Northwest Community College. 2014. NWCC Delivers Field Assistant Training in Nunavut. Available at: http://www.nwcc.bc.ca/news/nwcc-delivers-field-assistant-training-nunavut. Accessed March 9, 2015.

Northern News Service Online. 2014. Fisheries Strategy at Work. Available at: http://www.nnsl.com/frames/newspapers/2014-11/nov3_14leg.html. Accessed March 9, 2015.

Nunatsiaq Online. 2015. Eager to Learn About Underground Mining – the KIA Wants You. Available at: http://www.nunatsiaqonline.ca/stories/article/65674eager_to_learn_about_underground_mining_the_kia_wants_you/. Accessed March 6, 2015.

Nunavut Arctic College. 2014. 2014-2015 Arctic College Programs. Available at: http://www.arcticcollege.ca/en/2014-2015-program-offerings. Accessed March 9, 2015.

WSCC (Worker's Safety and Compensation Commission). 2015. Partner Courses. Available at: http://firewall.wcb.nt.ca/YourWSCC/SafetyEducation/Pages/PartnerCourses.aspx. Accessed March 9, 2015.

DOMINION DIAMOND

Information Request Number:	DAR- KIA-IR-88
Source:	Kitikmeot Inuit Association: Tannis Bolt
Subject:	Education Residual Effects / Northern Labour Force Development
DAR Section(s):	14.5.4 (Page14-86)

Preamble (KIA):

Recognition and discussion requested of Northern trans-boundary education /northern workforce development and how educational enhancement plans will be extended to the non-NWT LSA communities

Request (KIA):

Describe Northern trans-boundary education /northern workforce development and specifically how educational enhancement plans will be extended to the non-NWT LSA / IBA communities and residents of Kitikmeot

Response:

The extension of educational enhancement plans to non-Northwest Territories (NWT) communities applies only to the Hamlet of Kugluktuk, with which Dominion Diamond Ekati Corporation (Dominion Diamond) holds an Impact Benefit Agreement (IBA). A discussion of the provision of educational enhancement plans to other communities outside the NWT (excluding Kugluktuk) is out of scope for the Developer's Assessment Report of the Jay Project.

Dominion Diamond will continue to work with the Mine Training Society in the delivery of mining-related programming (e.g., recent [March 2015] Mining Boot Camp program delivered in Kugluktuk) to the Hamlet of Kugluktuk. Dominion Diamond will extend on the job training opportunities, including apprenticeships, to employees at the Ekati Mine, including those who reside in Kugluktuk. Through ongoing consultation with IBA communities, including the Hamlet of Kugluktuk, Dominion Diamond will work to identify opportunities to provide education and training to residents of IBA communities, where practicable.

DOMINION DIAMOND

Information Request Number:	DAR- KIA-IR-89
Source:	Kitikmeot Inuit Association: Tannis Bolt
Subject:	Community Well-being and Culture
DAR Section(s):	14.6.1.3 (Page 14-89)

Preamble (KIA):

Information regarding how the development surrounding Lac du Sauvage will impact trans-boundary LSA/IBA communities' ability to participate in traditional activities in proximity to the Project area (as per this section's acknowledgment that this activity and ability is an indicator for community and cultural well-being)

Request (KIA):

Describe how the development surrounding Lac du Sauvage will impact trans-boundary Kitikmeot Inuit LSA/IBA communities' ability to participate in traditional activities in proximity to the Project area as it relates to community and cultural well being. Confirm that Project will not affect Kitikmeot/Inuit community well-being and culture.

Response:

While the Information Request references Section 14.6.1.3 of the Developer's Assessment Report (DAR), the effects of the Project on the ability of Aboriginal groups (including transboundary Kitikmeot Inuit communities) to participate in traditional activities were assessed in Section 15 of the DAR (Cultural Aspects). The traditional land use activities considered in Section 15 included wildlife harvesting, fishing, plant harvesting, and other culturally important uses of the land. The study area for the assessment was selected to include the Kitikmeot Inuit communities of Kugluktuk, Omingmaktok (Umingmaktok), and Kingaok (Bathurst Inlet). The traditional land use assessment considered the following factors:

- changes in access to preferred land use or culturally important sites or areas;
- changes in the viewscape and light (i.e., Project-related sensory disturbances);
- Project-related noise disturbances; and,
- the results of other components (e.g., wildlife and caribou assessments).

The assessment also provided a discussion of social and economic factors affecting participation in traditional land use.

The results of the assessment (Section 15.4.1 of the DAR) predict moderate magnitude impacts to traditional wildlife harvesting, low to moderate magnitude impacts to traditional fishing and low magnitude impacts to traditional plant harvesting and other cultural uses of the land. The assessment further determined that the effects are not significant because they are not expected to result in a substantial reduction or alteration in the overall patterns of traditional land use activities and associated traditional lifestyle and culture.

DOMINION DIAMOND

Information Request Number:	DAR- KIA-IR-90
Source:	Kitikmeot Inuit Association: Tannis Bolt
Subject:	Effects on Non-Traditional Land Uses
DAR Section(s):	14.8.3 (Pages 14-112 and 14-113)

Preamble (KIA):

Discussion needed within this section concerning potential effects on non-Traditional Land Uses in the Lac du Sauvage area. This section mentions effects on fish and fish habitat and refers readers to the Fish and Fish Habitat KLOI (DAR Section 9). However more information is required in this section and context to capture these linkages; specifically as they relate to trans-boundary / Kitikmeot LSA/IBA communities.

Request (KIA):

Identify specific non-traditional land uses in the Kitikmeot and add detailed discussion regarding potential effects on non-Traditional Land Uses in the Lac du Sauvage area specifically as they relate to trans-boundary / Kitikmeot LSA/IBA communities.

Response:

Non-traditional land uses in the local study area (LSA) communities located in the Kitikmeot Regional Area include hunting and fishing activities as well as recreational activities. Canada North Outfitting offers guided hunting trips hunting of barren-ground grizzly bear (in the month of May) and barren-ground muskox (mid-March to mid-April) staged out of Omingmaktok (Umingmaktok) (Canada North Outfitting 2015a,b). These hunting outfitters use snowmobiles to conduct hunts around Omingmaktok (Umingmaktok).

The Bathurst Inlet Lodge is an eco-tourism wilderness lodge that offers wilderness activities such as hiking, boat tours, daily interpretive programs, and wildlife and nature viewing (Spectacular NWT 2015). A tourist destination, the lodge can accommodate up to 25 people and is open from June to early August. In 1984, Inuit residents of Kingaok (Bathurst Inlet) became full partners of the Bathurst Inlet Lodge (Bathurst Inlet Lodge 2013).

In Kugluktuk, recreational activities include hiking, camping, hunting, fishing, and snowmobile riding (Nunavut Tourism 2013). Lodges such as Plummer's Arctic Lodges (Plummer's Arctic Lodges 2011) offer fishing trips around Kugluktuk. Service providers such as Canoe North Adventures and Black Feather, offer guided canoe trips down Coppermine River that conclude in Kugluktuk (Canoe North Adventures 2015; Black Feather 2015). In addition, Kugluktuk is the departure or arrival point for Arctic cruises travelling the Northwest Passage (Polar Cruises 2015; World Expeditions 2015; The Great Canadian Adventure Company 2015).

The Kitikmeot LSA/Impact Benefit Agreement communities are located outside of the Non-Traditional Land Use LSA (see Section 2.2.2 of Socio-Economic Baseline and Map 2.2-2; Annex XV of the Developer's Assessment Report [DAR]). As Lac de Gras is in the headwaters of the Coppermine River, a

river in close proximity to Kugluktuk, there may be concerns that Jay Project (Project) activities could potentially have effects on non-traditional fishing opportunities in the Coppermine River.

The assessment of effects on fish and fish habitat is included in Section 9 of the DAR; however, a summary on fish and other aquatic life in the Coppermine River from that section is provided below.

For dewatering the diked area into Lac du Sauvage during construction, the low magnitude and short duration of flow increase was assessed as within the range of natural flow variability that would be expected at the outlet of Lac de Gras and downstream in the Coppermine River. Therefore, discharges from the dewatering of the diked area of Lac du Sauvage are not expected to measurably alter the habitat conditions for fish or affect fish population dynamics at the Lac de Gras outlet channel or downstream in the Coppermine River (Section 9.3.2.2.1 of the DAR).

As described in the water quality assessment (DAR Section 8.5.4 of the DAR), increased concentrations of some constituents are predicted in Lac de Gras as a result of the Project. However, concentrations are predicted to be less than guidelines and benchmarks at all assessment locations and during all phases, resulting in negligible effects to aquatic health (DAR Section 8.5.5). Based on these results, no adverse effects would be expected on fish populations in Lac de Gras (DAR Section 9.4.3.2). The increased nutrient concentrations during operations may result in a small increase in productivity at lower trophic levels in the eastern part of Lac de Gras, but a clear, defined change in composition of plankton and benthic invertebrate communities is not expected. Following closure, plankton and benthic invertebrate communities are expected to return to baseline conditions. No measurable effects to fish populations in Lac de Gras would be expected from the small increase in nutrients during operations. As water quality changes are predicted to result in no or negligible effects on fish populations in Lac de Gras, no effects would be expected on fish populations downstream in the Coppermine River. Non-traditional fishing in the river is, therefore, not expected to be affected by the Project-related changes to water quality.

Pumping water to back-flood the Jay Pit and dewatered diked area of Lac du Sauvage during closure is expected to take less than four years and will not affect the seasonal timing of flows. Due to the low magnitude of change predicted, and the implementation of mitigation to reduce pumping during low flow periods, this pathway was determined to be a secondary pathway with negligible effects to fish and other aquatic life in the Coppermine River (Section 9.3.2.2.2 of the DAR).

As a result, non-traditional fishing opportunities on the Coppermine River are not expected to be adversely affected by the Project.

References:

Bathurst Inlet Lodge. 2013. Our History. Available at: http://bathurstarctic.com/history/. Accessed March 4, 2015.

Black Feather. 2015. Coppermine River. Available at: http://www.blackfeather.com/canoe/canoe_coppermine.htm. Accessed March 4, 2015.

Canoe North Adventures. 2015. Coppermine River. Available at: http://canoenorthadventures.com/adventures/upcoming/coppermine-river/. Accessed March 4, 2015.

Canada North Outfitting. 2015a. Barren-Ground Grizzly. Available at: http://www.canadanorthoutfitting.com/barren_ground_grizzly.shtml. Accessed March 4, 2015.

Canada North Outfitting. 2015b. Barren-Ground Muskox. Available at: http://www.canadanorthoutfitting.com/barren_ground_muskox.shtml. Accessed March 4, 2015.

Nunavut Tourism. 2013. Kugluktuk. Available at: http://www.nunavuttourism.com/regions-communities/kugluktuk. Accessed March 2015.

Polar Cruises. 2015. Into the Northwest Passage. Available at: http://www.polarcruises.com/arctic/ships/expedition-ships/ocean-endeavour-arctic/northwest-passage. Accessed March 5, 2015.

Plummer's Arctic Lodges. 2011. Tree River. Available at: http://www.plummerslodges.com/lodges/tree-river. Accessed March 4, 2015.

Spectacular NWT. 2015. Bathurst Inlet Lodge. Available at: http://spectacularnwt.com/operators/bathurst-inlet-lodge-ltd/264. Accessed March 5, 2015.

The Great Canadian Adventure Company. 2015. Arctic cruise through the Northwest Passage from Greenland to Nunavut. Available at: http://adventures.com/Adventure/Tour/10/Arctic-cruise-through-the-Northwest-Passage-travelling-from-Greenland-to-Nunavut. Accessed March 5, 2015.

World Expeditions. 2015. Northwest Passage West to East. Available at: http://www.worldexpeditions.com/ca/index.php?id=514270. Accessed March 4, 2015.

DOMINION DIAMOND

Information Request Number:	DAR-KIA-IR-91
Source:	Kitikmeot Inuit Association: Tannis Bolt
Subject:	Cumulative effects: Socio-economics
DAR Section(s):	17.10 (Page 17-27 to 17-31)

Preamble (KIA):

Although there is a general discussion regarding the imminent cumulative effects on socio-economics in NWT, this section does not discuss specific study areas these comments pertain to not how the various socio-economic indicators will be affected cumulatively.

Request (KIA):

Identify and discuss cumulative effects on socio-economic indicators for Kitikmeot LSA/IBA communities.

Response:

The approach of the socio-economic assessment (Section 14 of the Developer's Assessment Report [DAR] for the Jay Project (Project) is first to describe the baseline environment (i.e., the year 2014, and trends leading up to this year). The Base Case is then crafted to describe what the socio-economic environment will be like in the future without the Project. The Base Case first discusses future conditions with no additional growth in the economy, considering only existing operations (e.g., the Ekati, Diavik, and Snap Lake Mines). The Base Case then moves on to add other major projects that almost certainly will occur, given their advanced development. For the purpose of the socio-economic Base Case, the other development considered is the Gahcho Kué Mine. The Project socio-economic effects are then measured against this cumulative Base Case. Therefore, the assessment of Project effects is inherently cumulative in nature, considering how the Project will interact with all existing and approved future projects.

The Izok Corridor and Doris North (Hope Bay) projects are proposed developments in the Kitikmeot region, but are not advanced enough in development to be considered in the Base Case and cumulative effects scenario for the socio-economic assessment in the DAR. Therefore, the only other developments with the potential for a cumulative interaction with the Project are the existing and approved mines in the Northwest Territories (NWT).

Where regional Project effects are anticipated, and where these regional effects are realized into the Kitikmeot region, a cumulative socio-economic effect for Kitikmeot communities could be expected. There is, however, limited potential for cumulative Project effects to extend into this region. Migration to the Kitikmeot Impact Benefit Agreement (IBA) community of Kugluktuk is not expected as a result of the Project, removing the potential for a cumulative in-migration effect, and associated effects on infrastructure, services, demographic composition, and community life stemming from population growth.

Cumulative Project economic effects to Kugluktuk are also not expected, as the Project will not be paying taxes or royalties to Nunavut. While the Ekati Mine is the only NWT mine with an IBA with the Hamlet of Kugluktuk, the Diavik Mine holds a Participation Agreement with the Kitikmeot Inuit Association (KIA) (not

specifically the Hamlet of Kugluktuk). Both agreements establish a framework for local (i.e., KIA) employment and procurement opportunities with the mines. It can be reasonably assumed that the Ekati and Diavik mines are having a combined, cumulative effect on employment and contracting in the Kitikmeot region. Assuming similar participation by KIA employees and business at both mines, this effect, while positive, would be modest, and would not be expected to result in significant associated residual effects (e.g., out-migration [at a scale relative to the total community population] as a result of enhanced mobility via wage income). The Project is expected to continue contracting and employment opportunities as currently available at the existing Ekati Mine, and is not expected to interact cumulatively with the Diavik Mine in a manner different from the current scenario.

As the other NWT mines do not hold IBAs with Kugluktuk or the KIA, they are not under the same obligation to hire Kugluktuk residents, or contract from businesses in the hamlet. Therefore, while the Project will have a direct effect on employment, community contributions and contracting in Kitikmeot, a cumulative effect is not expected. Cumulative effects associated with out-migration (e.g., change in community structure, loss of Aboriginal languages) stemming from employment and increased incomes are, therefore, also not anticipated.

The responses to DAR-KIA-IR-81, DAR-KIA-IR-90, and DAR-Tłı̨chǫ-IR-01 provide a discussion of Project effects on non-traditional land use (NTLU) in the Kitikmeot region. Overall, regional Project effects on NTLU are not anticipated, and so no cumulative effects on NTLU in the region are expected.

DOMINION DIAMOND

Information Request Number:	DAR- KIA-IR-92
Source:	Kitikmeot Inuit Association: Tannis Bolt
Subject:	Cumulative effects: Cultural Aspects
DAR Section(s):	17.11 (Page 17-32)

Preamble (KIA):

Although there is a general discussion regarding the imminent cumulative effects on traditional land use participation and cultural heritage, this section does not discuss specific study areas these comments pertain to.

Request (KIA):

Identify and discuss cumulative effects on cultural aspect indicators for Kitikmeot LSA/IBA communities.

Response:

This Information Request references Section 17.11 (page 17-32) of the Developer's Assessment Report (DAR), which is a summary section discussing cumulative effects. Valued components (VCs) and measurement indicators, and study areas for Cultural Aspects are discussed in Sections 15.2.2 and 15.2.3 of the DAR, respectively.

The VCs for Cultural Aspects are Traditional Land Use (TLU) and Heritage Resources (archaeological or historic sites, burial sites, other objects of cultural or religious importance). The measurement indicators for traditional land use considered effects to traditionally used resources (e.g., wildlife, fish), disturbance and access to preferred land use areas, sensory disturbance (light and noise), social and economic factors affecting participation in traditional activities, Aboriginal users' intangible relationships to the land, and concerns regarding ecological and human health. The measurement indicators for heritage resources considered intact and undisturbed heritage resources.

The study area used for assessing effects to traditional land use is described in Section 15.2.3 of the DAR, and includes the communities of Kugluktuk, Kingaok (Bathurst Inlet), and Omingmaktok (Umingmaktok). The TLU effects study area (ESA) was selected to encompass the existing mine site, the area that contains the potential new development, the entire Ekati claim block, and the lands, waterbodies, and communities beyond the Ekati claim block that include the Akaitcho Dene Asserted Territory, the Tłı̨chǫ Land Claim, and the portion of the Nunavut Kitikmeot Region that includes the Inuit communities identified above. The TLU ESA is used for discussing most effects on traditional land users and traditional harvesting. However, effects on TLU consider the effects on underlying traditionally used resources, which are discussed in other sections of the DAR (e.g., caribou in Section 12, vegetation in Section 11, fish and fish habitat in Section 9), as they relate to traditional harvesting. Therefore, when discussing effects on an underlying resource used for traditional harvesting, the ESA utilized within the assessment on that underlying resource is considered. For example, when discussing effects on caribou as it relates to traditional wildlife harvesting, the effects on caribou are discussed within the context of the caribou ESA(s).

The study area used to assess the effects to heritage resources is discussed in Section 15.2.3.2. The heritage regional study area (RSA) was selected to encompass all existing and proposed developments in the Lac de Gras region and an approximate 20 kilometre buffer. The RSA covers approximately 5,933 square kilometres, and includes areas that will be influenced by the Jay Project (Project) and areas that will remain unaffected.

The cumulative effects to TLU are described in Section 17.11 of the DAR. Cumulative effects on TLU are part of a process of interdependent social and cultural change and individual responses to that change, which causes the determination of the exact extent of effects due to development to be difficult. As a result, the assessment of potential cumulative effects on TLU is conducted qualitatively. The assessment predicts that cumulative effects will likely result in negative effects on traditionally used resources, the loss of a portion of preferred use areas, and result in changes in access. Cumulative effects are also expected for sensory disturbances, increased concerns regarding human and ecological health, and social and economic factors that may affect the continued participation in TLU activities. These effects are generally considered to be negative in nature. However, some effects may have both negative and positive dimensions due to differing individual responses to these changes. These effects are not predicted to result in a substantial reduction or alteration in the overall patterns of TLU activities or in associated traditional lifestyle and cultural practice.

The Project and cumulative effects to historical resources are summarized Section 15.4.4.1 of the DAR. The Project will have a positive residual impact to heritage resources. The Project results in an additional seven heritage resource sites being added to the heritage resources record, and will have either no linkage or secondary linkages to heritage resources. The mitigation measures applied, either avoidance or scientific data recovery, mitigate the impacts so that there will be a negligible residual effect on VCs relative to the Base Case. Further, it is not expected that these impacts would contribute to effects of other existing, approved, or reasonably foreseeable projects that would result in anything beyond a low magnitude of change on the VC.

DOMINION DIAMOND

Information Request Number:	DAR- KIA-IR-93
Source:	Kitikmeot Inuit Association: Tannis Bolt
Subject:	Fish and Fish Habitat
DAR Section(s):	9 (Page 9-165), Appendix 9A

Preamble (KIA):

Riparian habitat loss is provided as a percentage of the combined Lac du Sauvage and Lac de Gras (0.9%). It is unclear what percentage of riparian habitat will be lost within Lac du Sauvage alone. In addition, riparian habitat loss (10.6km) is not identified in the Fish Offsetting Plan.

Request (KIA):

Please provide an estimate of the percentage of riparian habitat loss in Lac du Sauvage, and indicate if this loss will be offset in the finalized fish offsetting plan. If riparian habitat will not be included, please specify the rationale for excluding it.

Response:

The Developer's Assessment Report (DAR) provided an assessment of the direct effects from the Jay Project footprint on fish Valued Components (VCs) using shoreline length as a measurement endpoint for riparian habitat (Section 9). The assessment informed the Conceptual Offsetting Plan (Section 9A) and was based on analyses under the following pathways in Section 9.4.3.1:

- *The construction of the horseshoe dike and Jay Pit within Lac du Sauvage will result in the direct loss or alteration of habitat, affecting fish and other aquatic life within Lac du Sauvage and Lac de Gras.*
- *The dewatering of the diked area will result in the direct loss or alteration of habitat in Lac du Sauvage, affecting fish and other aquatic life within Lac du Sauvage and Lac de Gras.*

Any changes were examined on a population-level scale so that the assessment provided an ecologically relevant and confident classification of the effects to VCs. This scale included Lac du Sauvage and Lac de Gras (i.e., Effects Study Area; DAR Table 9.1-4) and was consistently applied to all habitat calculations in the assessment (Section 9.4.2.1.1).

As summarized in the DAR, a section of the shoreline in Lac du Sauvage will be exposed in the diked area following dewatering and throughout operations, which may affect riparian habitat where present. The total length of affected riparian habitat was conservatively assumed to represent the entire length of shoreline to be exposed within the dewatered area (includes shorelines around islands). Thus, the length of affected riparian habitat is predicted to be approximately 9.46 kilometres (km) from the dewatered area and 1.14 km from the diked area (10.60 km in total). The estimated incremental loss of riparian habitat with the application of the Project represents 0.9 percent (%) of available riparian habitat in Lac du Sauvage and Lac de Gras. The amount of cumulative change to riparian habitat for the Application Case during operations is expected to result in no measurable effects to population abundance and distribution for fish VCs.

Effects from potential changes in riparian vegetation are also summarized in the response to DAR-IEMA-IR-05 where supplemental information from the Vegetation Baseline Report (Annex VI of the DAR) is provided. The Vegetation Baseline Report includes an ecological landscape classification in the vegetation baseline study area (BSA), and describes the mapped vegetation units. A key finding from the analysis is that riparian units (riparian tall shrub, birch seep, and shoreline shrub) account for less than 1% each of the landscape of the BSA (Annex VI, Section 3.1.1). Lac du Sauvage, the Lac du Sauvage-Lac de Gras Narrows (the Narrows), and Lac de Gras have a low abundance of riparian map units directly associated with them (Map 93-1). There are no discernible riparian habitat units directly adjacent to the shoreline of the Narrows. Photographs of the shoreline of Lac du Sauvage (taken during boat and helicopter-based surveys in 2013) confirm a predominately boulder/rocky shoreline and a general lack of riparian vegetation near the lake shorelines (Photos 93-1 to 93-4).

Although Section 9 of the DAR (Fish and Fish Habitat) assessed the direct effects of riparian habitat as a primary pathway, no measurable effects to population abundance and distribution for fish VCs are predicted, and shoreline length as a surrogate measure of riparian habitat may provide an overly conservative estimate of riparian losses as it relates to effects to fish VCs. Actual changes (both absolute and relative values) in riparian habitat may be less than what is reported. The vegetation assessment (Section 11.4.2.2) reports that approximately 1 hectare (ha) of riparian tall shrub and 16 ha of birch seep and riparian shoreline shrub may be removed by the Project, most of which will be affected by the Sub-Basin B Diversion Channel and related infrastructure. These losses are captured in calculations of the aquatic footprint (Section 9.4.3.1, and Section 9A4), and will be included in the Final Offsetting Plan, as they are currently provided in the Conceptual Offsetting Plan (Section 9A). Furthermore, altered shoreline and riparian habitats will be restored at closure as part of the closure and reclamation plan (Section 3.5.8 of the DAR).



LEGEND

- EKATI MINE FOOTPRINT
- DIAVIK MINE FOOTPRINT
- PROPOSED JAY FOOTPRINT
- WINTER ROAD
- TIBBITT TO CONTWOYTO WINTER ROAD
- NORTHERN PORTION OF TIBBITT TO CONTWOYTO WINTER ROAD
- ELEVATION CONTOUR (10 m INTERVAL)
- ESKER
- WATERCOURSE
- WATERBODY

ECOLOGICAL LAND CLASSIFICATION MAP UNITS

- RIPARIAN TALL SHRUB
- BIRCH SEEP AND RIPARIAN SHORELINE SHRUB

REFERENCE

VEGETATION CLASSIFICATION DATA: DIAVIK LANDSAT CLASSIFICATION 1997; WEST KITIKMEOT CLASSIFICATION 2001; MODIFIED BY GOLDER ASSOCIATES 2014
CANVEC © NATURAL RESOURCES CANADA, 2012
NATURAL RESOURCES CANADA, CENTRE FOR TOPOGRAPHIC INFORMATION, 2012
DATUM: NAD83 PROJECTION: UTM ZONE 12N

DOCUMENT

DAR-KIA-IR-93

4 0 4
SCALE 1:175,000 KILOMETRES

PROJECT
DOMINION DIAMOND™
JAY PROJECT
NORTHWEST TERRITORIES, CANADA

TITLE
RIPARIAN ECOLOGICAL LANDSCAPE CLASSIFICATION MAP UNITS

Golder Associates

PROJECT		1419751	FILE No. POSTDAR_IR_Veg_003_GIS	
DESIGN	JF	09/03/15	SCALE AS SHOWN	REV 0
GIS	AK/LS	02/04/15	MAP 93-1	
CHECK	CS	02/04/15		
REVIEW	KM	02/04/15		

G:\CLIENTS\DOMINION\DDEC Jay and Lynx Projects\Figures\13-1328-0041 Jay & Lynx EA\Vegetation\POST-DAR IRs\POSTDAR_IR_Veg_003_GIS.mxd

Photo 93-1 **Lac du Sauvage Narrows, August 12, 2013**



Photo 93-2 **Lac du Sauvage Shoreline, August 27, 2013**



Photo 93-3 **Lac du Sauvage Shoreline, August 23, 2013**



Photo 93-4 **Northwest Location of Proposed Dike, Aerial View, August 24, 2013**



DOMINION DIAMOND

Information Request Number:	DAR-KIA-IR-94
Source:	Kitikmeot Inuit Association: Tannis Bolt
Subject:	Fish spawning suitability
DAR Section(s):	Section 9 (Page 9-169), Appendix 9A (Maps 9A4.1-1 and 9A4.1-2)

Preamble (KIA):

Shoal habitats provide important spawning and rearing habitat for fish VC's in Lac du Sauvage. The shoal survey was completed in the late 1990s by Golder in order to identify shoal location and suitability for spawning. The details determining spawning suitability were not located by the reviewer within the provided reference materials. Maps 9A4.1-1 and 9A4.1-2 in the Fish Offsetting Plan (Appendix 9A) display the presence of shallow areas containing coarse substrates within the project footprint which may provide spawning habitat for fish VC's. Therefore, it is not clear why these areas were not considered as suitable habitat. In addition, while a thorough substrate survey was completed during the baseline program, a re-assessment of shoal suitability for spawning was not provided.

Request (KIA):

Please provide the report by Golder and/or the rationale provided for determining spawning suitability within Lac du Sauvage. In addition, please indicate how results from the recent substrate survey confirm the results of the shoal spawning suitability assessment provided in the late 1990's, and why shallow coarse substrate shoals within the project footprint were not considered as suitable spawning habitat.

Response:

Dominion Diamond is confident that the baseline information on fish habitat provided in the Developer's Assessment Report (DAR) is reliable and meets the objectives of the environmental assessment of the Jay Project. The assessment of direct effects from the Project footprint on shoal habitat is provided in DAR Section 9.4.3.1, and is as part of an evaluation of the following primary pathways:

- *The construction of the horseshoe dike and Jay Pit within Lac du Sauvage will result in the direct loss or alteration of habitat, affecting fish and other aquatic life within Lac du Sauvage and Lac de Gras.*
- *The dewatering of the diked area will result in the direct loss or alteration of habitat in Lac du Sauvage, affecting fish and other aquatic life within Lac du Sauvage and Lac de Gras.*

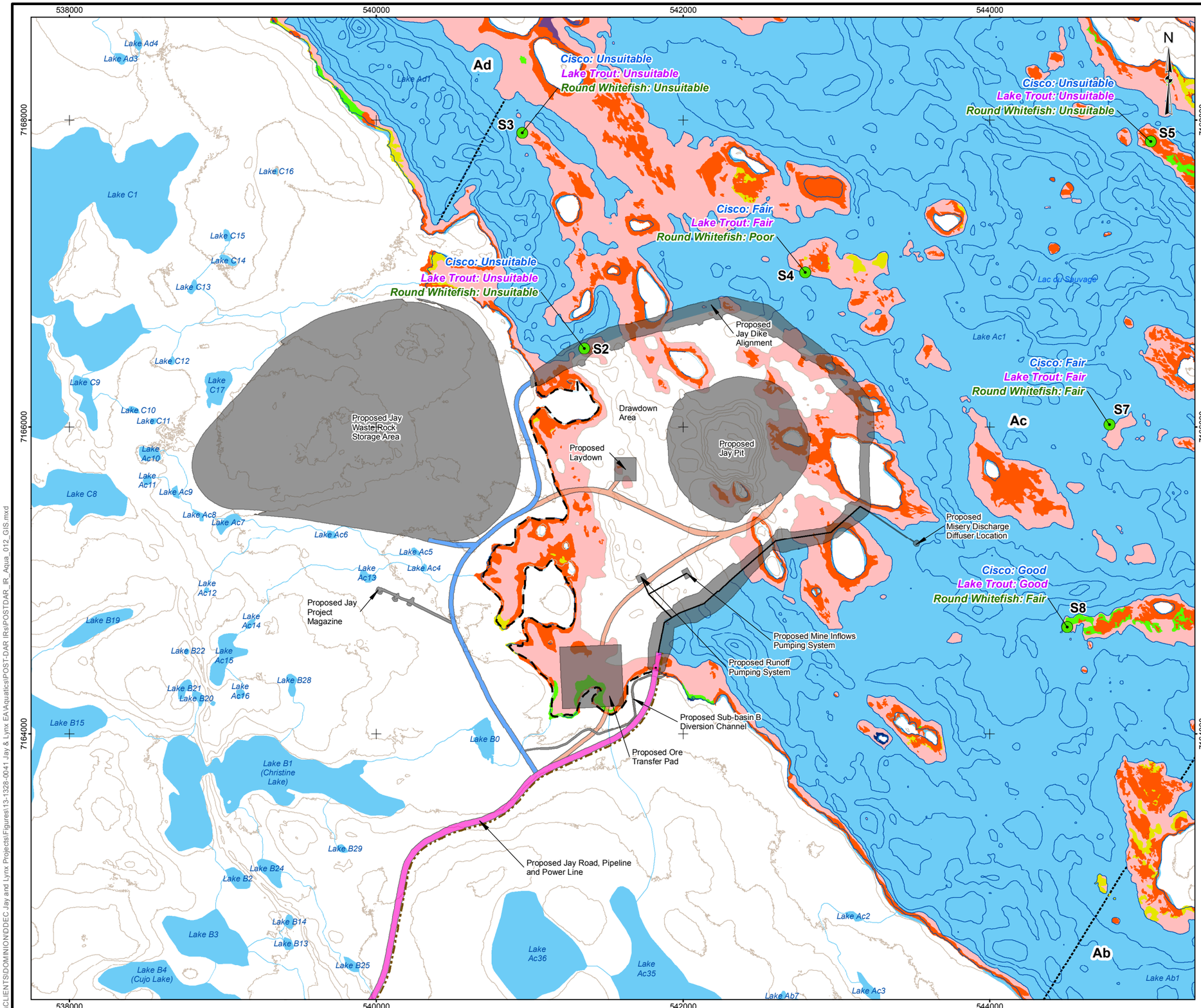
The assessment used three complementary methods and resulting datasets (including the historical information on shoals referenced in the preamble) to describe baseline conditions and evaluate the direct effects to shoal habitat (i.e., as potential spawning locations for fish Valued Components [VCs]). This approach reduces the uncertainty in the description of baseline conditions, increasing the reliability of the residual impact classification.

The first dataset used the 2013 hydroacoustic data to classify habitat for the entire area of Lac du Sauvage and to verify results from previous surveys (for detailed methods see Section 3.1.3.1.2 in Fish and Fish Habitat Baseline Annex XIV). The hydroacoustic data created a map of fines, mixed, and coarse

substrates, and from the map, a description of substrate per depth stratum (0 to 2 m, 2 to 6 m, 6 to 10 m, and greater than 10 m) was provided for a ranking, or evaluation, of habitat according to the key life history functions for fish VCs (see Section 9.4.2.1). For example, coarse substrates (including gravel, cobble, and boulder) are generally considered high-quality habitat for spawning and rearing Lake Trout and Lake Whitefish because of the cover provided around the interstitial spaces where eggs are laid (as stated in the DAR). Furthermore, coarse substrates at moderate depths (2 to 6 m) are likely preferred depths for spawning substrates for Lake Trout and Lake Whitefish, in part, because the depths are shallow enough to expose substrates to any currents in the area that would limit an abundance of epibenthic egg predators, such sculpins (*Cottus* spp.), but are also deep enough to exceed maximum ice thickness during winter (reviewed in Marsden et al. 1995).

A second, complementary dataset of substrate types was created using the more detailed habitat data derived for shoreline littoral areas from orthophotos and ground-truthed substrate delineations (for detailed methods see Section 3.1.3.1.3 in Fish and Fish Habitat Baseline Annex XIV). The area (or quantity) of available substrate types per depth stratum in Lac du Sauvage are provided for both datasets in DAR Tables 9.4-3 and 9.4-4. These tables provide information on shallow coarse substrate habitats within the Project footprint (i.e., dike and dewatered area).

Baseline conditions were also described by the shoal habitat survey conducted in 1996 in Lac du Sauvage and Lac de Gras (Golder 1997a). The surveys determined the suitability of shoals for spawning based on seven physical habitat characteristics: substratum type, substratum size, minimum depth, maximum depth, slope of rock substratum, substratum shape, substratum cleanliness, depth of interstitial spaces, and exposure to predominant wind and wave action (Golder 1997a). All but one (shoal S2) of the 21 shoals identified by Golder (1997a) in Lac du Sauvage fall outside of the proposed diked area (see Map 67-1 provided in DAR-MVEIRB-IR-67). Shoal S2 is located adjacent to the dike, but was classified as an unsuitable shoal for spawning by Lake Trout, Cisco, and Round Whitefish based on substrate (primarily silt/clay with some gravel) and substratum depth (3.9 m). A more recent assessment by Rescan (2007) of shoals in Lac du Sauvage documented similar findings, concluding that less than 5 percent of all shoals examined along 61 transects in the Jay Pipe area were ‘good’ habitat for spawning activity by Lake Trout, Lake Whitefish, and Round Whitefish. Most of the high-quality shoal habitats in the Effects Study Area (ESA) are located in Lac de Gras (Golder 1997a,b,c). Generally, shoals in Lac du Sauvage are not as deep or numerous, and have been found to provide less potential spawning habitat of good to fair quality for Lake Trout, Cisco, and Round Whitefish relative to shoal habitat in Lac de Gras (Golder 1997a; DDMI 1998).



LEGEND

- WATERCOURSE
- WATERBODY
- BATHYMETRY CONTOUR (5 M INTERVAL)
- ELEVATION CONTOUR (10 M INTERVAL)
- INTERNAL BASIN DIVIDE
- SPAWNING HABITAT

SPAWNING SHOALS (S)

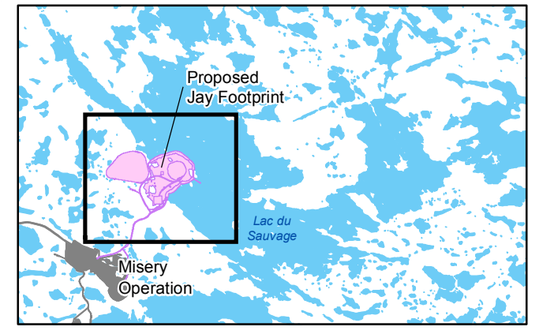
- *CISCO: SUITABILITY*
- *LAKE TROUT: SUITABILITY*
- *ROUND WHITEFISH: SUITABILITY*

SUBSTRATE TYPE (0-5 METRES)

- BO/CO - BOULDER/COBBLE
- BO/FI - BOULDER/FINES
- BR - BEDROCK
- FI - FINES
- FI/BO - FINES/BOULDER
- FI/CO - FINES/COBBLE

JAY PROJECT FOOTPRINT

- EXISTING SHORELINE OF DEWATERED AREA
- POWER LINE
- PROPOSED JAY PROJECT INFRASTRUCTURE
- PROPOSED JAY ROAD NORTH (HAUL ROAD)
- PROPOSED JAY ROAD (HAUL ROAD, PIPELINE AND POWER LINE)
- PROPOSED OPERATION ROADS



REFERENCE

1. GOLDER. 1997. TECHNICAL MEMORANDUM #12-2, SHOAL HABITAT SURVEY, LAC DE GRAS AND LAC DU SAUVAGE, SUMMER 1996. ENVIRONMENTAL BASELINE PROGRAM. SUBMITTED TO DIAVIK DIAMOND MINES INC. YELLOWKNIFE, NWT, CANADA. DOC NO. TM12-2.
2. CANVEC © NATURAL RESOURCES CANADA, 2012
3. NATURAL RESOURCES CANADA, CENTRE FOR TOPOGRAPHIC INFORMATION, 2012
4. BATHYMETRIC DATA OBTAINED FROM AURORA, 2013

DATUM: NAD83 PROJECTION: UTM ZONE 12N

DOCUMENT

DAR-KIA-IR-94

500 0 500

SCALE 1:25,000 METRES

PROJECT

DOMINION DIAMOND

JAY PROJECT
NORTHWEST TERRITORIES, CANADA

TITLE

SHORELINE HABITAT AND SPAWNING SHOALS NEAR THE PROPOSED JAY PROJECT IN LAC DU SAUVAGE

Golder Associates

PROJECT		1419751	FILE No. POSTDAR_IR_Aqua_012_GIS	
DESIGN	CS	10/03/15	SCALE AS SHOWN	REV 0
GIS	ANK	02/04/15		
CHECK	CS	02/04/15	MAP 94-1	
REVIEW	KM	02/04/15		

G:\CLIENTS\DOMINION\DOEC Jay and Lynx Projects\Figures\13-1328-0041 Jay & Lynx EA\Aquatics\POST-DAR IR\POSTDAR_IR_Aqua_012_GIS.mxd

The results of the 2013 baseline habitat survey in Lac du Sauvage were consistent with these previous studies (Golder 1997a; Rescan 2007) that identified limited, mostly low quality or unsuitable spawning shoal habitat for the fish VCs, based on water depths and substrate in the proposed diked area (Annex XIV, Section 3.2.3 and Section 4). Given the limited availability of spawning shoal habitat for fish VCs identified within the proposed diked area in Lac du Sauvage, and the availability of habitat elsewhere, any effect to fish VCs resulting from a decrease in shoal habitat within the Project footprint is expected to be negligible. The amount of cumulative change to shoal habitat for the Application Case is expected to result in no measurable effect to population abundance and distribution for fish VCs. Effects, if any, would be limited to a negligible change in the distribution of fish with no effects on the ongoing productivity of fisheries. Losses to fish habitat associated with the dike will be included in the final offsetting plan (based on the Conceptual Offsetting Plan in the DAR) submitted with the application to Fisheries and Oceans Canada for a *Fisheries Act* Authorization during the regulatory phase of the Project.

References:

DDMI (Diavik Diamond Mines Inc.). 1998. Diavik Diamonds Project Environmental Assessment – Environmental Effects Report on Fish and Water Quality. Diavik CD-ROM series, second edition. Yellowknife, NWT, Canada.

Golder. 1997a. Technical Memorandum #12-2, Shoal Habitat Survey, Lac de Gras and Lac du Sauvage, Summer 1996. Environmental Baseline Program. Submitted to Diavik Diamond Mines Inc. Yellowknife, NWT, Canada. Doc No. TM12-2.

Golder. 1997b. Technical Memorandum #13-3, Inland Lake Survey Report. 1996 Environmental Baseline Program. Submitted to Diavik Diamond Mines Inc. Yellowknife, NWT, Canada. Doc No. TM13-3.

Golder. 1997c. Technical Memorandum #14-2, Intensive Shoreline Habitat Survey. 1996 Environmental Baseline Program. Submitted to Diavik Diamond Mines. Yellowknife, NWT, Canada. Doc No. TM14-2.

Marsden JE, Casselman JM, Edsall TA, Elliott RF, Fitzsimons JD, Horns WH, Manny BA, McAughey SC, Sly PG, Swanson BL. 1995. Lake Trout Spawning Habitat in the Great Lakes – A Review of Current Knowledge. J Great Lakes Res. 21(Suppl. 1):487-497.

Rescan (Rescan Environmental Services Ltd.). 2007. Ekati Diamond Mine. 2006 Jay Pipe Aquatic Baseline. Prepared for BHP Billiton Diamonds Inc. Yellowknife, NWT, Canada, 325 pp.

DOMINION DIAMOND

Information Request Number:	DAR- KIA-IR-95
Source:	Kitikmeot Inuit Association: Tannis Bolt
Subject:	Fish population
DAR Section(s):	9 (Table 9.4-5), Annex XIV (Table 3.2-31)

Preamble (KIA):

The fish population estimate determined using hydroacoustic data had very wide confidence intervals (Section 9, Table 9.4-5) and was not validated using any mark recapture or catch curve analyses. In addition, it is unclear to the reviewer if fish in the littoral zone can be accurately detected and measured using this technology. Many fish species utilize shallow littoral areas, including lake trout if temperatures are within their preferred thermal range.

Request (KIA):

Please provide additional justification for the usage of hydroacoustic data for calculating fish population sizes in Lac du Sauvage. In addition, please indicate why other methods such as mark recapture or catch curve analyses were not employed to validate data. If possible, provide data from other studies which have validated hydroacoustic population estimates with other methods, or during the fish-out process.

Response:

A diverse range of sampling techniques have been developed for the assessment of fish populations in lakes around the world (Bonar et al. 2009). The selection of specific gear types typically depends on the habitats and species under examination, but also logistical issues, and in some cases, ethical issues. Because one gear type or method cannot be universally applied in all types of lake habitats, the standard or common practice is the use of a combination of more than one sampling technique (e.g., Yule 2000; Yule et al. 2007). Although a relatively new technique to be deployed in freshwaters of the Canadian Arctic, the use of transmitted underwater sound to survey fish populations (known effectively as hydroacoustics) has a long and extensive record of successful application in various ecosystem settings (e.g., Thorne 1983; Wanzenböck et al. 2003; Kubecka et al. 2009; Rudstam et al. 2009; Winfield et al. 2009; Yule et al. 2009; Dennerline et al. 2012). The approach has considerable potential for estimating population sizes when combined with limited sampling with gill nets (to determine other biological characteristics). The use of hydroacoustics (a remote observational technique) is increasing as an option for evaluating and monitoring fisheries resources (Kubecka et al. 2009; Winfield et al. 2009; Dennerline et al. 2012).

For describing baseline conditions of fisheries in Lac du Sauvage, hydroacoustic data on fish densities were combined with species composition data collected primarily from the use of short-duration gill net sets to predict densities and total abundance of fish in Lac du Sauvage. A major strength of the baseline assessment was the use of hydroacoustics over catch-per-unit effort (CPUE) or mark-recapture gill netting for a number of reasons. The hydroacoustic surveys efficiently covered large areas of the lake in the short-window of opportunity provided by the remoteness of the study location (also see Winfield et al. 2009) and Arctic setting where climate and weather conditions limits the effective period to survey fish

populations. Other methods would simply have failed in deriving a population estimate with any level of confidence for a relatively large lake such as Lac du Sauvage within this time window. Thus, the combination of extensive hydroacoustic coverage of the lake and limited gill net surveys facilitated the quantitative assessment of the abundance of fish valued component (VC) species. The capability of hydroacoustics in providing absolute estimation of the fishery in Lac du Sauvage (which CPUE statistics cannot) is a clear advantage of the method because it can best inform management or regulatory decisions even with a limited historical database, and ultimately providing a much better understanding of population processes (Thorne 1983; Wanzenböck et al. 2003).

Although the use of CPUE or mark-recapture data for determining population abundance is scientifically valid when the sampling effort is high, its destructive nature can produce problems with obtaining sampling permissions, and may even have impacts at the population scale for small or medium-size lakes with low fish populations (Winfield et al. 2009), such as Lac du Sauvage. In contrast to hydroacoustic surveys, which are non-invasive, mark-recapture or CPUE methods for a lake the size of Lac du Sauvage would require the handling of thousands of fish, many of which would have endured sub-lethal and lethal effects from the deployed gear types (e.g., gill net sets) and handling times associated with measuring and tagging fish. The use of hydroacoustic surveys was an opportunity for Dominion Diamond Ekati Corporation to minimize effects to the fishery while collecting the required baseline information for an environmental assessment to fish VCs. Furthermore, the current thinking is that the most appropriate role for gill nets in fisheries assessments may be to: 1) supplement hydroacoustic data by providing information on species composition and fish sizes, and 2) provide information on metrics other than fish abundance, such as fish growth and condition (Dennerline et al. 2012).

However, hydroacoustics is not a ‘standalone’ solution for all fisheries assessments of lakes in the Canadian Arctic. One limitation is the inability to directly differentiate species. Species composition can only be inferred using information on the size, depth, or location of fishes collected with secondary sampling gears such as gill nets. Differentiating fish from the bottom can also be problematic depending on substrate and fish size, so acoustics may not provide reliable estimates for some benthic species in some habitat types.

Any biases in the distribution of fish (e.g., missing fish in littoral zones) were minimized by deploying a horizontally-oriented transducer with the standard deployment of a vertically-oriented transducer (Kubecka and Wittengerova 1998; Knudesen and Saegrov 2002; Gangl and Whaley 2004). Use of horizontal beaming is the recommended approach for estimated fish densities in shallow water and in lakes where fish may be distributed near the surface. Horizontal beaming allows for fish detection near the surface (i.e., less than about 5 metres [m] in depth), where fish are typically missed by a vertically oriented transducer beam. Detection of fish, including small and large-bodied fish, was also improved by timing the hydroacoustic surveys during the appropriate diel period and season when fish are more evenly distributed in the lake. For example, timing of the surveys were restricted to the darkest hours of the 24-hour day (approximately 10 pm to 6 am) when many species of fish can migrate into different depths or disperse out of schools, becoming more evenly distributed across the lake (Yule 2000). Another consideration aimed at detecting as many fall-spawning fish as possible (e.g., Lake Trout) was the season in which the surveys were performed. The surveys were completed approximately mid-summer prior to late summer and early fall when adults move to and congregate on their spawning shoals (as suggested by Yule et al. 2007).

Although hydroacoustic abundance estimates often represent the “truth” in a scientific study (Dennerline et al. 2012), and there are many publications that compare different fish sampling gears with hydroacoustic methods (including the publications cited in this response and many others not listed here), there are very few available peer-reviewed studies or grey literature where hydroacoustic population estimates have been directly validated with census results derived from other methods (e.g., a fish-out process). Comparisons between acoustic estimates and fish counts have only been possible in unusual situations; for example, there are two published reports that directly verify acoustic estimates with a census of the total fish community after reservoir draining (Cadic et al. 1998; Godlewska et al. 2012). The findings of these reports were promising, demonstrating the usefulness of hydroacoustics as a quantitative tool in both shallow and deep lakes. One of the first programs that will provide census data to validate hydroacoustic population estimates for a lake in the Canadian Arctic was performed at Kennady Lake by De Beers Canada Inc. Hydroacoustic surveys were performed at Kennady Lake prior to initiating the fish-out in 2014, with the second phase of the fish-out planned for 2015. Analysis of the data collected from hydroacoustic surveys and the fish-out program at Kennady Lake will help with refining future study designs. However, Dominion Diamond is confident that the information provided by the 2013 hydroacoustic surveys of Lac du Sauvage provides sufficient information for the assessment of fish and fish habitat in the Developer’s Assessment Report (Section 9), including an assessment of losses for the Conceptual Offsetting Plan (Section 9A).

References:

Bonar SA, Huber WAD, Willis DW (Eds). 2009. Standard Methods for Sampling North American Freshwater Fishes. American Fisheries Society. 335 pp.

Cadic N, Irz P, Argillier C. 1998. A comparison between dam draining fish-stocktaking, gillnet sampling and acoustic sampling, for fish biomass assessment on a reservoir. In: Alippi, A., Canelli, G.B. (Eds.), Proceedings of the Fourth European Conference on Underwater Acoustics. Rome, pp. 261–266.

Dennerline DE, Jennings CA, Degan DJ. 2012. Relationships between hydroacoustic derived density and gill net catch: implications for fish assessments. Fish Res 2012: 78-89.

Gangl RS, Whaley RA. 2004. Comparison of fish density estimates from repeated hydroacoustic surveys on two Wyoming waters. N Am J Fish Manage 24:1279-1287.

Godlewska M, Frouzova J, Kubecka J, Wisniewolski W, Szlakowski J. 2012. Comparison of hydroacoustic estimates with fish census in shallow Malta Reservoir–which TS/L regression to use in horizontal beam applications?. Fish Res 123: 90-97.

Knudsen FR, Saegrov H. 2002. Benefits from horizontal beaming during acoustic survey: application to three Norwegian lakes. Fish Res 56: 205-211.

Kubecka J, Hohausova E, Matena J, Peterka J, Amarasinghe US, Bonar SA, Hateley J, Hickley P, Suuronen P, Tereschenko V, Welcomme B, Winfield IJ. 2009. The true picture of a lake or reservoir fish stock: a review of needs and progress. Fish Res 96:1-5.

Kubecka J, Wittingerova M. 1998. Horizontal beaming as a crucial component of acoustic fish stock assessments in freshwater reservoirs. Fish Res 35: 99-106.

Rudstam LG, Parker-Stetter SL, Sullivan PJ, Warner DM. 2009. Towards a standard operating procedure for fishery acoustic surveys in the Laurentian Great Lakes, North America. – ICES J Ma Sci 66: 1391-1397.

Thorne RE. 1983. Assessment of population abundance by hydroacoustics, Biological Oceanography 2:2-4, 253-262.

Wanzenböck J, Mehner T, Schulz M, Gassner H, Winfield IJ. 2003. Quality assurance of hydroacoustic surveys: the repeatability of fish-abundance and biomass estimates in lakes within and between hydroacoustic systems. ICES J Mar Sci: J Conseil, 60: 486-492.

Winfield IJ, Fletcher JM, Ben James J, Bean CW. 2009. Assessment of fish populations in still waters using hydroacoustics and survey gill netting: experiences with Arctic charr (*Salvelinus alpinus*) in the UK. Fish Res 96: 30-38.

Yule DL. 2000. Comparison of horizontal acoustic and purse-seine estimates of salmonid densities and sizes and eleven Wyoming waters. N Am J Fish Manage 20:759-775.

Yule DL, Adams JV, Stockwell JD, Gorman OT. 2007. Using multiple gears to assess acoustic detectability and biomass of fish species in Lake Superior. N Am J Fish Manage 27:106-126.

Yule DL, Stockwell JD, Schneider DR, Evrard LM, Balge M, Hrabik TR. 2009. Can pelagic forage fish and spawning cisco (*Coregonus artedi*) biomass in the western arm of Lake Superior be assessed with a single summer survey? Fish Res 96: 39-50.

DOMINION DIAMOND

Information Request Number:	DAR- KIA-IR-96
Source:	Kitikmeot Inuit Association: Tannis Bolt
Subject:	Fish population
DAR Section(s):	Annex XIV, p. 3-15

Preamble (KIA):

Hydroacoustic data used for estimating fish population size was collected over a single summer. Additional sampling would aid in determining interannual variability, and would possibly provide a more accurate population size estimate.

Request (KIA):

If possible, we recommend collecting an additional year of data for determining fish population estimates using hydroacoustic methods in Lac du Sauvage.

Response:

Dominion Diamond Ekati Corporation (Dominion Diamond) is confident that the 2013 hydroacoustic surveys of Lac du Sauvage provided abundance estimates for fish with the accuracy required for an assessment of effects on fish valued components in the Developer's Assessment Report (DAR). Dominion Diamond also recognizes that fluctuation or variability is an obvious characteristic of species population dynamics (e.g., juvenile recruitment into the population), and that understanding factors that underlie variation in the ecology of a species through time is a common challenge in environmental assessment. These factors might include stochastic processes (e.g., sampling effects, random variability) or deterministic processes (e.g., environment-species trend), potentially biasing interpretations of the collected data if not addressed and understood.

The hydroacoustic surveys were planned to provide reliable estimates of fish densities (see Algen 1983; Parker-Stetter et al. 2009). The transect coverage extended across the entire area of Lac du Sauvage, and the total length of transects per survey exceeded the recommended guideline for a hydroacoustic survey, where the coverage guideline is based on the survey length (in kilometres [km]) divided by the square root of survey area (in square kilometres [km^2]) (see Algen 1983, Parker-Stetter et al. 2009). The recommendation is that the ratio be at least 3.0 and preferably as high as 6.0; for the surveys of Lac du Sauvage (86 km^2 in area), the level of coverage exceeded the ratio of 6.0 for both passes performed in 2013 with over 58 km of transects surveyed during each pass of the lake.

Two survey passes were also performed in 2013 to explore the variability in data from one survey to the next (see Tables 3.2-27 and 3.2-28 in the Fish and Fish Habitat Baseline Report; Annex XIV of the DAR). Using the echo integration median statistics for total abundance, the difference between the first and second pass totals is approximately 40 percent of the average totals, and this level of precision is within the range of variability observed for other studies (Godlewska et al. 2009). However, as part of an environmentally conservative approach for an assessment, the highest value derived from the analysis of the hydroacoustic data was selected to describe the baseline abundance of fish in Lac du Sauvage.

There would be no benefit to the Environmental Assessment process of additional hydroacoustic surveys. Inland Arctic lakes have been described as 'stable', and Lac du Sauvage is predicted to have similar ecological properties as other inland Arctic lakes in the region. Specifically, long-term studies of Arctic lakes have shown that they contain stable populations of fish, constant in their age and size structure over long periods of time. Inland Arctic lake populations are considered stable in that (as summarized by Johnson 1994):

i) their age and size structure show little change in the face of environmental variability over their recent history;
ii) a large number of lakes examined over a wide geographic area show identical structure in populations;
iii) similar structure in populations is exhibited by dominant species, whether Lake Trout, Lake Whitefish, or Arctic Char (the dominant fish population is typically composed of abundant, large individuals, approximately 450 to 600 millimetres in length);
iv) observations on the same lake after an interval of many years show little change; and
v) examples of severely perturbed (i.e., exploited) lake populations quickly return to the pre-disturbance structure or state of the population and return without significant oscillation in population sizes.

A noted in the response to DAR-KIA-IR-95, the major strength of the present approach for describing baseline fisheries for the Jay Project was the use of hydroacoustics in Lac du Sauvage. The 2013 hydroacoustic data provides the necessary data to support the objectives of the DAR for the Jay Project.

References:

Algen A. 1983. Random errors of acoustic fish abundance estimates in relation to the survey grid density applied. FAO Fisheries Rept 300: 293-297.

Godlewska M, Długoszewski B, Doroszczyk L, Jóźwik A. 2009. The relationship between sampling intensity and sampling error—empirical results from acoustic surveys in Polish vendace lakes. Fish Res, 96(1), 17-22.

Johnson L. 1994. Long-term experiments on the stability of two fish populations in previously unexploited Arctic lakes. Can J Fish Aquat Sci 51: 209-225.

Parker-Stetter SL, Rudstam LG, Sullivan PJ, Warner DM. 2009. Standard Operating Procedures for Fisheries Acoustic Surveys in the Great Lakes. Great Lakes Fisheries Commission Special Publication 09-01.

DOMINION DIAMOND

Information Request Number:	DAR- KIA-IR-97
Source:	Kitikmeot Inuit Association: Tannis Bolt
Subject:	Fish Sampling
DAR Section(s):	Section 9 (Page 9-175), Appendix 9A (Page 9A-13)

Preamble (KIA):

Stream AC4 is identified as being non-fish bearing throughout the majority of the stream. The stream will be effectively cut off from Lac du Sauvage following project construction, and will not be re-routed by a diversion channel. Relating information documenting the habitat assessment of Stream AC4 was not located by the reviewer in Section 9 or in Annex XIV. Also, it is noted that the bottom section of the creek may provide limited habitat at high flows in stream.

Request (KIA):

Please provide the field assessment details for this watershed (including all upstream lakes), including fish sampling methods and dates, habitat assessment notes, photo documentation, and the estimated length of potential fish bearing habitat near the stream mouth. In addition, please clarify if the habitat loss from sub-basin AC4 will be including in the offsetting calculations, or provide justification otherwise.

Response:

For information on the Ac4 sub-basin, please see the response provided to DAR-DFO-IR-08. The requested information is also provided in detail in the 2014 Fish and Fish Habitat Supplemental Baseline Report (Dominion Diamond 2015); the report will be provided to the Mackenzie Valley Environmental Impact Review Board for inclusion on the public registry.

As summarized in the response to DAR-DFO-IR-08, the 2014 supplemental field studies support what was stated in the Conceptual Offsetting Plan in the Developer's Assessment Report (DAR; Section 9A3.3), specifically that Stream Ac4 is an ephemeral, non-fish bearing stream within sub-basin Ac4 (also see Rescan 2007). The 2014 field studies also suggest that the small lakes in the Ac4 sub-basin provide low-quality habitat and are unlikely to support fish because of the poor connection provided by Stream Ac4 to Lac du Sauvage (that would otherwise connect to a source population) and the shallow depths of the lakes that would preclude the overwinter survival of fish.

As a result, the Project will not result in Serious Harm to Fish (as defined by DFO 2013) for streams and lakes in the Ac4 sub-basin. It is also unlikely that the isolation of Stream Ac4 from the construction of the dike will directly affect the ongoing productivity of fisheries, or indirectly through effects to fish that support such fisheries, in Lac du Sauvage. A Final Offsetting Plan will be developed during the regulatory phase of the Project to meet the requirements of Fisheries and Oceans Canada (DFO).

References:

DFO. (Fisheries and Oceans Canada). 2013. Fisheries Protection Policy Statement. Ottawa, ON, Canada. ISBN 978-1-100-22885-3.

Dominion Diamond (Dominion Diamond Ekati Corporation). 2015. 2014 Fish and Fish Habitat Supplemental Baseline Report for the Jay Project. Prepared by Golder Associates Ltd., April 2015. Yellowknife, NWT, Canada.

Rescan (Rescan Environmental Services Ltd.). 2007. Ekati Diamond Mine 2006 Jay Pipe Aquatic Baseline. Prepared for BHP Billiton Canada Inc. Yellowknife, NWT, Canada.

DOMINION DIAMOND

Information Request Number: DAR-KIA-IR-98

Source: Kitikmeot Inuit Association: Tannis Bolt

Subject: Fish and Fish Habitat

DAR Section(s): 9 (Page 9-175)

Preamble (KIA):

The diversion channel will be designed to allow upstream passage of Arctic grayling, and to a lesser extent, lake trout. As other fish species are noted to reside in sub-basins ac35 and B (e.g., slimy sculpin, lake chub, round whitefish, lake trout), it would be helpful for Dominion Diamond to provide an analysis of the potential impacts of altered flows on other fish species.

Request (KIA):

Please indicate how the diversion channel design will differ from the natural stream channel, and potential effects on resident fish species. It would be helpful to include the sampling information and fish catch numbers available for these creeks in order to justify stream channel design.

Response:

The purpose of the proposed Sub-Basin B Diversion Channel is to create a temporary fish passage corridor to facilitate movement of spawning Arctic Grayling from Lac du Sauvage to upstream tributary reaches in Stream B1 (above Lake B0 and Stream B0) and Stream Ac35 during the period of mine operations (i.e., 10 years). It is expected that this design will also provide a corridor for other migratory species that use habitat in Lake B0 and Stream B1. Although habitats in upstream sections of Stream Ac35 are inaccessible in the summer because of the ephemeral nature of the stream, it is expected that the channel design will provide a corridor for Arctic Grayling to access upstream sections for spawning during the spring. All fish using Stream Ac35 and B0 are considered migratory species from Lac du Sauvage where they overwinter. It is highly unlikely that there are resident species in streams as these small streams freeze to the bottom in the winter.

Section 9.3.2.1.3 of the Developer's Assessment Report (DAR) describes the effectiveness of mitigation related to diversion channels specific to fish use. A key design feature of the proposed diversion channel is the positioning of the channel, crossing relatively flat topography along a sinuous path similar to other streams in the area. This design will maintain relatively low water velocities that facilitate upstream passage of target species, such as Arctic Grayling (Jones et al. 1974; Katopodis 1994; Peake 2008; Katopodis and Gervais 2012). Estimated velocities in the channel for the 1 in 2-year design flow (1.37 cubic metres per second) are 0.53 metres per second (m/s) along the minimum channel slope (0.1 percent [%]) and 1.7 m/s along the steepest 50 metres (m) section of the channel near the mouth at Lac du Sauvage (2.5%). Another important feature of the channel will be the 0.15 m thick drainage layer of cobble-sized substrate held by rip-rap. Variability (or unevenness) in the streambed and banks of the channel will result from the sinuous shape of the diversion channel and the use of substrate of varying size, creating varied flow conditions (i.e., water depths and velocities) that may be appropriate for a range of fish species. Thus, the channel will be constructed such that velocities and slopes are similar to natural streams in the area, adequate resting areas are provided, and water velocities are within the swimming

capabilities of the main target species, adult Arctic Grayling. Furthermore, maintaining minimal flows that coincide with other life history stages (e.g., young-of-year migrations) will be considered in channel design.

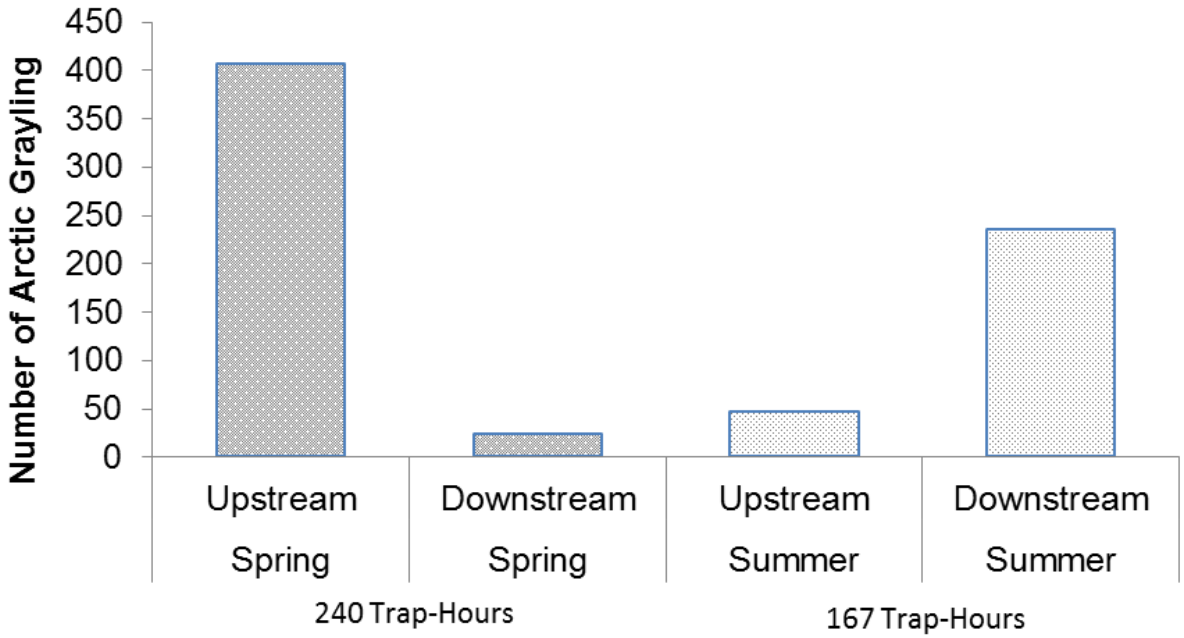
In systems such as Lac du Sauvage and Lac de Gras, adult Arctic Grayling migrate upstream in the early spring, sometimes great distances, seeking cold, fast-flowing tributaries to spawn (Stewart et al. 2007). The combined results from previously completed baseline studies in the fish and fish habitat baseline study area is consistent with what is known of the ecology of small streams in the north, and supports the proposed design of the diversion channel. For example, fish and fish habitat studies performed in 2013 in the baseline study area showed that tributary streams to Lac du Sauvage are characterized by a fish community dominated by Arctic Grayling (e.g., Table 9.2-9 and Table 9.2-10 of the DAR). Supplementary baseline studies performed during 2014 also recorded a fish community predominately of Arctic Grayling at Stream Ac35 and B0 (Dominion Diamond 2015).

A summary of the results of the 2014 studies is provided in the response to DAR-DFO-IR-12. In brief, the fish catch at Stream Ac35 included Arctic Grayling (100% of total catch), whereas the fish catch at Stream B0 included a predominance of Arctic Grayling (95% of total catch) with smaller numbers of Burbot, Lake Trout and Northern Pike also captured. Most of the Arctic Grayling captured in Stream B0 were captured with a two-way trap (99% of Arctic Grayling catch). Arctic Grayling captured in Stream B0 during the spring program were generally moving upstream, whereas most of the fish captured during the summer program were moving downstream (Figure 98-1). All of the species captured in B0 and Ac35 would be considered migratory species from Lac du Sauvage and would use the tributary habitats in B0 and Ac35 primarily as migration corridors. As these small streams freeze to the bottom in the winter, resident species would not be supported.

Arctic Grayling have been documented to use constructed diversion channels as migration corridors in the Northwest Territories immediately after they become connected to natural habitats (Jones et al. 2003). For more details on the expected use of the diversion channel as a migration corridor, see the response to DAR-KIA-IR-99.

In summary, Dominion Diamond Ekati Corporation is confident that the proposed channel design is appropriate for a temporary channel that will be removed at closure when the dike is breached, allowing the natural channels to be reconnected to Lac du Sauvage. The diversion channel will be designed to facilitate upstream and downstream passage of migratory species such as Arctic Grayling; changes to resident fish species are not predicted as a result of the construction and operation of the diversion channel. Operational monitoring of fish use of the channel will inform any new mitigation strategies as they are required in the future. Thus, the effects on fish use of Stream B1 (upstream of B0) and Ac35 are expected to be minor and of a short-duration. Minor changes, if any, are expected to have no significant adverse effect on ongoing fisheries productivity.

Figure 98-1 Movement of Arctic Grayling in Stream B0, 2014



Dominion Diamond would also like to direct the reviewer to the following selected references and locations where the Sub-Basin B Diversion Channel is discussed:

- Section 9.3.2.1.3 of the DAR includes a discussion of the effectiveness of mitigation related to diversion channels specific to fish and fish habitat.
- Section 9.4.3.1.3 of the DAR provides the residual effects from the diversion channel on tributary habitat for fish in Lac du Sauvage.
- 2014 Supplemental Fish and Fish Habitat Report (Dominion Diamond 2015) provides detailed methods and results of sampling efforts on fish-bearing streams affected by the proposed Sub-Basin B Diversion Channel.
- DAR-MVEIRB-IR-68, DAR-KIA-IR-99, and DAR-DFO-IR-12 include responses to information requests related to fish use of the diversion channel.
- Conceptual Offsetting Plan (Appendix 9A) considers the temporary losses associated with the diversion of waters from Stream Ac35 (112 m) and Stream B0 (355 m) below the diversion channel location; these losses will be considered in the Final Offsetting Plan to be submitted to Fisheries and Oceans Canada (DFO) during the regulatory phase of the Project.

References:

Dominion Diamond (Dominion Diamond Ekati Corporation). 2015. 2014 Fish and Fish Habitat Supplemental Baseline Report for the Jay Project. Prepared by Golder Associates Ltd., April 2015. Yellowknife, NWT, Canada.

Jones DR, Kiceniuk JW, Bamford OS. 1974. Evaluation of the swimming performance of several fish species from the Mackenzie River. J Fish Res Board Can, 31(10): 1641-1647.

Jones NE, Tonn WM, Scrimgeour GJ, Katopodis C. 2003. Productive capacity of an artificial stream in the Canadian Arctic: assessing the effectiveness of fish habitat compensation. Can J Fish Aquat Sci 60:849-863.

Katopodis C. 1994. Analysis of ichthyomechanical data for fish passage or exclusion system design. In Proceeding of an International Fish Physiology Symposium, Vancouver, BC, Canada, p. 318.

Katopodis C, Gervais R. 2012. Ecohydraulic analysis of fish fatigue data. River Res Appl, 28(4), 444-456.

Peake SJ. 2008. Swimming performance and behavior of fish species endemic to Newfoundland and Labrador: a literature review for the purpose of establishing design and water velocity criteria for fishways and culverts. Can Manusc Rep Fish Aquat Sci 2843: v + 52p.

Stewart DB, Mochnacz NJ, Reist JD, Carmichael TJ, Sawatzky, CD. 2007. Fish life history and habitat use in the Northwest Territories: Arctic grayling (*Thymallus arcticus*). Can Manuscr Rep Fish Aquat Sci. 2797: vi + 55 p

DOMINION DIAMOND

Information Request Number: DAR-KIA-IR-99

Source: Kitikmeot Inuit Association: Tannis Bolt

Subject: Fish and Fish Habitat

DAR Section(s): Section 9 (Page 9-176)

Preamble (KIA):

The proponent states: "There may be a delay (approximately one-year delay) in the response by fish in Lac du Sauvage and Lac de Gras as adults adapt, eventually selecting the new location where diverted flows enter the lake."

Request (KIA):

We recognise that this may be based on professional judgment, but please cite the relevant literature used to form this conclusion, and the level of confidence associated with this estimate of a one-year delay for fish to adapt to the new habitat.

Response:

Construction of the Jay Project will require the diversion of Streams B0 and Ac35 (using the Sub-Basin B Diversion Channel) to divert flow away from the diked area into Lac du Sauvage. As Arctic Grayling (*Thymallus arcticus*) in Lac du Sauvage use these streams for spawning and rearing (Dominion Diamond 2015), delayed use of the diversion channel to access spawning habitat upstream could potentially affect the abundance and distribution of Arctic Grayling in Lac du Sauvage. The pathway related to this request was evaluated in Section 9.4.3.1.3 of the Developer's Assessment Report (DAR), described as: *The construction of the horseshoe dike and diversion channel may alter access to tributary stream habitats to Lac du Sauvage, resulting in habitat loss for Arctic Grayling, Lake Trout, and Lake Whitefish.*

Arctic Grayling have been documented to use constructed diversion channels as migration corridors in the Northwest Territories immediately after they become connected to natural habitats (Jones et al. 2013). However, as stated in the DAR, it has been conservatively assumed there may be a delay in the response of some fish in Lac du Sauvage and Lac de Gras (up to one year) to utilizing the newly constructed diversion channel as a migration corridor to access spawning habitats upstream of the diversion channel in Streams B1 and Ac35. Individual fish that do not immediately find and use the constructed channel in the first year may require time to adapt to the new access location or seek out an alternate spawning site. The effects on fish use of Stream B1 (upstream of B0) and Ac35 for spawning are expected to be minor and of a short-duration.

Arctic Grayling generally migrate upstream in the early spring, sometimes great distances, seeking cold, fast-flowing tributaries to spawn and have been shown to exhibit site fidelity to natal streams, but also plasticity[1] in selecting alternate spawning sites if blockages or environmental conditions are not suitable in any given year (Stewart et al. 2007). The DAR reports a one-year delay in the response of some fish in Lac du Sauvage and Lac de Gras as a conservative estimate to address uncertainty underlying the

[1] Plasticity refers to the ability of an organism to change its phenotype (e.g., behaviour) in response to changes in the environment (Price et al. 2003).

behaviour of fish entering the channel. However, there may be a shorter delay in channel entry (e.g., a few days) because the outlet of the diversion into Lac du Sauvage is located as close to the natural stream outlet as practical while meeting design requirements for the diversion. Immediate use of the channel would be expected for Arctic Grayling that exhibit strong philopatry (i.e., natal homing) to upstream locations as well as plasticity in their behavioral responses to a changing environment. The expectation is that most adults are opportunistic and plastic in their movements and spawning behaviour because of the variable flow environments in which local populations have evolved.

In some populations, Arctic Grayling have been shown to exhibit site fidelity and reproductive homing, returning to the same streams each year (Lucas and Baras 2001). Tack (1980) suggested site imprinting may be established when Arctic Grayling follow adults to spawning areas, which would allow for some plasticity in the selection of spawning locations. Site fidelity is possible due to reproductive homing, which allows the individual to navigate to a specific site to spawn. Reproductive homing is common among members of the Salmonidae family (which includes Arctic Grayling), with spatial mapping by reference to 'landmarks' and chemical cues believed to be important factors during navigation (Lucas and Baras 2001). Although specific rates of return have not been established for Arctic Grayling, European Grayling (*Thymallus thymallus)* have been shown to have a high degree of site fidelity in northern European systems (up to 85 percent; see Pavlov et al. 1998; Kristiansen and Dølving 1996). When Arctic Grayling are unable to locate or access their intended spawning habitat, for example, due to a blockage such as a beaver dam, they continue to mature, eventually selecting alternate spawning locations (Fleming and Reynolds 1991; Walker 2005).

After construction of the stream diversion, spatial and chemical cues relevant to Arctic Grayling reproductive homing are expected to be largely conserved, facilitating the selection of the new channel to access upstream locations. The source water of the diversion channel (i.e., Streams B1 and Ac35) will remain unaltered in terms of flow and drainage area and chemical cues are expected to be largely conserved. Some short-lived alterations in the chemical signature are expected after initial flows 'flush' the channel during its early operation, which may also contribute to a delay in the use of the channel during the first year. The close proximity of the diversion channel outflow to the original stream outflow in Lac du Sauvage will also provide spatial landmarks for Arctic Grayling during the reproductive migration. However, it is possible that some Arctic Grayling may not locate the diversion channel right away, and will either select alternate spawning locations or require additional time to adapt to the diversion channel location. Fish wary of the new location may only locate and use the channel by following other spawning adults.

Use of the diversion channel as a migration corridor to access upstream spawning habitat in Streams B1 and Ac35 will be confirmed through operational monitoring, and additional mitigation measures will be implemented, if required, to maintain fish access to upstream spawning habitats during operations similar to baseline conditions. Based on the information available, it is likely that any effects of the diversion channel on the use of Streams B1 and Ac35 by Arctic Grayling will be minor and of a short-duration. The diversion channel will result in no measurable effects, or minor residual effects, to the population abundance and distribution for Arctic Grayling in Lac du Sauvage and Lac de Gras. Minor changes, if any, are expected to have no significant adverse effect on ongoing fisheries productivity.

References:

Dominion Diamond (Dominion Diamond Ekati Corporation). 2015. 2014 Fish and Fish Habitat Supplemental Baseline Report for the Jay Project. Prepared by Golder Associates Ltd., April 2015. Yellowknife, NWT, Canada.

Fleming DF, Reynolds JB. 1991. Effects of spawning-run delay on spawning migration of Arctic grayling. American Fisheries Society Symposium, 10: 299-305.

Jones NE, Tonn WM, Scrimgeour GJ, Katopodis C. 2003. Productive capacity of an artificial stream in the Canadian Arctic: assessing the effectiveness of fish habitat compensation. Can J Fish Aquat Sci 60:849-863.

Kristiansen HD, Dølving KB. 1996. The migration of spawning stocks of grayling *Thymallus thymallus*, in LakeMjøsa, Norway. Environ Biol Fish, 47: 43-50.

Lucas MC, Baras E. 2001. Migration of Freshwater Fishes. Oxford: Blackwell Science Ltd.

Pavlov D, Nezdolii VK, Ostrovskii MP, Formin VK. 1998. Homing in the grayling *Thymallus thymallus* in the basin of the upper Volga. J Ichthyol, 38: 552-553.

Price TD, Qvarnström A, Irwin DE. 2003. The role of phenotypic plasticity in driving genetic evolution. Proceedings of the Royal Society B: Biological Sciences 270 (1523): 1433–40.

Tack SL. 1980. Migrations and distributions of Arctic grayling, *Thymallus arcticus* (Pallus). Interior and Arctic Alaska. Annual performance report, 21.

Stewart DB, Mochnacz NJ, Reist JD, Carmichael TJ, Sawatzky, CD. 2007. Fish life history and habitat use in the Northwest Territories: Arctic grayling (*Thymallus arcticus*). Can Manuscr Rep Fish Aquat. Sci. 2797: vi + 55 p.

Walker J. 2005. Status of the Arctic Grayling (*Thymallus arcticus*) in Alberta. Prepared for Alberta Sustainable Resource Development and the Alberta Conservation Association. Alberta Wildlife Status Report No, 57.

DOMINION DIAMOND

Information Request Number:	DAR-LKDFN-IR-01
Source:	Lutsel K'e Dene First Nation - Chief or Wildlife, Lands and Environment: Peter Unger
Subject:	Project alternatives – underground mining vs. open pit
DAR Section(s):	2

Preamble (LKDFN):

The proponent has considered project alternatives, including underground mining and a single dike. However, the proponent has also indicated that underground mining could still be an option following the mining within the dike, yet this is not discussed in the project alternatives section. Each method is assigned a value of “1” for the criteria of Environmental Considerations.

Request (LKDFN):

LKDFN does not find this to be an accurate representation of Environmental Considerations, especially if underground mining is likely to be pursued after mining in the dike is finished. How can underground mining alone be considered the same as a dike combined with underground mining? LKDFN requests that the proponent take into account the possibility of underground mining following mining within the diked area and adjust the rankings of Environmental Considerations accordingly.

Response:

As described in Section 2.4.6 of the Developer's Assessment Report (DAR), the Project alternatives were evaluated in a pre-screening assessment that was based on a high-level evaluation of technical feasibility, Project economic viability, environmental considerations, and social and economic considerations. For this pre-screening assessment, the three alternatives that were considered were: Underground – Jay Only; Diversion and Drawdown – Jay-Cardinal; and Single Dike – Jay Only. The intent of the pre-screening assessment was to eliminate alternatives that were identified to have “fatal flaws” at a high level of assessment, rather than carrying these alternatives forward into the more detailed multiple accounts analysis. A fatal flaw is generally defined as something that is so unfavourable that it cannot be offset by any other benefit. A pre-screening assessment is a common first step used in alternative assessment processes, as it is meaningless to perform a detailed alternatives assessment on projects that are not viable and would not be developed.

For the pre-screening assessment of the Jay Project mining method alternatives, each alternative was given a binary score of either 0 or 1 (i.e., either “no” or “yes”). A score of 0 meant that the alternative did not meet the pre-screening criteria and a score of 1 meant that it did. The four categories assessed during the pre-screening step were: technical feasibility, Project economic viability, environmental considerations, and social and economic considerations. Alternatives were required to meet all the pre-screening criteria to be carried forward into the analysis of alternative means. The pre-screening assessment scoring does not provide a ranking to differentiate between alternatives, or relative scores, as it determined whether the alternative was considered a project suitable to be carried forward into the more detailed alternatives analysis.

All of the Jay Project mining method alternatives (Underground – Jay Only, Diversion and Drawdown – Jay-Cardinal, and Single Dike – Jay Only) were given scores of 1 for Environmental Considerations because it was considered that any of these alternatives could be developed taking into account Environmental Considerations. This does not imply that these mining method alternatives are considered to be equal from an environmental perspective, but that none of the alternatives were considered to have a “fatal flaw” with respect to Environmental Considerations.

The Jay-Cardinal Alternative had a much larger footprint than the Single Dike – Jay Only Alternative, which was identified as a concern to local communities during Dominion Diamond’s community engagement program. Dominion Diamond made changes to the original Jay-Cardinal project due to concerns heard during the engagement process with communities and stakeholders, and as such, the Jay-Cardinal Alternative was not carried forward for further consideration.

The Underground – Jay Only alternative was identified to have “fatal flaws” relating to both Project Economic Viability and Technical Feasibility, specifically because it was not economically viable and could not meet the timeline required for ore release and the required production rates. These were flaws that could not be offset by other benefits, which led to the Underground – Jay Only alternative not passing the pre-screening assessment.

As a result, the Single Dike – Jay Only Alternative was brought forward from the pre-screening assessment for the next stage of the alternatives analysis evaluation. In Section 2.4.7 of the DAR, a detailed alternatives analysis (Multiple Accounts Analysis) was conducted for the three dike alignment alternatives for the Single Dike – Jay Only Alternative. The evaluation criteria included: technical feasibility; Project economic viability; environmental considerations; and, social and economic considerations. Alternative 2 (Meadowbank-Style Dike, Option 2 Alignment [Horseshoe]) ranked higher than the other alternatives, and was therefore, considered most viable option for the Project.

In terms of the potential for underground mining following the Jay open pit operation, as described in Section 3.2 of the DAR, the Jay Project (Project) includes an approximately ten year period of open pit mining of the Jay kimberlite pipe. Underground mining is not part of the Project. Significant exploration would be required to adequately assess the feasibility of underground development. This would include, at a minimum, drilling to characterize the Jay kimberlite pipe at depth and analysis to demonstrate reasonable prospects of eventual economic extraction. None of this information exists at this time, and as a result, Dominion Diamond has not reported a Mineral Resource associated with underground mining at Jay, only exploration potential.

For the reasons described above, Dominion Diamond Ekati Corporation does not believe it is necessary to re-assess the Jay Project mining method alternatives pre-screening assessment.

DOMINION DIAMOND

Information Request Number:	DAR-LKDFN-IR-02
Source:	Lutsel K'e Dene First Nation - Chief or Wildlife, Lands and Environment: Peter Unger
Subject:	Management of vehicle traffic
DAR Section(s):	Section 3, sub-section 3.5.1.6, and section 12

Preamble:

The DAR states that “Other traffic will include the bulk explosives trucks, crew transport vehicles, road maintenance equipment, garbage trucks, low-bed trucks to transport larger equipment, water trucks, emergency vehicles, and light vehicles.” There are no estimates regarding the numbers and frequency of these vehicles.

Given the uncertainty of the methods used to evaluate road avoidance by caribou, it would be prudent to have a more detailed estimate of the amount of total traffic that will be encountered on the road (including potential external users).

Request:

LKDFN suggests that the proponent provide a comprehensive plan for the management of traffic, including detailed estimates for the numbers of ALL vehicles. This plan should explicitly describe measures to protect caribou and minimize their disturbance.

Response:

Detailed information of traffic volumes for all vehicle types is provided in Appendix C (Traffic Associated with the Jay Project). The environmental design features and traffic mitigation strategies identified in the Developer’s Assessment Report (DAR) are also summarized in Appendix C.

In the Developer’s Assessment Report (DAR), Dominion Diamond Ekati Corporation (Dominion Diamond) proposed to construct caribou crossings at appropriate discreet locations along the Jay Road. After receiving input from Aboriginal communities during our engagement process and during site visits, Dominion Diamond has changed its approach to caribou crossings along the Jay Road to reflect that feedback, as described below.

Because of the importance of the esker for caribou movement as identified through community engagement, the portion of the Jay Road that cuts through the esker will be constructed as a caribou crossing. The pipelines will be covered over with crushed rock along this section of road, except where there are valves or joints that require visual inspection for safe operation. Dominion Diamond will strategically construct the pipelines to reduce the number of joints or valves through the esker crossing.

Dominion Diamond’s community engagement program has indicated that the area to be crossed by the Jay Road is important for caribou movement. In response to the feedback received through community engagement, Dominion Diamond proposes to construct an increased number of caribou crossings along the main section of the Jay Road (i.e., roughly between King Pond Dam and the approach to the active

operations area at Lac du Sauvage). This main section of the Jay Road will be constructed with frequent and wide caribou crossings that will respect the communities' identification of the importance of this area for caribou movement. Caribou crossings will not be built in areas where raised safety berms are required by the Mines Inspector, or at locations where there are necessary joints and valves in the pipelines that require visual inspection for safe operation. The pipelines will be strategically designed to reduce the number of locations that cannot be constructed as caribou crossings due to joints and valves. This approach also makes beneficial use of 'lessons-learned' from the original Misery Road, where caribou crossings were only installed after construction of the road.

Caribou crossings will be constructed using crushed rock (200 millimetres or less in size) so that the side slopes of the road are flatter and easier walking for caribou than the large roadfill rock. In the caribou crossing areas, the pipelines will also be covered with crushed rock. Once the road is constructed, monitoring, including by Aboriginal community members, will be implemented to assess the effectiveness of the constructed caribou crossings.

The DAR describes the mitigation policies, practices, and procedures that will protect caribou from harm and that will enable their continued movement though the Ekati Mine site. An updated Traffic Management Plan is being prepared and will be circulated by Dominion Diamond that will document current practices for protection of safe caribou movement around roads at the Ekati Mine (under internal review, April 2015). The mitigations are based on those that have been developed at the Ekati Mine over the past 15 years of mine operations, and have been augmented for the Jay Project where needed to address a new or increased risk. For example, Dominion Diamond has proposed to increase early monitoring of caribou movement through satellite collar maps obtained from the Government of the Northwest Territories (GNWT). This would provide advanced warning of when caribou may be approaching the Ekati Mine. Also, Dominion Diamond proposes to construct additional kimberlite stockpile areas so that the Ekati Mine can operate through brief road closures if this is necessary to allow caribou to safely move through the mine site. The frequency of road reconnaissance surveys, modification of traffic patterns, and road closures would reflect the number and group composition of caribou near the mine site, which is a hierarchical approach.

The Northwest Territories *Wildlife Act* will require that Dominion Diamond provide a Wildlife and Wildlife Habitat Protection Plan (WWHPP) and a Wildlife Effects Monitoring Program (WEMP) for the Ekati Mine (inclusive of the Jay Project). These plans will provide a compilation of details and procedures for caribou monitoring and mitigation, and would include a hierarchical approach. The WWHPP will contain details on mitigation policies, practices, and procedures, and the results from adaptive management that have been implemented during the operation of the Ekati Mine, and how mitigations will be specifically modified for the Jay Project. The WEMP will provide details on the study designs and sampling methods used to test effects predictions and the effectiveness of mitigation.

DOMINION DIAMOND

Information Request Number:	DAR-LKDFN-IR-03
Source:	Lutsel K'e Dene First Nation - Chief or Wildlife, Lands and Environment: Peter Unger
Subject:	Water quality threshold for dewatering of Jay Pit
DAR Section(s):	3.5.5.1

Preamble (LKDFN):

The DAR states, “The acceptable limit for TSS concentrations in dewatering water is anticipated to be addressed during the regulatory stage of the Project following successful completion of the environmental assessment review process.”

Given that the estimates of water volumes for dewatering are based on predicted TSS concentrations, the proponent must have some idea of what the TSS threshold will be.

Request (LKDFN):

LKDFN requests that the proponent provide, at minimum, a range for the TSS threshold (to be further specified during the regulatory process), as well as the values used to calculate the proposed water volumes described in the tables in this section.

Response:

The source of the 50% volume estimate of the diked area that can be discharged directly to Lac du Sauvage is an empirical estimate based on similar experience at other northern mines. An assumed TSS threshold value was not used and was not required for this purpose. Two similar instances of dewatering a diked area to access the lakebed for mining have occurred at the nearby Diavik Mine in Lac de Gras. For the A154 diked area, 53 percent (%) of the planned 10.2 million cubic metres (m^3) was discharged directly to Lac de Gras without treatment (Diavik 2002); for the A418 diked area, 76% of the 2.3 million m^3 was discharged directly to Lac de Gras (Diavik 2007). Although the 50% estimate is lower than the proportion dewatered in the two Diavik Mine instances, it is considered a reasonable estimate for the mine water management plan. Numerous factors influence turbidity levels during dewatering, including, but not limited to: ice cover, wind conditions, lakebed sediment thickness, topography of the area being dewatered, intake pipe locations, and dewatering flow rates.

As acknowledged in the information request, the specific TSS threshold for dewatering the diked area of Lac du Savage is anticipated to be resolved as part of the regulatory permitting stage of the project. This is typically specified in a Dewatering Plan required under the Water Licence for approval of the Wek'èezhìı Land and Water Board.

For conceptual planning purposes, Dominion Diamond has assumed that the TSS threshold would be in the range of 25 to 50 milligrams per litre (mg/L), which is based on the current Ekati Mine Water Licence. The Ekati Mine Water Licence provides for a maximum TSS concentration of 25 mg/L in any single grab sample for routine effluent discharges, and for a maximum TSS concentration of 50 mg/L for short term

'construction' events. The elevated concentration allowed for construction events acknowledges that beneficial work may be required which generates unavoidable, minor increases in TSS while the work is underway. Dominion Diamond will consider whether the 'construction' limit is the more appropriate for the Lac du Sauvage dewatering program and may propose it in the (future) Dewatering Plan.

The sampling and analysis for TSS will be undertaken frequently at the source of dewatering discharge to Lac du Sauvage as a monitoring component of the Surveillance Network Program. The determination of TSS concentrations will be done on site so as to provide immediate feedback for control of the dewatering program.

References:

Diavik (Diavik Diamond Mines Inc.). 2002. A418 Dewatering Program Report for Diavik Diamond Mines Inc. Submitted to the Wek'éezhii Land and Water Board, Yellowknife, NWT. December 2007.

Diavik. 2007. A418 Dewatering Program Report for Diavik Diamond Mines Inc. Submitted to the Wek'éezhii Land and Water Board, Yellowknife, NWT. January 2007.

DOMINION DIAMOND

Information Request Number:	DAR-LKDFN-IR-04
Source:	Lutsel K'e Dene First Nation - Chief or Wildlife, Lands and Environment: Peter Unger
Subject:	Adaptive management for the freezing of the WRSA
DAR Section(s):	Section 3, sub-section 3.5.6; Appendix 3B

Preamble (LKDFN):

The proponent proposes to encourage permafrost conditions in the WRSA to prevent leaching. LKDFN has not been able to locate adaptive management measures should the WRSA not freeze or if it were to thaw at a later time.

Given the threat to permafrost from climate change and the uncertainty of permanent freezing conditions in the WRSA, LKDFN would like to understand the potential impacts and the options for adaptive management measures should the WRSA not freeze or if it were to thaw at a later date.

Request (LKDFN):

LKDFN requests an analysis of the potential impacts on the environment should the WRSA not freeze or if it were to thaw at a much later date. LKDFN also requests some proposed options for adaptive management for this scenario.

Response:

The Jay Project (Project) waste rock storage area (WRSA) does not need to be frozen to maintain physical stability or for geochemical management; however, a frozen condition within the WRSA is beneficial and will be promoted.

The ground within the footprint and surrounding the proposed Jay WRSA is currently permafrost with only a shallow active layer that thaws annually during the summer and re-freezes during the winter. The Jay WRSA is anticipated to freeze by permafrost aggradation into the pile. Permafrost aggradation into the WRSA can be promoted by placement of a basal layer of granitic rock, and by creating stepped side slopes, which are practices that have evolved from site-specific experience at the Ekati Mine. The 5-m-thick granitic cover will be placed on an ongoing basis on the sides and upper surface of the WRSA rather than waiting until final reclamation.

Recent (2014) thermal modelling for the design of the Pigeon WRSA at the Ekati Mine (Waste Rock and Ore Storage Management Plan [WROMP] Vers. 4.1) was provided to the Wek'èezhìi Land and Water Board (WLWB) as part of the Water Licence requirements for the Pigeon WRSA Design (Dominion Diamond 2014). This thermal modelling is also relevant for the design of the Jay WRSA. The thermal modelling validated that frozen conditions can be maintained within the pile below the 5 m granite cover under a 100-year climate change scenario. The climate change scenario was described as follows (excerpted from Section 4.5 of Tetra Tech EBA 2014):

Global warming was integrated into the model to help predict long-term thermal effects. Environment Canada's 2009 report from Adaptation and Impacts Research Section (AIRS) (Environment Canada 2009) reviewed the most recent modelling assessment for the Arctic. An ensemble approach (multi-model means/medians) was adopted by AIRS reduce the uncertainty associated with any individual model. Model validation over the historical period from 1971 to 2000 was first used to identify those models which best reproduced the mean annual temperature of this period against the National Centre for Environmental Prediction global gridded dataset. Subsequently, only the four best-agreement models were used to produce the final ensemble projections. The four best-ranking models within each sector were then used as an ensemble to produce projections of temperature changes in the 2020s, 2050s, and 2080s for both the A1B (balanced emission emphasis), and A2 (high emission) scenarios. CSA (2010) adopted the climate change projections from Environment Canada (Environment Canada, 2009). A moderate A1B greenhouse gas emission scenario was adopted in the thermal analyses, which represents a reasonably conservative case.

Ekati (64°43`N 110°37`W) is located in Arctic Sector C1 as classified in Environment Canada (Environment Canada, 2009) and CSA (CSA, 2010). The predicted mean temperature changes from 1971 to 2000 baseline under the moderate greenhouse gas emission scenario at the Arctic Sector C1 (CSA, 2010) are presented in Table 4. These rates of the predicted temperature change were applied in the thermal analyses.

Table 4 Predicted Seasonal Air Temperature Changes in Arctic Sector C1 (CSA 2010)

Period	Predicted Seasonal Air Temperature Changes from 1971-2000 Baseline under the Moderate (A1B) Green-house Gas Emission Scenario (°C)			
	Winter	Spring	Summer	Autumn
2011 to 2040	1.9	1	0.8	1.3
2041 to 2070	4.2	2.1	1.8	2.7
2070 to 2100	6.2	2.8	2.4	3.4

Source: Tetra Tech EBA 2014

Thermistors will be installed in the Jay WRSA after completion of the pile to monitor temperatures in the pile foundation and within the pile itself.

Operational mixing of potentially acid generating (PAG) and non-potentially acid generating (non-PAG) mine rock (on top of a basal layer of granite) will mitigate the acid generation potential of PAG rock in the Jay WRSA. Co-deposition of PAG and non-PAG rock during waste rock deposition minimizes the potential for formation of zones of PAG rock with a greater susceptibility for acid generation. Co-deposition of waste rock from the Jay Pit on an "as-mined" basis during operations is possible because of the simultaneous production of both metasediment and granite, with a predominance of granite, throughout the mine life.

According to the guidance in the Mine Environment Neutral Drainage prediction manual (MEND 2009), waste rock with greater than two times more neutralization potential (NP) than acid potential (AP) is generally regarded to be non-PAG. The mine plan was used to calculate the NP/AP ratio of the waste rock material mined from the Jay Pit on a quarterly basis. The purpose of this evaluation was to confirm that an NP/AP ratio greater than 2 can be achieved based on the amount of each rock type (metasediment, granite, and overburden) mined each quarter. An NP/AP ratio of at least 2 was achieved over the life of mine.

The assumption that the Jay WRSA would not become acid generating was carried forward into the Developer's Assessment Report (DAR) water quality predictions. Constant values were assigned to Jay WRSA seepage and runoff during spring melt (i.e., freshet) and the summer period, since these are the only periods when drainage from the facility is expected to occur. Seepage water quality monitoring results from 2001 to 2004 collected from the Misery WRSA during the months of June through September were used to represent the seepage and runoff quality from the Jay WRSA. Use of these data is considered conservative since the Misery WRSA contains a higher proportion of PAG material compared to other WRSAs located at the Ekati Mine operations. The rock types stored in the existing Ekati Mine WRSAs are the same as proposed for the Jay WRSA; however, there is variability in their composition ratios and placement methods. Details of the model inputs used to represent the quality of the Jay WRSA runoff quality are provided in Section 8E3.4 of Appendix 8E of the DAR.

Flow estimates from the Jay WRSA used in the site water balance model did not consider the development of permafrost in the pile, and application of the WRSA chemical profile to this flow provides a conservative estimate of the load from this facility. Under the assumption that the WRSA will not become acid generating, the model case provided in the DAR conceptually represents a model case for no development of permafrost in the Jay WRSA. Projected water quality constituent concentrations in Lac du Sauvage and Lac de Gras, accounting for operational, closure, and post-closure discharges from the Project that includes runoff from the Jay WRSA, indicate the Project is not expected to have a significant adverse effect to surface water quality.

It is recognized that water quality modelling is based on several inputs, all of which have inherent uncertainty. Dominion Diamond will develop a robust monitoring plan to validate water quality predictions and proactively apply adaptive management strategies, if required. Following the existing Ekati Mine WROMP Vers. 4.1, seepage surveys of all WRSAs and ore stockpiles at the Ekati Mine are conducted twice a year (during spring freshet, and again in late summer or fall before freeze-up), in accordance with the requirement of the Water Licence. The testing of seepage chemistry is designed to detect changes that may affect the receiving environment. The Jay WRSA will be added to the Ekati WROMP and will be included in these seepage surveys.

If monitoring identifies any seeps as 'potentially problematic', the frequency of monitoring will increase where necessary and, if required, seepage water will be collected and managed. The objectives of seepage monitoring include detection of undesirable changes in chemistry and unacceptable high concentrations of specific constituents.

The Ekati Mine has an adaptive management process in place for the existing WRSAs that is described in Section 7.7 of the WROMP Ver. 4.1; this adaptive management process will also apply to the Jay WRSA. The adaptive management strategy outlined in the WROMP for the Ekati Mine includes the following components:

- Identification of issue, verification of trigger, and development of a response plan;
- Additional studies to determine the extent of the impact of seepage (if any), and modification of the WROMP and seepage management program; and,
- Implementation of modified programs, and design / construction of mitigation structures and facilities (if required).

At the time of closure of the Jay WRSA, monitoring data of seepages and runoff will have been collected for approximately 10 years at the Jay WRSA and for approximately 25 years at the other Ekati Mine WRSAs. This long-term monitoring will provide valuable data and insight into water quality trends, if they occur.

References:

Dominion Diamond (Dominion Diamond Ekati Corporation). 2014. Ekati Diamond Mine Waste Rock and Ore Storage Management Plan. Version 4.1, May 2014.

CSA (Canadian Standards Association). 2010. Technical Guide – Infrastructure in Permafrost: A Guideline for Climate Change Adaptation. CSA Reference Number: Plus 4011-10.

Environment Canada. 2009. Arctic Ensemble Scenarios, 2009. Prepared by Adaptation and Impacts Research Section (AIRS) Climate Research Division, Environment Canada, 2009, 26 p.

MEND (Mine Environment Neutral Drainage). 2009. Prediction Manual for Drainage Chemistry from Sulphidic Geologic Materials. MEND Report 1.20.1. December 2009.

Tetra Tech EBA Inc. 2014. Pigeon Pit Waste Rock Storage Area Design – Revision 1, Ekati Diamond Mine, NT. April 2014.

DOMINION DIAMOND

Information Request Number:	DAR-LKDFN-IR-05
Source:	Lutsel K'e Dene First Nation - Chief or Wildlife, Lands and Environment: Peter Unger
Subject:	Mixing in Misery pit and in Lac du Sauvage
DAR Section(s):	Appendix 3A, page 44, Sub-section 7.2.2.2; Appendix 3C, page 22, Sub-section 4.3.6; Appendix 8F

Preamble:

The proponent plans to establish meromictic conditions in Misery Pit and Jay Pit as part of the closure plan. The proponent recognizes the possibility of mixing and loss of meromictic conditions as an environmental risk.

LKDFN views mixing of high TDS layers and freshwater as a significant impact, and has not been able to locate any modelling in the DAR to give an indication of the likelihood of such an event. Also, regardless of the low likelihood, LKDFN believes that there should be an adaptive management plan in place for this scenario.

Request:

LKDFN requests that the proponent provide more information on the likelihood of mixing of water layers in Misery Pit and Jay Pit, both from natural causes (unusually strong winds) and human error during mine operations and closure. LKDFN also requests more information on what adaptive management measures are possible should this mixing occur.

Response:

The hydrodynamic modelling completed for the Developer's Assessment Report (DAR) water quality Section 8.3.4 indicated that stable meromixis will persist in both Project pit lakes. This prediction is supported by empirical evidence of similar northern pit lake case studies, as described below.

Gunnar Pit Lake in Northern Saskatchewan, near Lake Athabasca, was first described by Tones (1982), and later by Muldoon and Schramm (2009). Gunnar Pit Lake is located at a former uranium mine that closed in 1964. After closure, a trench was blasted to connect the pit lake to Lake Athabasca, and the entire pit was flooded, but with no induced stratification. The trench was later closed by backfilling with about 2.7 million cubic metres (m^3) of waste rock. Over time, the lake established a meromictic density gradient and pycnocline (zone of vertically changing densities). The lake stratifies seasonally at a depth of about 10 m and has a pycnocline over a gradient from 75 to 90 m deep. The specific conductivity is reported as 300 micromhos per centimetre (µmho/cm; equivalent to microSiemens per centimetre [µS/cm]) in the mixolimnion and 1,900 µmho/cm in the monimolimnion.

Pieters and Lawrence (2014) describe six meromictic pit lakes in Northern BC, the Yukon Territories, and the Northwest Territories (NWT). They also discuss factors that affect meromixis in northern mine pit lakes, such as high depth, steep walls, and brackish water.

- Faro Pit at the Faro Mine in the Yukon is at least 90 m deep with a pycnocline at 20 m due to a salinity difference of about 200 mg/L (~1,020 mg/L in mixolimnion and 1,250 mg/L in monimolimnion).
- Grum Pit Lake, also at the Faro Mine, is at least 50 m deep and is strongly stratified at 7 m. It has a uniform salinity of almost 900 mg/L in the monimolimnion and a variable salinity of about 700 to 770 mg/L (during the four surveys completed in 2011) in the mixolimnion.
- Vangorda Pit Lake is also at the Faro Mine. It is at least 50 m deep and was stratified at 5 m depth. The TDS concentration in the monimolimnion is ~2,000 mg/L, and 1,050 to 1,450 mg/L in the monimolimnion (the maximum concentration in the monimolimnion was measured under ice, when salt exclusion from ice is high).
- Zone 2 pit lake at the former Colomac Mine, NWT and Waterline pit lake at the Equity Silver Mine, BC, are 110 and 40 m deep, respectively, and have pycnoclines at less than 20 m. The physical limnology of these lakes is altered by deep inflows, which are also changing the overall salinity of the lakes with time. The range of mixolimnion to monimolimnion TDS concentrations for these pit lakes are approximately 600 to 770 mg/L and approximately 1,000 to 2,000 mg/L, respectively. As described in the response to DAR-IEMA-IR-17, deep inflows are not expected to be an issue in either Jay or Misery pit lake.
- Main Zone pit lake at the Equity Silver Mine in BC is mechanically stirred by the disposal of acid mine drainage sludge into the water column. Little congruence would be expected to this pit lake since sludge will not be pumped through the water column of either Jay or Misery pit lakes.

With the possible exception of lakes that are being influenced by ongoing mining activities (e.g., Main Zone pit), all of the abovementioned case studies involve meromictic lakes. This empirical evidence supports the prediction that Dominion Diamond's pit lakes (i.e., Misery and Jay) will be permanently stratified, and possibly at shallower depths than predicted in the Developer's Assessment Report (DAR; Section 8.5.4.2.3; Appendix 8G). A shallower pycnocline would mean that the downward movement of the pycnocline predicted in the DAR, and concomitant upward advection of saline water, would have been over-predicted (i.e., would conservatively over-predict the load of TDS and other constituents delivered to receiving waterbodies at closure). Put another way, the observations at the referenced pit lakes in the literature indicate that the DAR predictions regarding pit lake limnology are conservative.

In theory, there are three types of mechanisms that could cause a disruption to meromixis in the Jay and Misery pits: climate or meteorological events, direct physical disruption, and human error. Each of these types of mechanisms is discussed below.

Climate or Meteorological Events

Most turbulent mixing that occurs in lakes is a result of wind shear forces that are propagated downwards from the lake surface. The model applied to the pit lakes, CE-QUAL-W2, was selected because it considers these forces mechanistically and it has been shown to generate reasonably accurate predictions of vertical stratification with minimal calibration (Wells and Cole 2008). The model simulation that predicted the stability of the pycnocline considered measured wind events at an hourly frequency over the past 14 years. A sensitivity analysis that considered a 25% higher wind speed over the entire duration of the simulation resulted in a slightly deeper pycnocline, but not a complete turnover event in

either the Jay or Misery Pit. Given that the simulation exceeded any reasonably foreseeable meteorological event, a disruption of the pycnocline due to a prolonged wind storm is considered highly unlikely.

Direct Physical Disruption

The stability of the pycnocline could be disrupted by direct input of materials into the monimolimnion. For example pit wall failures have been documented to disrupt meromixis in Summer Camp Lake (Parshley and Bolwell 2003) and Berkely Pit Lake (Gammons and Duaime 2006). Pit wall stability will be monitored and managed in Misery Pit during the ten years while it is being used to store water associated with the Jay Project. During this time, a 10 metre (m) freeboard will be maintained which will reduce the likelihood of any water in the Misery Pit from entering the receiving environment, even in the case of a pit wall failure.

Back-flooding of Jay Pit will occur once mining of the Jay deposit is complete and will take approximately 3 years, and a further 9 months to fill the dewatered portion of the lakebed in the diked area (Appendix 3A of the Developer's Assessment Report [DAR], Mine Water Management Plan). During this time, water in the Jay Pit will continue to be isolated from Lac du Sauvage. Monitoring will occur during the refilling. Water quality will need to meet closure criteria, prior to local breaching of the Jay Dike and hydraulically reconnecting the Jay Pit area to Lac du Sauvage.

Pit wall instability is more likely to occur during the initial re-flooding as a result of the change in water pressures in the pit walls and thawing of rock mass. In the long term, having the pits filled with water increases the stability.

As is standard practice throughout open pit development, pit wall stability will be reviewed to assess and compare conditions to the geotechnical and geomechanical models for the pit designs. Site specific data gathered including mapping of structural features and groundwater inflows will be used in this assessment. Information gathered throughout open pit development will be utilized to assess the likelihood of large scale pit wall failures that could impact the long term stability of the meromictic condition with the pits.

A second source of direct physical disruption to meromixis would be a large magnitude earthquake. This scenario is highly unlikely because the Project is not within an active seismic area. In the case of a distant earthquake, consequence to the pit lake would most likely be an internal seiche, as has been observed in other lakes affected by earthquakes (USGS 2015).

Finally, direct input of water from underwater adits has been observed to disrupt meromixis in pit lakes that are connected to underground mines, such as Waterline pit at the Equity Mine (Peiters and Lawrence 2014). This source of disruption is not applicable to either of the Project pit lakes because neither will have underwater adits.

Human Error

As with all endeavours, there is the potential for human error in managing the pit lake. Human error could disrupt meromixis if the pit filling waters were not placed in such a way as to maximize the density gradient and minimize turbulence. The designs for the discharge pipe location and outlet configuration

that will be used to inject high total dissolved solids (TDS) water into the Misery Pit and the Jay Pit have been developed and will continue to be developed through the detailed design stage in a manner to reduce the turbulence and minimize potential disturbance to the meromixis. The design includes that the diameter of the last 10 m of the pipe will be increased, such the discharge velocity will be decreased to 1 metre per second (m/s), to minimize disturbance. During mining of the Jay open pit, monitoring of the water quality in the Misery Pit will be conducted. These data will be utilized to assess the effectiveness of the water management system and modifications can be implemented if deemed necessary to create the stable meromixis condition.

Human error will be minimized by studying other pit lakes with induced meromixis (e.g., Island Copper on Vancouver Island [Fisher and Lawrence 2006], Anchor Hill Pit Lake [Lewis et al. 2003] and Lake Vollert-Süd in Germany [Stottmeister et al. 1998 as cited in Geller et al. 2012]) to incorporate best practices developed at those sites, and will be incorporated into the mine closure plan.

As mentioned above, freeboard will be maintained in the pits during operations and while they are filling, which will allow meromixis to be measured and confirmed before releasing water to the receiving environment. In the highly unlikely event that meromixis does not establish, if water quality in the discharge water from either pit lake is not acceptable for release by the time the lakes are nearing discharge elevation, adaptive management would be implemented. One adaptive management strategy could be to draw down a nominal 10 m of pit lake water and recap with very low TDS water to re-establish a chemocline with a higher density gradient to further maximize the strength of meromixis.

References:

Fisher TSR, Lawrence GA. 2006. Treatment of acid rock drainage in a meromictic mine pit lake. J Environ Eng 132(5):515–526.

Gammons CH, Duaime TE. 2006. Long term changes in the limnology and geochemistry of the Berkeley Pit Lake Butte, Montana. Mine Water and the Environment. 25: 76-85.

Geller W, Schultze M, Kleinman B, Wolkersdorfer C (Eds). 2012. Acidic Pit Lakes; The Legacy of Coal and Metal Surface Mines. Springer Heidelberg. 536pp. DOI 10.1007/978-3-642-29384-9

Lewis NM, Wangerud KW, Park BT, Fundingsland SD, Jonas JP. 2003. Status of in situ treatment of Anchor Hill pit lake, Gilt Edge Mine Superfund site, South Dakota, USA. In: Farell T, Taylor G (eds) Proceedings, 6th International Conference on Acid Rock Drainage (ICARD), Australian Inst of Mining and Metallurgy Publ. Series No: 3/2003, Carlton Victoria, Australia, pp 779–788.

Muldoon J, Schramm LL. 2009. Gunnar Uranium Mine Environmental Remediation: Northern Saskatchewan. In ASME 2009 12th International Conference on Environmental Remediation and Radioactive Waste Management (pp. 621-632). American Society of Mechanical Engineers.

Parshley JV, Bowell RKJ. 2003. The Limnology of Summer Camp Pit Lake: A Case Study. Mine Water and the Environment. 22:170–186.

Pieters R, Lawrence GA. 2014. Physical processes and meromixis in pit lakes subject to ice cover. Canadian Journal of Civil Engineering, 41(6), 569-578.

Stottmeister U, Weißbrodt E, Becker PM, Pörschmann J, Kopinke FD, Martius GGM, Wießner A, Kennedy C. 1998. Analysis, behaviour and fate of a lignite pyrolysis wastewater deposite. In: Proceedings Contaminated Soil '98. Thomas Telford Publ, London, UK, pp 113–121.

Tones PI. 1982. Limnological and fisheries investigation of the flooded open pit at the Gunnar uranium mine. Saskatchewan Research Council, Saskatoon (Canada).

USGS (United States Geological Survey). 2015. Seismic Seiches. http://earthquake.usgs.gov/learn/topics/seiche.php

Wells SA, Cole TM. 2008. CE-QUAL-W2: A Two-Dimensional, Laterally Averaged, Hydrodynamic and Water Quality Model, Version 3.6. User's Manual. U.S. Army Corps of Engineers Instruction Report EL-08-1. 712 pp.

DOMINION DIAMOND

Information Request Number:	DAR-LKDFN-IR-06
Source:	Lutsel K'e Dene First Nation - Chief or Wildlife, Lands and Environment: Peter Unger
Subject:	Fish survival in Misery, Panda, Koala and Lynx Pits
DAR Section(s):	Appendix 3B, Section 8, Section 9

Preamble (LKDFN):

LKDFN is unable to locate information on the suitability of the Misery, Panda, Koala and Lynx Pits as fish habitat after mine closure.

While there is documentation on predicted water quality in these mined out pits, as well as a closure plan, it is unclear what measures are being taken to ensure that fish can survive in these water bodies after the mine closes.

Request (LKDFN):

LKDFN requests that the proponent clarify the suitability of these pits for fish habitat after mine closure and describe the measures that will be taken to ensure that fish can survive in these new water bodies.

Response:

As described in the approved Interim Closure and Reclamation Plan (ICRP) for the Ekati Mine, reclamation of open pits at the Ekati Mine, including the Misery, Panda/Koala, and Lynx pits, is not intended to create fish habitat post-closure; however, water quality at these sites will be safe for use by fish, wildlife, and people and outflow channels will be constructed to safely convey surface runoff to the natural receiving environment (BHP Billiton 2011; Dominion Diamond 2014). Reclamation activities are similar for the Misery, Panda/Koala and Lynx pits and details can be located in the ICRP (BHP Billiton 2011, Tables 5.2-4, 5.2-13, 5.2-14, and 5.2-16). Uppermost pit benches may be modified and vegetation may be planted in some areas of open pit perimeters to promote possible, long-term progression towards fish habitat. A research program, established through the ICRP, will result in a final pit closure design for these pits for approval by the Wek'èezhìi Land and Water Board under the Final Closure and Reclamation Plan. Water quality monitoring is scheduled at each pit for 10 years post closure to confirm that water quality is acceptable and that the pits are physically safe for people and wildlife.

As described in Section 3.5.8 of the Developer's Assessment Report, the Jay Project introduces necessary changes to the Ekati Mine ICRP, including amended pit back-flooding approaches for the Misery, and Panda/Koala open pits. The change in the backflooding approach does not affect the reclamation objectives for these pits as summarized above and described fully in the approved ICRP. Dominion Diamond has proposed that the ICRP should be amended to incorporate the Jay Project as part of the regulatory requirements of the Wek'eezhii Land and Water Board after approval of the Project.

References:

BHP Billiton (BHP Billiton Canada Inc.). 2011. Ekati Diamond Mine Interim Closure and Reclamation Plan. Prepared for the Wek'eezhii Land and Water Board. 842 pp.

Dominion Diamond (Dominion Diamond Ekati Corporation). 2014. Ekati Diamond Mine 2014 Closure and Reclamation Progress Report. Prepared for the Wek'eezhii Land and Water Board. 154 pp.

DOMINION DIAMOND

Information Request Number:	DAR-LKDFN-IR-07
Source:	Lutsel K'e Dene First Nation - Chief or Wildlife, Lands and Environment: Peter Unger
Subject:	Mine closure – Esker repair
DAR Section(s):	Appendix 3B

Preamble (LKDFN):

LKDFN is unable to locate information on the restoration of the esker after mine closure.

The DAR acknowledges the importance of the esker as a wildlife corridor and describes measures to be taken during construction and operation to minimize the disturbance of this corridor. It is unclear whether or not there is an intention to restore this esker after mine closure.

Request (LKDFN):

LKDFN requests clarification on the measures that will be taken to restore the esker as a wildlife corridor during the closure of the mine.

Response:

Esker material disturbed during construction will be stockpiled for use in restoration during the closure phase of the Jay Project. During closure, the pipelines and power lines will be removed and the area where the esker was cut will be rebuilt to form. During restoration, the esker will be graded to match the surrounding terrain. The surface will be dressed with material that was saved and stockpiled from the esker cut during construction. Any natural channels that are modified near the esker as part of road and pipeline construction will be re-established in the closure phase.

DOMINION DIAMOND

Information Request Number:	DAR-LKDFN-IR-08
Source:	Lutsel K'e Dene First Nation - Chief or Wildlife, Lands and Environment: Peter Unger
Subject:	Community and Public Concerns
DAR Section(s):	Section 4, All tables

Preamble:

The DAR presents three tables in section 4 which contain a column labelled “Relevant Comments/Issues.” However, the content of this column does not list any comments or issues at all and instead records incidents of engagement.

Community and Public concerns are an integral to the environmental assessment process and their documentation is essential. This section does an excellent job of listing the incidents of engagement, but does not provide the content of these engagements, which is arguably far more important. Knowledge of what is of concern for each implicated community is needed to make informed decisions regarding the impact of this project.

Request:

LKDFN requests that the proponent provide a new table, listing all implicated parties, a brief summary of the concerns and issues they have raised, and a brief summary of the measures that the proponent has proposed to address these concerns.

Response:

As discussed in the Developer’s Assessment Report (DAR), Dominion Diamond carried out a series of Community Engagement meetings, workshops, and site visits with the Kitikmeot Inuit Association, Łutselk’e Dene First Nation, North Slave Métis Alliance, Tłı̨chǫ Government, and Yellowknives Dene First Nation to discuss the Jay Project.

As described in the response to DAR-NSMA-IR-04, Dominion Diamond made changes to the original Jay-Cardinal project to mine the Jay pipe only and entirely removed the Cardinal pipe from the Project due to concerns heard during the engagement process with communities and stakeholders.

Another example of the type of measures introduced by Dominion Diamond to address issues raised by communities was the proposal to construct caribou crossings at appropriate discrete locations along the Jay Road. After receiving input from Aboriginal communities during the engagement process and during site visits, Dominion Diamond has changed its approach to caribou crossings along the Jay Road to reflect that feedback. The main section of the Jay Road will be constructed with frequent and wide caribou crossings that will respect the communities’ identification of the importance of this area for caribou movement. Once the road is constructed, monitoring, including by Aboriginal community members, will be implemented to assess the effectiveness of the constructed caribou crossings. The mine plan utilizes several environmental design features and mitigation to eliminate or reduce the potential for Project activities to result in adverse environmental effects on hydrogeology,

hydrology, and water quality. The majority of concerns are addressed throughout the body of the DAR and can be found under the relevant component sections.

The response to DAR-IEMA-IR-37 provides a detailed list of the concerns identified by First Nations, Inuit, and Métis in the Traditional Land Use and Traditional Knowledge Baseline Report (Annex XVII) and elsewhere in the DAR, and the sections and subsections of the DAR where they are addressed, including Ekati Mine or Jay Project mitigation to be employed.

Dominion Diamond will continue its community engagement activities for the Jay Project and for the Ekati Mine in general, as described in the *Ekati Mine Engagement Plan* approved by the Wek'èezhìi Land and Water Board. Dominion Diamond's engagement will continue to solicit and implement community suggestions for improving the tracking and communication of concerns or questions raised.

DOMINION DIAMOND

Information Request Number:	DAR-LKDFN-IR-09
Source:	Lutsel K'e Dene First Nation - Chief or Wildlife, Lands and Environment: Peter Unger
Subject:	Definition of significance
DAR Section(s):	6.7.2, 6.22

Preamble:

The DAR lists a number of assessment endpoints in section 6.2.2, and goes on to later state, “As much as possible, effects are classified and significance determined using established guidelines, thresholds or screening values, and scientific principles.”

LKDFN apologizes for being repetitive, as other IRs will also discuss significance, but in more specific contexts. However, it appears that the assessment endpoints are fairly vaguely defined when considering the statement quoted above. Many of the endpoints are open to interpretation and it is doubtful that LKDFN’s interpretation would coincide with the proponent’s. It would be useful if the “established guidelines, thresholds or screening values” were listed among the assessment endpoints to allow for clarity. It would be especially important so that all parties are clear on which guidelines are used, as some parties may prefer alternative standards and it is difficult to debate the merits or one regime over the other when it is not particularly clear which ones the proponent is suggesting.

Request:

LKDFN requests that the assessment endpoints be presented with quantifiable indicators or at least a listing of the guidelines and thresholds to be adhered to.

Response:

Section 6 of the Developer’s Assessment Report (DAR) provides a general or high level overview of the environmental assessment approach for the Jay Project. The section was not intended to provide comprehensive and detailed methods for classifying residual impacts and determining significance for each valued component (VC). It is difficult (and not appropriate) to provide definitions for all residual adverse effects criteria and significance that are universally applicable to each VC. Consequently, specific definitions are provided for each VC in the Key Line of Inquiry and Subject of Note sections of the DAR (Section 6.7.1).

To summarize, the assessment endpoints and determination of significance used established guidelines, thresholds, or screening values when available. When not available, significance was determined qualitatively using a reasoned narrative approach. Table 9-1 identifies the sections in the DAR that define VC assessment endpoints and quantitative and qualitative significance thresholds.

Table 9-1 Developer's Assessment Report Location of Assessment Endpoint and Significance Thresholds Considered for Valued Components

Valued Component	Assessment Endpoint(s)	Quantitative or Qualitative Significance Threshold(s)
Air Quality	Section 7.1.3	Section 7.6
Water Quality and Quantity	Section 8.1.3	Section 8.7
Fish and Fish Habitat	Section 9.1.3	Section 9.6
Vegetation	Section 11.1.3	Section 11.6
Barren-ground Caribou	Section 12.1.3	Section 12.6
Wildlife and Wildlife Habitat	Section 13.1.3	Section 13.6
Socio-economics	Section 14.1.2.3	Section 14.7.4
Culture	Section 15.2.2	Section 15.2.6.1.1

DOMINION DIAMOND

Information Request Number:	DAR-LKDFN-IR-10
Source:	Lutsel K'e Dene First Nation - Chief or Wildlife, Lands and Environment: Peter Unger
Subject:	Dust deposition
DAR Section(s):	7.2.4

Preamble (LKDFN):

The DAR states that “Avoidance of the Project by local game due to dust was raised as a potential effect of the Project, as was accumulation or deposition of dust in water.” However, the DAR does little to address dust deposition. Section 7 addresses emissions, but there is no discussion of the amount and range of predicted dust deposition.

While there are estimates for the amount of dust emitted, there are no predictions for where this dust will end up. LKDFN would like to know where this dust is likely to end up, if some areas are more at risk than others for high levels of deposition and how far the dust is predicted to travel.

Request (LKDFN):

LKDFN requests an analysis containing the maximum predicted distance that dust could travel from the mine-site, as well as areas where dust is likely to be deposited in higher levels based on wind currents.

Response:

A discussion of the dust deposition predictions due to the Jay Project (Project) is provided in this Information Request response. The predicted dust deposition rates are represented by the predicted total suspended particulate (TSP) deposition rates that were used in the assessment of water quality in the Developer’s Assessment Report (DAR). TSP is defined as airborne particles or aerosols that are less than 100 micrometres (µm) in size. The emissions calculated for the purposes of the modelling for the DAR do not include particles larger than those greater than 100 µm (dust), as particles this large settle quickly with distance from their source. Dust can include much larger, mechanically generated particles that can become airborne even if only for a relative short distance before they are deposited on the ground. The majority of the dust emitted by the Project is related to site roads, and to a lesser extent, from other mining activities (blasting, loading/unloading of material, bulldozing, and grading). A large portion of fugitive dust emissions from these sources will settle close to the emission sources, within a few hundred metres. By evaluating TSP rather than dust, we are assessing particles that can be suspended in the air for longer period of time and travel longer distance.

The Government of Northwest Territories does not have regulatory criteria for dustfall. There are also no federal criteria for dustfall. However, adjacent jurisdictions such as Alberta and British Columbia (BC) have established dustfall guidelines or standards which can be used to evaluate the TSP deposition predictions for the Project. Alberta has two dustfall guidelines, one for residential and recreational areas and another for commercial and industrial areas. The more stringent guideline is 53 milligrams per 100 square centimetre per 30 days (mg/100 cm^2/30 d) or approximately 1.8 mg per square decimetre per day

(mg/dm²/d). BC has a range of dustfall objectives depending on the areas of the application and the type of industry. The BC objectives range from 1.7 to 4.1 mg/dm²/d. A summary of these dustfall guidelines and objectives is provided in Table 10-1. For the discussion of the predicted TSP deposition results for the Project, the most stringent value of 1.7 mg/dm²/d from these two jurisdictions is selected as a benchmark.

Table 10-1 Dustfall Guidelines and Standards from Various Jurisdictions

Jurisdiction	Industry	Receptor	Guideline or Objective
Alberta	All	Residential and recreational areas	53 mg/100 cm²/30 d or 1.8 mg/dm²/d
	All	Commercial and industrial areas	158 mg/100 cm²/30 d) or 5.3 mg/dm²/d
British Columbia	Mining, smelting and related industries	All	1.7 to 2.9 mg/dm²/d
	Forest products industry	Residential areas	1.7 mg/dm²/d
		Others	2.9 mg/dm²/d
	Food processing, agricultural, chemical, petroleum and other industries	Residential areas	1.7 to 2.3 mg/dm²/d
		Others	2.9 to 4.1 mg/dm²/d

mg/cm²/d = milligrams per square centimetre per day; mg/dm²/d = milligrams per square decimetre per day.

Maps 10-1 to 10-3 present the annual TSP deposition rates for the Base Case, Application Case, and Construction Case, respectively. The Base Case represents anticipated conditions from existing and approved developments within the effects assessment study areas prior to the start of the Project's construction activities. The Construction Case represents predictions of the cumulative effects of the developments in the Base Case combined with the effects from the Project's construction activities. The Application Case represents predictions of the cumulative effects of the developments in the Base Case combined with the effects from the production phase of the Project. As expected, the highest TSP deposition predictions in each assessment case are located near haul road and mine areas, and depositions progressively reduce with distance away from the emission source. In the Application Case, there are predicted TSP deposition rates outside of the Project footprint that exceed the conservative 1.7 mg/dm²/d benchmark. However, these predictions are confined to an area within 500 metres outside of the Project footprint. The predictions reduce to 10 percent (%) of the benchmark within 3 kilometres (km) from the Project perimeter; and they reduce to 1% of the benchmark within 10 km from the Project perimeter. These are conceptual estimates that do not take into account variations in natural conditions, such as large fires, that can result in dust deposition unrelated to mine activities.

Based on Maps 10-1 to 10-3, the deposition of TSP tends to occur close to the source of the TSP emissions (e.g., haul road and mine areas). The prevailing wind pattern does not appear to have a high influence on the deposition of TSP over the course of an entire year.

Using TSP deposition rates as a surrogate for dustfall provides a conservative estimate of the spatial extent of true dust, the larger, heavier particles. These large particles that deposit close to their source are best characterized through a monitoring program. The existing Ekati Mine Air Quality Monitoring and Management Program, which includes a dust monitoring program will be spatially adapted in due course to consider the effects of the Project.



LEGEND

- EKATI MINE FOOTPRINT
- DIAVIK MINE FOOTPRINT
- PROPOSED JAY FOOTPRINT
- WINTER ROAD
- TIBBITT TO CONTWOYTO WINTER ROAD
- NORTHERN PORTION OF TIBBITT TO CONTWOYTO WINTER ROAD
- ELEVATION CONTOUR (20 m INTERVAL)
- ESKER
- WATERCOURSE
- WATERBODY

DEPOSITION (mg/dm²/d)

- 0 to <0.017 (BLANK)
- 0.017 to <0.170
- 0.170 to <0.425
- 0.425 to <0.850
- 0.850 to <1.275
- 1.275 to <1.700
- 1.700 to <3.400
- 3.400 and Above

REFERENCE

NATIONAL TOPOGRAPHIC BASE DATA (NTDB) 1:250,000
CANVEC © NATURAL RESOURCES CANADA, 2012
NATURAL RESOURCES CANADA, CENTRE FOR TOPOGRAPHIC INFORMATION, 2012
DATUM: NAD83 PROJECTION: UTM ZONE 12N

DOCUMENT

DAR-LKDFN-IR-10

5 0 5
SCALE 1:250,000 KILOMETRES

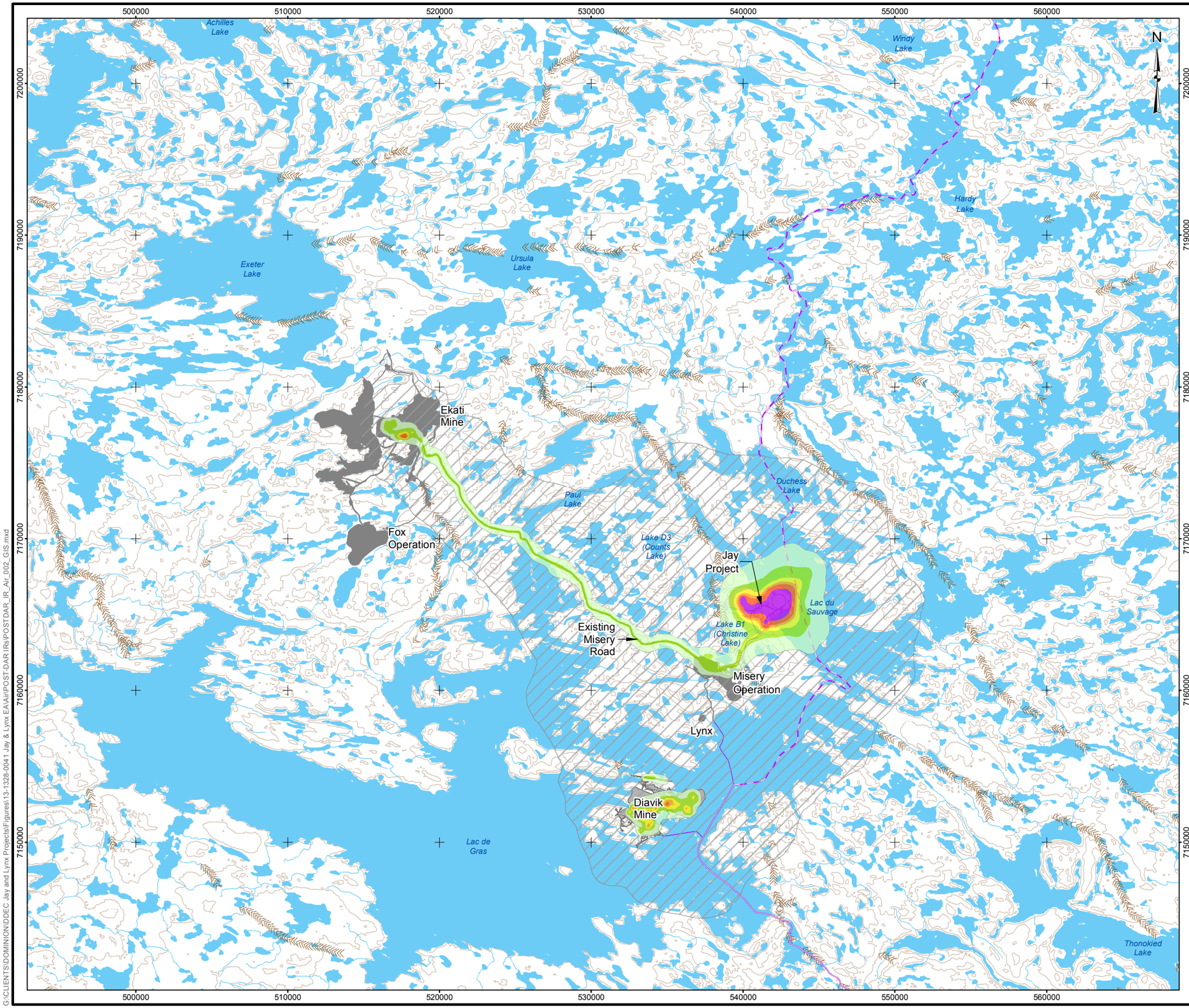
PROJECT
DOMINION DIAMOND™
JAY PROJECT
NORTHWEST TERRITORIES, CANADA

TITLE
BASE CASE MAXIMUM ANNUAL TOTAL SUSPENDED PARTICULATE DEPOSITION

Golder Associates

PROJECT		1419751	FILE No. POSTDAR_IR_Air_002_GIS	
DESIGN	DC	04/03/15	SCALE AS SHOWN	REV 1
GIS	SBM	16/03/15	MAP 10-1	
CHECK	DC	02/04/15		
REVIEW	CM	02/04/15		

G:\CLIENTS\DOMINION\DDEC_Jay and Lynx Projects\Figures\13-1328-0041 Jay & Lynx EA\Air\POST-DAR IRs\POSTDAR_IR_Air_002_GIS.mxd



LEGEND

- EKATI MINE FOOTPRINT
- DIAVIK MINE FOOTPRINT
- PROPOSED JAY FOOTPRINT
- WINTER ROAD
- TIBBITT TO CONTWOYTO WINTER ROAD
- NORTHERN PORTION OF TIBBITT TO CONTWOYTO WINTER ROAD
- ELEVATION CONTOUR (20 m INTERVAL)
- ESKER
- WATERCOURSE
- WATERBODY

DEPOSITION (mg/dm²/d)

- 0 to <0.017 (BLANK)
- 0.017 to <0.170
- 0.170 to <0.425
- 0.425 to <0.850
- 0.850 to <1.275
- 1.700 to <3.400
- 3.400 and Above

REFERENCE

NATIONAL TOPOGRAPHIC BASE DATA (NTDB) 1:250,000
CANVEC © NATURAL RESOURCES CANADA, 2012
NATURAL RESOURCES CANADA, CENTRE FOR TOPOGRAPHIC INFORMATION, 2012
DATUM: NAD83 PROJECTION: UTM ZONE 12N

DOCUMENT

DAR-LKDFN-IR-10

5 0 5
SCALE 1:250,000 KILOMETRES

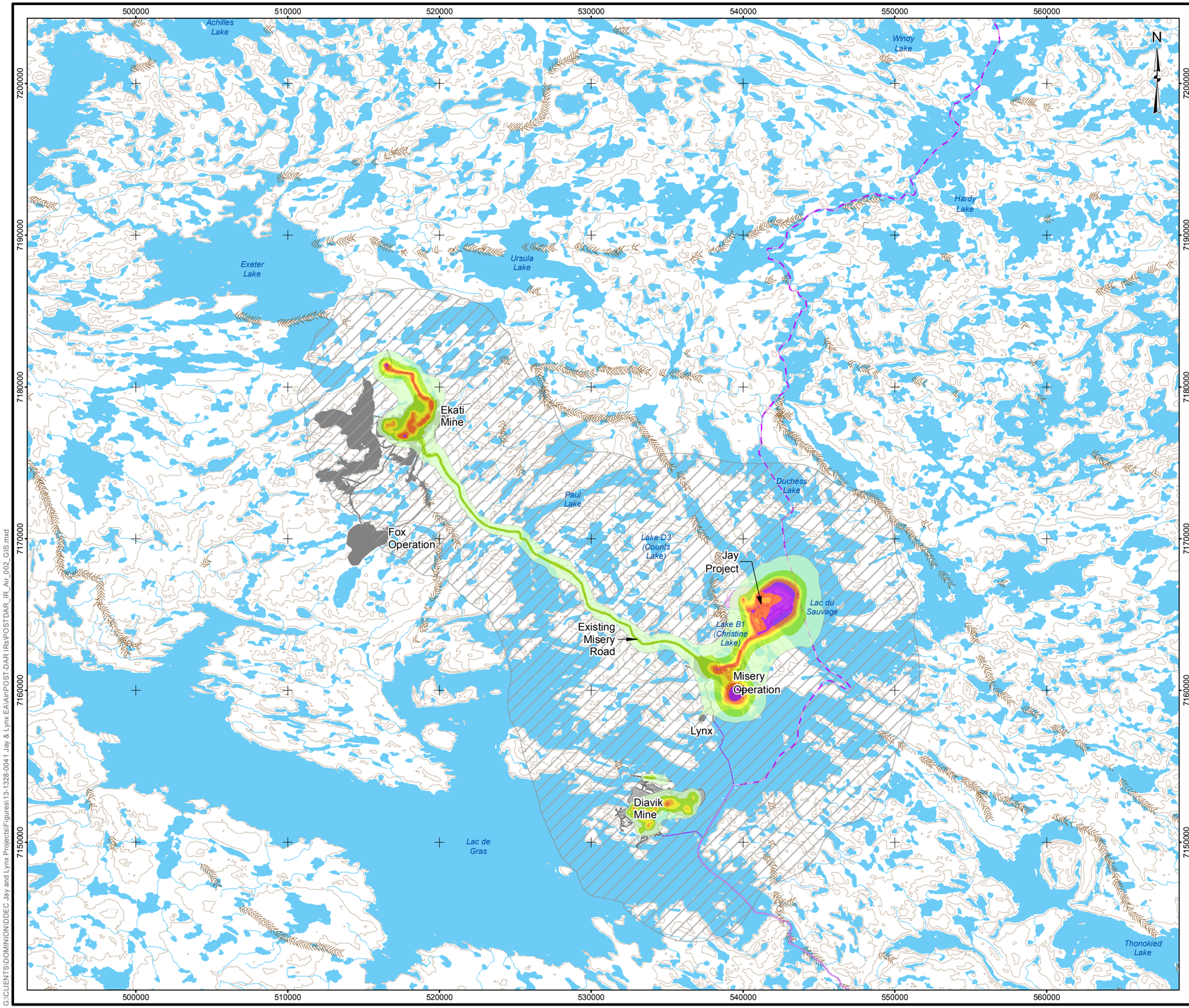
PROJECT
DOMINION DIAMOND™
JAY PROJECT
NORTHWEST TERRITORIES, CANADA

TITLE
APPLICATION CASE MAXIMUM ANNUAL TOTAL SUSPENDED PARTICULATE DEPOSITION

Golder Associates

PROJECT		1419751	FILE No. POSTDAR_IR_Air_002_GIS	
DESIGN	DC	04/03/15	SCALE AS SHOWN	REV 1
GIS	SBM	16/03/15	MAP 10-2	
CHECK	DC	02/04/15		
REVIEW	CM	02/04/15		

G:\CLIENTS\DOMINION\DDEC Jay and Lynx Projects\Figures\13-1328-0041 Jay & Lynx EA\Air\POST-DAR IRs\POSTDAR_IR_Air_002_GIS.mxd



LEGEND

- EKATI MINE FOOTPRINT
- DIAVIK MINE FOOTPRINT
- PROPOSED JAY FOOTPRINT
- WINTER ROAD
- TIBBITT TO CONTWOYTO WINTER ROAD
- NORTHERN PORTION OF TIBBITT TO CONTWOYTO WINTER ROAD
- ELEVATION CONTOUR (20 m INTERVAL)
- ESKER
- WATERCOURSE
- WATERBODY

DEPOSITION (mg/dm²/d)

- 0 to <0.017 (BLANK)
- 0.017 to <0.170
- 0.170 to <0.425
- 0.425 to <0.850
- 0.850 to <1.275
- 1.275 to <1.700
- 1.700 to <3.400
- 3.400 and Above

REFERENCE

NATIONAL TOPOGRAPHIC BASE DATA (NTDB) 1:250,000
CANVEC © NATURAL RESOURCES CANADA, 2012
NATURAL RESOURCES CANADA, CENTRE FOR TOPOGRAPHIC INFORMATION, 2012
DATUM: NAD83 PROJECTION: UTM ZONE 12N

DOCUMENT

DAR-LKDFN-IR-10

5 0 5
SCALE 1:250,000 KILOMETRES

PROJECT
DOMINION DIAMOND™
JAY PROJECT
NORTHWEST TERRITORIES, CANADA

TITLE
CONSTRUCTION CASE MAXIMUM ANNUAL TOTAL SUSPENDED PARTICULATE DEPOSITION

Golder Associates

PROJECT		1419751	FILE No. POSTDAR_IR_Air_002_GIS	
DESIGN	DC	04/03/15	SCALE AS SHOWN	REV 1
GIS	SBM	16/03/15	MAP 10-3	
CHECK	DC	02/04/15		
REVIEW	CM	02/04/15		

G:\CLIENTS\DOMINION\DDEC Jay and Lynx Projects\Figures\13-1328-0041 Jay & Lynx EA\Air\POST-DAR IRs\POSTDAR_IR_Air_002_GIS.mxd

DOMINION DIAMOND

Information Request Number:	DAR-LKDFN-IR-11
Source:	Lutsel K'e Dene First Nation - Chief or Wildlife, Lands and Environment: Peter Unger
Subject:	Air quality threshold
DAR Section(s):	Section 7, sub-section 7.6,

Preamble (LKDFN):

The DAR states that “Magnitude is the primary criterion used to determine significance” and that significant is defined as “Predicted concentrations are above the AAQS for the NWT and exceedances of the relevant criteria are widespread, continuous, and occur well-beyond the Project area.” It goes on to state that “if a prediction is reversible and short-term or medium-term in duration, but it is above the established threshold at times, it would receive a not significant rating.”

LKDFN does not find this to be a stringent or effective definition of significance. The NWT AAQS are relatively lenient. For example, the World Health Organization (WHO) sets the limits for Nitrogen Dioxide at 40 µg/m3 for the annual mean and 200 µg/m3 for the 1-hour mean; and Sulphur Dioxide is limited at 20 µg/m3 for a 24-hour mean and 500 µg/m3 for a **10-minute mean** (http://whqlibdoc.who.int/hq/2006/WHO_SDE_PHE_OEH_06.02_eng.pdf). Please note that the WHO sets these guidelines globally, so this includes all developing countries, where air quality management is much more challenging than in a developed country such as Canada. Given that NWT AAQS are far more lenient than the international standard and that the NWT AAQS were specifically designed with developments, such as this project, in mind, LKDFN fails to understand how the proponent can suggest that exceeding them can be considered not significant.

Request (LKDFN):

LKDFN requests that significance be defined as “Predicted concentrations are above the AAQS for the NWT” with no additional qualifiers to allow for exceedances. The AAQS were established for a reason and were designed to be the maximum allowable concentrations for these specified substances. There should be no excuse for exceeding them.

Response:

The residual impact classification and determination of significance for the air quality assessment is provided in Section 7.6 of the Developer’s Assessment Report (DAR).

The air quality significance is not solely based on magnitude which is based on compliance with Northwest Territories Ambient Air Quality Standards (NWT AAQS) (GNWT-ENR 2014) as stated in the DAR (see Table 7.6-1). It also includes other considerations such as likelihood (of the maximum predicted impacts), uncertainty (including conservatism in the assumptions and assessment approach), geographic extent (Project effect confined to the Local Study Area [LSA]), duration of the effect, frequency of the effect, reversibility of the effect, and the level of scientific understanding to the impacts based on previous studies at similar projects. For the air quality assessment in the DAR, a significant impact was considered

to be one where irreversible and long-term changes in air quality would be expected after mitigation and other design features are implemented. If a prediction is reversible and short-term or medium-term in duration, but it is above the established threshold at times, it would receive a not significant rating. Conversely, if a compound is expected to result in an irreversible and long-term change in air quality but it is below the established guideline, it may receive a rating of significant. Dominion Diamond believes that the significance definition chosen for air quality assessment is appropriate for the following reasons:

- All air quality effects were local in geographic extent, and compliance met within the LSA.
- All effect durations were considered to be medium-term (for the lifetime of the Project).
- All effects were reversible, and would cease with the completion of the Project.
- No reversible effects were long-term, and no effects above the NWT AAQS thresholds were irreversible or long-term.

For example, the determination of significance for nitrogen dioxide (NO_2) with respect to the magnitude of concentrations predicted compared with the NWT AAQS as mentioned in the preamble was as follows. The nitrogen oxides (NO_X) emissions associated with the Project are almost exclusively from two types of sources: power generation, and mine vehicle exhaust. The power generators for the Jay Project will be the existing power generators already being used at the existing Ekati Mine. The mine vehicles associated with the Jay Project will mostly be mine vehicles currently being used at the Ekati Mine with the exception of a new type of haul trucks (e.g., 240-tonne roadtrain). Between the two main type of NO_X emission sources, mine vehicle exhaust has the highest level of influence on the predicted NO_2 ground-level concentrations due to two factors:

- the low release height for the vehicle exhaust constrains immediate dispersion; and,
- the sources (e.g., haul roads) and the receptors where NWT AAQS are applicable are exceptionally close together (e.g., receptors adjacent to the haul roads).

The frequency of predicted NO_2 concentrations was revised in the response for DAR-EC-IR-04 to correct typographic errors in the DAR. The areas with predictions over the NWT NO_2 AAQS are confined to within a few hundred metres of the perimeter of the Project disturbance area and adjacent to the main haul roads. The predicted magnitude as compared with the AAQS is considered high (Table 7.6-2 of the DAR), and as the AAQS are higher than the World Health Organization standards referenced in the preamble, no change in magnitude would occur in the assessment using lower concentration standards. Frequency is considered to be infrequent to frequent, depending on the averaging period. The extent is local, as the exceedances are confined to near the disturbance area. The duration is over the life of the Project, and is reversible at closure. Although conservatisms are built into the approach (described below), the likelihood is considered likely. These effects are thus not significant, i.e., no reversible effects for NO_2 were long-term, and no NO_2 effects above the AAQS thresholds were irreversible or long-term.

NO_2 monitoring data collected between 2009 and 2011 from a station near a haul road (approximately within a few hundred metres from a haul road and well within the disturbance area) at the Ekati Mine (see DAR Annex I, Table 5.1-2) indicated that maximum 1-hour and 24-hour NO_2 concentrations in each year

typically ranged between 30 percent (%) and 80% of the NWT AAQS. No exceedance of NWT AAQS was measured during this period.

A large proportion of the haul roads follow the perimeter of the Jay Project. The mine disturbance was kept small and without inclusion of a buffer zone along the perimeter of the disturbance area. By doing so and without the inclusion of a buffer zone, the area outside the Project disturbance footprint, including the locations along the outer edge of a large proportion of haul roads are required to meet the NWT AAQS. Compared with a typical industrial facility where typically the compliance with applicable ambient air quality standards is only required at the facility's property fenceline, the Project disturbance area was used instead as the boundary at which compliance was assessed. This is a conservative approach, as there is no effective fenceline at the Project other than the Ekati claim block. The claim block is quite large when compared to the immediate disturbance area of the Project, and while the Ekati claim block boundary has been used previously to gauge predicted air quality concentrations against NWT guidelines (Rescan 2006), concentration predictions at the claim block boundary do not provide a conservative approach to assessing the impact of the Project on air quality with respect to the AAQS due to the distance of the claim block boundary from the Project.

A number of conservative assumptions were also made in the emission estimations and dispersion modelling of the Project. By making conservative assumptions, it is expected that the results of the dispersion modelling present a "worst case" scenario which may exceed actual air contaminant concentrations outside of the disturbed area boundary during the operation of the Project. A number of the conservatisms made in the air quality assessment of the Project included:

- The Project is assumed to be operating at maximum capacity throughout the lifetime of the Project;
- Peak emission scenarios were assumed for each of the cases assessed (Base, Application, and Construction);
- The Application Case used the operation year 2022 which is expected to be the peak year for emissions, other years would likely have lower emissions;
- For mitigated sources (such as using dust suppression on a haul road), mitigation factors chosen were conservative so that actual emissions from mitigated sources are likely lower than those modelled;
- Certain emission sources were considered to be emitting at peak continually, when in reality they would be emitting with fluctuating loads which may be operating lower than peak, such as for power generators; and,
- If detailed emission rates were not known for sources, conservative emission rates were generally chosen.

For the reasons discussed above, the residual impact classification and determination of significance for the air quality assessment provided in Section 7.6 of the Developer's Assessment Report is appropriate.

References:

GNWT-ENR (Environment and Natural Resources, Government of the Northwest Territories). 2014. Guideline for Ambient Air Quality Standards in the Northwest Territories. Yellowknife, NWT, Canada, 5 pp.

Rescan (Rescan Environmental Services Ltd.). 2006. Ekati Diamond Mine CALPUFF Air Dispersion Modelling Assessment, October 2006.

DOMINION DIAMOND

Information Request Number:	DAR-LKDFN-IR-12
Source:	Lutsel K'e Dene First Nation - Chief or Wildlife, Lands and Environment: Peter Unger
Subject:	Baseline water quality for Lake C17
DAR Section(s):	8.2.5

Preamble:

It does not appear that there was any baseline water quality testing for Lake C17.

Given Lake C17's close proximity to the proposed Waste Rock Storage Area (WRSA), the potential for issues caused by runoff from the WRSA, and the predicted change in flows to and from the lake, LKDFN deems it would be prudent to have some baseline water quality information for this lake.

Request:

LKDFN requests that the proponent provide baseline water quality information for Lake C17.

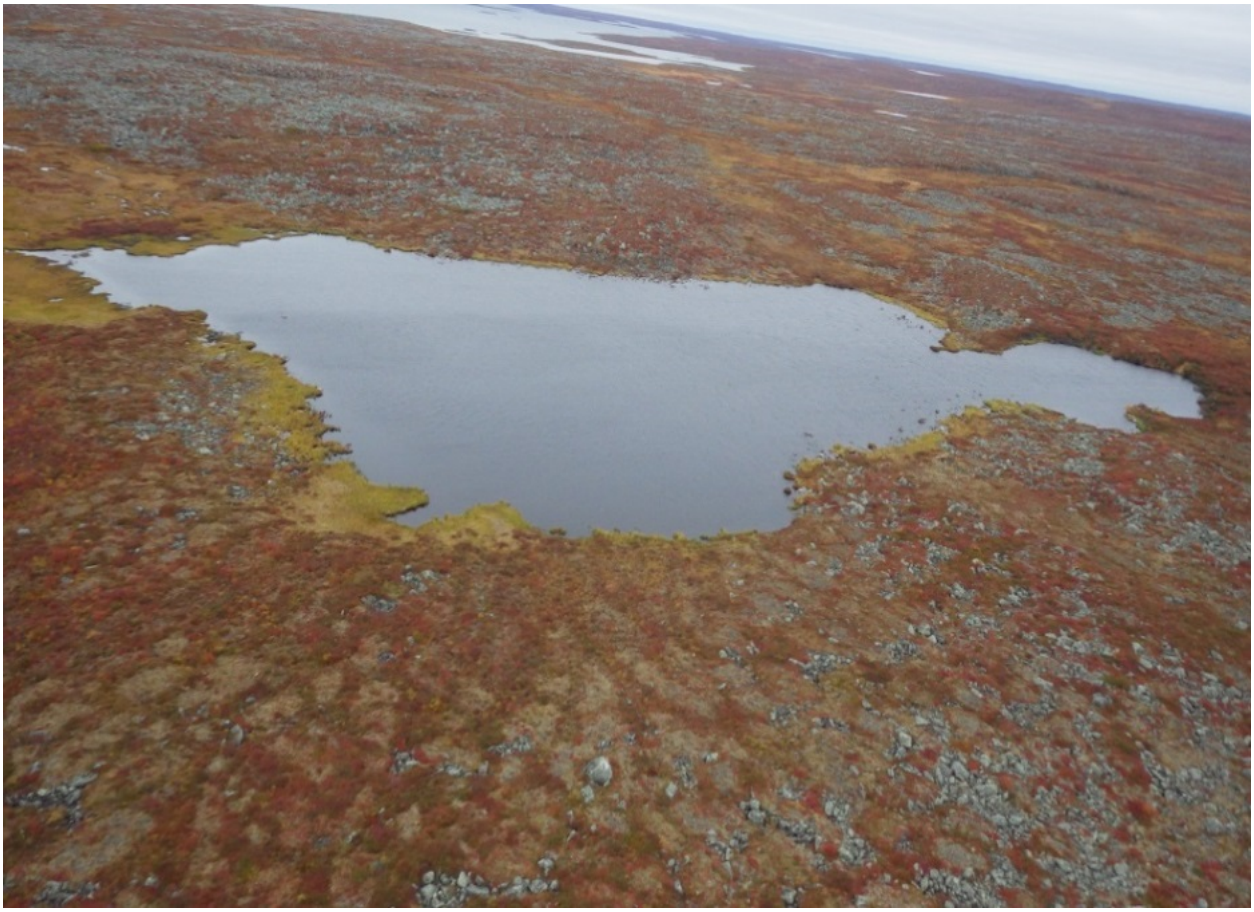
Response:

A site visit was conducted at Lake C17 on August 27, 2014, as part of the fish and fish habitat supplemental baseline program (Golder 2015). During the site visit, it was determined that the maximum depth of the 2.8 hectare lake was 0.5 metres, and that it was not a fish-bearing lake. Lake C17 is located high in the watershed with an ephemeral outlet so fish are unable to migrate to it in the summer (Photo 12-1). Additionally, with such a shallow depth, this lake would freeze to the bottom over winter. Physico-chemical field water quality data, and water samples for chemical analysis, were not collected as part of the August 27, 2014 visit because this lake was not characterized as a fish-bearing lake and any changes to water quality in the lake would not affect fish valued components.

However, Dominion Diamond Ekati Corporation will use the opportunity of planned supplemental baseline water quality monitoring during open water conditions in 2015 to collect water quality information from this lake.

Bi-annual (spring and fall) waste rock storage area (WRSA) seepage surveys are a requirement of the Ekati Mine Water Licence that is proposed to apply in future to the Jay WRSA. These surveys inspect for and sample seepage flows exiting the WRSA, and therefore, will provide water quality information in the vicinity of Lake C17 if WRSA seepage is present.

Photo 12-1 Aerial View of Lake C17, August 27, 2014



References:

Dominion Diamond (Dominion Diamond Ekati Corporation). 2015. 2014 Fish and Fish Habitat Supplemental Baseline Report for the Jay Project. Prepared by Golder Associates Ltd., April 2015. Yellowknife, NWT, Canada.

DOMINION DIAMOND

Information Request Number:	DAR-LKDFN-IR-13 and DAR-LKDFN-IR-15
Source:	Lutsel K'e Dene First Nation - Chief or Wildlife, Lands and Environment: Peter Unger
Subject:	Definition of “self-sustaining and ecologically effective” and Definition of significance for parturition rate decreases
DAR Section(s):	12 (Page 12-4), 12.1.3; 12 (Page 12-118), 12.4.3; 12 (Page 12-124), 12.6.1.2

Preamble (LKDFN):

DAR-LKDFN-IR-13

The proponent states “A self-sustaining and ecologically effective population is the assessment endpoint for barren-ground caribou.”

“Self-sustaining and ecologically effective” are not clearly defined. While table 12.1-1 does provide some indicators, there is no quantifiable metric for measuring these attributes of the caribou population and no threshold provided below which the population would be considered no longer “self-sustaining and ecologically effective.” The proponent states that “An ecologically effective population of a highly interactive species is one that is large enough to maintain ecosystem function.” However, there is no numerical value provided to indicate what the proponent deems a large enough population in this specific situation. LKDFN questions some of the proponent’s assessments of significance, and it would be easier to discuss this topic with a clear definition of what is too low for the population to be ecologically effective.

DAR-LKDFN-IR-15

The proponent states that without development, but high insect harassment, the caribou parturition rate could decrease by as much as 26.8%. The proponent goes on to state that with development, this parturition rate in similar high insect harassment could be as high as 32.2%. This is a difference of 5.4% and the proponent goes on to indicate that this is not a significant impact.

Given the recent reductions in the Bathurst herd population, it is important to be very clear about significance. This section has not provided any numerical values for what would be considered significant. It would also be useful to know which starting population numbers were used in determining this significance. What may have not been considered significant for the population in 2012 may well be considered significant for the drastically reduced population observed in 2014.

Request (LKDFN):

DAR-LKDFN-IR-13

LKDFN requests that the terms “self-sustaining and ecologically effective” be defined in a quantifiable, evidenced-based manner, with clear numerical thresholds below which the caribou population would no

longer be considered “self-sustaining and ecologically effective.” This could be done in terms of population numbers or population growth rates.

DAR-LKDFN-IR-15

LKDFN requests that the proponent provide thresholds for significance. If a 5.4% decrease in parturition rates is not considered significant, what rate would be considered significant? LKDFN requests that the proponent use the most recent information regarding Bathurst population numbers to determine these thresholds.

Response:

Response to Thresholds Requested in DAR-LKDFN-IR-13 and DAR-LKDFN-IR-15

Quantitative thresholds, critical values or screening values (e.g., protective value before reaching the threshold) that relate the changes in measurement indicators to effects on assessment endpoints are not available for barren-ground caribou. Because thresholds and critical values are not available, the Developer’s Assessment Report (DAR) provided a reasoned qualitative narrative founded on ecological principles supported by science, and when possible by Traditional Knowledge, to describe the what constitute significant effects to barren-ground caribou. This approach is consistent with the requirements of the Terms of Reference (TOR; MVEIRB 2014). Section 4.2 (pp. 17) of the TOR states:

“If a determination is made that significant adverse impacts are not likely, the developer will provide a narrative statement that identifies what, in its opinion, the threshold for significance would be. It is acknowledged that quantitative thresholds for all components may not be feasible.”

Section 12.6 of the DAR provides a reasoned qualitative narrative of thresholds for significance from development disturbance for measurement indicators for caribou including:

- permanent removal of preferred habitat loss or highly productive areas important for survival and reproduction of caribou at the population level;
- an abrupt change in abundance from dividing a caribou herd could decrease the effectiveness of predator swamping or lead to inbreeding depression (all of which are termed Allee effects [Vors and Boyce 2009; Swift and Hannon 2010]); and,
- long-term or permanent depression in caribou abundance where the population is still self-sustaining but no longer supports ecosystem functions such as nutrient cycling through grazing and deposition of fecal nitrogen (see Vors and Boyce 2009), and stable wolf, grizzly bear, and wolverine populations.

Response to DAR-LKDFN-IR-13

As noted in the preamble to this request, the measurement indicators for barren-ground caribou are presented in Table 12.1-1 of the DAR. It is agreed that the set of measurement indicators is without thresholds, but they are quantifiable metrics. Although not explicitly stated in the DAR, the changes in abundance and distribution at the population level are inferred from the independent or combined results of the numerical and qualitative analyses of changes in the other measurement indicators (e.g., habitat quantity and quality, and survival and reproduction).

The request for a quantitative target that is near or exceeding species resilience limits to support a self-sustaining population could be viewed as a theoretical minimum viable population (MVP) size. Shaffer (1981) defined an MVP as the smallest population within a given habitat that provides a defined probability (e.g., 95%) of remaining in existence over a defined period (e.g., 1,000 years).

Estimating MVP size requires simulation modelling to account for the multitude of stochastic (i.e., random) factors that influence population size. These include (Shaffer 1981):

- demographic stochasticity – chance events that affect survival and reproduction;
- environmental stochasticity – temporal variation in habitat quality and quantity as well as interactions with competitors, predators, parasites, insects, and disease;
- natural catastrophes – extreme environmental events such as fires, floods, and drought; and,
- genetic stochasticity – changes in genetic diversity due to random genetic processes.

However, deriving realistic MVP estimates is difficult to impossible (Boyce 1992). There are no perfect numbers that will guarantee sustainability of a population against stochastic events and/or to systematic (e.g., harvest, development) pressures. The probability estimated with an MVP estimate only applies under the exact conditions modelled and because there are limited data to estimate the effects of all factors influencing population size, simulation model outputs are wrought with uncertainty (Boyce 1992). Using such estimates to assess the significance of impacts puts too much weight on a single model and could lead to erroneous conclusions. In contrast, the DAR examined several lines of evidence (changes in habitat quantity and connectivity, habitat quality, movement and behaviour, energetics, and calf production) to determine that the Project and other developments do not significantly contribute to adverse cumulative effects on the Bathurst caribou herd.

Population models make valuable contributions toward understanding impacts and were used in a population viability analysis (DAR-MVEIRB-15) to evaluate the comparative influence of the Project and other developments (through survival and fecundity rates [vital rates], and carrying capacity), extreme weather-related events, periodic extreme insect harassment, and level of hunter harvest on the abundance of adult female caribou.

The population modelling, along with detailing impacts to assessment endpoints themselves (i.e., critical factors that influence population size such as habitat quantity and quality, fragmentation, and direct mortality) allowed for clear evaluation and explicit and transparent scientific-based inference of how the Project may affect the ability of the Bathurst caribou herd to be self-sustaining and ecologically effective. The outcome and conclusions of the population modelling are discussed below.

With respect to the suggestion to select a specific rate of population decline or minimum population size as a lower threshold of resilience, consideration must be given to the cyclic nature of barren-ground caribou populations. The Bathurst herd has gone through prolonged periods of population decline (i.e., Lambda < 1.0) in the past and has been resilient to those declines. Despite low population levels, the herd has recovered and increased subsequent to each decline, demonstrating its resilience.

Response to DAR-LKDFN-IR-15

The results of the population modelling completed in response for Adequacy item 8.8 (DAR-MVEIRB-15), included the effects of habitat loss and decreased fecundity from development encounters in the Reasonably Foreseeable Development (RFD) Case in the DAR. The population modelling examined both the decline phase of the Bathurst caribou herd (based on the most recent comprehensive estimates for vital rates) and for an increasing population phase. The vital rates provided following the 2012 calving ground photographic survey (Boulanger et al. 2011, 2014) are the most recent vital rates that have been calculated for the Bathurst herd that reconcile all available sources of information (Adamczewski 2015). These vital rates were used in the population modelling. From the modelling:

- Based on the current estimates of vital rates for reference conditions (Boulanger et al. 2014), the results show the negative trend in population growth is predicted to be similar with and without the development-related cumulative changes in habitat quantity and quality, and caribou behaviour and energetics and decreased fecundity.
- The information required for the determination of vital rates (Boulanger et al. 2014) requires information not gathered in the 2014 reconnaissance survey. However, a discussion of the 2014 reconnaissance survey results and the relationship with population decline is provided in the Adequacy Response to DAR-MVEIRB-15; any set of vital rates consistent with the 2014 reconnaissance survey results will show decline in the population for all assessment cases.
- The final set of scenarios presented in DAR-MVEIRB-15 examined RFD cases built on a population stage matrix of vital rates that may be closer to those expected during an increasing population phase. The results of those models showed the potential for population growth with high levels of insect harassment, maximum levels of disturbance in the RFD Case, and continued harvest of the population.

There are no strong mechanisms by which development reduces adult female survival and fecundity. From the different scenarios examined in population modelling, the additional energetic costs from changes in movement and behaviour associated with the Project and other developments are not expected to decrease population resilience and increase the risk to the viability of the Bathurst herd at any phase of the population cycle. Conservative assumptions were used to predict maximum effects from development and natural factors, and provide ecologically relevant and confident impact predictions. Without defining threshold values, the population modelling results demonstrate that the maximum predicted effects do not prevent a positive growth rate for the Bathurst caribou herd with realistic vital rates for the increasing phase of a barren-ground caribou population.

References:

Adamczewski J. 2015. Personal communication. Wildlife Biologist, Ungulates – Environment & Natural Resources, Wildlife Division, Government of the Northwest Territories. Phone call with J. Rettie, Golder Associates. March 2, 2015.

Boulanger J, Gunn A, Adamczewski J, Croft B. 2011. A Data-Driven Demographic Model to Explore the Decline of the Bathurst Caribou Herd. J Wildlife Manage 75: 883-896.

Boulanger J, Croft B, Adamczewski J. 2014. An Estimate of Breeding Females and Analyses of Demographics For The Bathurst Herd of Barren-ground Caribou: 2012 Calving Ground Photographic Survey. Integrated Ecological Research Unpublished File Report No. 142 for Environment and Natural Resources, GNWT. 81 pp.

Boyce, MS. 1992. Population viability analysis. Annual Review of Ecology and Systematics. 23:481-506.

MVEIRB (Mackenzie Valley Environmental Impact Review Board). 2014. Revised Terms of Reference (EA1314-01) Jay Project Dominion Diamond Ekati Corporation. July 17, 2014.

Shaffer, ML 1981. Minimum population sizes for species conservation. Bioscience. 31: 131-134.

Swift TL, Hannon SJ. 2010. Critical Thresholds Associated with Habitat Loss: A Review of the Concepts, Evidence, and Applications. Biol Review 85: 35-53.

Vors LS, Boyce MS. 2009. Global Declines of Caribou and Reindeer. Glob Chan Biol. doi: 10.1111/j.1365-2486.2009.01974.x

DOMINION DIAMOND

Information Request Number:	DAR-LKDFN-IR-14
Source:	Lutsel K'e Dene First Nation - Chief or Wildlife, Lands and Environment: Peter Unger
Subject:	Caribou and road avoidance
DAR Section(s):	Section 12, sub-sections 12.2.1.1.3 and 12.2.2.2, pages 12-11 and 12-20

Preamble:

The DAR states that only caribou within 200 metres of the road were recorded in road surveys, only caribou tracks within metres of the road were recorded, and caribou on wildlife cameras were observed for road deflection. The DAR also noted that 89% of observations were of groups smaller than five individuals.

LKDFN suggests that there are flaws in the methodology used to evaluate road permeability for caribou. The observation methods presented could only have recorded caribou that had already committed to crossing the road. It is quite possible that caribou decide whether or not to cross the road at a distance further than 200 metres from the road and these cases of avoidance would not be reflected in this analysis. This is especially concerning when traditional knowledge provided by KIA suggests that caribou do avoid crossing roads (page 12-40). LKDFN also finds it curious that observations were overwhelmingly of very small groups, given that caribou groups in Northern Canada have generally been recorded as larger (Heard, Douglas C., T. Mark Williams, and Kent Jingfors. 1986. "Precalving distribution and abundance of barren-ground caribou on the northeastern mainland of the Northwest Territories." *Arctic*: 24-28.; Duquette, Laurel S., and David R. Klein. 1987. "Activity budgets and group size of caribou during spring migration." *Canadian journal of zoology* 65.1: 164-168.; Government of Northwest Territories, 2004,*Ecology of Boreal Woodland Caribou in the Lower Mackenzie Valley, NT: Work Completed in the Inuvik Region, April 2003 to November 2004*. Department of Resources, Wildlife and Economic Development). This adds to doubts about the accuracy of this evaluation of avoidance.

Request:

LKDFN requests clarification from the proponent regarding the methods used to evaluate road avoidance among caribou, including some evidence to support that 200 metres is an adequate distance from which to evaluate road avoidance and that groups of smaller than 5 individuals can be considered representative of a caribou herd as a whole.

Response:

A range of methods are used to document caribou abundance, distribution, and behaviour. Aerial surveys, radio-collar movements, and scan and focal scanning were completed to understand caribou reactions to the Ekati Mine at a regional and local scales, while remote cameras, snow track surveys, road observations, response to stressors, and incidental observations were completed to understand caribou reactions in the area immediately surrounding the Ekati Mine and Misery Road (all methods are documented in the Developer’s Assessment Report [DAR] Section 12.2.1.1). The conclusions from these

studies were used in a weight-of-evidence approach to assess the likely effects of the Jay Project; the conclusions are not based on the results of any one survey alone. The DAR conservatively assumed that caribou would not cross Misery, Jay, or Sable roads although monitoring results indicate that the Misery Road is not a complete barrier to caribou movement (Rescan 2011; ERM Rescan 2014).

The group sizes reported are typical for the location and season. Barren-ground caribou typically congregate as they approach the calving grounds, and disperse after leaving the calving grounds. Map 12.1-3 of the DAR illustrates how the seasonal ranges expand as caribou migrate from the calving ground to the winter range. Map 12.2-4 of the DAR illustrates the range of group sizes observed during aerial surveys, and shows group sizes ranging from 1 to 5,000 in the immediate vicinity of the Ekati Mine. These aerial surveys have not documented a change in caribou group size with distance from the Ekati Mine.

References:

Rescan (Rescan Environmental Services Ltd.). 2011. EKATI Diamond Mine: 2010 Wildlife Effects Monitoring Program. Prepared for BHP Billiton Canada Inc. by Rescan Environmental Services Ltd.: Yellowknife, NWT, Canada.

ERM Rescan (ERM Rescan Environmental Services Ltd.). 2014. Ekati Diamond Mine: 2013 Wildlife Effects Monitoring Program. Prepared for Dominion Diamond Ekati Corporation by ERM Rescan: Yellowknife, NWT, Canada.

DOMINION DIAMOND

Information Request Number:	DAR-LKDFN-IR-15
Source:	Lutsel K'e Dene First Nation - Chief or Wildlife, Lands and Environment: Peter Unger
Subject:	Definition of significance for parturition rate decreases
DAR Section(s):	Section 12, page 12-118,sub- section 12.4.3; also page 12-124, sub-section 12.6.1.2

Preamble:

The proponent states that without development, but high insect harassment, the caribou parturition rate could decrease by as much as 26.8%. The proponent goes on to state that with development, this parturition rate in similar high insect harassment could be as high as 32.2%. This is a difference of 5.4% and the proponent goes on to indicate that this is not a significant impact.

Given the recent reductions in the Bathurst herd population, it is important to be very clear about significance. This section has not provided any numerical values for what would be considered significant. It would also be useful to know which starting population numbers were used in determining this significance. What may have not been considered significant for the population in 2012 may well be considered significant for the drastically reduced population observed in 2014.

Request:

LKDFN requests that the proponent provide thresholds for significance. If a 5.4% decrease in parturition rates is not considered significant, what rate would be considered significant? LKDFN requests that the proponent use the most recent information regarding Bathurst population numbers to determine these thresholds.

Response:

Please see response to DAR-LKDFN-IR-13.

DOMINION DIAMOND

Information Request Number:	DAR-LKDFN-IR-16
Source:	Lutsel K'e Dene First Nation - Chief or Wildlife, Lands and Environment: Peter Unger
Subject:	Effects of power lines on caribou
DAR Section(s):	12 (Page 12-123), 12.5

Preamble:

The proponent states that “The magnitude of changes to caribou movement and behaviour from the power lines along Misery and Jay roads compared to the physical presence of the roads and associated traffic is unknown. Research suggests that effects from power lines are minor when compared to active roads (Berger et al. 2000; Reimers et al. 2000, 2007; Vistnes et al. 2008). However, little specific research has been completed on how low voltage distribution lines affect caribou movement and distribution.”

Recent research suggests that power lines could have more significant impacts on caribou than previously assumed (ref: Tyler, N., Stokkan, K.-A., Hogg, C., Nellemann, C., Vistnes, A.-I. and Jeffery, G. (2014), Ultraviolet Vision and Avoidance of Power Lines in Birds and Mammals. Conservation Biology, 28: 630–631. doi: 10.1111/cobi.12262). LKDFN does not consider this assessment complete without a more thorough evaluation of potential impacts from power lines.

Request:

LKDFN requests that the proponent conduct further research into the potential effects of power lines on caribou and provide the results to the Review Board.

Response:

A qualitative analysis of the potential effects of the power distribution line was presented in the Developer’s Assessment Report (DAR) Section 12.4.2.2.2 (pages 12-97 and 12-98). The analysis identified a range of magnitude of observed effects from power lines, roads, traffic, and human activity levels on caribou (Berger et al. 2000; Reimers et al. 2000; Vistnes and Nellemann 2001; Reimers et al. 2007; Vistnes et al. 2008). Potential effects from corona noise and ultraviolet light were also considered (Flydal et al. 2003, 2009; Harper 2014; Hogg et al. 2014; Tyler et al. 2014). Overall, the information suggests that above-ground power lines have smaller effects on caribou movement and distribution than roads and traffic. Therefore, the focus of mitigation and monitoring for the power distribution lines, Jay and Misery roads is directed at Jay Road design, caribou crossings, modification of traffic patterns, and road closures.

References:

Berger R, Martinez I, Wisener M. 2000. Analysis of GPS Relocation Data (1995-1999) for the Owl Lake Woodland Caribou – Report to Manitoba Hydro, Manitoba Conservation, Pine Falls Paper Company, Manitoba Model Forest and Time to Respect Earth’s Ecosystems. 88 pp + appendices.

Flydal K, Rogstad I, Per E, Reimers E. 2003. Reindeer (Rangifer tarandus tarandus) Perception of noise from powerlines. Rangifer 23:21-24.

Flydal K, Korslund L, Reimers E, Johansen F, Colman JE. 2009. Effects of power lines on area use and behaviour of semi-domestic reindeer in enclosures. Int J Ecol: 2009.

Harper M. 2014. Lines Designer, McGregor Construction 2000 Ltd. Calgary, AB, Canada. E-mail. July 8, 2014.

Hogg C, Neveu M, Stokkan K-A, Folkow L, Cottrill P, Douglas R, Hunt DM, Jeffrey G. 2014. Arctic reindeer extend their visual range into the ultraviolet. J Exp Biol 214: 2017-2019.

Reimers E, Flydal K, Stenseth R. 2000. High Voltage Power Lines and Their Effect on Reindeer: A Research Programme in Progress. Polar Res:75-82.

Reimers E, Dahle B, Eftestøl S, Colman JE, Gaare E. 2007. Effects of a power line on migration and range use of wild reindeer. Biol Conserv 134: 484-494.

Tyler N, Stokkan K-A, Hogg C, Nellemann C, Vistnes A-I, Jeffery G. 2014. Ultraviolet vision and avoidance of power lines in birds and mammals. Conserv Biol 3: 630-632.

Vistnes I, Nellemann C. 2001. Avoidance of cabins, roads, and power lines by reindeer during calving. J Wildlife Manage 65: 915–925.

Vistnes II, Nellemann C, Jordhøy P, Støen, O-G. 2008. Summer distribution of wild reindeer in relation to human activity and insect stress. Polar Biol 31:1307-1317.

DOMINION DIAMOND

Information Request Number:	DAR-LKDFN-IR-17
Source:	Lutsel K'e Dene First Nation - Chief or Wildlife, Lands and Environment: Peter Unger
Subject:	Bathurst caribou herd population
DAR Section(s):	12.2.2.3, 12.6.2

Preamble:

The DAR is not clear how it has taken into account the recent collapse in the Bathurst caribou herd. It is briefly mentioned under “Caribou Population Characteristics,” and in the final Results section. However, it is not clear if the drastic reduction in herd population is included as part of analyses and if models were designed to account for this decline.

Clarity should be provided about whether or not the recent decline in population in the Bathurst caribou herd, and the presumed associated decrease in resilience, has been accounted for.

Request:

LKDFN requests that the proponent provide the population numbers that were used in completing the analyses in Chapter 12.

Response:

Analyses of the effects of the primary pathways by which the Project is expected to affect the Bathurst herd are presented in Section 12.4 of the Developer’s Assessment Report (DAR). The residual effects on Bathurst caribou were analyzed using measurement indicators (habitat quantity and fragmentation, habitat quality, survival, and reproduction). Changes in the quantity and quality of habitat within the zone of influence (ZOI) around development can influence the number of animals that the landscape is able to support (i.e., carrying capacity). If animals strongly avoid human development, then the use of less disturbed areas may become higher and more concentrated. Changes to behaviour (such as decreased time spent feeding or increased time spent moving away from disturbance) within the ZOI can influence the energy balance of caribou and alter survival and reproduction. These changes can ultimately affect caribou population size and distribution. Project effects on measurement indicators were not measured against a population of a specific size. However, analyses of the measurement indicators included conservative assumptions and steps to overestimate effects at all phases of the population cycle making them applicable for the current low abundance of the Bathurst herd.

Subsequent to the DAR, population modelling was completed in response to the Mackenzie Valley Environmental Impact Review Board Jay Project Adequacy Item 8.8 (submitted as response DAR-MVEIRB-15). The starting population size in the population models was 15,935 female caribou, which is the population estimated from the 2012 calving ground photographic survey (Boulanger et al. 2014a). The vital rates (i.e., survival and calf productivity) calculated for the Bathurst herd following the 2012 survey are the most recent data available for creating a population model. The modelling report included a discussion of the population decline suggested by results of the 2014 reconnaissance survey (Boulanger

et al. 2014b). The conclusion in the population modelling report is that the negative trend in population growth associated with current population and vital rate estimates for the Bathurst herd is predicted to be similar with and without development-related effects on the Bathurst herd and its range. The Jay Project and other developments are not expected to decrease population resilience and increase the risk to the viability of the Bathurst herd at any phase of its population cycle.

References:

Boulanger J, Croft B, Adamczewski J. 2014a. An Estimate of Breeding Females and Analyses of Demographics For The Bathurst Herd of Barren-ground Caribou: 2012 Calving Ground Photographic Survey. Integrated Ecological Research Unpublished File Report No. 142 for Environment and Natural Resources, GNWT. 81 pp.

Boulanger J, Croft B, Cluff D. 2014b. Trends in size of the Bathurst caribou herd from the 2014 calving ground reconnaissance survey. Integrated Ecological Research. July 31, 2014.

DOMINION DIAMOND

Information Request Number:	DAR-LKDFN-IR-18
Source:	Lutsel K'e Dene First Nation - Chief or Wildlife, Lands and Environment: Peter Unger
Subject:	Lessons learned from Ekati – socio-economics
DAR Section(s):	14

Preamble (LKDFN):

Section 14 discusses base cases and projections for the future, but does not appear to contain much discussion about the success rate of measures implemented at Ekati thus far and what lessons have been learned. For example, sub-section 14.1.3 lists existing agreements and mentions standing hiring targets, but does not discuss performance to date and measures to address areas where targets have not been met.

While many of the physical aspects of the Jay Project differ from previous Ekati activities, the socio-economic implications are very similar. LKDFN is surprised to see that there is little to no discussion of how Ekati has previously performed in terms of meeting targets set forth in the Socio-Economic Agreement. This would seem to be an ideal time and place to examine previous targets and, where they have not been met, apply measures to ensure that they achieved this time around.

Request (LKDFN):

LKDFN requests that the proponent list the performance of previous Ekati operations in meeting the targets set in the Socio-Economic Agreement and propose measures to ensure that the Jay Pit will meet the targets where they were not met previously.

Response:

Employment

The Socio-Economic Agreement (SEA) for the Ekati Mine sets the following targets for the operations phase of the mine (Mining North 1996):

- Northern employment will be 62 percent (%) of total employment associated with the operations phase of the Project, including Contractor employment, at production below 18,000 tonnes per day (tpd).
- Aboriginal employment will equal at least 50% of the Northern Resident employment (implying that, at minimum, 31% of the total workforce should be Aboriginal).

Dominion Diamond is committed to meeting its commitments under the SEA for employment. However, one challenge in the Ekati Mine reaching its targets has been that, while the proponent (i.e., BHP Billiton 1999-2012; Dominion Diamond 2013 onward) may internally meet their hiring targets in terms of direct employment of Northerners and Northern Aboriginals, it may be difficult for contractors to achieve the

same results. Where no competitive Northern contractor is available to meet specialized service requirements of a mine, the proponent must, necessarily, source from southern-based firms. While a mine, given its longevity in one region and consistent demand for labour, is able to hire locally, and developing the local labour force through training and employment initiatives, southern based contractors may not be in a position to improve the capacity of northerners. This scenario has been the case for the Ekati Mine.

Section 4.5.1 of the SEA provides the following measures aimed at encouraging contractors to adhere to SEA targets:

> *"[Dominion Diamond] hereby commits to take all reasonable steps to ensure that its Contractors at the Project adopt a hiring policy that is consistent with this Agreement. [Dominion Diamond] shall, where appropriate, in connection with bids for contracts on the Project:*
>
> *(i) require all Contractors to expressly state their commitment to hiring Northern Residents;*
> *(ii) evaluate bids on the basis of whether appropriate commitments to hire Northern Residents are included or planned for in the bid;*
> *(iii) incorporate the successful bidder's commitments to hire Northern Residents into the contract document; and*
> *(iv) require all contractors to regularly report on their Northern Resident hires and to explain their performance to management."*

All bids for contracts at the Ekati Mine are evaluated through an evaluation process that includes Northern/Northern Aboriginal ownership and content as a standard evaluation criteria against which bidders are rated. The standard Ekati Mine contract that all contractors are required to accept includes the SEA Northern hire targets and a requirement for all contractors to strive for achievement.

Once a contact is awarded, regular contract performance meetings are held with contractor management to review all aspects of contract performance, including SEA Northern hire targets. The performance meetings are organized by the Ekati Mine Procurement Team, who are accountable for all aspects of contractor performance, including SEA northern hire targets. Contractors are given access to Ekati Mine resources, such as the Aboriginal employment coordinators, to assist in achieving SEA Northern hire targets.

In addition to the targets established through the SEA, the four Ekati Mine Impact Benefit Agreements (IBAs) provide additional means and opportunities for preferential contracting of Northern Aboriginal companies. The details of these programs are confidential to each IBA and cannot be published.

Table 18-1 provides a breakdown of direct and contractor employment at the Ekati Mine, by year and hiring priority, from 1999 to 2013. The Ekati Mine met the employment targets set in the Socio-Economic Agreement regarding Northern Employment (i.e., 62%) in 1999, 2000, 2001, and 2004, and the targets regarding Aboriginal employment in 1999, 2000, 2004, 2005, 2006, and 2007.

In years where a SEA target was met (either in the context of direct employment, contracting, or total employment), the cell in Table 18-1 has been highlighted in green. This is only applicable to the rows depicting total Aboriginal and Northern employment. While the 2014 SEA report for the Ekati Mine is not

yet available, early evaluation of the mine's SEA performance indicates that targets for the direct hire of Northern and Aboriginal employment have been achieved.

In 2013, Dominion Diamond's NWT Resident employment was 57%. It is anticipated that this number will increase to the stated goal of 62% in the short-term. At the same time, Dominion Diamond is turning its attention to overall workforce numbers which were lower, in part, due to the skilled-labour contractor employees needed to operate the mine site. As the new owner of the mine, Dominion Diamond inherited contracts related to the safe and effective operation of the Ekati Mine. Often, these contracts were multi-year agreements. Dominion Diamond is in the process of reviewing contracts as they expire, and will work with incumbent and future contractors, including Northern contractors, to create incentives to increase overall Northern workforce representation.

Dominion Diamond is committed to increasing the number of Northerners and Northern Aboriginals employees at the Ekati Mine and to work to meet the targets in the SEA. For example, the company is in the process of reviewing its contracts as they expire, and will work with incumbent and future contractors, including Northern contractors, to create incentives to increase the overall Northern workforce percentages. Measures to enhance Northern employment moving forward, and to support Dominion Diamond in their effort to continue to meet the SEA targets, are described further in the Socio-Economic Supplemental Report to Adequacy Review Items 11.1 to 11.5 (Dominion Diamond 2015).

Table 18-1 Employment by Priority, Person Years, 1999 to 2013

Employment[a] By Priority (Person Years)		1999	2000	2001	2002	2003	2004	2005	2006			2007			2008			2009			2010			2011[b]			2012			2013		
		Total	Total	Total	Total	Total	Total	Total	Direct	Contractor	Total	Direct	Contractor	Total	Direct	Contractor	Total	Direct	Contractor	Total	Direct	Contractor	Total	Direct	Contractor	Total	Direct	Contractor	Total	Direct	Contractor	Total
Aboriginal	#	235	312	357	401	399	410	429	222	115	336	250	168	418	287	121	408	255	156	411	240	86	326	243	74	317	267	117	384	272	105	377
	%	33	32	30	28	28	34	32	35	29	33	39	31	35	33	21	28	32	23	28	31	19	27	30	18	26	32	22	28	34	20	28
Other Northern	#	259	299	366	419	427	381	392	228	52	279	183	103	286	235	69	304	240	122	362	240	104	344	233	99	333	225	106	331	183	111	294
	%	37	31	31	30	30	32	29	36	13	27	28	19	24	27	12	21	30	18	25	31	23	51	29	24	27	27	20	24	23	21	22
Total Northern	**#**	**495**	**611**	**723**	**820**	**826**	**791**	**821**	**449**	**166**	**615**	**433**	**271**	**704**	**522**	**190**	**712**	**495**	**278**	**773**	**480**	**190**	**670**	**476**	**174**	**650**	**492**	**223**	**715**	**455**	**216**	**671**
	%	**70**	**64**	**62**	**58**	**58**	**65**	**61**	**71**	**42**	**60**	**67**	**50**	**59**	**60**	**33**	**49**	**63**	**42**	**53**	**62**	**41**	**54**	**59**	**42**	**54**	**58**	**43**	**52**	**57**	**41**	**50**
Other	#	214	350	452	592	598	419	517	188	231	418	215	274	489	345	385	730	293	391	684	292	267	559	325	238	563	353	299	652	348	317	665
	%	30	36	39	42	42	35	39	29	58	40	33	50	41	40	67	51	37	58	47	38	59	46	41	58	46	42	57	48	43	59	50
Total	#	709	961	1,174	1,412	1,424	1,209	1,337	637	397	1,034	648	545	1,193	867	575	1,442	788	669	1,457	772	457	1,229	801	412	1,213	845	522	1,367	803	533	1,336
	%	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100

Source: BHP Billiton (2006 to 2011); Dominion Diamond Corporation (2012, 2013).

Note: Some historical totals may vary slightly from those reported in the most recent socio-economic agreement report (2013) given changes to the reporting procedure. Totals are reflective of those reported in the Developer's Assessment Report.

Some percent totals may not add to 100% due to rounding.

Cells highlighted in green are years where a SEA target was met (either in the context of direct employment, contracting, or total employment).

a) Operations non-capital employment.

b) Totals for the 2011 year have been adjusted since the date of original publication. For the purposes of this Information Request, the original numbers have been presented in order to show the breakdown of direct and contractor employment.

% - percent; # = number.

Procurement

The Ekati Mine SEA sets a procurement target of 28% North purchase of goods and services during construction and 70% during operations.

In 2013, the majority of the top expenditure categories at the Ekati Mine were accrued to the North. Earth moving equipment, drilling, blasting, vehicle repair, and domestic services are largely procured from the North, with 80% to 100% of procurement being accrued to Northern businesses. Other services (e.g., transportation, marketing, accommodations, human resources, communications, and social services), construction materials and labour, hardware, and select equipment (e.g., bearings, safety equipment, plumbing supplies, vehicle parts) are also procured predominantly from Northern sources (Table 10-1 in the response to DAR-MVEIRB-IR-10). Overall, in most areas where goods and services can be procured in the North, Dominion Diamond exceeds the procurement targets outlined in the SEA.

In 2009, Dominion Diamond began reporting its fuel purchase as a southern expenditure because it is purchased from the Strathcona refinery in Alberta. This change in reporting led to a significant change in performance against targets, despite no actual change to business practices, as the purchase of fuels and lubricants is the single largest procurement expenditure at the mine.

In areas where the majority of the demand for goods and services cannot be procured from Northern sources, Dominion Diamond is not able to meet the SEA procurement targets. Specialized equipment, tools and machinery, most fuel needs, and select technical services (e.g., lab testing, finance and insurance services, large-scale information technology (IT) and data support) are currently not procured from Northern sources. Goods and services associated with the fabrication and maintenance of specialized equipment, tools and machinery are, similarly, procured outside the North (Table 10-1 in the response to DAR-MVEIRB-IR-10). This is to be expected, given the lack of large-scale manufacturing and fuel supply industries in the North. While some technical services (e.g., training, engineering, environmental and legal services), are available in the North, given the small size of the labour force (i.e., 23,300[1] [GNWT Bureau of Statistics, 2015]), the capacity of Northern suppliers may not be sufficient to meet the needs of a large mining operation, thereby necessitating the use of non-Northern service providers to some extent.

Dominion Diamond is committed to procuring from Northern sources, wherever practical, and is continually exploring opportunities to maximize the use of Northern businesses.

For a full breakdown of all 2013 expenditures, please refer to the response to DAR-MVEIRB-IR-10.

References:

BHP Billiton. 2006. Ekati Mine. Annual Report on Northern Employment and Spending 2006 Operations Phase - EKATI Diamond Mine. Yellowknife. NWT. Canada.

BHP Billiton. 2007. Ekati Mine. Annual Report on Northern Employment and Spending 2007 Operations Phase - EKATI Diamond Mine. Yellowknife. NWT. Canada.

BHP Billiton. 2008. Ekati Mine. 2008 Sustainable Development Report Ekati Diamond Mine. Yellowknife. NWT. Canada.

BHP Billiton. 2009. Ekati Mine. Ekati Diamond Mine 2009 Year in Review. Yellowknife. NWT. Canada.

BHP Billiton. 2010. Ekati Mine. Ekati Diamond Mine 2010 Year in Review. Yellowknife. NWT. Canada.

BHP Billiton. 2011. Ekati Mine. Ekati Diamond Mine 2011 Year in Review. Yellowknife. NWT. Canada.

Dominion Diamond Corporation. 2012. Ekati Mine. Ekati Diamond Mine 2012 Year in Review. Yellowknife. NWT. Canada.

Dominion Diamond Corporation. 2013. Dominion Diamond's 2013 Socio-Economic Agreement Report. Yellowknife. NWT. Canada.

Dominion Diamond (Dominion Diamond Ekati Corporation). 2015. Response to: Jay Project Adequacy Review Items 11.1, 11.2, 11.3, 11.4, and 11.5. Submitted to Mackenzie Valley Environmental Impact Review Board. Yellowknife, NWT, Canada. January 2015.

[1] The majority of those in the labour force are not employed in positions associated with direct contracting of goods and services related to mining.

Mining North. 1996. Socio-Economic Agreement BHP Billiton Project. Available at: http://www.miningnorth.com/wp-content/uploads/2011/10/EKATI-Socio-Economic-Agreement.pdf. Accessed: March 10, 2015.

DOMINION DIAMOND

Information Request Number:	DAR-LKDFN-IR-19
Source:	Lutsel K'e Dene First Nation - Chief or Wildlife, Lands and Environment: Peter Unger
Subject:	Cumulative effects on the Bathurst caribou herd
DAR Section(s):	17.8

Preamble:

The cumulative effects analysis does not account for the recent decline in the population of the Bathurst caribou herd. It also does not appear to provide any suggestions for mitigation measures.

The section only mentions population cycles, but should take into account the recent collapse of the Bathurst caribou herd. It should also suggest some mitigation measures. Ideally, there should be a commitment to coordination with other developers, the government and aboriginal groups to improve protection of the Bathurst range and to prevent disturbance and mortality. The Bathurst caribou herd is of special significance to the community of Lutsel K'e with important spiritual importance as well as having significant implications for subsistence and traditional livelihoods. It is of paramount importance for LKDFN that the Bathurst caribou herd be protected to the maximum extent possible.

Request:

LKDFN requests that the proponent provide additional analysis of cumulative effects on caribou, taking into account the recent population declines in the Bathurst caribou population. LKDFN also requests some commitment to mitigation of these effects, ideally through coordination with other stakeholders (government, industry, aboriginal groups).

Response:

Section 17 of the Developer's Assessment Report (DAR) provides a summary of results from cumulative effects analysis of valued components. The comprehensive and detailed analyses of cumulative effects of development on barren-ground caribou are provided in DAR Section 12. The pathway analysis in Section 12.3 identifies environmental design features and mitigation that reduce or eliminate potential effects of the Jay Project (Project) to barren-ground caribou. The residual incremental effects of the Project and cumulative effects of previous, existing, and reasonably foreseeable developments (i.e., Base Case, Application Case, and Reasonably Foreseeable Development [RFD] Case) on the Bathurst caribou herd were examined through assessment of three primary pathways of potential effects:

- Direct loss and fragmentation of habitat from the Project footprint causes changes in caribou abundance and distribution;
- Sensory disturbance (lights, smells, noise, dust, viewscape) and barriers to movement causes changes to caribou distribution and behaviour, and changes to energetics and reproduction;

- Increased traffic on the Misery Road and Jay Road and the above-ground power line along these roads may create barriers to caribou movement, change migration routes, and reduce population connectivity.

Subsequent to the submission of the DAR, population modelling of cumulative effects of development was completed in response to the Mackenzie Valley Environmental Impact Review Board Adequacy Item 8.8 (submitted as response DAR-MVEIRB-15). The analyses examined both declining and increasing phases of the Bathurst herd using the most recent population vital rates from the Government of the Northwest Territories (GNWT) and included maximum cumulative effects predicted in the DAR. The results support the conclusion that cumulative effects of the RFD Case will not prevent the Bathurst herd from increasing. The RFD Case represents the maximum predicted cumulative effects from development and natural factors.

In the DAR, Dominion Diamond Ekati Corporation (Dominion Diamond) proposed to construct caribou crossings at appropriate discrete locations along the Jay Road. After receiving input from Aboriginal communities during our engagement process and during site visits, Dominion Diamond has changed its approach to caribou crossings along the Jay Road to reflect that feedback, as described below.

Because of the importance of the esker for caribou movement as identified through community engagement, the portion of the Jay Road that cuts through the esker will be constructed as a caribou crossing. The pipelines will be covered over with crushed rock along this section of road, except where there are valves or joints that require visual inspection for safe operation. Dominion Diamond will strategically construct the pipelines to reduce the number of joints or valves through the esker crossing.

Dominion Diamond's community engagement program has indicated that the area to be crossed by the Jay Road is important for caribou movement. In response to the feedback received through community engagement, Dominion Diamond proposes to construct an increased number of caribou crossings along the main section of the Jay Road (i.e., roughly between King Pond Dam and the approach to the active operations area at Lac du Sauvage). This main section of the Jay Road will be constructed with frequent and wide caribou crossings that will respect the communities' identification of the importance of this area for caribou movement. Caribou crossings will not be built in areas where raised safety berms are required by the Mines Inspector, or at locations where there are necessary joints and valves in the pipelines that require visual inspection for safe operation. The pipelines will be strategically designed to reduce the number of locations that cannot be constructed as caribou crossings due to joints and valves. This approach also makes beneficial use of 'lessons-learned' from the original Misery Road, where caribou crossings were only installed after construction of the road.

Caribou crossings will be constructed using crushed rock (200 millimetres or less in size) so that the side slopes of the road are flatter and easier walking for caribou than the large roadfill rock. In the caribou crossing areas, the pipelines will also be covered with crushed rock. Once the road is constructed, monitoring, including by Aboriginal community members, will be implemented to assess the effectiveness of the constructed caribou crossings.

The DAR describes the mitigation policies, practices, and procedures that will protect caribou from harm and that will enable their continued movement though the Ekati Mine site. Dominion Diamond has documented current practices for protection of safe caribou movement around roads at the Ekati Mine

(Appendix C, Traffic Associated with the Jay Project). The mitigations are based on those that have been developed at the Ekati Mine over the past 15 years of mine operations, and have been augmented for the Jay Project where needed to address a new or increased risk. For example, Dominion Diamond proposes to increase early monitoring of caribou movement through satellite collar maps obtained from the GNWT. This would provide advanced warning of when caribou may be approaching the Ekati Mine. Also, Dominion Diamond proposes to construct additional kimberlite stockpile areas so that the Ekati Mine can operate through brief road closures if this is necessary to allow caribou to safely move through the mine site. The frequency of road reconnaissance surveys, modification of traffic patterns, and road closures would reflect the number and group composition of caribou near the mine site, which is a hierarchical approach.

The Northwest Territories *Wildlife Act* will require that Dominion Diamond provide a Wildlife and Wildlife Habitat Protection Plan (WWHPP) and a Wildlife Effects Monitoring Program (WEMP) for the Ekati Mine (inclusive of the Jay Project). These plans will provide a compilation of details and procedures for caribou monitoring and mitigation, and will include a hierarchical approach. The WWHPP will contain details on mitigation policies, practices, and procedures, and the results from adaptive management that have been implemented during the operation of the Ekati Mine, and how mitigations will be specifically modified for the Jay Project. The WEMP will provide details on the study designs and sampling methods used to test effects predictions and the effectiveness of mitigation.

DOMINION DIAMOND

Information Request Number:	DAR-LKDFN-IR-20
Source:	Lutsel K'e Dene First Nation - Chief or Wildlife, Lands and Environment: Peter Unger
Subject:	Traditional Knowledge from Lutsel K'e Dene First Nation
DAR Section(s):	Annex XVII

Preamble (LKDFN):

The annex provides a great deal of information about land use but is missing key elements from LKDFN.

LKDFN has noticed that some key publications and some key travel routes are not listed in this section. The following publications should be added: Parlee, B. et al. 2005. *Understanding and communicating about ecological change: Denesoline indicators of ecosystem health*. pp. 165-182. Breaking Ice: renewable resource and ocean management in the Canadian North. University of Calgary Press. Parlee B. et al. 2005. *Using Traditional Knowledge to adapt to ecological change: Denesoline monitoring of caribou movements*. Arctic 53:1. In addition, LKDFN recommends reviewing some of the traditional knowledge gathered for the Gahcho Kue and Diavik mines, as some of the recorded trails reach close to the Ekati site.

Request (LKDFN):

LKDFN requests that the proponent update the Traditional Knowledge section to include these sources.

Response:

Dominion Diamond appreciates the identification of the Parlee et al. (2005a and 2005b) reports for attention and inclusion into the overall summary of baseline information and assessment of the Jay Project. These reports have now been referenced. Summaries of the information relevant to the Jay Project are provided below for the public record.

Seasonal Use Cycle

The Denesǫłıne have been described as the most widely travelled and most numerous of the Northern Athapascans. Traditionally, the Denesǫłıne did not inhabit a single community (i.e., Lutsel K'e) but organized themselves into local and regional family groups across the 'forest-tundra ecozone' of the southeastern Northwest Territories (NWT) and northern Saskatchewan, encompassing the fall and winter ranges of the Bathurst, Beverly, and Ahiak caribou herds (Parlee et al. 2005a; 2005b).

Fall

Prior to the fall hunt, families organized themselves into hunting parties at camps established along the northern shores of Great Slave Lake where fish and moose could be captured. Hunters would then make their way north/northwest towards Tha K'ai Tué (McKay Lake) or north/northeast toward Tla Kai Tué (Alymer Lake), the Lockhart River, and Edacho Tué (Artillery Lake). The narrow parts of the lakes or narrows (eda) found between two large lakes were key areas for finding caribou. Some of the major caribou crossings known to the Denesǫłıne area found on Tha K'ai Tué, Tla Kai Tué, and Edacho Tué (Parlee et al. 2005b).

Winter

By the end of the fall, many families would often congregate for the winter. Camps were established near the treeline where wood was available and near where caribou would overwinter. Excess meat was shared between families, cached for later use of dried for the winter (Parlee et al. 2005b). During the winter, wolverine, wolf, and fox are typically harvested through trapping (Parlee et al. 2005a).

Spring

In addition to caribou, the Denesǫłıne hunt geese, ducks, northern pintail, scaup, and white-winged scoter, and fish for whitefish, lake trout, and herring in the spring (Parlee et al. 2005a)

Summer

By the end of the summer, caribou would begin returning to K'ai Tué and Tla Kai Tué areas, beginning with the fat bulls, followed by the cows and calves. Calfless cows travel alone. The fat bulls were the ideal harvest, especially before the beginning of the rut when they become thin and etsen (smelly with an unpleasant taste). Any extra meat harvested during the late summer migration would be cached away for others to use or for later use (Parlee et al. 2005b).

Land Use Sites

Cultural or Spiritual Sites

Place names provide a lot of information about land use, culture and spirituality. Sacred sites to the Denesǫłıne include tsankui theda (the Old Lady of the Falls) on the Lockhart River, Beaver Dam and Hachoghe's Shovel on Edacho Tué which are associated with traditional stories and legends as well as physical features on the landscape such as kahdele (areas of open water) and eda (narrows) that are important for the wellbeing of both wildlife and humans.

Camps were not established at eda because they are considered sacred. Instead, camps would be located some distance away and offerings given to the crossing for protection and respect. Such demonstrations of respect are a means of limiting the "uncertainty associated with caribou movements by limiting the impact of small-scale human disturbance" (Parlee 2005b: 34).

Camps and Cabins

Prior to the fall hunt, families organized themselves into hunting parties at camps established along the northern shores of Great Slave Lake where fish and moose could be captured. Once in the barrenlands, travelling hunters would periodically reconnect at familiar camping locations in areas where resources such as wood and water were available and where caribou were known to have passed in previous years. The best camps were those which provided a good lookout of the surrounding area, some shelter from the elements, good drinking water, and both dry and green wood for fuel and camp construction. Periodic meetings at these strategic locations provided the opportunity for hunters to share food and information about caribou movements (Parlee et al. 2005b).

Similarly, hunters would situate themselves on high points of land near eda to wait, watch and listen for approaching caribou. These k'a (waiting places) provided a good view of the surrounding area and often contained large boulders or erratics behind which the hunters could hide. Where large boulders were not present, hunting blinds would be constructed using smaller stones and rocks. Camps were not established at these crossings because they are considered sacred. Instead, camps would be located some distance away and offerings given to the crossing for protection and respect (Parlee et al. 2005b).

Depending on where the caribou were found in a given year, families would remain in existing camps or move to other camps to join families nearer the hunt. By the end of the fall, many families would often congregate for the winter. Camps were established near the treeline where wood was available and near where caribou would overwinter (Parlee et al. 2005b).

According to the Denesǫłıne, the identification of traditionally used areas can be determined by the availability of wood (green and dry), water, vegetation (traditional plants and berries), animal denning habitat, and shelter. Common signs of previous use include hunting blinds and camp remains (Parlee et al. 2005a).

Travel Routes

Countless trails lead into the barrenlands from the shores of Great Slave Lake but the main trails used by the Denesǫłıne are known as That a Deze, Des Delgahi Deze, Des Tsel Che Deze, and Desnethche. While hunting in the barrenlands, hunters could cover 10 to 20 km per day depending on the distribution and movements of the caribou and location of familiar camping locations. Whenever possible, hunters traveled along lake shorelines, eskers, and other heights of land which allowed for easier movement and increased the likelihood of finding game (Parlee et al. 2005b).

Knowledge and Use of Resources

Denesǫłıne elders distinguish between edo (natural change) and edo aja (unnatural change) in the environment. These changes can have effects on the health of the land and waters, the health and populations of wildlife, and the health and wellness of people. Edo aja and the feeling of helplessness associated with the changes have been identified as significant sources of anxiety in communities since the increased development of the lands for mining and because of changes in water and vegetation as a result of climate change (Parlee et al. 2005a).

The body fat of the animals harvested provide an indication of species health for all harvested animals. Questions harvesters will ask themselves as they assess the health of hunted and captured wildlife include: are the animals a normal size and shape?; is the weight proportionate to the size?; are there any deformities?; are the animals fat or skinny?; are there any cuts or parasites on the organs?; is the flesh soft or firm?; what is the color of the meat?; how does the meat taste? (Parlee et al. 2005a).

Similarly, the Denesǫłıne recognize and communicate many ecological indicators of health for the lands and water on which they depend: is game abundant?; have populations changed?; have uncommon species been seen?; have some species disappeared?; does the land look or smell clean?; has the ground or vegetation been disturbed?; are the water levels changing?; is travel becoming more difficult as a result of lowering water levels?; have portages gotten longer?; has the water changed colour?; does water turn black in tea?;does the water taste different? If the annual range of wildlife has changed it is a sign that something in the region has caused that change (Parlee et al. 2005a).

Land and Water

Nene (land, a word similar to the concept of ecosystem) is a Chipewyan word reflecting the interconnectedness of the physical and spiritual worlds including humans and the rest of the environment. It reflects the human and wildlife on productive lands and clean waters for sustaining healthy populations (Parlee et al. 2005a).

Kahdele (areas of open water) are important to both wildlife and people traveling through the barrenlands. Fish benefit from the higher levels of productivity in open water areas while birds and other wildlife depend on these locations for food during the winter when food is scarce and during the spring migrations. The loss of such areas could have impacts on the entire nene (Parlee et al. 2005a).

Wildlife

Caribou

Caribou are the most important source of traditional food for the Denesǫłıne of Lutsel K'e, driving traditional land use patterns and social organization (Parlee et al. 2005a).

Some of the major fall caribou crossings known to the Denesǫłıne area found on Tha K'ai Tué, Tla Kai Tué, and Edacho Tué. Caribou are known to be good swimmers but will follow the shoreline of lakes until they find narrow points (eda) to cross. Like the funnel for caribou movement created by eda, other physical landscape features, such as vegetation and boulders, could also be used to predict caribou movement. Caribou are most likely to be found on thai nen (flat land), sheth (hills), or thai t'ath (eskers), and in areas vegetated with foods such as caribou lichen. They are less likely to be found among na yaghe (boulder fields), ni horelghus nen (hummocky lands), or elel (very wet areas). Along eda, hunters would wait, watch and listen for approaching caribou. Here, they could observe the health of the herds by making note of the size and composition of the groups, the direction of their movement, their behavior and overall body condition (Parlee et al. 2005a,b).

Environmental conditions such as insects would sometimes affect caribou health and signs of stress in animals would help the Denesǫłıne decide which animals to harvest. The healthier bulls were the ideal harvest, identified by their wide chests, hidden tail, thick coat, and large antlers. The absence of caribou in some years was often attributed to a lack of respect shown for the animals (Parlee et al. 2005a; 2005b). Traditionally, all parts of a caribou should be used: "In the olden days, they didn't even throw away caribou bones. They used the bones for fat… Everything was kept from the caribou" (Parlee et al. 2005b: 34).

Other factors affecting caribou movements include human disturbances and forest fires. Roads are of particular concern for caribou movement and several Denesǫłıne have identified the Misery Road at the Ekati Mine as being of particular concern: "The road is like a corral or wall, blocking the caribou from moving west through the area (Parlee et al. 2005b: 34). Some Denesǫłıne have recommended that if the road must be constructed, they should be built closer to the ground so that the caribou can cross at any location (Parlee et al. 2005b). When caribou are seen during the fall migration with injured or broken legs, the Denesǫłıne attribute the injuries to the impacts of roads and other structures along the migration route (Parlee et al. 2005a).

Other Animals

During the winter, fur-bearers such as wolverine, wolf, and fox are trapped. The Denesǫłıne hunt geese, ducks, northern pintail, scaup, and white-winged scoter in the spring. The Denesǫłıne harvest fish including whitefish, lake trout and herring in the spring and summer. Like caribou, body fat and other characteristics of the animals harvested provide an indication of species health (Parlee et al. 2005a).

Plants

Wood

The small pockets of black spruce and thickets of willow and birch found in ts'u dzaii (valleys) and ts'u dza aze (along rivers) in the barrenlands provided a significant source of fuel for traveling hunters and are often a sign of a good camping or meeting place (Parlee et al. 2005a,b). Trees were also used to protect and mark the location of cached meat: "Small trees would be cut down to mark the spot because of the severe winter with its blizzards and bad weather" (Parlee et al. 2005b: 33).

Berries and Medicinal Plants

Berries, such as cranberries and blueberries and plants, such as Labrador tea and spruce gum, are harvested in the summer (Parlee et al. 2005a).

Lichen and Moss

The availability of caribou lichen, caribou food, could be used as a predictor for where caribou might be during their migration. In addition to physical limitation to travel, the availability of food was a limiting factor for caribou movement (Parlee et al. 2005b). Elders have identified concerns with the increased frequency of fires in recent years and the impacts fire have on lichen: "If the lichen burns, it will take over 100 years for the plants to grow back… There never used to be so many forest fires" (Parlee et al. 2005b: 34).

Moss was used to help preserve cached caribou meat: "Some of the meat would be cached under the moss and it freezes there" (Parlee et al. 2005b: 33).

Traditional Knowledge collected for the Gahcho Kué and Diavik mines relevant to the Jay Project have been included in the DAR, where available. At the request of communities and Aboriginal groups, certain reports have not been released to the general public as they contain sensitive community specific information or proprietary traditional knowledge. In the case of the Diavik Mine Environmental Assessment, only each respective community, Diavik Diamond Mines Inc. and the relevant experts within government have access to the confidential traditional knowledge documents developed for the Comprehensive Study. Dominion Diamond welcomes the ongoing review and incorporation of TK into the environmental assessment process and will include additional sources into its review and assessment as they are identified. If the Łutselk'e Dene First Nation could identify or provide specific sources they would like Dominion Diamond to consider it would be very helpful. References related to the Diavik and Gahcho Kué mines already used in the DAR include:

- De Beers (De Beers Canada Inc.). 2010. Gahcho Kué Environmental Impact Statement. De Beers Canada Inc. Yellowknife, NWT, Canada.
- DKFN (Deninu K'ue First Nation). 2012. The Deninu K'ue Ethno-history Report. Prepared for De Beers Canada for the Gahcho Kué Project. NWT, Canada.
- LKDFN (Łutselk'e Dene First Nation), Drybones M, Drybones N, Catholique J, Desjardans V, Lockheart M, Marlowe P, Michel A, Michel J, Rabesca JB, Catholique M, Parlee B, Catholique B, Catholique L.1999. Habitats and Wildlife of Gahcho Kué and Katth'I Nene. West Kitikmeot Slave Study. Yellowknife, NWT, Canada.

- LKDFN, Parlee B, Basil M, Casaway N. 2001. Traditional Ecological Knowledge in the Kaché Tué Study Region. West Kitikmeot Slave Study. Yellowknife, NWT, Canada.
- Łutselk'e Dene Elders and Land Users, Ellis S, Catholique B, Desjarlais S, Catholique B, Catholique H, Basil M, Casaway N, Catholique S, Lockhart J. 2002a. Traditional Knowledge in the Kache Tué Study Region: Phase Three – Towards a Comprehensive Environmental Monitoring Program in the Kakinÿne Region. West Kitikmeot Slave Study. Yellowknife, NWT, Canada
- Łutselk'e Dene Elders and Land Users, Ellis S, Basil M, Catholique B, Casaway N, Desjarlais S, Catholique S. 2002b. Denesǫłıne Land-Use in the Eedacho Kué and Desnedhé Che Region Report #1: Traditional Practice – The Land of Legend. Submitted to De Beers Canada Exploration and BHP Billiton Inc. Yellowknife, NWT, Canada
- NWTMN. 2012. Gahcho Kue Mine Project Values, Interests, and Issues Identified at NWT Métis Nation Community TK Study Sessions. NWTMN, Fort Smith, NWT, Canada.
- Stevenson, M. 1999. Can't Live Without Work. North Slave Métis Alliance, Yellowknife, NWT, Canada.
- TG (Tłı̨chǫ Government). 2012. Tłı̨chǫ Knowledge for De Beers Canada Proposed Gahcho Kué Diamond Project. Tłı̨chǫ Knowledge Research and Monitoring Program. Behchokǫ̀, NWT, Canada

References:

Parlee B, Manseau M, Łutselk'e Dene First Nation. 2005a. Understanding and communicating about ecological change: Denesoline indicators of ecosystem health. In: *Breaking Ice: Renewable Resource and Ocean Management in the Canadian North*. Ed: F. Berkes et al. Univ Calgary Press, Calgary AB. P. 165-182.

Parlee B, Manseau M, Łutselk'e Dene First Nation. 2005b. Using Traditional Knowledge to adapt to ecological change: Denesoline monitoring of caribou movements. In *Arctic: Journal of the Arctic Institute of North America*. 53:1. Ed: K.M. McCullough et al. Univ Calgary Press, Calgary AB. P. 26-37.

DOMINION DIAMOND

Information Request Number:	DAR-LKDFN-IR-21
Source:	Lutsel K'e Dene First Nation – Chief or Wildlife, Lands and Environment: Peter Unger
Subject:	Removal of IEMA board members
DAR Section(s):	GNWT, Project Proponent, implicated Government of Canada departments

Preamble:

The Northwest Territories government, Dominion Diamond Corporation and the federal government are removing three long-time members of the board responsible for monitoring Dominion's Ekati mine.

Given that these board members have been working with IEMA for a substantial amount of time, LKDFN finds it curious that they would be removed now, in the middle of the environmental assessment process for the Jay Project, when their input is most needed. LKDFN does not question the justification, but the timing. If it wasn't a problem for their initial appointment and the time they have served, then it should not be so pressing an issue to act now in the middle of the environmental assessment process.

Request:

LKDFN requests justification for the timing of this removal. LKDFN also requests that the board members be retained until the environmental assessment process for the Jay Project is completed and suitable replacements can be instated immediately afterwards.

Response:

We note this Information Request is outside of the scope of the Environmental Assessment (EA) process for the Jay Project. However, the following is provided for the information of the reviewer.

As contemplated by the Environmental Agreement, Dominion Diamond worked with the Government of the Northwest Territories and the federal government, in consultation with the Aboriginal Peoples, to identify highly qualified, technically competent and experienced northern candidates to serve on this important Board.

Dominion Diamond is committed to building a strong and viable northern-based mining company with a strong northern workforce. To facilitate this, Dominion Diamond has made a number of important changes to build a strong northern company with a resident workforce including: headquartering the company and its senior management in the Northwest Territories; making changes to its internal processes to retain and encourage a northern resident workforce, including cancelling the charter from Edmonton to Yellowknife; and increasing opportunities for northerners (i.e., increasing the number of apprenticeship positions). Dominion Diamond applied this same principle of northern residency to the appointment of the Agency Board of Directors who oversee the Ekati Mine.

The timing of this change was not driven by the timing of the Jay Project EA process. Dominion believes that Independent Environmental Monitoring Agency (IEMA) always has important business in front of it, and there is unlikely to be a “quiet” time where no files would require handover and transition. During 2014, IEMA provided important input to the Jay EA Terms of Reference, reclamation security issues, and Lynx permitting, among other things. During 2016, if the Jay EA goes ahead on schedule, IEMA will have an important role in the Water Licence and Land Use Permitting processes. The Agency still has full quorum on its board and a competent staff to support its work. We note that the four members appointed by the Aboriginal Peoples, as well as Mr. Bill Ross, continue to serve on the Agency Board, and we understand the Agency is in the process of briefing the two new members to ensure a smooth transition. As well, we understand that IEMA has retained Mr. Kim Poole as a technical expert for the EA process.

DOMINION DIAMOND

Information Request Number:	DAR-LKDFN-IR-22
Source:	Lutsel K'e Dene First Nation - Chief or Wildlife, Lands and Environment: Peter Unger
Subject:	New Impact Benefit Agreement
DAR Section(s):	Section 14

Preamble:

The Jay Pit is a new development not covered under the current IBA with LKDFN. The DAR does not mention the plan for the way forward in terms of an IBA.

LKDFN is curious to know the views of the project proponent and the GNWT in terms of what is viewed as the best way forward in terms of an IBA.

Request:

LKDFN requests some information on planning for a new IBA, if this is the intent of the proponent. LKDFN would appreciate GNWT's views on this subject as well.

Response:

Broken Hill Proprietary Company (BHP) entered into an impact benefit agreement for the Ekati Mine with the Akaitcho Treaty 8 (specifically, the Yellowknives Dene First Nation and Łutselk'e Dene First Nation) effective November 14, 1996 (the "**AT8 IBA**"). This impact benefit agreement set out a comprehensive approach for compensating affected Aboriginal communities for the full life of the Ekati Mine. Consistent with this approach, new impact benefits agreements have not been entered into as other pipes within the Ekati Mine claim block have been permitted or brought into production (e.g., the Pigeon and Beartooth pipes).

The Jay kimberlite pipe forms part of the previously defined claim block for the Ekati Mine, and was first discovered in 1994. The 1994 Project Description Report made clear that there were other diamondiferous pipes that would be mined if proved economically viable (BHP 1994). For example, the Lynx and Jay pipes were not originally developed by the previous owner, BHP, because they did not represent as attractive an investment as some of the other pipes due to the relatively high capital required for development and the relatively low ore value. The Jay pipe is encompassed within the operational footprint of the Ekati Mine and will rely on current infrastructure (processing facilities, airstrip, camp, etc.). It is clearly an extension of the Ekati Mine and not a distinct new mining project, and is therefore, within the scope of the existing AT8 IBA.

When it acquired the Ekati Mine, Dominion Diamond assumed all of the liabilities and obligations of BHP Billiton Canada Inc. under the AT8 IBA and has continued to honour those obligations throughout its operation of the Ekati Mine. Dominion Diamond does not intend to re-open the existing impact benefits agreements, or negotiate new agreements for the Jay Project.

References:

BHP (Broken Hill Proprietary Company). 1994. NWT Diamonds Project Description Report. Submitted by BHP Diamonds Inc., December 9, 1994. Yellowknife, NWT, Canada.

DOMINION DIAMOND

Information Request Number:	DAR-MVEIRB-IR-1
Source:	MVEIRB Information Requests from Chuck Hubert
Subject:	Barren Ground Caribou - Adaptive management and mitigations
DAR Section(s):	12

Preamble (MVEIRB):

The DAR requires that DDEC describe and assess the success to date of mitigation methods used in relation to past and present Ekati mine operations for caribou. The proposed mitigation measures are to be evaluated as to their technical and economic feasibility or discuss constraints, uncertainties and implementation. The DAR states that the proposed mitigation objectives to reduce encounters and exposure of the caribou to mine structures are the same as already in use at Ekati where mitigation is considered successful. The DAR lists environmental design features (Table 12.3-1) and gives a descriptive account of fences around pits but does not provide analyses or describe constraints, uncertainties and especially, how mitigation can be reduced or intensified relative to monitoring results. On p. 12-46, mitigation on the winter road is described as effective but no analyses of traffic frequency or caribou responses are presented. The TOR requires that the success of mitigation be assessed. The DAR does not include this. For example, the measurable zone of influence and partial avoidance of the Misery road suggests that mitigation is inadequate. The DAR does not describe the existing chemical changes in lichens and snow course data (see Rescan. 2011. Ekati Diamond Mine: 2008 Air Quality Monitoring Program. Prepared for BHP Billiton Canada Inc. by Rescan Environmental Services Ltd., Yellowknife, NWT) which coincide with the current size of the Zone of Influence where caribou distribution is reduced. Those reported chemical changes suggest that dust mitigation effectiveness is limited. It is unreported as to whether mitigation can be intensified to reduce the likelihood of dust from Jay pit and road use adding to the existing levels of dust. The Gahcho Kué Panel recommendations included enhanced mitigation to reduce the size of the Zone of Influence and activities through avoiding, minimizing, or compensating effects. The three categories of mitigation are linked through monitoring and adaptive management.

Request (MVEIRB):

Dominion, please provide a comprehensive review with analyses to evaluate the technical and economic feasibility, constraints, and uncertainties for current and proposed mitigation. Explain how mitigation is related to monitoring and how mitigation can be scaled down or intensified in the context of adaptive management.

Response:

A qualitative review of the effectiveness of mitigation to reduce or eliminate potential effects of the Jay Project (Project) to barren-ground caribou was provided in Section 12.3.2.1 of the Developer's Assessment Report (DAR). The review presented a history of various mitigation practices and procedures used at the Ekati Mine, including where designs were altered through adaptive management and feedback from communities. The effectiveness or success of mitigation was assessed by examining the magnitude and frequency of effects associated with the different pathways (e.g., how many and how often

were caribou killed by vehicles or other mine-related activities). This information was then used in Section 12.3.2.2 as part of the pathway screening process to determine whether Project design features and mitigation removed or reduced effects from different pathways on the abundance and distribution of caribou. For example, effects pathways related to site hazards, collisions with aircraft and vehicles, and ingestion of contaminants were identified in Table 12.3-1, and if not mitigated, would be expected to affect caribou abundance due to injury or mortality. During the past 15 to 17 years, there have been few mine-related injuries or mortalities of caribou reported at operating mines in the Northwest Territories, which confirms that the desired outcome of design features and mitigation has been achieved. The mitigation described in the DAR is technically and economically feasible because it is already in place at the Ekati Mine. Site surveillance monitoring, which is part of the Wildlife Effects Monitoring Program, will continue to provide information on the effectiveness of mitigation (which includes deterrents), reduce uncertainty, and generate feedback for the adaptive management of mine operations.

The low number of caribou mortalities relative to the variation in traffic volume during the operational history of the Tibbitt to Contwoyto Winter Road (TCWR) suggest that speed limits and communication of caribou presence have been successful at limiting mortalities (see Section 12.3.2.2.2; Table 12.3-2). Research on other animals has also demonstrated that these practices are effective at reducing collision risk (Seiler 2004; Danks and Porter 2010; Neumann et al. 2012; Meisingset et al. 2014). Caribou are not monitored by the TCWR Joint-Venture, so the frequency of caribou interactions with the TCWR as a function of traffic volume is unknown.

There are practical constraints with quantitatively assessing the efficacy of mitigation. For example, studies have detected correlative changes in caribou behaviour near mines (see Section 12.2.1.1.2), but it is unknown whether these behavioural changes (e.g., a zone of influence) are in response to mine-related noise, smells, dust, vibration, or other sensory disturbance. Since these potential disturbances occur at the same time during mine construction and operation, the relative contribution from the residual effect of each type to an observed behavioral change is unknown. There are several technical challenges and constraints to establishing cause and effect relationships between a type of sensory disturbance and behavioural changes. These include:

- isolation of sensory disturbance types;
- representative controls; and,
- sufficient replication at the scale of development to provide confidence in conclusions.

Such an experiment would require a significant change in how mines operate, which would affect their economics. It may also require a reduction of other types of mitigation, which may have consequences to the target wildlife species or other components of the receiving environment.

The possibility of learned behaviour of caribou near mines, such as habituation to sources of sensory disturbance (Meisingset et al. 2013; Johnson and Russell 2014), or the intentional avoidance of a mine regardless of the actual sensory disturbance represent additional technical challenges. Habituation and/or avoidance behaviour (memory) may further complicate the ability to assess the efficacy of mitigation, as changes to mitigation may not lead to immediate and detectable changes in caribou behaviour. The approach used at the Project, the Ekati Mine, and other operating mines is to mitigate all potential mechanisms as much as practically possible. For example, noisy equipment will be housed inside

buildings and mufflers used, roads will be watered regularly to supress fugitive dust production, and food waste will be segregated and incinerated to limit smells. The use of multiple forms of mitigation is a conservative approach to managing uncertainty of the effectiveness of any particular mitigation type in a unique local environment.

Mitigation is used to remove or reduce impacts from a development on the receiving environment. Monitoring of measurement indicators is used to verify impact predictions, and determine the effectiveness (success) of mitigation. Adaptive management includes the review of monitoring information and adjustment to mitigation (and monitoring) when necessary. Further details on monitoring indicators and activities for caribou and the adaptive management process are described in response to DAR-MVEIRB-IR-12. This response also provides an example of how Misery and Jay road traffic will be adaptively managed to mitigate impacts to caribou.

References:

Danks, ZD, Porter, WF. 2010. Temporal, Spatial, and Landscape Habitat Characteristics of Moose–Vehicle Collisions in Western Maine. J Wildlife Manage 74:1229–124.

Johnson CJ, Russell DE. 2014. Long-term distribution responses of a migratory caribou herd to human disturbance. Biol Conserv 177:52-63.

Meisingset EL, Loe LE, Brekkom Ø, Moorter BV, Mysterud, A. 2013. Red Deer Habitat Selection and Movements in Relation to Roads. J Wild Manage 77:181–191.

Meisingset EL, Loe,LE, Brekkom Ø, Mysterud A. 2014. Targeting Mitigation Efforts: The Role of Speed Limit and Road Edge Clearance for Deer–Vehicle Collisions. J Wildlife Manage 78:679–688.

Neumann, W, Ericsson G, Dettki, H, Bunnefeld, N, Keuler, NS, Helmers, DP, Radeloff, VC. 2012. Difference in spatiotemporal patterns of wildlife road-crossings and wildlife-vehicle collisions. Biol Conserv 145:70-78.

Seiler, A. 2004. Trends and Spatial Patterns in Ungulate-vehicle Collisions in Sweden. Wildlife Biol 10:301-313.

DOMINION DIAMOND

Information Request Number:	DAR-MVEIRB-IR-2
Source:	MVEIRB Information Requests from Chuck Hubert
Subject:	Caribou and other wildlife crossing dewatered lakebed.
DAR Section(s):	13.3

Preamble (MVEIRB):

On page 13-78, DDEC assessed injury or mortality to wildlife being trapped in exposed lakebed sediments as a pathway with no linkage resulting in the pathway not being carried through in the assessment. Therefore no mitigation was proposed (Table 13.3-1 and 12.3-1). However, page 13-93 in the wildlife section and 12-62 in the caribou section observe that vegetation establishment in the lakebed may attract wildlife, in particular caribou to the drained lakebed. The current 5 km dike design results in a 4.2 km portion of lakebed exposed during mine operations. Due to nearby presence of the esker and water rock management area, wildlife including caribou may move along the dike and cross portions of the dewatered lake bed.

Request (MVEIRB):

Dominion, please provide evidence for statement that “the dewatered portion of Lac du Sauvage will form a hard pan crust” as rationale for concluding that this pathway has no linkage. Please describe how DDEC will manage caribou and other wildlife that migrate through or enter the exposed lakebed in the diked area of Lac du Sauvage and mitigate any adverse impacts.

Response:

To clarify, this pathway was assessed as ‘secondary’ for caribou (Section12.3.2.2.2 of the Developer’s Assessment Report [DAR]) and ‘no linkage’ for grizzly bear, wolf, and wolverine (Section 12.3.2.2.1). For carnivores, there is no record of individuals becoming trapped in exposed lakebed sediments during the 15 to 17 years of construction and operations of the Ekati and Diavik mines. Three caribou died after becoming stuck in exposed lakebed sediments during the dewatering of King Pond at the Ekati Mine that occurred in 2000/2001; no other caribou mortalities have occurred involving lakebed sediments (BHP 2012). There is no record of injury or mortality to caribou or other wildlife from becoming trapped in processed kimberlite fines in the processed kimberlite containment areas at existing diamond mine sites in the NWT. Subsequently, this pathway was assessed as no linkage for carnivores and secondary for caribou.

The risk for mortality from being stuck in exposed lakebed sediments is likely to be higher during the final stages of dewatering when the lakebed sediments are saturated with water. Experience from the Diavik Mine suggests that the exposed lakebed will develop a hard, caked or crusted surface upon desiccation. Soils with high clay and silt content (such as lakebed sediments) have higher bulk density and penetration resistance than other soil types (Daddow and Warrington 1983). The sediments in Lac du Sauvage are predominantly silt (median = 50 percent [%]) followed by clay (median = 30%) (Section 8.2.5.3 of the DAR). As such, dry lakebed sediments are anticipated to pose less of a threat for caribou mortality.

Additionally, if and when vegetation colonizes the lakebed sediments, the sediment is anticipated to be in a state that would likely represent little risk for caribou (and carnivores) to become trapped.

The proposed Jay dike is expected to limit caribou access to the exposed lakebed sediments. Additionally there will be a high amount of traffic and other sensory disturbance associated with the Jay Pit, which is likely to limit caribou attraction to the dewatered portion of Lac du Sauvage. The Jay dike and pit area will be part of routine site surveillance monitoring for the Ekati Wildlife Effects Monitoring Program. If caribou approach the diked area, Dominion Diamond will implement deterrent procedures (e.g., walking towards caribou) to keep animals and people safe (DAR Section 12.3.2.2.2).

References:

Daddow RL, Warrington GE. 1983. Growth-Limiting Soil Bulk Densities as Influenced by Soil Texture. Watershed Systems Development Group Report WSDG-TN-00005. USDA Forest Service, Fort Collins, CO, USA.

BHP Billiton. 2012. Ekati Diamond Mine 2012 Environmental Impact Report. Yellowknife, NWT, Canada. October 2012.

DOMINION DIAMOND

Information Request Number:	DAR-MVEIRB-IR-4
Source:	MVEIRB Information Requests from Chuck Hubert
Subject:	Project Alternatives - Alternatives assessment of power supply
DAR Section(s):	2.5.3

Preamble (MVEIRB):

The multiple accounts analysis considered four alternatives and the sole environmental consideration was the location of the fuel storage.

Request (MVEIRB):

Dominion, please describe if there would be any differences in greenhouse gas emissions between the options. Consideration should, at a minimum, be given to possible transmission losses and the possible reduction in greenhouse gas emissions given that a proportion of electricity is supplemented by wind energy at Diavik.

Response:

As discussed in Section 2.4.7.4 of the Developer's Assessment Report, only evaluation criteria that differentiate between the alternatives were included in the assessment. That is, there may be other important factors with respect to technical feasibility, Project economic viability, environmental considerations, and social and economic considerations; however, unless the factor allowed for differentiation between the alternatives, it was not included in the assessment.

The transmission distances between the alternatives are relatively similar, and therefore, do not have substantial differences in transmission losses, so transmission losses are considered to be non-differentiating and were not included in the alternatives assessment. It is recognized that greenhouse gas emissions can be reduced with a reduction in diesel use; however, greenhouse gas emissions would be expected to be the same between all of the power generation alternatives because they all depend on diesel power generation.

Alternative 2 – purchase or lease electricity from the Diavik Mine, would only result in reduced greenhouse gas emissions if the Diavik Mine was not able to use all the power supplied from their wind farm. Rio Tinto (2015) reports that wind power has provided 8.5 to 11 percent (%) of the Diavik Mine's annual power requirement and peak power levels, achieved for brief periods, have surpassed 50%. This indicates that Diavik is able to utilize all the wind power produced, and is reliant on diesel generation for the remainder of their operation. Purchasing power from the Diavik Mine would not further reduce greenhouse gas emissions for the combination of the two mines.

References:

Rio Tinto. 2015. Innovative and efficient wind farm delivers. Available at: http://www.riotinto.com/ourcommitment/features-2932_12151.aspx Accessed: March 2015.

DOMINION DIAMOND

Information Request Number: DAR-MVEIRB-IR-5

Source: MVEIRB Information Requests from Chuck Hubert

Subject: Water Quality and Quantity - Water Balance

DAR Section(s): 8

Preamble (MVEIRB):

Dominion has provided a regional water balance model and information regarding the site water balance through the water management plan and other portions of section 8 of the DAR. However, a detailed site water balance has not been included as a whole.

Request (MVEIRB):

Dominion, please provide the site water balance for the Jay Project. This should include the water balance for the Jay Pit as well as the water balance for the main camp area as it will be altered by the Jay production.

Response:

A site wide water balance was developed for the Jay Project. The proposed mine and water management infrastructure was included in the model, which was then used to simulate the conveyance and storage of water within the mine site from dewatering of the diked area in Lac du Sauvage through the post-closure phases of the Project. The water balance model for the Jay Project was developed using GoldSim Version 11.1 (GoldSim 2014). GoldSim was selected because it is well suited to simulating a dynamic, computationally intensive but well-defined networked model such as a water balance.

A summary of the conceptual model that was incorporated into the water balance follows. Details of the water management strategy and the assumptions used in the water balance model can be found in the Appendix 3A of the DAR (Mine Water Management Plan). Estimated annual flow volumes associated with the Project site that were incorporated into the water balance model are provided in Table 5-1 and presented in Figure 5-1. The reader is referred to Table 6.1 of Appendix 3A of the DAR for a complete list of flows and estimated quantities.

To access the Jay Pit, a small area of Lac du Sauvage will be diked off and dewatered to facilitate safe access and mining of the Jay Pit. During the dewatering period, water will be pumped from the diked area to Lac du Sauvage until total suspended solids (TSS) concentrations no longer meet discharge criteria for this constituent. The total volume of water pumped to Lac du Sauvage during dewatering and stripping is estimated to be 14.98 million cubic metres (m^3). At this point, the remaining water in the diked area of Lac du Sauvage will be pumped to the mined-out Lynx or Misery pits (Figure 5-1), which will be used as storage and settling ponds to settle the suspended sediment. The total volume pumped to the Misery Pit during dewatering and stripping will be about 8.7 million m^3.

The Lynx Pit has an estimated maximum storage capacity of approximately 5.2 million m^3. However, only 4.9 million m^3 of water will be pumped to the Lynx Pit during dewatering. This provides approximately 3

metres (m) of freeboard or 300,000 m^3 storage allowance, which corresponds to approximately 2.5 years of natural net inflows to the Lynx Pit. This time is expected to be sufficient to allow for TSS settling within the Lynx Pit Lake. Once the storage capacity of the pit lake is filled, runoff reporting to the Lynx Pit Lake will discharge through the Lynx Pit Lake outlet to Lac de Gras.

During operations, water reporting to the diked area of Lac du Sauvage and the Jay Pit will be pumped to the Misery Pit. The total volume of water pumped to the Misery Pit during the life of mine is estimated to be 81.5 million m^3. Excess water stored in the Misery Pit will be discharged to Lac du Sauvage to accommodate additional storage from inflows to the Jay Pit and the diked area of Lac du Sauvage. The total volume of water pumped out of the Misery Pit during operations, and discharged through the diffuser into Lac du Sauvage, is estimated to be 44.6 million m^3. Water balance modelling indicates approximately five years will be required to fill the Misery Pit to the design storage capacity before discharge is required.

Precipitation over the Jay waste rock storage area (WRSA) is generally anticipated to infiltrate into the pile and freeze resulting in a low proportion of surface minewater runoff. This assumption is consistent with observations at the existing WRSAs at the Ekati Mine. The volume and timing of this runoff were modelled in the site water balance. During construction and operations, runoff from the Jay WRSA will culminate in the diked area in Lac du Sauvage.

Fine processed kimberlite (FPK), produced from mining of the Jay Pit will be stored in the mined-out Panda and Koala pits. Excess water stored in the Panda and Koala pits will be directed to the Long Lake Containment Facility (LLCF) where it will subsequently be discharged to the Koala watershed. Modelling of the discharge from the LLCF was completed by ERM Rescan (2014). Projected LLCF discharge quatities were then incorporated in the regional water balance for the purpose of assessing effects to surface water quantity.

At closure, Dominion Diamond proposes to pump approximately 13.7 million m^3 of water from the Misery Pit to the bottem of the mined-out Jay Pit. The volume of water pumped from the Misery Pit to the Jay Pit will be replaced with freshwater pumped from Lac du Sauvage (P8) to develop a 60 m low-density freshwater cap (mixolimnion) over denser saline water with elevated concentrations of total dissolved solids (TDS) (monimolimnion).

The total capacity of the Jay Pit is approximately 120 million m^3, including the storage capacity of the diked area in Lac du Sauvage. In addition to the 13.7 million m^3 of water pumped from the Misery Pit, 97.1 million m^3 will be pumped from Lac du Sauvage. The remaining volume will be back-flooded with water from the following sources:

- groundwater inflows;
- wall rock runoff;
- WRSA runoff;
- pumped water from Lac du Sauvage;
- natural catchment runoff; and,
- direct precipitation.

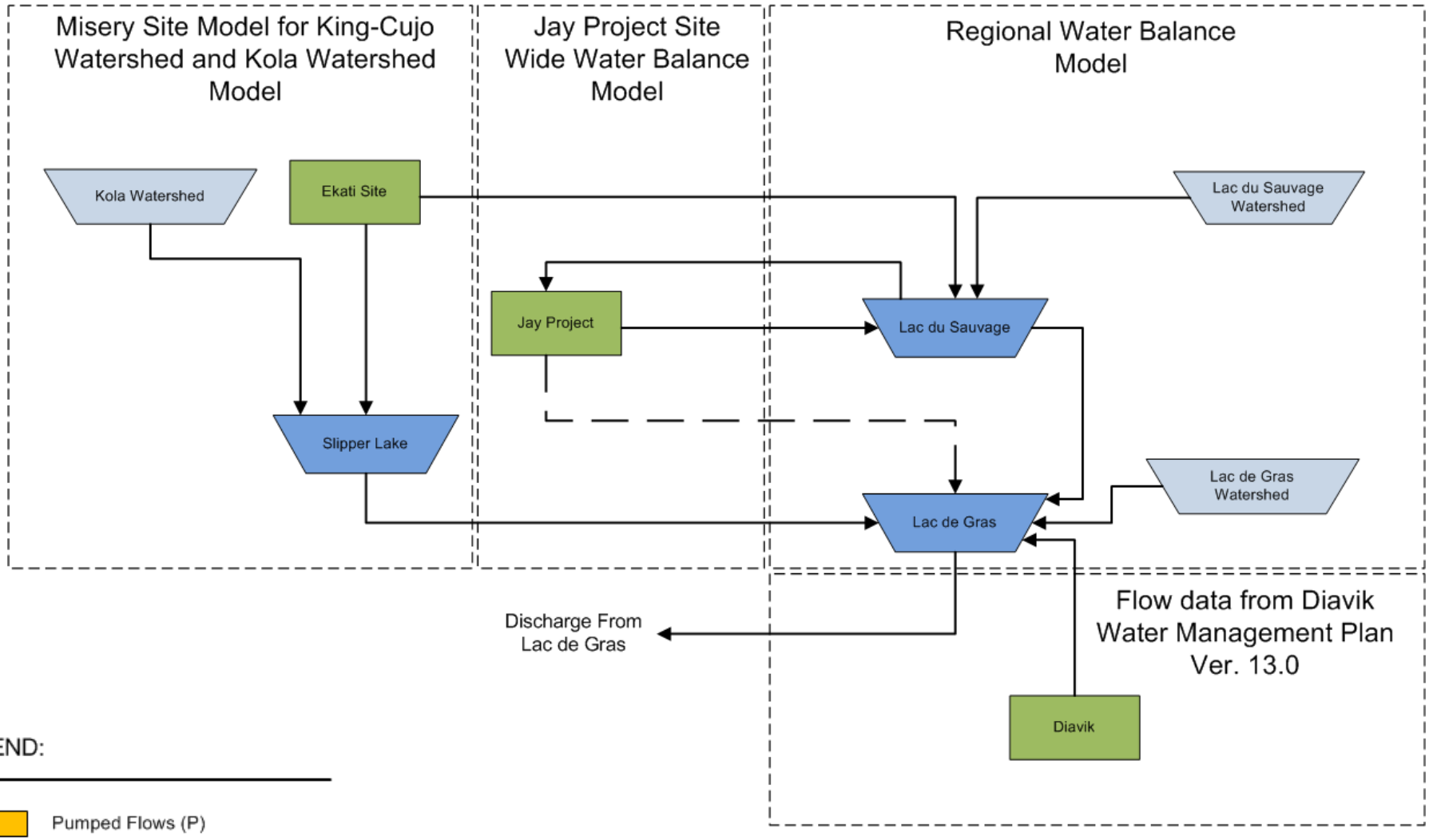
Water balance modelling indicates the Jay Pit and the diked area of Lac du Sauvage will require approximately four years to back-flood.

Following the cessation of mining in the Jay Pit, FPK stored in the Panda and Koala pits at the Ekati site will be flooded to create a freshwater cap and excess water stored in the pits will be discharged to the LLCF and subsequently to the Koala watershed. Flows from the LLCF in closure were estimated by ERM Rescan (2014) and included in the regional water balance developed for the Project.

During post-closure, quantities of the following site discharges were modelled and incorporated into the regional watershed model for the purpose of assessing effects in the DAR:

- Misery Pit overflow to Lac de Gras;
- Misery Pit seepage to Lac de Gras;
- Jay WRSA runoff to Lac du Sauvage; and,
- LLCF discharge to the Koala watershed.

O:\Active\ 2013\1328\13-1328-0041 2000 DD Eng\2020 Pre-Feasibility\10 Lake Drawdown\Water Balance\Flow Diagram



LEGEND:

- Pumped Flows (P)
- Evaporation (E)
- Runoff (R)
- Seepage Flows (S)
- Overflows (O)
- Flow
- Post Closure Flow

PROJECT **Dominion Diamond Resources Corporation**
Jay Project
Northwest Territories, Canada

TITLE

Site Wide Water Balance Flow Chart

Golder Associates

PROJECT No. 1419751			PHASE No. 3200	
DESIGN	MLP	12MAR15	SCALE NTS	REV. 0
CADD	MLP	12MAR15		
CHECK	PC	12MAR15	**FIGURE 1**	
REVIEW				

Table 5-1 Annual Lac de Sauvage Water Balance (million m^3)

	Inflows						Outflows						
	Snow-melt[a]	Rain-fall[a]	Upstream Inflows	Pumped from Diked Areas (dewatering) (P1)	Pumped from Misery (discharge) (P6)	Total Inflows	Evaporation	Pumped to diked Area (reflooding) (P8)	Pumped to Misery (reflooding) (P7)	Seepage	Discharge to Lac de Gras	Total Outflows	Change in Storage Volume
2019	32.64	31.73	201.07	14.98	0.00	280.41	32.15	0.00	0.00	0.14	247.97	280.26	0.16
2020	32.63	31.73	200.97	0.00	0.00	265.33	32.15	0.00	0.00	0.04	233.36	265.54	-0.21
2021	32.63	31.73	200.98	0.00	0.00	265.35	32.15	0.00	0.00	0.55	232.74	265.44	-0.09
2022	32.63	31.73	200.98	0.00	0.00	265.34	32.15	0.00	0.00	1.14	232.15	265.44	-0.10
2023	32.63	31.73	200.96	0.00	0.00	265.32	32.15	0.00	0.00	1.64	231.61	265.41	-0.08
2024	32.63	31.73	200.94	0.00	2.28	267.58	32.15	0.00	0.00	2.20	232.41	266.76	0.82
2025	32.63	31.73	200.91	0.00	7.80	273.08	32.15	0.00	0.00	2.76	238.08	272.99	0.09
2026	32.63	31.73	200.88	0.00	7.92	273.16	32.15	0.00	0.00	3.16	237.89	273.19	-0.04
2027	32.63	31.73	200.85	0.00	8.28	273.49	32.15	0.00	0.00	3.58	237.76	273.50	0.00
2028	32.63	31.73	200.82	0.00	8.68	273.86	32.15	0.00	0.00	3.89	237.79	273.83	0.03
2029	32.63	31.73	200.79	0.00	9.63	274.78	32.15	0.00	0.00	4.31	238.40	274.86	-0.08
2030	32.63	31.73	200.76	0.00	0.00	265.12	32.15	17.04	7.68	1.29	212.26	270.43	-5.30
2031	32.63	31.73	200.72	0.00	0.00	265.09	32.15	23.49	8.95	0.31	200.37	265.27	-0.18
2032	32.63	31.73	200.69	0.00	0.00	265.06	32.15	31.54	0.00	0.03	201.22	264.94	0.12
2033	32.65	31.73	200.71	0.00	0.00	265.09	32.15	25.20	0.00	0.00	204.40	261.75	3.33
2034	33.64	32.73	200.94	0.00	0.00	267.31	33.09	0.00	0.00	0.00	232.72	265.81	1.50
2035	33.64	32.73	201.02	0.00	0.00	267.39	33.09	0.00	0.00	0.00	234.26	267.35	0.04
2036	33.64	32.73	201.06	0.00	0.00	267.43	33.09	0.00	0.00	0.00	234.35	267.44	-0.01
2037	33.64	32.73	201.09	0.00	0.00	267.45	33.09	0.00	0.00	0.00	234.36	267.45	0.00
2038	33.64	32.73	201.11	0.00	0.00	267.47	33.09	0.00	0.00	0.00	234.38	267.47	0.00
2039	33.64	32.73	201.12	0.00	0.00	267.48	33.09	0.00	0.00	0.00	234.39	267.48	0.00

a) Includes both direct precipitation/snowmelt and precipitation/snowmelt on the catchment area.

References:

GoldSim (GoldSim Technology Group). 2014. GoldSim User's Manual Version 11.1, Issaquah, WA, USA. May 2014.

ERM Rescan (ERM Rescan Environmental Services Ltd.). 2014. Predicted Slipper Lake Outlet Water Quality and Quantity Predictions. Provided via email from Eric J. Denholm (Dominion Diamond) to Michael Herrell (Golder Associates Ltd.) Fw: data request. Thursday, December 4, 2014 6:40 AM

DOMINION DIAMOND

Information Request Number:	DAR-MVEIRB-IR-6
Source:	MVEIRB Information Requests from Chuck Hubert
Subject:	Water Quality and Quantity - description of thresholds
DAR Section(s):	Section 8 p. 8-446 Section 8.7.1.2 (p. 8-447)

Preamble (MVEIRB):

Section 4.2 of the ToR requires Developer's opinion on significance of impacts. Section 8, p. 8-446 states "Through the above process, a screening threshold was identified for each constituent and used to evaluate the modelled data (Table 8.5-13)". Section 8.7.1.2 (p. 8-447) describes how significance was determined. Dominion has proposed very general classifications of criteria that could be used to inform the question of significance. General narrative statements ("relative contribution" or "weight of evidence"), are used or screening criteria or guidelines (CCME) which are, of themselves, far below the magnitude required for significance. As such, the statement that "...comparison of predicted values to the screening values provides confidence in...determining environmental significance" is not accurate. Significance is assessed as: "the key drivers to determining environmental significance are magnitude, duration, and geographic extent, with moderate to high magnitude effects generally leading to significance if it occurs over a large area (ie regional in geographic extent) and are long term or permanent in their duration" This does not provide any means for the reviewer to determine what the developer would consider to be significant. This statement of significance would also serve to inform the future Response Framework requirements for Adaptive Management.

Request (MVEIRB):

Dominion, please provide a narrative and semi-quantitative description of significance that incorporates magnitude, extent, duration, frequency and reversibility of impacts. One might consider statements such as "Constant increases in COPC of X% or higher in more than 20% of Lac du Sauvage or which interact with other developments to change X% of Lac de Gras and which persist for Y years or longer."

Response:

To assess the effect of the Project on water quality, quantitative water quality models were used to predict changes in concentrations of water quality constituents. Interpretation of the predictions were used to evaluate the significance of the Project from changes in water quality.

For water quality, significance is determined by evaluating how the Project could affect the assessment endpoint or the end users (i.e., aquatic biota and humans). For the water quantity and quality key line of inquiry, the assessment endpoint was defined as "the suitability of surface water quality to support and maintain healthy and sustainable aquatic and terrestrial ecosystems, maintenance of ecological function, aquatic life that is not impaired, and water that is good to drink" (Developer's Assessment Report [DAR] page 8-4). The approach taken for the Project was to evaluate if a change in a numerical value would be significant to an end user and thus directly address the assessment endpoint (e.g., a change in water quality would alter the suitability of the water to support aquatic life and maintain ecological function).

In the DAR, a definition for significance of Project effects for changes in water quality was provided (Section 8.7.1.2); this definition was updated in a response to the MVEIRB adequacy review (DAR-MVEIRB-18). The significance definitions for water quality are as follows:

> ***Not significant*** *– impacts are measureable but are not likely to increase the risk to aquatic health, the sustainability of the aquatic ecosystem, or the continued opportunity for traditional use or drinkability of the water. Impacts occur at the local scale, and may be strong enough to be detectable at the regional scale.*
>
> ***Significant*** *– impacts are measureable at a level such that there is a prolonged exceedance of a screening value (tied to a guideline) that has predicted effects to aquatic health and/or resulting effects to the sustainability of the aquatic ecosystem, and/or changes to water that would prevent continued traditional use or drinkability of the water. A number of high magnitude and irreversible impacts at the regional scale would be significant.*

In the DAR (Section 8.7.1), significance is assigned based on the classification of residual impacts for six criteria: magnitude, geographic extent, duration, frequency, reversibility, and likelihood. Magnitude is the primary criterion used to determine environmental significance, while geographic extent and duration are used as modifiers and to provide context when assigning magnitude. In this case, the magnitude ratings relate to predicted concentrations relative to aquatic life or drinking water guidelines and objectives (Table 8.5-13 in the DAR) and not to a percent increase. The absolute differences in concentrations of constituents provides ecological context and relevance for evaluating the risk (significance) to the aquatic ecosystem and human health.

Note that for water quality, magnitude is semi-quantitative because it compares projected constituent concentrations against screening values (i.e., guidelines and site-specific water quality objectives) for aquatic life and drinking water; it also considers the results of the aquatic health assessment and potential for effects on fish and other aquatic life (i.e., sustainability of the aquatic ecosystem). Magnitude is evaluated relative to guidelines and objectives because they are based on scientifically defensible toxicological data, which are used to evaluate measured or modelled data. Aquatic guidelines are designed to be protective of all forms of aquatic life and the most sensitive species of aquatic life (CCME 1999), and drinking water guidelines are designed to be protective of the most vulnerable members of society (Health Canada 2012). Magnitude is not evaluated as a percent increase or percent change in a constituent. A magnitude of change of 5, 50, 100, or 200+ percent (%) in a chemical constituent is only environmentally significant if it may lead to a detrimental effect to human health or aquatic health. For example, a change in chloride levels from 1 to 2 milligrams per litre, or a change in arsenic from 0.25 to 0.5 micrograms per litre (µg/L), represents a change of 100%, but is environmentally insignificant. A change in arsenic from 5 to 10 µg/L, represents a change of 100%, and could be considered significant because concentrations would increase from the aquatic life guideline to the drinking water guideline. In all three examples, the magnitude of change is 100%, but the potential environmental effect is substantially different.

In the DAR, the residual impacts were classified (Table 8.7-2 in the DAR), and it was concluded that the incremental and cumulative changes in water quality from the Project and previous and existing developments are expected to not have a significant adverse effect on the assessment endpoint because

magnitude was classified as low, geographical extent was classified as local to regional, and duration was classified as permanent.

Description of Significance

The assessment endpoints in an environmental assessment represent the key properties of the valued component (VC) that should be protected for use and enjoyment by future human generations, and are general statements regarding what is to be protected. These also form the starting point in setting of significance thresholds for aquatic effects monitoring programs.

Based on the definition provided for “significant”, predicted magnitude, geographic extent, and duration, and the defined assessment endpoint, a significant adverse effect would be as follows:

- a substantial change in water quality (through elevated concentrations of multiple constituents above aquatic life guidelines) such that aquatic ecosystems and/or ecological function in Lac du Sauvage or Lac de Gras is no longer maintained (e.g., disruption of key ecological functions provided by the Lac du Sauvage and Lac de Gras ecosystem, such that, for example, Arctic Grayling, Lake Trout, and Lake Whitefish populations are no longer self-sustaining and ecologically effective); and,
- a change in water quality, above drinking water guidelines for multiple constituents, such that the water in Lac du Sauvage or Lac de Gras is no longer safe to drink.

The effect of mine water discharge to Lac du Sauvage during operations is expected to result in a general increase in productivity at lower trophic levels in the main basin of Lac du Sauvage and a similar, but less pronounced, effect in the eastern part of Lac de Gras (Section 9.4.3.2). A clear, defined change in composition of plankton and benthic invertebrate communities is not expected. Following closure, plankton and benthic invertebrate communities are expected to return to baseline conditions not influenced by the Project. Due to the increased food base (lower trophic levels and forage fish), there may also be a minor increase in growth and reproduction rates in the fish VCs. However, effects will be limited primarily to Lac du Sauvage during the late operations phase and potentially into closure.

Based on the aquatic health assessment (Section 8.5.5), changes to concentrations of all substances considered are predicted to result in negligible effects to aquatic health in Lac du Sauvage and Lac de Gras. As a result, adverse effects to the health of fish VCs (Arctic Grayling, Lake Trout, and Lake Whitefish) are unlikely, and thus, no effects would be expected to the self-sustaining and ecologically effective fish populations.

Based on the human health risk assessment (submitted February 2, 2015; Dominion Diamond [2015]), it is predicted that there will be no residual effects to Aboriginal and non-Aboriginal receptors from ingestion of water or dermal contact with water or sediment, the overall magnitude of risk is likely negligible, and the effect of the Project is not significant.

Based on the classification of residual impacts of the Project to water quality, lower trophic levels, fish, aquatic health, and human health risk, the Project will not have a significant adverse effect on the maintenance or suitability of water to support a healthy and sustainable ecosystem, continued traditional use, or drinkability of the water.

References:

CCME (Canadian Council of Ministers of the Environment). 1999. Canadian Environmental Quality Guidelines, with updates to 2014. Publication No. 1299. Winnipeg, MB, Canada. ISBN: 1-896997-34-1.

Dominion Diamond (Dominion Diamond Ekati Corporation). 2015. Human and Wildlife Health Risk Assessment Report for the Jay Project. February 2015. Submitted to the Mackenzie Valley Environmental Impact Review Board on February 2, 2015.

Health Canada. 2012. Summary of Guidelines for Canadian Drinking Water Quality (CDWQ). Prepared by the Federal-Provincial Subcommittee on Drinking Water of the Federal-Provincial-Territorial Committee on Environmental and Occupational Health. Ottawa, ON, Canada.

DOMINION DIAMOND

Information Request Number: DAR-MVEIRB-IR-07

Source: MVEIRB Information Requests from Chuck Hubert

Subject: Kimberlite transport to Ekati Mill

DAR Section(s): 3.5.1

Preamble (MVEIRB):

Section 3.5.1.6.8 states “About 15 190-tonne rock trucks will cycle between the proposed Jay Pit and proposed Jay WRSA. About seven CAT 777, 90-tonne rock trucks will cycle between the Jay Pit and the proposed ore transfer pads at the Jay and Misery roads.” There is the potential for dust loss during transport of ore to the mill from the Jay project that could be easily mitigated if ore transport trucks were covered, but this pathway is not addressed.

Request (MVEIRB):

Dominion, please confirm if kimberlite transport trucks will provide covers for the ore or other means to minimize loss of dust or ore during transport to the mill.

Response:

Fugitive dust emissions associated with haul truck traffic are primarily from road dust. Road dust emission can be generated when the haul road surface material is pulverized by the wheels of mine vehicles, and the road surface material can become airborne by turbulent wake behind vehicles. Potential fugitive dust emissions generated due to air turbulence exerted on ore (kimberlite) or waste rock carried in the box of the haul trucks are relative small compared to the road dust emissions, because the pulverized road surface material is much smaller in size and can be become more readily airborne. Installing covers for the haul truck buckets as required in many municipalities would not significantly reduce the fugitive dust emissions associated with the haul trucks at the Jay Project. To reduce road dust, which is the largest source of fugitive dust or particulate matter (PM) emissions at the Jay Project, water and approved chemical suppressants will be used on the haul roads during seasons when the ground is free of snow and ice, which provide a high level of natural dust mitigation. Covers for trucks will not be used as a method to control fugitive dust emissions, as it would have an insignificant effect as opposed to water and chemical dust suppression for the haul roads.

DOMINION DIAMOND

Information Request Number: DAR-MVEIRB-IR-8

Source: MVEIRB Information Requests from Chuck Hubert

Subject: Fish and Fish Habitat - Fish habitat and dike interstitial waters

DAR Section(s): 9.3.2.2.2

Preamble (MVEIRB):

7.3.2 Impacts to fish and fish habitat from project components states “The developer will describe (incorporating seasonal variation and the sensitivities of specific life cycle stages) the impacts to fish, aquatic life, species-at-risk, and respective habitats from project-related changes to: … the potential for fish use of the Lac du Sauvage diking as fish spawning habitat and the potential for impacts to eggs or fry from any contaminants coming off or within the interstitial spaces of the dike” Vol. 9 Sect. 9.3.2.2.2, p. 9-150 describes the inert nature of the granite used to build the dike. The conclusion above is based on a) an unqualified statement that the granite material is inert and does not address direct assessments of leaching that were carried out by Diavik Diamond Mines in 2010 (DDMI. 2011. Lakebed sediment, water quality and benthic invertebrate study A154 Dike - Year 4 Results, A 418 Dike - Year 2 Results. August 2011. Rpt. 1073-00) b) Partial conclusions of the Fitzsimons (2013) report on spawning activity, which found no evidence of spawning activity on the dikes but which also discussed the problems of detecting spawning lake trout anywhere in Lac de Gras.

Request (MVEIRB):

Dominion, plese re-evaluate the pathway “The dike isolating the Jay pipe may provide spawning habitat for fish where any potential contaminants within interstitial spaces may affect survival of eggs or fry in Lac du Sauvage” with a complete discussion of the supporting evidence.

Response:

The egg survival pathway identified in the information request was assessed in Section 9.3.2.2.2 of the Developer’s Assessment Report (DAR) for the Jay Project under the pathway of *The dike isolating the Jay pipe may provide spawning habitat for fish where any potential contaminants within interstitial spaces may affect survival of eggs or fry in Lac du Sauvage*.

The potential concern related to the dike material and spawning is whether the dike material may elevate concentrations of metals within interstitial spaces of the dike materials such that they are toxic to fish eggs that may be deposited within the spaces, affecting survival of developing embryos. Fish species, such as Lake Trout, deposit eggs on rocky spawning shoals; the eggs settle into cracks and crevices in the shoal, where they incubate from four to five months (species life history reviewed in Richardson et al. 2001). If shoal-spawning fish such Lake Trout were attracted to the dike material (i.e., the dike material attracts fish from their natal spawning location), which is not expected (see below), there could be a potential for effects on populations of fish if water quality was extremely poor, which is not expected (see below).

Within the DAR, the assessment of the pathway was based on results of the acid generation tests on granite summarized in the Geochemistry Baseline Report (Annex VIII), and a review of the potential use of dike materials as spawning habitat using information in the Fitzsimons (2013) report and the Fish and Fish Habitat Baseline Report (Annex XIV). The assessment of the pathway concluded that the potential for fish eggs or fry to be affected by contaminants coming off or within the interstitial spaces of the dike was negligible because of:

1) the inert nature of the granite to be used to construct the dike; and,

2) the predicted low levels of spawning activity by shoal-spawning species on the dike.

As such, the pathway was determined to be secondary and have negligible residual effects to Lake Trout and Lake Whitefish.

The following provides additional information for the pathway and to provide further evidence to support the assessment that the potential for fish eggs or fry to be affected by contaminants coming off of or within the interstitial spaces of the dike is predicted to be negligible. As described in Section 3.3.2 of the DAR and the Geochemistry Baseline Report (Annex VIII), geochemical characterization of the main rock types at the Ekati Mine has been ongoing since 1995. A regional geochemical dataset was compiled using existing data from the Ekati Mine, which were collected between 1995 and 2014. The regional dataset was used to develop an understanding of the acid rock drainage and metal leaching potential of the main rock types in the Project area, including granite. The granitic rock at the Ekati Mine has been characterized as non-potentially acid generating (non-PAG); this is the reason that granite is used, commonly as a requirement of the Water Licence or the Inspector, for all construction activities at the Ekati Mine. As stated in the DAR, the dike isolating the Jay pipe in Lac du Sauvage will be constructed of granite rockfill which geochemical testing determined to be non-PAG (Section 8.2.2.3; Annex VIII). Therefore, parameter concentrations (e.g., metals) would not increase to levels harmful to developing embryos as a result of leaching from the dike material. Based on the placement of the dike and associated fetch in Lac du Sauvage, wind and wave action along the dike will allow for flushing and movement of water into the interstices of the dike. As a result, the water chemistry within the interstitial spaces of the dike is not expected to deviate substantially from ambient lake water, or from interstitial water at natural spawning habitat.

Given the close proximity of the Jay Project to the Diavik Diamond Mine (Diavik Mine), it is anticipated that the rockfill material used to construct the dike for the Jay Project would be of similar composition to that of the dikes at the Diavik Mine. Monitoring was conducted for two dikes at the Diavik Mine (i.e., Dikes A154 and A418), which are located near East Island in Lac de Gras. The results are reported in “Lakebed Sediment, Water Quality and Benthic Invertebrates Study: A154 Dike – Year 4 Results; A418 Dike – Year 2 Results” (DDMI 2011); it was determined that the dikes have little effect on water quality, sediment quality, and benthic invertebrate communities

DDMI (2011) investigated the potential effects of the two dikes on water quality, sediment quality, and benthic invertebrate communities, while taking into account the confounding factor provided by mine water discharge. The study design compared samples from several radial transects extending from the dikes to control locations in Lac de Gras. The water quality investigation included samples from near the lake bottom, and samples collected from interstitial spaces in the dike material using passive diffusion samplers. Increased concentrations of water quality parameters could not be conclusively linked to

leaching from the dike, and if leaching from the dike was occurring, it was most likely to be restricted to only increases in major ions and turbidity (DDMI 2011). Furthermore, the only parameter to exceed the Canadian Council of Ministers of the Environment (CCME) Canadian Water Quality Guidelines for the Protection of Aquatic Life was pH, which was naturally below the guideline's lower limit in samples collected from control locations (DDMI 2011).

Similarly, DDMI (2011) found that potential for effects on sediment quality from the dikes were low. Concentrations of arsenic, chromium, and copper frequently exceeded CCME Sediment Quality Guidelines at both locations near the dikes and at control locations, indicating naturally elevated concentrations. Benthic invertebrate communities also showed no negative responses to the dikes. With the exception of the sampling locations nearest to the mine water discharge, all sampling transects nearest to the A154 dike had higher benthic invertebrate densities when compared to control stations, which the researchers suggest potentially indicates a positive effect of the dikes on invertebrate density (DDMI 2011). Proximity to the dike did not appear to have an effect on benthic invertebrate diversity and richness.

Results of geochemical testing of granitic waste rock from the Renard Diamond Project, located in Quebec, Canada (Stornoway 2011a,b) were also reviewed for additional context. The environmental impact statement for the Renard Diamond Project (Stornoway 2011a) which includes three open pits for mining kimberlite pipes and a 740 metre (m) deep shaft for underground extraction of kimberlite pipes, provides another example where granite material is shown to be relatively inert. Kinetic geochemical testing to determine the potential for leaching was conducted on the granitic waste rock which concluded that the material was not leachable, nor acid generating (Stornoway 2011a,b). As such, metals were not expected to leach at concentrations that that could represent a risk to aquatic life (Stornoway 2011a). These characteristics allowed waste rock to be used for construction without restrictions (Stornoway 2011a).

Potential use of the dike material as spawning habitat for Lake Trout and Lake Whitefish is another consideration in the potential assessment of exposure to water chemistry in the interstitial spaces (where habitat use is generally defined the way an animal uses the habitat). Use of the dike may be driven by external considerations such as competition (e.g., exclusion), or by active selection by fish for the characteristics of the dike (e.g., Beyer et al. 2010). Thus, potential use of the dike may be determined by the suitability of the material for spawning (e.g., substrate size, location of the material relative to prevailing winds), and the availability of spawning shoals in the lakes (i.e., within both Lac de Gras and Lac du Sauvage). For example, if the availability or abundance of spawning shoal habitat is a limiting factor for population sizes in a lake (i.e., there is very little suitable habitats for spawning), then it is expected that there could be a high potential for adults to leave their natal spawning locations and use (or select) newly deposited dike material for spawning. However, a previous assessment of the Diavik Mine dike in Lac de Gras did not detect Lake Trout spawning on the dike or adjacent habitats even though they were constructed of appropriately sized substrates for spawning (Fitzsimons 2013). The findings suggest that spawning habitat is not limiting in Lac de Gras for species such as Lake Trout. Rather, fish populations are likely limited at other life history stages or by other factors, such as food production. In oligotrophic Arctic lakes where nutrient inputs can be limited (e.g., Johnson 1976), changes in bottom-up processes (e.g., production of plankton) can influence fish abundance if food is limiting. An increase in the size of a waterbody (i.e., the amount of foraging habitat) can have a similar effect on fish abundance.

The findings in Fitzsimons (2013) are also supported by the fact that the existing environment for fish provides an abundance of suitable spawning habitat throughout Lac de Gras and Lac du Sauvage, as summarized in Section 9.2.4.1.1 of the DAR (and also reported in Annex XIV, see Map 2.2-1 to 2.2-3). Within Lac du Sauvage, an estimated 18 million square metres (m^2) of Lake Trout spawning habitat of good and fair quality was identified as present as non-attached shoals and shoals extending from small islands. Lac de Gras may provide as much as 58 million m^2 of Lake Trout spawning habitat (Annex XIV). Thus, the addition of dike material in Lac du Sauvage is unlikely to attract fish for spawning because of existing conditions that provide an abundance of natural shoal habitats throughout the effects study area. The "if you build it, they will come" scenario may not apply for the dike for spawning fish in Lac du Sauvage and Lac de Gras due to the abundance of high quality natural spawning habitat in Lac du Sauvage and Lac de Gras. Although incidental use of the dike for egg placement by fish is possible, there remains negligible to no potential for significant adverse effects to the eggs of the few fish that may spawn on the dike.

In summary, the potential for fish eggs or fry to be affected by contaminants coming off of or within the interstitial spaces of the dike is predicted to be negligible and the conclusion of this pathway in the DAR remains valid. The pathway is determined to be secondary and have negligible residual effects to Lake Trout and Whitefish populations.

References:

Beyer HL, Haydon DT, Morales JM, Frair JL, Hebblewhite M, Mitchell M, Matthiopoulos J. 2010. The interpretation of habitat preference metrics under use–availability designs. Philosophical Transactions of the Royal Society of London B: Biological Sciences 365: 2245-2254.

DDMI (Diavik Diamond Mines Inc.). 2011. Lakebed sediment, water quality and benthic invertebrate: A154 dike – year 4 results, A418 dike – year 2 results.

Dominion Diamond. 2014. Jay Project Developers Assessment Report: Section 9 Fish and Fish Habitat. October 2014.

Fitzsimons JD. 2013. Assessment of the use of dikes at Diavik Diamond Mine Lac de Gras for Lake Trout Spawning 2011. Unpublished Report. Available online: http://www.mvlwb.ca/Boards/WLWB/Registry/2007/W2007L2-0003/W2007L2-0003%20-%20Diavik%20-%20Assessment%20of%20Dike%20Exteriors%20for%20Lake%20Trout%20Spawning%20in%20Lac%20De%20Gras%20-%20Jan%2015_13.pdf; accessed September 21, 2014. 24 pages.

Johnson L. 1976. Ecology of Arctic populations of lake trout, *Salvelinus namaycush*, lake whitefish, *Coregonus clupeaformis*, Arctic char, *Salvelinus alpinus*, and associated species in unexploited lakes of the Canadian Northwest Territories. J Fish Res Bd Canada 33: 2459-2488.

Richardson ES, Reist JD, Minns CK. 2001. Life history characteristics of freshwater fishes occurring in the Northwest Territories and Nunavut, with major emphasis on lake habitat requirements. Can Manusc Rep Fish Aquat Sci 2569: vii + 146 p.

Stornoway (Stornoway Diamond Corporation). 2011a. Environmental and Social Impact Assessment – Main Report. Renard Diamond Project. Available online: http://www.ceaa-acee.gc.ca/050/documents-eng.cfm?evaluation=55169. Accessed February, 2015.

Stornoway. 2011b. Environmental and Social Impact Assessment – Appendix 3.6.1. Static and kinetic testing of waste rock, kimberlite and processed kimberlite. Renard Diamond Project, Quebec.

DOMINION DIAMOND

Information Request Number:	DAR-MVEIRB-IR-09
Source:	MVEIRB Information Requests: Chuck Hubert
Subject:	Socio-Economics - Transfer of skills post mine closure
DAR Section(s):	14.6.2, 14.1.3, 14.4.4

Preamble (MVEIRB):

DDEC has indicated that plans for closure are in place but have not described the details of these programs.

Request (MVEIRB):

Dominion, please describe in further detail how DDEC's programs will address the possible shift in skills that will be needed and what jobs employees will already be qualified for including what sectors will be applicable.

Response:

Commitment to Education and Re-Training During Closure

The Socio-Economic Agreement (SEA) for the Ekati Mine (Section 9.3) identifies the following commitments related to the topic of closure, training and skills transfer:

> *"9.3.1 In the event that BHP decides to permanently close the Project, it will give as much notice as possible to the GNWT.*
>
> *9.3.2 Prior to permanently closing the Project, BHP will provide reasonable levels of assistance for the education and re-training of Northern Resident employees as well as employment and relocation counselling for Northern Resident employees."* (BHP 1996)

Dominion Diamond intends to adhere to the SEA, and will provide reasonable levels of assistance for the education and re-training of Northern employees, and will support employment transition and relocation counselling to Northern employees in the event of closure. The exact format of this assistance and counselling will be determined as appropriate to the economic context at the time of closure.

Transfer of Operations Skills to Closure and Reclamation Activities

The closure and reclamation activities associated with the Jay Project (Project) would draw upon the skills of the existing labour force, creating the opportunity for operations workers to maintain employment into this final stage to the Ekati Mine life. Demand for employment would, however, taper during closure and reclamation given reduced activity, and so not all current employees could be retained. The Developer's Assessment Report (DAR) indicates that the Project would yield an estimated 1,132 full-time equivalents (FTEs) annually, on average, during operations. During final closure and reclamation, it is estimated that the Project would require approximately 282 FTEs, over the course of the two peak years of activity (DAR Section 14.4.3.1). There would be some positions associated monitoring following the initial period of closure and reclamation.

Some positions associated with earth moving, truck driving, facility maintenance, and equipment operation would be maintained during closure and reclamation. Entry level, semi-skilled and skilled positions would be more commonly associated with these activities. There would be less demand for professional and managerial positions during the closure and reclamation phase. Ongoing environmental monitoring would require a small number of positions, which could be filled by operations employees.

Post-Closure Transfer of Skills

The economic and employment context at the time of post-closure is not fixed, and not predictable with high certainty. As other sectors and resource extraction activities develop over the life of the Project, the demand for skilled labour will fluctuate. In a context with little or no economic development, employees trained in mining and mining support-related occupations may have difficulty securing local employment, and thus, transferring their skills. This could in turn result in trained individuals looking to other economic regions (e.g., Southern Canada) for employment opportunities. Conversely, in a context where economic development is thriving, with large investments in other exploration and resource extraction activities, the demand for a trained labour force could facilitate transition from the Ekati Mine to other operations in the Northwest Territories (NWT) following closure. In reality, the economic and employment context at the time of closure will likely be somewhere between these two scenarios.

Given the uncertainty of the economic setting following closure, the discussion of transfer of skilled labour to other opportunities is necessarily general.

Following closure, skills developed by employees while employed with Dominion Diamond could be transferred to other employment opportunities in the North. For example, many corporate staff positions (e.g., administration, accounting, procurement, human resources) would have developed skill sets transferable to other industries including resource extraction, the public sector and tourism – three of the NWT's most prominent employers. Positions associated with the transportation of goods, personnel, and ore could also transfer their skills to other industries that require trained transportation professionals. Certifications and formal training (e.g., H2S, OHS, CHRP) obtained while employed with Dominion Diamond would be desirable to other employers and are broadly transferable to other industries. Training obtained by employees in the trades (e.g., welders, mechanics, electricians) would be transferrable to other industries (e.g., oil and gas, construction).

Through their employment with Dominion Diamond, Northern residents will develop skill sets, and receive training that will enhance their employability, and that will be transferrable to other employment opportunities.

References:

BHP (Broken Hill Proprietary Company). 1996. Socio-Economic Agreement, BHP Diamonds Project. Tabled in the 4th Session of the 13th Assembly, Agreement Made October 22, 1996.

DOMINION DIAMOND

Information Request Number:	DAR-MVEIRB-IR-10
Source:	MVEIRB Information Requests from Chuck Hubert
Subject:	Socio-Economics - Goods and services required by phase and sourcing requirements
DAR Section(s):	14.1.3.2, 14.4.3.4

Preamble (MVEIRB):

In section 14.3.1.6, the local business capacity is described by listing the Aboriginal businesses in the local study area (LSA) and the contracts currently held by Ekati with the Northern and/or Aboriginal businesses. In section 14.1.3.2, DDEC identified its procurement targets as 28% of goods and services from local (Northern) businesses during construction and 70% during operations. In listing this information, DDEC has not described how it will meet these objectives and how these objectives were established.

Request (MVEIRB):

Please address how DDEC will meet the goal of northern utilization of 28% during construction and 70% during operations. In addition, please describe what the specific areas/goods and services are that cannot be directly provided by the NWT. Finally, please explain how the targets of 28% during construction and 70% during operations were established.

Response:

Establishing Procurement Targets

The Socio-Economic Agreement (SEA) for the Ekati Mine identifies Northern procurement targets for construction (28 percent [%]) and operations (70%). These targets were carried forward into the Developer's Assessment Report (DAR), Section 14.1.3.2. Targets in the SEA were established through agreement between the Government of the Northwest Territories and BHP Billiton, and were based on the projected procurement totals from the 1995 Northwest Territories (NWT) Diamonds Project (now the Ekati Mine) Environmental Impact Statement (EIS) (Section 4.3.3.1, Table 4.3-13 [construction] and Section 4.3.8 [operations]).

Since the beginning of diamond mining in the NWT (i.e., 1998), the capacity of Northern businesses to supply goods and services needed by a mine has, in some areas, increased beyond levels predicted in the 1995 NWT Diamonds Project EIS. However, the demand for these goods and services has also increased beyond levels predicted in the EIS. Higher than predicted demand at the Ekati Mine, as well as demand from the Diavik and Snap Lake mines, has meant that, while the total value of goods and services procured from the North has grown in conjunction with increased capacity of Northern businesses, the proportion (i.e., percentage) of the total goods and services procured by the Ekati Mine from Northern businesses has not changed substantially since early operations.

Efforts to Meet Procurement Targets

The SEA mandates the procurement of Northern goods and services, and provides the following strategies:

> "*7.2.1 It is the intent of the Parties that BHP will apply every reasonable effort consistent with the targets established pursuant to Section 7.3, to purchase goods and services provided by Local Businesses to the extent that such purchases do not add materially to the cost of the Project or compromise the quality or timing of the Project. …*
> *7.4.1 BHP agrees to:*
> *(a) establish a procurement office in the Northwest Territories for the Operation Phase;*
> *(b) to conduct business opportunity seminars and workshops in the Points of Hire and will make the business community aware of its corporate policy respecting procurement guidelines;*
> *(c) make reasonable efforts to provide Local Businesses with information relating to BHP's procurement needs which may include workshops, publications and advertisements in trade magazines;*
> *(d) wherever practicable, facilitate subcontracting opportunities for smaller Local Businesses, particularly aboriginal-owned businesses provided that there will be no adverse economic effect on the cost or quality of the Project. BHP will unbundle contracts whenever practicable;*
> *(e) assist Local Businesses which are awarded contracts in securing downpayment monies for the acquisition of goods and equipment by providing financial institutions with the necessary documentation establishing that the contract has been awarded subject to suitable financing being secured; and*
> *(f) share with the GNWT any available Local Business listing and work with the GNWT to identify possible opportunities for joint ventures by Local Businesses, and particularly by Aboriginal-owned businesses.*" (BHP 1996).

Dominion Diamond Ekati Corporation (Dominion Diamond) will adhere to the measures outlined in the SEA in an effort to meet the Northern procurement targets of 28% during construction, and 70% during operations.

Procurement by Category and Geographic Location

In the event that a good or service is not offered by Northern businesses, or if a good or services is offered, but at an uneconomical cost, Dominion Diamond must, out of necessity, procure from other sources. To describe this in greater detail, additional analysis of Dominion Diamond's 2013 procurement data has been summarized into Table 10-1, which shows procurement by major category, and the portion of each category procured from Northern sources. Data for 2014 procurement have not yet been aggregated, but will be available at a later date in the Ekati Mine annual SEA report.

Table 10-1 Procurement by Category and Source, 2013

Procurement Category	Expenditure	Northern Expenditure	Percent Northern
Fuels and Lubricants	$83,100,455	$2,187,768	2.6%
Earth Moving Equipment	$73,641,692	$70,277,947	95.4%
Freight, Cargo and Mail Transport	$50,012,990	$49,746,529	99.5%
Mine drilling and blasting services	$34,725,690	$34,724,964	100.0%
Vehicle Repair and Maintenance	$17,212,810	$17,212,810	100.0%
Personal and Domestic Services	$14,441,241	$14,441,241	100.0%
Passenger Transport	$13,125,902	$8,764,996	66.8%
Feeding, Crushing & Support Equipment	$9,806,851	$0	0.0%
Building Construction and Maintenance	$9,762,839	$7,764,062	79.5%
Environmental Services	$7,300,229	$3,005,934	41.2%
Computer, Data & IT Support Services	$6,977,389	$124,666	1.8%
Professional Engineering Services	$6,950,534	$2,973,134	42.8%
Chemicals and Additives	$5,549,359	$3,943	0.1%
Human Resources Services	$4,938,625	$4,000,321	81.0%
Hardware	$4,238,295	$4,068,673	96.0%
Community and social services	$4,216,595	$3,955,724	93.8%
Vehicle Components & Parts (excluding Tyres)	$4,128,100	$3,694,749	89.5%
Earth Moving Tyres	$3,826,828	$1,100,643	28.8%
Financial & Insurance Services	$3,734,777	$0	0.0%
Pumps, Compressors and Filters	$3,378,499	$2,221,724	65.8%
Electrical Equipment and Components	$2,995,891	$1,104,422	36.9%
Castings, Moldings, Extrusions	$2,724,489	$0	0.0%
Data & IT Support	$2,550,147	$0	0.0%
Security & Safety Equipment	$2,032,457	$1,653,776	81.4%
Telecommunication and Information Services	$1,971,346	$1,725,572	87.5%
Buildings, Structures and Support Bases	$1,871,712	$0	0.0%
Bearings and gears	$1,834,942	$1,834,942	100.0%
Underground Mining Equipment	$1,827,890	$1,738,561	95.1%
Accommodation and Meeting Facilities	$1,822,940	$1,785,330	97.9%
Production and Project Management services	$1,518,825	$0	0.0%
Healthcare Services	$1,256,660	$303,170	24.1%
Pipes, Valves and Fittings	$1,078,340	$538,975	50.0%
HVAC, Boilers and Accessories	$842,980	$390,604	46.3%
IT Equipment and Accessories	$721,918	$0	0.0%
Customs, Taxation and Regulatory	$717,386	$433,318	60.4%
Non-mining Machinery Repair services	$691,245	$348,114	50.4%
Training and Education Services	$648,080	$118,009	18.2%
Printing, Translation and Photographic Services	$534,732	$142,059	26.6%
Laboratory, Measuring and Testing Equipment	$496,666	$0	0.0%
Temporary personnel services	$494,112	$127,575	25.8%
Marketing, Advertising and Promotion	$435,858	$385,869	88.5%
Construction Materials	$223,974	$197,981	88.4%
Mining Machinery Repair services	$190,867	$11,357	6.0%
Vehicle and Machinery Rental Services	$179,757	$179,757	100.0%

Table 10-1 Procurement by Category and Source, 2013

Procurement Category	Expenditure	Northern Expenditure	Percent Northern
Domestic Appliances and Consumer Products	$175,678	$124,891	**71.1%**
Hand and speciality tools	$175,318	$0	**0.0%**
Utilities	$167,204	$167,204	**100.0%**
Material handling machinery and equipment	$153,246	$0	**0.0%**
Elements and Gases	$147,295	$27,932	**19.0%**
Fabrication services	$141,389	$0	**0.0%**
Industrial Processing Machinery	$131,805	$0	**0.0%**
Medical Equipment and Accessories and Supplies	$119,164	$110,913	**93.1%**
Legal Services	$117,904	$51,513	**43.7%**
Geology and field data processing services	$82,531	$0	**0.0%**
Cleaning Services	$70,943	$63,813	**90.0%**
Office Supplies	$67,884	$62,072	**91.4%**
Management Advisory Services	$67,637	$0	**0.0%**
Memberships & Associations	$45,952	$20,952	**45.6%**
Security & Safety Services	$29,183	$27,888	**95.6%**
Cleaning Equipment and Supplies	$2,620	$2,620	**100.0%**

% : 50% or more procured in the North
% : 25% to 49.9% procured in the North
% : 0.1% to 24.9% procured in the North
% : 0.0% procured in the North

Note: This table excludes other uncategorized procurement expenditures. The value of uncategorized procurement expenditures is small relative to the values presented in this table, and so do not represent a substantial expenditure.
Source: Dominion Diamond (2014).
% = percent.

Dominion Diamond is committed to maximizing Northern procurement wherever practicable. In 2013, the majority of the top expenditure categories were accrued to the North. Earth moving, drilling, blasting, vehicle repair, and domestic services are largely procured from the North, with 80% to 100% of procurement being accrued to Northern businesses. Other services (e.g., transportation, marketing, accommodations, human resources, communications, and social services), construction materials and labour, hardware, and select equipment (e.g., bearings, safety equipment, plumbing supplies, vehicle parts) are also procured predominantly from Northern sources (Table 10-1). Overall, in most areas where goods and services can be procured in the North, Dominion Diamond exceeds the procurement targets outlined in the SEA.

In areas where the majority of the demand for goods and services cannot be procured from Northern sources, Dominion Diamond is not able to meet the SEA procurement targets. Specialized equipment, tools and machinery, most fuel needs, and select technical services (e.g., lab testing, finance and insurance services, large-scale information technology (IT) and data support) are currently not procured from Northern sources. Goods and services associated with the fabrication and maintenance of specialized equipment, tools and machinery are, similarly, procured outside the North (Table 10-1). This

is to be expected, given the lack of large-scale manufacturing and fuel supply industries in the North. While some technical services (e.g., training, engineering, environmental, and legal services), are available in the North, given the small size of the labour force (i.e., 23,300[1] [GNWTBS 2015]), the capacity of Northern suppliers may not be sufficient to meet the needs of a large mining operation, thereby necessitating the use of non-Northern service providers to some extent.

References:

BHP (Broken Hill Proprietary Company). 1996. Socio-Economic Agreement, BHP Diamonds Project. Tabled in the 4th Session of the 13th Assembly, Agreement Made October 22, 1996.

Dominion Diamond (Dominion Diamond Ekati Corporation). 2014. 2013 Procurement Roll Up. Email communication between R. Bargery (Dominion Diamond) and J. O'Brien (Golder) August 8, 2014.

GNWTBS (Bureau of Statistics, Government of the Northwest Territories). 2015. V46438826 - Labour Force, Seasonally Unadjusted. Available at: http://www.statsnwt.ca/TSR/series.php?seriesid=V46438826. Accessed February 3, 2015.

[1] The majority of those in the labour force are not employed in positions associated with direct contracting of goods and services related to mining.

DOMINION DIAMOND

Information Request Number: DAR-MVEIRB-IR-100

Source: MVEIRB Information Requests from Chuck Hubert

Subject: Barren-ground Caribou model

DAR Section(s): Adequacy Response DAR-MVEIRB-15

Preamble (MVEIRB):

a) The developer's population model is a 10-year projection of the trend in the size of the Bathurst herd starting from GNWT's 2012 estimated number of breeding females. The reason for not using much lower 2014 starting population based on a reconnaissance calving ground survey is (p. 2) is that vital rates estimated after 2012 were not available. However, Fig. 28 in Boulanger et al. (2014a) shows extrapolated numbers of breeding females plotted against adult survival rates. The 2014 estimate suggests a lower adult survival rate as explanatory power and could have been used in the Proponent's population viability analysis. The energetic model is used to modify fecundity and calf survival rates for development and weather scenarios in the population model. The energetic modelling predicted up to 13% reduction in pregnancy (uncorrected estimate) but it is not clear how energetic projections for fecundity and calf survival (the following year) were used to calculate the population model input. DAR Reference: Boulanger J, Croft B, Adamczewski J. 2014a. *An Estimate of Breeding Females and Analyses of Demographics For The Bathurst Herd of Barren-ground Caribou: 2012 Calving Ground Photographic Survey*. Integrated Ecological Research Unpublished File Report No. 142 for Environment and Natural Resources, GNWT. 81 pp.

Request (MVEIRB):

a) Please indicate if Dominion requested that GNWT provide updated vital rates since 2012 given the 2012-2014 decline.

b) Please consider whether using an extrapolated adult survival rate (0.68) from the 2012 report would change conclusions from the population model.

c) Please provide more detail to clarify how the fecundity and calf survival were calculated from the energetics model projections (revised) for body weight and pregnancy.

Response:

a) A request was made of the Government of Northwest Territories (GNWT) for Bathurst caribou herd vital rates based on the results of the 2014 calving ground reconnaissance survey. Calf:cow ratios were obtained from GNWT composition surveys conducted in October 2012 (2012 birth year, 24 calves:100 cows) and spring 2014 (2013 birth year, 32 calves:100 cows). However, adult female survival rates from the same period are important in the interpretation of recruitment from calf:cow ratios as they affect the denominator in the ratio. For example, if adult female survival in an interval is 50 percent (%) and calf survival is 100%, then the denominator is half of what it was at the start of the interval and the calf:cow ratio doubles even though the number of calves does not change. Data to confidently estimate adult female survival for 2012 to 2014 are not available. The approach to

estimating a set of vital rates for the Bathurst herd used in Boulanger et al. (2011, 2014) has not been applied to account for the apparent 2012 to 2014 decline. The vital rates provided following the 2012 calving ground photographic survey (Boulanger et al. 2011, 2014) are the most recent vital rates that have been calculated for the Bathurst herd that reconcile all available sources of information (Adamczewski 2015). The information required for the determination of vital rates (Boulanger et al. 2014) requires information not gathered in the 2014 reconnaissance survey.

b) The selection of an adult female survival rate of 0.68 noted in the request is unclear. Figure 28 in Boulanger et al. (2014) shows the relationship between different adult female survival rates and the population of adult female caribou in 2012, given historic starting populations and holding other productivity parameters constant (Boulanger et al. 2014, page 58). From the figure, an adult female survival rate of 0.68 from would coincide with an estimate of approximately 9,000 breeding females in 2012 with the assumed starting population and productivity level. The estimate of 15,935 breeding females in 2012 led Boulanger et al. (2014, page 61) to conclude that the actual annual adult female survival rate from 2009 to 2012 was 78%.

   As noted in the preamble, population modelling was completed in response to Mackenzie Valley Environmental Review Board Jay Project Adequacy Review Item 8.8 and presented in the response to DAR-MVEIRB-15 (hereafter referred to as “modelling report”). In the absence of empirical vital rates for the Bathurst herd for the 2012 to 2014 period, the modelling report (page 12) noted that adult survival rates between 51% and 62% were consistent with the 2014 Bathurst herd reconnaissance survey population estimate. Regardless of the specific vital rates that would fit the observed population data, the end result would be the same: an annual decline of 48% over a two-year period. The modelling report addressed adult female survival rates below the 68% value in this request, addressing more extreme mortality scenarios than requested.

   As noted in the modelling report (pages 12 to 13), the current low population of the Bathurst herd should allow more selective use of habitat. As there is no strong mechanism by which development reduces adult female survival, the negative trend in population growth associated with the current estimates of vital rates is predicted to be similar with and without the development-related cumulative changes in habitat quantity and quality, and caribou behaviour and energetics. Consequently, the use of a lower annual adult female survival rate will not change the conclusions of the modelling report.

c) Fecundity and calf survival rates from Boulanger et al. (2014) were used as the initial stage matrix rates for the Base Case simulations (modelling report, page 3 and Table 15-2). Changes in calf survival rates were determined as the percent changes from the Base Case for each scenario at low insect harassment levels (insect harassment was applied independently as a stochastic variable in the population modelling). As the population models were run for the female portion of the population only, the changes applied to fecundity were half of those applied to calf survival (i.e., an assumed 1:1 sex ratio at birth). Table 100-1 shows the sources of the modifier variables presented in Table 15-3 of the modelling report.

Table 100-1 Source and Magnitudes of Relative Changes in Parturition and Fecundity Applied in Bathurst Caribou Herd Population Models

Population Model Simulation	Source Table	Scenario (Assessment Case)	% Change in Calf Survival from DAR Base Case	% Change in Fecundity from DAR Base Case
Reference 1 Reference 2	DAR 12.4-27	Reference Condition	+3.6	+1.8
Application 1 Application 2	DAR 12.4-27	Application Case	-0.3	-0.2
RFD 1 RFD 2	Sable Addendum 4.2-17	RFD Case (with Sable Project)	-3.9	-2.0

Note: Percentage changes reflect difference between the Scenario (Assessment Case) noted and the Base Case, low IHI scenario presented in DAR Table 12.4-27.

DAR = Developer's Assessment Report; RFD = reasonably foreseeable development; IHI = insect harassment index; % = percent.

References:

Adamczewski J. 2015. Personal communication. Wildlife Biologist, Ungulates – Environment & Natural Resources, Wildlife Division, Government of the Northwest Territories. Phone call with J. Rettie, Golder Associates. March 2, 2015.

Boulanger J, Gunn A, Adamczewski J, Croft B. 2011. A Data-Driven Demographic Model to Explore the Decline of the Bathurst Caribou Herd. J Wildlife Manage 75: 883-896.

Boulanger J, Croft B, Adamczewski J. 2014. An Estimate of Breeding Females and Analyses of Demographics For The Bathurst Herd of Barren-ground Caribou: 2012 Calving Ground Photographic Survey. Integrated Ecological Research Unpublished File Report No. 142 for Environment and Natural Resources, GNWT. 81 pp.

DOMINION DIAMOND

Information Request Number:	DAR-MVEIRB-IR-101
Source:	MVEIRB Information Requests from Chuck Hubert
Subject:	Barren-ground Caribou - Population model
DAR Section(s):	Jay Project Adequacy Review Item 8.8 (Response DAR-MVEIRB-15)

Preamble (MVEIRB):

The population model projects declines for all scenarios from 14% to 29% over 10 years (relative to an undisturbed landscape) using the current GNWT population data (Table 15.6). The projected declines include a small effect of the Jay Pit (p.11).

Request (MVEIRB):

Given the projection of population declines based on current GNWT data, please list any further mitigation options to reduce effects.

Response:

The population modelling referred to in the preamble was completed in response to Mackenzie Valley Environmental Review Board Jay Project Adequacy Review Item 8.8. Results from population modelling were presented in the Jay Project Adequacy Review response DAR-MVEIRB-15.

The residual effects analyses in the DAR examined three primary pathways of the Jay Project on barren-ground caribou; two of the pathways were related to habitat. In the Developer's Assessment Report (DAR), the effects of the Jay Project (and of the cumulative effects in the Reasonably Foreseeable Development Case) on habitat quantity, quality, and fragmentation were assessed as being small and considered to be not significant. That determination applies to the Bathurst caribou herd during all phases of the population cycle. As reported on pages 12 and 13 of the Jay Project Adequacy Review response DAR-MVEIRB-15, the limiting effects of reductions in habitat are expected to be density-dependent and would have even smaller effects at low population levels.

The third primary pathway identified and addressed in the DAR was related to the potential barrier effects of the Jay and Misery roads. Mitigation and monitoring were identified to address the potential barrier effects on caribou abundance and distribution. Mitigation includes constructed caribou crossings, stockpiling of ore, modifications to traffic patterns, and the implementation of road closures. Together, these are expected to provide opportunities for caribou to move across the roads, limiting the effect of increased traffic from the Jay Project on caribou movement through the Ekati Mine area, and maintaining population connectivity. To provide key information that will inform decisions on road closures and traffic modification, Dominion Diamond will implement monitoring of the Bathurst caribou herd to track migratory movements with the use of (i) satellite radio-collars (i.e., data requested from the Government of the Northwest Territories), (ii) reconnaissance surveys near the roads, and (iii) road surveys. The data collected during these monitoring activities will also be used to test effects predictions and the success of proposed mitigation to limit effects to caribou from increased traffic on the roads.

The mitigation and monitoring measures identified in the DAR are considered appropriate for the Bathurst herd at all population levels. No additional mitigation is proposed.

DOMINION DIAMOND

Information Request Number:	DAR-MVEIRB-IR-102
Source:	MVEIRB Information Requests from Chuck Hubert
Subject:	Barren-ground Caribou
DAR Section(s):	Sable Addendum (Appendix I, Section 1.3)

Preamble (MVEIRB):

The Sable pit and road are north and west of Jay and Misery pits and may initially be encountered by caribou moving south through the corridor between Yamba and Pellet lakes. Higher numbers of caribou may possibly be involved. It is uncertain from the Sable Addendum what the distribution of caribou is relative to the habitat along Sable Road and pit, based on incidental sightings, remote camera sightings or aerial surveys. The approach used in 2014 for describing and mapping caribou trails in the vicinity of the Jay pit is excellent and a useful step toward designing mitigation.

Request (MVEIRB):

Please integrate annual and seasonal incidental sightings, aerial survey sightings and camera sightings to provide tables and maps of caribou distribution in the vicinity of the Sable pit and road. For the next field season, will Dominion commit to undertake a similar finescale track survey as was undertaken in 2014 for Jay to further reduce uncertainty?

Response:

The Sable open pit and road has already undergone Environmental Assessment (EA99-004) through the Mackenzie Valley Environmental Impact Review Board (MVEIRB 2001) and was fully permitted in 2002 as part of the Sable, Pigeon, and Beartooth Expansion Project. Land Use Permit No. W2008F0009 issued by the Wek'èezhìı Land and Water Board is in place to directly regulate construction and use of the Sable Road, should it be built in future. The Land Use Permit states:

> *28. The Permittee shall ensure that adequate Caribou crossings are constructed so as to allow caribou free access to the road.*

The Jay Project is not conditional on the development of the Sable project, which is a reasonably foreseeable development in the Developer's Assessment Report. As described in the Sable Addendum, (Dominion Diamond 2014) Dominion Diamond Ekati Corporation (Dominion Diamond) is conducting exploration work (bulk sample) at the Sable pipe in winter 2015 to gather additional geological information.

Should the Sable project proceed, Dominion Diamond would involve communities in identifying caribou crossings and other mitigation for the Sable project, and consider other field observation data. For example, a number of caribou monitoring programs related to the Sable project were completed from 1999 to 2003 and could be used for this purpose. This includes data on historical caribou trails detected in aerial photos in 1998 and 1999 and caribou snow tracks and focal behaviour of caribou groups from 1999 to 2003 (Rescan 1999; Golder 1999, 2001, 2002, 2004). At that time, the adequacy of information

would be reviewed and would be augmented if necessary to ensure that caribou crossings were adequately designed to meet the requirement of the Land Use Permit, as repeated above. It would be appropriate to develop any such additional information at that time so that it would be based on the most current knowledge.

References:

MVEIRB (Mackenzie Valley Environmental Impact Review Board). 2001. Report of Environmental Assessment on the proposed development of Sable, Pigeon and Beartooth Kimberlite pipes. Prepared by the Mackenzie Valley Environmental Impact Review Board, February 7, 2001. Yellowknife, NWT, Canada.

Dominion Diamond (Dominion Diamond Ekati Corporation). 2014. Jay Project Developer's Assessment Report – Sable Addendum. Prepared by Golder Associates Ltd., December 2014. Yellowknife, NWT, Canada.

Golder (Golder Associates Ltd.) 1999. 1998 Wildlife Effects Monitoring Program – construction phase. NWT Diamonds Project, BHP. Prepared by Golder Associated Ltd., Yellowknife, NWT, Canada.

Golder. 2001. Ekati Diamond Mine: 2001 Wildlife Effects Monitoring Program. Prepared for BHP Billiton by Golder Associates Ltd., Yellowknife, NWT, Canada.

Golder. 2002. Ekati Diamond Mine: 2001 Wildlife Effects Monitoring Program. Prepared for BHP Billiton by Golder Associates Ltd., Yellowknife, NWT, Canada.

Golder. 2004. Ekati Diamond Mine: 2003 Wildlife Effects Monitoring Program. Prepared for BHP Billiton by Golder Associates Ltd., Yellowknife, NWT, Canada.

Rescan (Rescan Environmental Services Ltd.). 1999. Ekati Diamond Mine: 1999 Wildlife Effects Monitoring Program. Prepared by Rescan Environmental Services Ltd., Yellowknife, NWT, Canada.

DOMINION DIAMOND

Information Request Number: DAR-MVEIRB-IR-103

Source: MVEIRB Information Requests from Chuck Hubert

Subject: Barren-ground Caribou

DAR Section(s): 12

Preamble (MVEIRB):

Table 1.2-1 lists six adaptive management actions but no details on the relationship between monitoring and decisions about mitigation. Five listed actions refer to mitigation for roads and caribou. The DAR states the Ekati Mine Wildlife Effects Monitoring Program is designed to provide evidence for adaptive management. IEMA's mandate includes overseeing wildlife monitoring at Ekati.

Request (MVEIRB):

To IEMA: Please provide information on whether and how IEMA has documented how monitoring led to changes in mitigation (such as changes in method, reduction or intensification) for the effects of roads on caribou and habitat (including dustfall) at Ekati. Based on these findings please provide specific steps to improve adaptive management for improving crossing of roads by caribou.

DOMINION DIAMOND

Information Request Number: DAR-MVEIRB-IR-11

Source: MVEIRB Information Requests from Chuck Hubert

Subject: Hydrostratigraphy

DAR Section(s): 8.2.1.2.2

Preamble (MVEIRB):

In this section, it states that: "experience at other mines in the Canadian Shield demonstrates that Enhanced Permeability Zones (EPZs) that are extensive on the scale of a mine can be challenging to identify in advance of mining on the basis of single-well response tests that sampled a limited volume of rock. However, experience at the Snap Lake and Diavik mines also shows that in situations where mining occurs beneath a major lake in a large open talik and far away from permafrost, the hydraulic connection that these EPZs provide to the lake can be substantial."

Request (MVEIRB):

Is there any utility or any plans to do further hydrogeologic testing to further delineate the EPZ(s) prior to mining?

Response:

The 2015 Winter Drilling Program includes deep boreholes that will aid in the delineation of the potential EPZ that was discussed in the Developer's Assessment Report (DAR). The program includes geological and geotechnical logging to identify structural contacts and weak zones, and packer testing to establish near-borehole hydraulic conductivity over discrete intervals along each borehole to assess continuity and larger-scale properties of potential EPZ(s). This information will be used to update our conceptual understanding of hydrogeological conditions adjacent to the Jay pipe. Results of these additional sampling events will be used in the detailed design of the water management facilities and development of the groundwater monitoring plan.

It is expected that further information obtained in the 2015 Winter Drilling Program will be used to refine the interpreted extent and orientation of the EPZ or EPZs in the hydrogeological conceptual model; however, conservative assumptions have been made in the DAR regarding the presence of an EPZ. Therefore, there is a high level of confidence that effects to the environment have not been underestimated. Appendix 8A of the DAR describes a Reference Case, which represents Dominion Diamond's reasonable expectation of hydrogeological conditions. This is in comparison to the more conservative DAR Environmental Assessment Conservative Scenario that was used as the basis of the environmental assessment. In both the Reference Case and the Environmental Assessment Conservative Scenario presented in Appendix 8A of the DAR, it is assumed that an EPZ extends over the entire model domain both vertically and laterally. In the Reference Case, which is considered to be more likely, the EPZ is assumed to be 60 metres (m) wide, and to have a hydraulic conductivity as follows (DAR Appendix 8A, Table 8A3-1):

- 1×10^{-5} metres per second (m/s) to 400 m depth;
- 5×10^{-6} m/s from 400 to 750 m depth;
- 5×10^{-7} m/s from 750 to 1,000 m; and,
- 1×10^{-7} m/s from 1,000 to 1,500 m depth.

In the Environmental Assessment Conservative Scenario, which was carried forward to the water quality modelling and assessment in the DAR, the width of the EPZ was increased to 100 m, such that the transmissivity of the Jay EPZ was equivalent to Duey's Fault at the Diavik Mine (DAR Appendix 8A, Section 8A4). Duey's Fault is the most transmissive EPZ that has been encountered at the existing Diavik and Ekati mines.

DOMINION DIAMOND

Information Request Number: DAR-MVEIRB-IR-12

Source: MVEIRB Information Requests from Chuck Hubert

Subject: Hydrostratigraphy - existing environment

DAR Section(s): 8

Preamble (MVEIRB):

Dominion stated that enhanced conductivity is not expected between the kimberlite and competent rock as this was the case at the Panda, Fox, and Koala pipes.

Request (MVEIRB):

Is enhanced conductivity not occurring between kimberlite and competent rock in the Misery and Lynx pipes and is it fair to expect similar conditions for the Jay pipe?

Response:

Although minor groundwater was observed to be infiltrating along the kimberlite-country rock contact at the Misery Pit (SWS 2010), overall seepage quantities observed during mining were minor with the majority of seepage originating near the pit crest, likely from the active layer (Developer's Assessment Report [DAR] Appendix 8C, Section 8C2.1). These observations indicate that the contact zone between the kimberlite and the host rock does not have a substantively enhanced permeability. This is consistent with hydraulic testing at the Misery Pit which indicated that the kimberlite and contact zone have low hydraulic conductivity of 5×10^{-9} metres per second (m/s) and 1×10^{-8} m/s, respectively (Klohn Crippen 2004).

At present, information on the hydrogeological properties of the contact zone at the Lynx pipe is not available. The Lynx pipe has not been mined and, therefore, the contact zone has not been exposed.

Based on available information from nearby kimberlite pipes that have been mined (Panda, Fox, Koala, and Misery), the numerical hydrogeological model that was developed for the Jay Project assumes that the permeability of the contact zone is not enhanced. However, conservative assumptions on hydrogeological parameters were included elsewhere in the numerical hydrogeological model, that more than account for the effects on the quantity and quality of mine inflow of an enhanced permeable contact zone. These assumptions include:

- The conservative assumption of a 60 to 100 metres wide, highly transmissive Enhanced Permeability Zone (EPZ) that is in contact with the Jay pipe over the entire model depth. In effect, the width and hydraulic conductivity of this EPZ provides a pathway for groundwater flow and solute transport that has a greater effect on predicted groundwater inflows (i.e., greater inflow and higher total dissolved solids) than the effects from a thin enhanced permeability contact zone.
- The hydraulic conductivity assigned to the Jay pipe (3×10^{-6} m/s; DAR Appendix 8A, Table A3-1) is considered to be a conservative high value based on the geologic description of the pipe (Geology Baseline; DAR Annex III, Section 4.1.6), and from hydraulic testing at the existing Diavik

and Ekati mines. The value is approximately one order of magnitude higher than the kimberlite hydraulic conductivity estimated from the testing at the Diavik Mine and at least two orders of magnitude higher than the results of testing at the Panda and Misery pipes (Hydrogeology Baseline, DAR Annex IX, Section 4.5). The conservatively high value of kimberlite hydraulic conductivity that was used in the model effectively incorporates a permeable pathway up through the kimberlite in the hydrogeological model, that would more than account for a permeable contact zone.

References:

Klohn Crippen. 2004. Ekati Mine Hydrogeological Evaluation of Misery Pit and Underground. File: M08788 07.500.

SWS (Schlumberger Water Services). 2010. Misery Resource Development Definition Study – Feasibility Hydrology and Hydrogeology. Prepared for BHP Billiton Diamonds Inc. September 2010.

DOMINION DIAMOND

Information Request Number: DAR-MVEIRB-IR-13

Source: MVEIRB Information Requests from Chuck Hubert

Subject: Hydrogeology Baseline Report

DAR Section(s): Annex IX (Sections 4, 7)

Preamble (MVEIRB):

On the basis of hydrogeologic testing in the area of the Jay Pit, the presence of an EPZ intersecting the pit is inferred. The orientation of this EPZ is inferred to be in a northwest to southeast direction based on data from boreholes 3, 5, and 6. As described in the text, there is a great deal of uncertainty as to the size and orientation of the EPZ or even if there is one large EPZ or several smaller ones running in different directions. In the interests of being conservative, a larger EPZ has been inferred and the uncertainty in this conclusion has been well documented in this Annex and in the DAR. Nonetheless, this is the current prediction and so it is important to understand how it was arrived at and what the implications are. For example, in Figure 7.1-1 (also see Figures 8A2-1 and 2 from Appendix 8A), the proposed EPZ has been pictorially represented as intersecting the Jay Pipe on an angle at a depth of about 500 m. This visual representation makes it seem as though most of the pipe could be mined (i.e., down to 500 m) before the EPZ is encountered.

Request (MVEIRB):

In general, it is hard to understand how the EPZ orientation, angle/depth of intersection with the Jay Pipe and other properties have been inferred from the borehole data. Yet this is important since it greatly affects effluent quality/quantity predictions. As it is likely difficult to provide further written description of the EPZ, it is recommended that Dominion/Golder come to the Technical Sessions prepared to describe and discuss this further so that all parties can understand the assumptions and uncertainties around the EPZ. For example, please come prepared with information on the final values used for the EA case (i.e., hydraulic conductivities), the contribution of the EPZ for the EA relative to the Reference case, and the implications on the water balance.

Response:

Figure 7.1-1, Figure 8A2-1, and Figure 8A2-2 provided in Annex IX and Appendix 8A of the Developer's Assessment Report (DAR) show a conceptual interpretation of the enhanced permeability zone (EPZ) extent. In this interpretation, the EPZ extends laterally away from the Jay pipe to the boundaries of the baseline and effects study area and vertically to a significant depth below the ultimate pit bottom. For illustrative purposes, the EPZ is depicted as sub-vertical; whereas, in reality its vertical orientation (and lateral extent) is uncertain.

In the numerical hydrogeological model (Appendix 8A of the DAR), however, it is assumed that the EPZ is vertical and extends from the bedrock/overburden contact down to the model base approximately 1 kilometre (km) below the ultimate pit bottom with the hydraulic properties summarized in Appendix 8A of the DAR (Table 8A3-1 and Section 8A4). The model assumes that the EPZ is in direct contact with the Jay pipe at all depth intervals intercepted during mining and below. Similarly, the EPZ intersects the walls

of the Jay open pit from the overburden/bedrock contact to the pit bottom. Because the geologic data (including borehole data) collected to date (Annex III) are limited, the vertical orientation of this feature is still uncertain; therefore, the vertical configuration of the EPZ extent (for both the reasonable estimate Reference Case and the upper bound Environmental Assessment [EA] Conservative Scenario) was chosen to provide the most conservative (i.e., high) predictions of mine inflow quantity and quality. The extent of the EPZ, as incorporated in the numerical groundwater model, is shown on Figure 8A3-3 (panel C) in the DAR (Appendix 8A). Appendix 8A of the DAR describes a Reference Case, which represents Dominion Diamond's reasonable expectation of hydrogeological conditions. This is in comparison to the more conservative 'DAR Environmental Assessment Conservative Scenario' that was used as the basis of the environmental assessment. The EPZ contributes a greater proportion of the inflow quantity in the EA Conservative Scenario with the average contribution of the EPZ in the Reference Case at approximately 60 percent (%), while in the EA Conservative Scenario, the average contribution is approximately 70%. This result occurs due to the higher assumed transmissivity of the EPZ in the EA Conservative Scenario.

As requested, additional explanation can be provided during upcoming Jay Project Technical Sessions.

DOMINION DIAMOND

Information Request Number:	DAR-MVEIRB-IR-14
Source:	MVEIRB Information Requests from Chuck Hubert
Subject:	Hydrogeology Baseline Report
DAR Section(s):	Annex IX (Section 4.4 and 7.3)

Preamble (MVEIRB):

The EPZ mentioned above is referred to as a "sub-vertical" EPZ but no definition is given.

Request (MVEIRB):

Could you please define what "sub-vertical" means with respect to the EPZ?

Response:

Please refer to the response DAR-MVEIRB-IR-13.

DOMINION DIAMOND

Information Request Number:	DAR-MVEIRB-IR-15
Source:	MVEIRB Information Requests from Chuck Hubert
Subject:	Hydrogeological Model
DAR Section(s):	Appendix 8A (Section 8A3)

Preamble (MVEIRB):

In the sensitivity analysis, the EPZ is discussed and assigned different dimensions in order to test the sensitivity of the model to the assumptions about the EPZ size and shape. Both of the additional possibilities analyzed with respect to the EPZ size and shape resulted in lower volumes of groundwater inflow than the original assumption. However, it seems possible to imagine other scenarios which would produce more conservative predictions than currently presented.

Request (MVEIRB):

Does the amount of groundwater inflow from the EPZ depend on the depth at which it might intersect with the Jay pipe? Again, it would be helpful to explore the assumptions and possibilities around the EPZ more in the Technical Sessions.

Response:

Please refer to the response to DAR-MVEIRB-IR-13 with respect to the vertical orientation of the EPZ in the hydrogeological model. As suggested in DAR-MVEIRB-IR-13, due to the uncertainty in the actual vertical orientation of the enhanced permeability zone (EPZ), it is possible that it could intersect the Jay open pit over only a portion of the pit walls. If this was the case, the predicted mine inflow water quantity would be smaller than the inflow predicted by the model that assumed that the EPZ is vertical and intersects the pit walls and kimberlite over the entire depth of mining and several hundreds of metres below the depth of mining. Similarly, if the EPZ was not vertical and/or did not extend to the model base (as assumed in the model), the predicted mine inflow water quality would be better than that presented in the Developer's Assessment Report (DAR) as presented in Table 8A3-6 of Appendix 8A. Because of the conservative assumptions of the permeability and extent (vertical and lateral) of the EPZ in the hydrogeological model, there is a high level of confidence that groundwater inflow quantity and quality have not been underestimated in the DAR.

Appendix 8A of the DAR describes a Reference Case, which represents Dominion Diamond's reasonable expectation of hydrogeological conditions. This is in comparison to the more conservative Environmental Assessment (EA) Conservative Scenario that was used as the basis of the environmental assessment in the DAR. In both cases, the EPZ is conservatively assumed to be vertical. This assumption combined with the other conservative assumptions summarized in Appendix 8A Table 8A3-2 result in incorporation of a reasonable level of conservatism in the predictions presented for the Reference Case (Appendix 8A Table 8A3-5). The EA Conservative Scenario contains additional conservatism with the transmissivity of the EPZ and hydraulic conductivity of the surrounding competent rock increased from that of the Reference Case. The EA Conservative Scenario provides a reasonable upper bound and is used to assess environmental effects in the DAR, and as such, provides a high level of confidence that the effects on the environment have not been underestimated. Water quality modelling for the reasonable estimate case (Appendix B) demonstrates the conservative nature of the water quality predictions assessed in the DAR which were based on the EA Conservative Scenario.

DOMINION DIAMOND

Information Request Number:	DAR-MVEIRB-IR-16
Source:	MVEIRB Information Requests from Chuck Hubert
Subject:	Mitigation of Effects of Project Infrastructure and Dike Construction to Water Quantity, Roads and Culverts
DAR Section(s):	8.4.2.2.1

Preamble (MVEIRB):

Dominion stated that culverts will be designed for peak flows corresponding to a 1 in 50 yr, 24hr rainfall event.

Request (MVEIRB):

How was this event chosen? Does the 24hr event represent the peak Intensity-Frequency-Duration event?

Response:

The Developer's Assessment Report (DAR) indicated that culvert designs consider the 1 in 50 year event (excluding for the culverts associated with the Sub-Basin B Diversion Channel, as discussed in responses to other Information Requests) in Table 8.4.1 and Section 8.4.2.4.2 of the DAR. Section 8.4.2.2.4 also identifies the 1 in 50 year, 24-hour duration rainfall event as the design event.

The design criteria for culverts will be to the 1 in 50 year return period peak event for the rainfall intensity and duration associated with the site-specific time of concentration for the contributing watershed. This can also be worded as the peak Intensity-Duration-Frequency event for the watershed time of concentration. The contributing watershed time of concentration, and therefore, the rainfall intensity will be determined during the detailed design phase. Calculation of the watershed time of concentration may lead to a duration of less than the 24-hour rainfall event (and therefore a greater rainfall intensity) being selected for design; short-duration rainfall intensities applicable to the Jay Project area are presented in Table 8.2-16 of Section 8.2.3.4.2 of the DAR.

Culverts will be designed and constructed such that structures will provide a minimum design conveyance for the 1-in-50 year event without overtopping the roadway, maintain natural drainage patterns and reduce the use of ditches and diversion berms. In addition, culverts will be installed or upgraded as necessary, and monitored along site access roads to use and maintain natural drainage patterns and minimize potential for erosion.

DOMINION DIAMOND

Information Request Number:	DAR-MVEIRB-IR-17
Source:	MVEIRB Information Requests from Chuck Hubert
Subject:	Mitigation of Effects of Project Infrastructure and Dike Construction to Water Quantity
DAR Section(s):	8

Preamble (MVEIRB):

It was stated for roads and culverts that a 1 in 50 year event would be used; for diversions, 1 in 100 year event; and for the Jay run-off sump, a 1 in 10 year event.

Request (MVEIRB):

Why is there a difference in the event chosen? If there are diversions crossing roads, what event will be used to size the culverts?

Response:

The design criteria for the road culvert crossings, Sub-Basin B Diversion Channel, and for the Jay runoff sump were selected based on the risk associated with overtopping of these structures. Consideration has been given to snowmelt and rainfall events, where the governing condition for larger basins (with attenuation and storage effects) is a snowmelt event, while the governing condition for very small basins (with little to no attenuation and storage effects) is an extreme rainfall event.

Culverts for mine site roads will be designed to provide conveyance for a 1-in-50 year event without overtopping the roadway, and roads and cross-drainage structures will be inspected, and maintained regularly, as required. The 1-in-50 year rainfall event (event duration to be confirmed during detailed design based on basin time of concentration) was selected as the design criterion because of the proposed use of the road for approximately 20 years spanning the construction, operations, and closure phase of the Jay Project, and because of the general absence of additional public infrastructure near the road. In addition, these crossings have small drainage basins where rainfall events are expected to govern. Extreme rainfall events exceeding the 1-in-50 year rainfall event may result in short-term surcharging of culvert head ponds (or in extreme cases, temporary overtopping of the roadway) are not expected to occur often, and would not represent an environmental risk, due to the generally coarse nature of materials that will be used to construct the roads. In the extreme event, short term overtopping of the roads would not be expected to cause road instability.

The culvert(s) associated with the Sub-Basin B Diversion Channel were designed based on a 1-in-100 year return period rainfall on snowpack event. This design criterion (greater than the criterion used for other roadway culvert crossings) was selected for the following reasons:

- Consistency with the design criterion selected for the Sub-Basin B Diversion Channel (1-in-100 year).
- The 1-in-100 year event is commonly used for diversions at mines in the northern Canada.

- The Sub-Basin B Diversion Channel and associated culverts have been identified as having a larger watershed, in comparison with the other culverts that are located in minor headwater streams with expected small and intermittent flow (small catchments).
- Because Stream Ac35 and Stream B0/1 are used by Arctic Grayling from Lac du Sauvage, the Sub-Basin B Diversion Channel will have design features that facilitate movements of fish from Lac du Sauvage to upstream locations; the proposed culvert designs for the channel will minimize any potential effects to habitat connectivity during a high rainfall event.

The Jay run-off sump will be designed for the 1-in-10 year event, 24-hour rainfall event. The estimated contingency storage capacity in this sump is 220,000 cubic metres (Section 4.6, Appendix 3A of the Developer's Assessment Report). Rainfall events exceeding the 1-in-10 year rainfall event may result in excess water reporting to the dewatered lakebed surface, downstream of the dike, and/or ultimately to the Jay Pit. Water will be contained within the diked area, and as such, water is not anticipated to be released directly to the environment.

DOMINION DIAMOND

Information Request Number:	DAR-MVEIRB-IR-18
Source:	MVEIRB Information Requests: Chuck Hubert
Subject:	Jay Waste Rock Storage Area (WRSA) Seepage and Contingency
DAR Section(s):	8.4.2.2.1 (Page 8-146)

Preamble (MVEIRB):

It states here that the Sub Basin B Diversion Channel will be built to accommodate a 1 in 100 year flood with additional freeboard.

Request (MVEIRB):

Does the Sub Basin B Diversion Channel have the same design basis as the Panda Diversion Channel? If not what are the differences?

Response:

Comparisons to the Panda Diversion Channel are of limited applicability to the Sub-Basin B Diversion Channel. The purpose, and therefore, the detailed features, of the Panda Diversion Channel is to provide a permanent stream channel containing instream habitat for all life stages of relevant fish species, and as part of a habitat compensation agreement for a *Fisheries Act* authorization for the Ekati Mine. This is fundamentally different than the purpose of the Sub-Basin B Diversion Channel. Additionally, the physical setting, streamflow volumes, and risks are substantively different between the two diversion channels.

As described in Section 3.5.3.2 of the Developer's Assessment Report, the Sub-Basin B Diversion Channel is a temporary structure designed to minimize the amount of natural runoff to be managed within the diked area. The proposed Sub-Basin B Diversion Channel will be constructed to divert inflow from a small drainage area to the west of Lac du Sauvage (Christine Lake outflow). Surface runoff will be intercepted as it drains towards the dewatered area, and diverted to the south of the Project site into the main basin of Lac du Sauvage. The diversion channel is anticipated to be approximately 1.3 kilometres long, with a base width and depth of 1.5 metres (m).

The 1-in-100 year return period rainfall on snowpack flood event represents a design criteria commonly used for diversions at mines in the northern Canada. A design flow with a 1-in-100-year return period, plus a minimum 0.3 m of freeboard, was used to design the Sub-Basin B Diversion Channel. This design is considered appropriate to mitigate the risk of pit flooding during extreme seasonal peaks. The design concept for the channel is that it will be lined with riprap underlain by a layer of non-woven geotextile.

Information Request Number: DAR-MVEIRB-IR-19

Source: MVEIRB Information Requests: Chuck Hubert

Subject: Closure of the Jay Pit

DAR Section(s): Closure Plan

Preamble (MVEIRB):

The current closure plan is to breach the dike and re-integrate the Jay pit lake into Lac du Sauvage.

Request (MVEIRB):

Please describe the pros and cons of not reconnecting the diked area of the Jay pit to Lac du Sauvage.

Response:

Reconnection of the diked area to Lac du Sauvage is the best and designated closure approach. This is consistent with the closure approach that has been accepted for other similar projects, such as the dikes associated with the A418, A154, and A21 pits at the Diavik Mine, and the Bay-Goose Dike at the Meadowbank Mine. Table 19-1 has been prepared to present pros and cons of reconnecting the diked area with Lac du Sauvage, following the completion of mining.

Table 19-1 Advantages (Pros) and Disadvantages (Cons) of Reconnection of the Diked Area to Lac de Sauvage

Item	Reconnection of the Diked Area with Lac du Sauvage	
	Advantages (Pros)	**Disadvantages (Cons)**
Long term dike stability	**PRO -** Water level inside and outside of the dike will be equal which will result in no hydraulic gradient across the dike and the dike is, therefore, in a more stable closure configuration.	**CON -** At a minimum, a spillway would be required to allow excess water in the diked area to flow out into Lac du Sauvage, to prevent overtopping. This would require water levels inside the diked area to be higher and result in a hydraulic gradient across the dike and a small decrease in overall long term stability.
Water quality in diked area	**PRO -** Water circulation with the main basin can be achieved to maintain water quality similar to Lac du Sauvage to support re-establishment of aquatic species.	**CON -** With no lake circulation, and longer residence time (i.e., no natural inlet or outlet to refresh the water), water quality within the diked area could degrade over time.
Water Quality in Lac du Sauvage	**PRO -** Water from the closure landscape would safely mix with water from Lac du Sauvage; water quality modelling indicates this will not result in any residual adverse effects and that this option is sustainable in the long-term.	**CON -** Water from the open pit mine footprint post-closure would be isolated from Lac du Sauvage and may degrade over time due to lack of inflows and circulation; this could result in the overflow of degraded water into Lac du Sauvage, through the spillway.
Reclamation	**PRO -** Re-establishment of water levels in Lac du Sauvage and flows at the Lac du Sauvage Narrows.	**CON -** Not re-establishing a connection results in a permanent loss of this watershed area of Lac du Sauvage with a small decrease to baseline conditions.

Table 19-1 Advantages (Pros) and Disadvantages (Cons) of Reconnection of the Diked Area to Lac de Sauvage

Item	Reconnection of the Diked Area with Lac du Sauvage	
	Advantages (Pros)	**Disadvantages (Cons)**
Turbidity	**NEUTRAL -** During breach construction, silt curtains will be used to minimize area affected.	**NEUTRAL –** During construction of a spillway, silt curtains will be used to minimize area affected.
Fish Habitat	**PRO –** Fish habitat area within Lac du Sauvage will be restored close to baseline conditions and upstream spawning habitats in Streams B1 and Ac35 will be reconnected with natural channels.	**CON –** The diked area would be permanently lost for fish habitat, and connectivity to upstream spawning habitats would need to be maintained using a permanent diversion channel.

The advantages of reconnection of the diked area outweigh advantages of not reconnecting the diked area with Lac du Sauvage. Reconnection is considered the best closure option for the Jay Project.

Information Request Number: DAR-MVEIRB-IR-20

Source: MVEIRB Information Requests from Chuck Hubert

Subject: Hydrogeology - Secondary Pathways

DAR Section(s): 8.4.2.4.2 (Page 8-184)

Preamble (MVEIRB):

With respect to potential changes to groundwater discharges to lakes nearby to the open pit, it is concluded that there may be effects to Lake C1 but that: "Early monitoring during initial stages of Jay pit dewatering will allow refinement of the extent of the enhanced permeability zone, and if necessary, the implementation of mitigation for changes in groundwater discharge from Lake C1".

Request (MVEIRB):

What kind of mitigation could be implemented in this case?

Response:

The lateral extent of the enhanced permeability zone (EPZ) east of the Jay pipe is uncertain and in reality may not pass through Lake C1. Moreover, the transmissive properties of the EPZs (i.e., the permeability and/or the width) may decrease with distance from the Jay pipe. Conceptually, the genesis of a kimberlite pipe would indicate that the greatest disturbance to the rock mass through fracturing would be near to the kimberlite pipe and that this disturbance would reduce with distance away from the pipe and with depth. Similarly, the width and permeability of the EPZ would be greatest near to the kimberlite pipe and that this would be diminish with distance away from the pipe and with depth. The hydrogeological model (Appendix 8A of the Developer's Assessment Report [DAR]) conservatively assumes that the EPZ passes through Lake C1 and that EPZ permeability and width does not change with distance from the pipe (both assumptions result in predicted mine inflow and predicted effects to the lake that are conservatively high). With these conservative assumptions in place, the resulting potential effect on Lake C1 is anticipated to be limited to small changes in water level, with monthly mean stages of water levels during the open water season (June to September) being expected to change by less 0.04 m during mining (DAR Section 8.5.2.3). Therefore, there is limited potential for these water level changes to affect water quality and sediment quality (DAR Section 8.4.2.4.2, Page 8-205) and effects to fish habitat are expected to be negligible (DAR Section 9.3.2.2, Page 9-146). Lake C1 is a relatively deep lake (23.5 m in maximum depth) with populations of Round Whitefish, Lake Trout, Arctic Grayling, and Slimy Sculpin; habitat connectivity between Lac du Sauvage and Lake C1 is maintained by Stream C1 (DAR Section 9.2). Once again, these predictions in water level changes are based on conservative assumptions of the location of the EPZ (DAR Section 8.4.2.4.2; Appendix 8A).

Despite the expectation of only a small water level change in Lake C1 during mining, water levels and outlet discharge will be monitored to track the hydrological conditions at Lake C1 as part of the environmental monitoring programs (DAR Section 8.8.2, Page 8-456). These data will be compared to the effects predictions for lake water levels, discharges, and basin connectivity for Lake C1, and thus provide a mechanism to identify unanticipated effects if they occur. If changes are identified that indicate a trend

that exceeds DAR expectations, the data will be used inform the implementation of adaptive management plans. In the unlikely event that observations collected in the early stages of mining indicate that the EPZ near the Jay pipe does affect lake levels or outlet water flow in Lake C1 such that fish populations in Lake C1 may be adversely affected, then mitigation could be considered if necessary under the adaptive management framework. The need for, and extent of any, mitigation would be discussed with Fisheries and Oceans Canada as part of the monitoring and adaptive management framework.

DOMINION DIAMOND

Information Request Number: DAR-MVEIRB-IR-21

Source: MVEIRB Information Requests from Chuck Hubert

Subject: Water Quality Modelling Methods

DAR Section(s): 8.5.3.3.4 (Page 8-184)

Preamble (MVEIRB):

Table 8.5-4 shows a water transfer of over 20 million m^3/year in 2017.

Request (MVEIRB):

What event is this transfer related to? If it is the back flooding of the open pits at DDMI, this is confusing since other places in the DAR assume that event doesn't take place until 2019. Please explain.

Response:

Section 8.5.3.3.2 of the Developer's Assessment Report (DAR) provides an assessment of the Ekati and Diavik Mine operations and closure activities potentially overlapping with the Jay Project, including the back-flooding of pits. As described in this section, effects to surface hydrology within the Lac de Gras basin are based on information provided in the Diavik Mine Environmental Assessment (DDMI 1998). As the Environmental Assessment was based on three pits (A154, A418, and A21) being part of the Diavik Mine, the water transfers associated with Diavik Mine in Table 8.5-4 also account for the A21 pit back-flooding volumes (in year 2017).

The timing of the Diavik pit back-flooding events has changed since the 1998 reference document was developed. The actual timeframe for back-flooding the A21 pit from Lac de Gras is likely to be immediately following the end of mining operations, currently scheduled for 2023 (Rio Tinto 2014). However, the range of maximum effects to hydrology within Lac de Gras (DAR Section 8.5.3.3.5) remains valid because Diavik pit back-flooding woud not occur concurrently with Jay and Misery pit back-flooding, which takes place from 2030 to 2033.

References:

DDMI (Diavik Diamond Mines Inc.). 1998. Diavik Diamonds Project Environmental Assessment – Environmental Effects Report on Fish and Water Quality. Diavik CD-ROM series, second edition. Yellowknife, NWT, Canada.

Rio Tinto. 2014. Diavik Diamond Mine – development of the A21 pipe. November 27, 2014. http://www.riotinto.com/media/media-releases-237_13678.aspx.

DOMINION DIAMOND

Information Request Number: DAR-MVEIRB-IR-22

Source: MVEIRB Information Requests from Chuck Hubert

Subject: Hydrogeology Baseline Report

DAR Section(s): Annex IX (Section 1.3)

Preamble (MVEIRB):

Section 1.3 describes the baseline study area for hydrogeology but does not rationalize how the area was chosen or provide any references.

Request (MVEIRB):

Please describe how the boundaries for the BSA for hydrogeology was chosen or provide a reference to another part of the DAR.

Response:

A description of the baseline study area (BSA) for hydrogeology is provided in Section 1.3 of the Hydrogeology Baseline Report (Annex IX of the Developer's Assessment Report [DAR]). The extent of the BSA for hydrogeology was selected such that it encompassed the area where groundwater might be affected by the Jay Project (Project) activities, and a buffer zone where these activities were not expected to have any effect. This was accomplished early in the study by conducting analytical calculations and model simulation trials to establish the maximum extent of the drawdown cone that could be created during mine dewatering. Because the Jay open pit will be surrounded on three sides by Lac du Sauvage, the drawdown cone is not expected to extend over large distances due to recharge from this lake that would mitigate potential decreases in hydraulic heads in the underlying bedrock. Nevertheless, the BSA was extended well beyond the anticipated drawdown cone: approximately 7.5 kilometres (km) south of the Jay pipe to encompass a portion of Lac de Gras,10 km east to include the eastern arm of Lac du Sauvage, 11 km north to include a portion of Duchess Lake, and 10 km west to include a number of smaller waterbodies, and a portion of Paul Lake.

Figure 8A3-8 in Appendix 8A of the DAR presents the extent of the predicted drawdown at the end of mining, when the Jay open pit is at its ultimate extent and the extent of the drawdown cone is near its maximum. The 1 metre drawdown contour encompass an area where some changes in groundwater flow conditions could be expected. The footprint of this area is entirely within the BSA and shows that BSA is of sufficient extent to include all groundwater affected by Project activities.

DOMINION DIAMOND

Information Request Number:	DAR-MVEIRB-IR-23
Source:	MVEIRB Information Requests from Chuck Hubert
Subject:	Water Quality in Lac du Sauvage and Lac de Gras during Operations and Post-Closure
DAR Section(s):	8

Preamble (MVEIRB):

The first screening criteria for constituents with benchmarks is listed as: "If concentrations under existing conditions (pre-Project) and modelled concentrations were above guidelines or benchmarks, but modelled concentrations were less than or equal to 10% higher than the maximum existing condition concentrations, the constituent was excluded from further review".

Request (MVEIRB):

Based on the way Dominion has chosen to define the Base Case (i.e., on existing conditions instead of Reference or pre-development conditions), this screening criteria automatically cuts out constituents that have exceeded guidelines because of pollution from existing developments. This essentially eliminates issues of true cumulative effects from the Reference condition. Please verify if any constituents eliminated from further review at this step were actually below benchmarks prior to any industrial developments in the region.

Response:

No constituents were eliminated from the screening step. All modelled results were screened as per the assessment process detailed in the Developer's Assessment Report (DAR) in Section 8.5.4.2.2 and in the Jay Project (Project) Adequacy Review response DAR-MVEIRB-17. In the assessment for the DAR and in the adequacy review response, all modelled results for Lac de Gras were compared to available Reference Condition data, and to available 2014 Baseline Condition data. For purposes of the cumulative effects assessment in Lac de Gras, the Base Case was divided into the Reference Condition (pre-2000, no mine discharge) and the 2014 Baseline Condition (2010 to 2014). The Reference Condition was defined as the environmental condition prior to any discharge from the Long Lake Containment Facility and change to water quality within Lac de Gras; the 2014 Baseline Condition was defined as conditions from all previous and existing developments before the Project (i.e., the environmental condition with the existing Ekati and Diavik mines).

For Lac de Gras, there is a discernible Reference Condition and 2014 Baseline Condition for water quality under the Base Case. Based on the annual Aquatic Effects Monitoring Program studies conducted in Lac de Gras for the Ekati Mine (ERM Rescan 2014) and the Diavik Mine (DDMI 2014), there is evidence of change in water quality in Lac de Gras from the Reference Condition as a result of mining activities. For Lac de Gras, water quality data collected prior to 2000 (DDMI 2001) were used to describe the Reference Condition (i.e., pre-Ekati discharge and pre-Diavik Mine), while data collected from 2010 to 2012 (DDMI 2011, 2012, 2013; ERM Rescan 2013; Rescan 2011, 2012) were used to describe the 2014 Baseline Condition. Although data are available prior to 2010, the most recent data were used to reduce the

variability in analytical detection limits in the dataset that changed over time. Even with this approach, detection limits still varied and for some metal constituents, most reported data were less than the detection limit. A high number of non-detectable values can influence the interpretation of results.

As stated in the DAR (Section 8.5.4.1.2), modelled constituent concentrations were evaluated against screening thresholds following a general multi-step data process to identify constituents that required further review or investigation. One of the steps in the process was:

> "If concentrations under existing conditions (pre-Project) (i.e., 2014 Baseline Conditions) and modelled concentrations were above guidelines or benchmarks, but modelled concentrations were less than or equal to 10% higher than the maximum existing condition concentrations, the constituent was excluded from further review."

The information request asks whether if an additional step was added, would a different list of constituents have been retained, and thus, would this have changed the outcome of the DAR? The additional step in the process could be as follows:

> "If modelled concentrations were less than or equal to 10% higher than concentrations under existing conditions (pre-Project) (i.e., 2014 Baseline Conditions), and higher than guidelines or benchmarks, and modelled concentrations were greater than 10% of the *Reference* Condition, the constituent would be retained for further review",

To address this question, maximum predicted constituent concentrations through each of the Project phases were compared to the reference condition data for Lac de Gras (Table 8.2-50 in Section 8.2.5.2.2 of the DAR). Modelled constituent concentrations that were predicted to be more than 10% higher than the Reference Condition concentrations included ammonia, aluminum, and arsenic. These constituents were identified in the DAR and Jay Project (Project) Adequacy Review response DAR-MVEIRB-17 as having maximum modelled concentrations higher than the 75th percentile Reference Condition concentration and were discussed further. In the DAR, nickel was also identified as being modelled higher than Reference Condition concentrations; however, the updated modelling (Golder 2015) as presented in the response to adequacy review DAR-MVEIRB-17 resulted in nickel remaining within the Reference Condition concentration range.

As a result of this additional screening step, the findings of the DAR, with respect to water quality, do not change.

References

DDMI (Diavik Dominion Mines Inc.) 2001. Diavik Dominion Mine 2000 Aquatic Effects Monitoring Program. Technical Report. March 2001.

DDMI 2011. Diavik Diamond Mine Aquatic Effects Monitoring Program 2010 Annual Report. Submitted to Wek'èezhìi Land and Water Board. Yellowknife, NWT, Canada.

DDMI. 2012. Diavik Diamond Mine Aquatic Effects Monitoring Program 2011 Annual Report. Submitted to Wek'èezhìi Land and Water Board. Yellowknife, NWT, Canada.

DDMI. 2013. Diavik Diamond Mine Aquatic Effects Monitoring Program 2012 Annual Report. Submitted to Wek'èezhìi Land and Water Board. Yellowknife, NWT, Canada.

DDMI. 2014. Diavik Diamond Mine Aquatic Effects Monitoring Program 2013 Annual Report. DRAFT. Submitted to Wek'èezhìi Land and Water Board. Yellowknife, NWT, Canada.

ERM Rescan (ERM Rescan Environmental Services Ltd.). 2013. Ekati Diamond Mine 2012 Aquatic Effects Monitoring Program Annual Report. Prepared for BHP Billiton Canada Inc. Yellowknife, NWT, Canada.

ERM Rescan. 2014. Ekati Diamond Mine 2013 Aquatic Effects Monitoring Program Annual Report. Prepared for Dominion Diamond Ekati Corporation. Yellowknife, NWT, Canada.

Golder (Golder Associates Ltd.). 2015. Jay Project – Lac de Gras Hydrodynamic Model Updates. Technical Memorandum. Prepared by Golder Associates Ltd. For Dominion Diamond. January 2015.

Rescan (Rescan Environmental Services Ltd.). 2011. Ekati Diamond Mine 2010 Aquatic Effects Monitoring Program Annual Report. Prepared for BHP Billiton Canada Inc. Yellowknife, NWT, Canada.

Rescan. 2012. Ekati Diamond Mine 2011 Aquatic Effects Monitoring Program Annual Report. Prepared for BHP Billiton Canada Inc. Yellowknife, NWT, Canada.

DOMINION DIAMOND

Information Request Number:	DAR-MVEIRB-IR-24
Source:	MVEIRB Information Requests from Chuck Hubert
Subject:	Potential Pathways for Effects on Hydrogeology, Surface Water, and Surface Water Quality
DAR Section(s):	8 (Table 8.4-1, Page 8-164)

Preamble (MVEIRB):

Under the Project Activity of "Post closure reconnection of the back flooded diked area…", one of the effects pathway to water quality is described as "Closure of the Panda and Koala pits may cause a change to water quality."

Request (MVEIRB):

Please explain how the pit closures could affect water quality and in which water body that effect is expected.

Response:

Dominion Diamond proposes to process kimberlite mined from the Jay Project (the Project) at the existing plant site, located at the Ekati Mine operations, and store fine processed kimberlite (FPK) from the Jay Pit in the mined-out Panda and Koala pits and underground workings. This approach is described in the approved Ekati Mine Wastewater and Processed Kimberlite Management Plan (Dominion Diamond 2013) as a preferred future approach should mining extend beyond the current 2019 mine schedule and the completion of underground mining in the Koala kimberlite pipe. The Panda and Koala pits are within the Koala watershed; this watershed drains to Slipper Bay of Lac de Gras through a series of small interconnected lakes and streams (Slipper Lake is the last lake in the series).

The influence of the closure of the Panda and Koala pits at the Ekati Mine was accounted for in the Lac de Gras hydrodynamic water quality model (Appendix 8F of the Developer's Assessment Report [DAR]) and the water quality projections presented in the DAR. ERM Rescan previously developed a water quality model for the Koala watershed to support Ekati permitting activities and to estimate the influence of the Ekati operations on Slipper Lake water quality and flows (Rescan 2012). This model was updated for the Project to reflect changes to flows and water quality through Jay operations and post-closure (ERM Rescan 2014).

During the initial (approximately) five years of the Jay Project operations, the FPK slurry from the Jay Pit will be directed to and contained within the mined-out Panda and Koala pits, during which time, there will be no pumped outflow from the pits and only natural runoff and minor minewater inflows will pass through the Long Lake Containment Facility (LLCF) for discharge into the Koala watershed. When the water level in the Panda and Koala pits has risen to a pre-defined operating range that provides adequate operational freeboard, excess minewater will be pumped to the LLCF, where it will contribute to outflow to the Koala watershed. The downstream receiving environment will be protected by effluent quality criteria in the Ekati Mine Water Licence to regulate the water quality of the discharge from the LLCF.

For closure, the in-pit water level will be reduced to 30 metres (m) below overflow, if necessary, and a 30 m 'cap' of freshwater will be pumped in. This back-flooding is expected to take four years, during which time, water quality monitoring will be regularly conducted. When water quality monitoring in the back-flooded pits indicates closure criteria have been achieved, the Panda/Koala pit lakes will be reconnected to the Koala watershed, and they will flow into Kodiak Lake. The downstream receiving environment will remain protected in the post-closure by pre-determined water quality criteria governing pit lake outflow to the natural receiving environment. This approach is analogous to the current approved use of the Beartooth pit for FPK deposition with a 30 m freshwater 'cap' for closure. Post-closure water quality in the Beartooth pit lake has been modelled (ERM Rescan 2013), as part of the Interim Closure and Reclamation Plan, with acceptable results; similar results are anticipated for the Panda/Koala pit lake.

References:

Dominion Diamond (Dominion Diamond Ekati Corporation) 2013. Wastewater and Processed Kimberlite Management Plan. Version 4.0. November 2013

ERM Rescan (ERM Rescan Environmental Services Ltd.). 2013. Ekati Diamond Mine: Modelling Predictions of Water Quality for Pit Lakes. Prepared for Dominion Diamond Ekati Corporation. Yellowknife, NWT, Canada

ERM Rescan. 2014. Predicted Slipper Lake Outlet Water Quality and Quantity Predictions. Provided via email from Eric J. Denholm (Dominion Diamond) to Michael Herrell (Golder Associates Ltd.) Fw: data request. Thursday, December 4, 2014 6:40 AM

Rescan (Rescan Environmental Services Ltd.). 2012. Ekati Diamond Mine: Water Quality Modeling of the Koala Watershed. Prepared for BHP Billiton Canada Inc. Yellowknife, NWT, Canada.

DOMINION DIAMOND

Information Request Number: DAR-MVEIRB-IR-25

Source: MVEIRB Information Requests from Chuck Hubert

Subject: Water Quality - Methods

DAR Section(s): 8.2.5.1

Preamble (MVEIRB):

In this section, a supplemental program for collecting additional data in 2014 was described. It states that analysis and reporting of these data will be provided in a separate addendum at a later date.

Request (MVEIRB):

Why was additional data collected in 2014, how will this information be incorporated into this environmental assessment, will it affect the effects assessment conclusions and when will the information be submitted?

Response:

Additional water quality and sediment quality data were collected in 2014 to supplement the data set collected in 2013 to better understand the spatial and seasonal variability in the study area. For the 2014 sampling program, samples were collected from Lac du Sauvage, small lakes near the Jay Project (Project) site (e.g., Christine Lake and Lake P5), and Lac de Gras (east bay near the Lac du Sauvage outlet and Slipper Bay downstream of the Slipper Lake outlet).

The design of the 2014 program was developed to build upon information used for the Developer's Assessment Report (DAR) from the historical dataset and the data collected in 2013 applicable to the Project; 2014 provided another year of baseline data collection for Lac du Sauvage. An additional year of baseline data collection focusing on Lac du Sauvage was useful because this lake will be subject to direct effects from the Project, and because this region of the watershed has not been as comprehensively monitored as the watersheds near the Ekati Mine and Diavik Mine operations.

Data from the 2014 program have been reviewed and are similar to the baseline data used in the DAR to characterize the effects study area under existing conditions and that were used as calibration data for the DAR water quality modelling. As such, the additional year of baseline data does not change the conclusions of the DAR. Nevertheless, these data will be, and have been, referenced in addressing post-DAR information requests and technical comments, and modelling updates, and will be used as a reference in the development of future monitoring programs.

The 2014 baseline supplemental report is being finalized and will be posted to the Mackenzie Valley Environmental Impact Review Board site as soon as it is available.

DOMINION DIAMOND

Information Request Number:	DAR-MVEIRB-IR-26
Source:	MVEIRB Information Requests from Chuck Hubert
Subject:	Water Quality in Lac du Sauvage and Lac de Gras during Operations to Post closure
DAR Section(s):	8.5.4.2.2

Preamble (MVEIRB):

The analysis for Lac du Sauvage shows that the maximum predicted concentrations of total phosphorus will be about 0.012 mg/L which is higher than the level of phosphorus corresponding to oligotrophic lakes. However, Dominion concludes the following: "Given the potential for natural variability in TP in Lac du Sauvage of up to 0.018 mg P/L, the CCME (2004) trigger for mesotrophic to meso-eutrophic status was used as the screening value. All predicted TP concentrations are less than this trigger value."

Request (MVEIRB):

The conclusion here contradicts Dominion's earlier characterization of Lac du Sauvage as oligotrophic (see Section 8.2.5.2.1). Is the lake considered oligotrophic or not? Is it common practice to assign a trophic status (and therefore a phosphorus objective) based on a maximum measured value or on a median or mean? If the lake is oligotrophic, then the conclusion that "no COPCs were identified for nutrients" as stated on page 8-357 is not correct.

Response:

In Section 8.2.5.2.1 of the Developer’s Assessment Report (DAR), the characterization of Lac du Sauvage as oligotrophic is made in reference to the median total phosphorus (TP) concentration (0.006 milligrams phosphorus per litre [mg P/L]) under existing conditions (i.e., for data collected from 2004 to 2013) compared to the TP trigger ranges for Canadian lakes and rivers (CCME 2004). As shown in Table 26-1 (extracted from Table 8.2-49 in the DAR), the range of TP concentrations for open-water and under-ice conditions in Lac du Sauvage is 0.0026 to 0.018 mg P/L (n = 234), which broadens the characterization of Lac du Sauvage from ultra-oligotrophic to mesotrophic.

TP concentration data used to characterize water quality, and in particular trophic status, in Lac du Sauvage were collected in 2004, 2006, 2010, 2011, 2012, and 2013 (Table 8.2-49 in the DAR). The summary statistics for TP in Lac du Sauvage, updated with data collected in 2014, are provided below in Table 26-1.

Table 26-1 Base Case Total Phosphorus Concentrations in Lac du Sauvage (2004, 2006, 2010, 2012, 2013, 2014)

Parameter	Unit	Lac du Sauvage							
		Under-Ice				Open-Water			
		Count	Minimum	Median	Maximum	Count	Minimum	Median	Maximum
Total phosphorus	mg P/L	96	0.0034	0.0052	0.0098	171	0.0026	0.0064	0.018

Note: updated from the Developer's Assessment Report.

mg P/L = milligrams phosphorus per litre.

The maximum projected concentration of TP in Lac du Sauvage, presented in Section 8.5.4.2.2 of the DAR (Table 26-2), is 0.012 mg P/L, and is expected to occur in the final year of Misery Pit discharge; the peak median value is 0.0092 mg P/L (Table 26-2). The predicted values are within the natural measured range for the lake. The screening value for TP was set at 0.02 mg P/L to account for the natural measured range in Lac du Sauvage. Predicted TP did not exceed the screening threshold, and thus, the conclusion that TP is not a constituent of potential concern (COPC) is reaffirmed.

Table 26-2 Predicted Total Phosphorus Concentrations in Lac du Sauvage by Project Phase and Assessment Location

Assessment Location	Early Operations (2019 to 2023)			Operations (2024 to 2029)			Closure - Pit Back-Flooding Period (2030 to 2033)			Post-Closure (2034 to 2060)		
	Min	Med	Max	Min	Med	Max	Min	Med	Max	Min	Med	Max
Under-Ice												
LDS-P1	0.0068	0.0072	0.0072	0.0069	0.0092	**0.012**[(a)]	0.0067	0.0079	**0.012**[(a)]	0.0068	0.0074	0.0076
LDS-P2	0.0067	0.0071	0.0073	0.0069	0.009	**0.012**[(a)]	0.0067	0.0079	**0.012**[(a)]	0.0069	0.0073	0.0076
LDS-P3	0.0067	0.0071	0.0073	0.0068	0.0079	**0.011**[(a)]	0.0065	0.0077	**0.011**[(a)]	0.0066	0.0074	0.0077
Open-Water												
LDS-P1	0.0066	0.0067	0.007	0.0064	0.0069	0.0091	0.0064	0.0067	0.0085	0.0065	0.0067	0.0073
LDS-P2	0.0065	0.0067	0.0071	0.0064	0.0068	0.0082	0.0064	0.0066	0.0075	0.0065	0.0067	0.0072
LDS-P3	0.0065	0.0066	0.0069	0.0063	0.0068	0.0077	0.0063	0.0066	0.0072	0.0064	0.0068	0.0072

Note: Units are mg P/L = milligrams per litre as phosphorus.

a) Concentration higher than the CCME (2004) trigger range for Canadian lakes and rivers for transition from oligotrophic to mesotrophic status (0.01 mg P/L).

Min = minimum; Med = medium; Max = maximum

The effects of the increase in nutrients in Lac du Sauvage as a result of the Misery Pit discharge to fish and other aquatic life valued components were assessed in the Fish and Fish Habitat section of the DAR (Section 9). Section 9 concluded that the biomass of phytoplankton, zooplankton, and benthic invertebrates in Lac du Sauvage will likely increase during operations, but a clear, defined change in composition of plankton and benthic invertebrate communities is not expected as a result (Section 9.4.4). Thus, from a fish and fish habitat perspective, the conclusion that TP is not a COPC is also reaffirmed.

Maximum TP concentrations (from depth averaged modelling projections) in Lac du Sauvage by mining phase and assessment location were presented in the DAR (Table 8.5-24 in the DAR). To put these TP

concentration projections into context, minimum, median, and maximum statistics from the DAR modelling results are presented (Table 26-2).

In summary:

- median predicted TP concentrations remain less than the CCME (2004) oligotrophic trigger value concentration for lakes and rivers (0.01 mg P/L) at all assessment locations through all Jay Project (Project) phases.
  - the maximum TP concentration predicted in Lac du Sauvage is 0.012 mg P/L (Table 26-2); this is within the natural measured variability of the lake (Table 26-1), but higher than the oligotrophic trigger value.
- as existing TP concentrations range between oligotrophic and mesotrophic trophic levels, using the mesotrophic trigger value (0.02 mg P/L) as the screening criterion for Lac du Sauvage was appropriate.

The DAR concluded that TP is not a COPC because the Project will not cause a change in the lake outside of the measured range of natural variability, and because a community shift in lower trophic organisms was not anticipated as a result of the predicted TP concentrations.

During the construction, operations, closure, and post-closure phases of the Project, water quality in Lac du Sauvage will be monitored, as well as lower trophic communities. Water quality monitoring will include seasonal sampling for nutrients and dissolved oxygen within Lac du Sauvage.

References:

CCME (Canadian Council of Ministers of the Environment). 2004. Canadian Water Quality Guidelines for the Protection of Aquatic Life: Phosphorus: Canadian Guidance Framework for the Management of Freshwater Systems. In: Canadian Environmental Quality Guidelines, 2004. Publication No. 1299. Winnipeg, MB, Canada. ISBN: 1-896997-34-1.

DOMINION DIAMOND

Information Request Number:	DAR-MVEIRB-IR-27
Source:	MVEIRB Information Requests from Chuck Hubert
Subject:	Mitigation of Effects from Use of Explosives to Water Quality
DAR Section(s):	8.4.2.3.1

Preamble (MVEIRB):

At the Diavik Mine, large volumes of water entering the A154 pit from Dewey's Fault resulted in a high number of very wet explosive boreholes. Despite the use of ANFO explosives, large quantities of ammonia dissolved into the water in the boreholes prior to detonation. This dissolved ammonia was then collected in the mine sump for discharge to the receiving environment. Because of this problem, the concentrations of ammonia in the effluent exceeded predictions and DDMI was forced to seek an amendment to its water licence in order to raise the ammonia EQC. In the end, the WLWB directed DDMI to develop and implement an Ammonia Management Plan that, among other things, included special procedures for blasting in these very wet areas. In summary, the additional water flowing into an open pit can affect not only the quantity of effluent but also the quality because of the problems of excessively wet boreholes.

Request (MVEIRB):

Going forward, it is recommended that Dominion become aware of the additional procedures implemented by DDMI with respect to blasting in excessively wet conditions. If the Enhanced Permeability Zone in the Jay Pipe is larger than currently predicted, then Dominion may want to consider the additional mitigations developed at Diavik.

Response:

As part of the Mine Water Management Plan for the Jay Project (Appendix 3A of the Developer's Assessment Report [DAR]), conservatively high estimates of groundwater inflow volumes, which consider the presence of an enhanced permeability zone (EPZ), into the Jay Pit (Appendix 8A of the DAR) were used in the water quantity and water quality modelling (Section 8 of the DAR). Minewater from the Jay open pit will be pumped to the bottom of the Misery Pit for storage prior to being discharged into Lac du Sauvage through a diffuser. As part of the water quality modelling, the total volume of water pumped from the Jay open pit, including the conservatively high estimate of groundwater inflow, were assigned the median ammonia (5.5 milligrams nitrogen per litre [mg N/L]) and nitrate (22.6 mg N/L) concentrations observed in existing mine sumps at the Ekati Mine. Due to the inherent conservatism built into the water balance, this approach provides a conservative estimate of the ammonia and nitrate load in the water pumped from the Jay Pit to the Misery Pit.

Dominion Diamond has also developed a reasonable estimate case water quality model (Appendix B, Compendium of Supplemental Water Quality Modelling) that uses conservative, but more realistic assumptions, to predict water quality. Comparison of the water quality results from the reasonable estimate case with those from the assessment case upon which the Project environmental assessment is based, demonstrates the level of conservatism incorporated. The assessment case in the DAR used

conservative assumptions about hydrogeological conditions (i.e., Environmental Assessment Conservative Scenario in Appendix 8A), such as, the hydraulic conductivity of Dewey's fault at the Diavik Mine.

One of the strengths of the Jay Project Water Management Plan is the extended timeframe (5 to 6 years of the 10-year operating schedule for the Jay open pit) for collection of site-specific water quality data prior to the need for minewater discharge to the receiving environment. This monitoring timeframe, allows Dominion Diamond to monitor water quality and quantity, observe trends, and compare site conditions to predictions from the modelling. If necessary, Dominion Diamond has time to implement adaptive management plans in the absence of minewater discharge and without risk to the receiving environment.

DOMINION DIAMOND

Information Request Number:	DAR-MVEIRB-IR-28
Source:	MVEIRB Information Requests from Chuck Hubert
Subject:	Water Quality in Lac du Sauvage and Lac de Gras during Operations to Post-closure
DAR Section(s):	8-360

Preamble (MVEIRB):

The second paragraph on this page seems to have incorrect units for the reported peak concentrations for various metals (i.e., written here as mg/L but likely meaning ug/L).

Request (MVEIRB):

Please confirm what the correct units are for each metal.

Response:

The correct units in the second paragraph on page 8-360 should be micrograms per litre (µg/L), and not milligrams per litre (mg/L). The paragraph should read:

> *Maximum concentrations of aluminum, barium, bismuth, cobalt, molybdenum, strontium, and uranium in Lac du Sauvage are predicted to peak in late operations coinciding with the final year of Misery Pit discharge to Lac du Sauvage. To show trends in metals, figures for aluminum, molybdenum, strontium, and uranium are provided (Figure 8.5-86; Figure 8.5-87; Figure 8.5-88; Figure 8.5-89). Peak concentrations of aluminum, barium, bismuth, cobalt, molybdenum, strontium, and uranium are predicted to be 18 µg/L, 0.7 µg/L, 0.006 µg/L, 0.1 µg/L, 0.6 µg/L, 521 µg/L, and 0.6 µg/L higher than maximum measured existing condition data, respectively. In post-closure, steady state concentrations of these metals are expected to be similar or slightly higher than maximum measured concentrations under existing conditions:*

DOMINION DIAMOND

Information Request Number: DAR-MVEIRB-IR-29

Source: MVEIRB Information Requests from Chuck Hubert

Subject: Adequacy of Water Quality Data

DAR Section(s): 8.6.3.1 (Page 8-429)

Preamble (MVEIRB):

One source of uncertainty in the pit water quality data generated by the Site Discharge Model is the possibility that an EPZ may cause a higher than expected loading of ammonia in the pit water as was the case at Diavik. As mentioned earlier, at Diavik the unexpected volumes of water coming into the A154 pit from Dewey's Fault caused the explosives' boreholes to fill with water and much of the ammonia dissolved in the water instead of being consumed by the eventual blast. This was at least one of the factors that resulted in higher than expected ammonia concentrations in the effluent and DDMI was forced to seek an EQC amendment and to implement an Ammonia Management Plan.

Request (MVEIRB):

There isn't really a way to reasonably incorporate the potential for higher ammonia concentrations in the pit sump water because of an EPZ; however, it should be considered as an additional uncertainty in the overall water quality modelling results.

Response:

It is standard practice in modelling future developments to use conservative assumptions in deriving water quality predictions so that projected concentrations are not under-estimated. This was the approach used to develop site discharge water quality projections for the Jay Project (the Project). Several conservative assumptions were used in the site water quality predictions to address uncertainty in the model inputs, and therefore, the projections provided in the Developer’s Assessment Report (DAR) represent a conservative estimate of water quality and it is expected concentrations will be less than predicted during operations.

The conservative predictions carried forward into the DAR are considered to represent the sensitivity requested as part of this information request. The conservatively high estimates of groundwater inflow volumes, which consider the presence of an enhanced permeability zone (EPZ), into the Jay Pit (Appendix 8A of the DAR) were used in the water quantity and water quality modelling (Section 8 of the DAR). As part of the water quality modelling, the total volume of water pumped from the Jay open pit, including the conservatively high estimate of groundwater inflow, were assigned the median ammonia (5.5 milligrams nitrogen per litre [mg N/L]) and nitrate (22.6 mg N/L) concentrations observed in existing mine sumps at the Ekati Mine. Due to the inherent conservatism built into the water balance, this approach provides a conservative estimate of the ammonia and nitrate load in the water pumped from the Jay Pit to the Misery Pit. It is appropriate to assign a high degree of conservatism to one of the model input factors; however, application of conservative assumptions to all model inputs is considered “over-conservative” and can produce meaningless model outputs that would not occur in reality. During the model development stage, it was identified that the discharge water quality is most sensitive to the

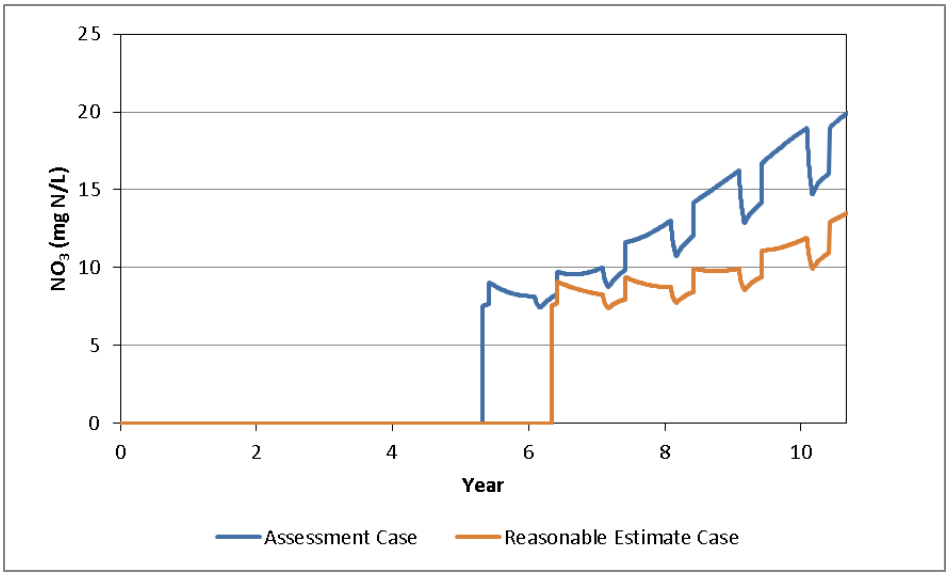
volume of groundwater produced by the Jay Pit. Therefore, as this is the overarching input parameter, as opposed to chemistry, median nitrate and ammonia concentrations were applied to the conservatively high inflows.

To provide a more realistic estimate of Project discharge water quality, Dominion Diamond retained Golder Associates Ltd. to provide water quality projections for a reasonable estimate case that represents a less conservative, but more reasonable estimate of the expected discharge water quality from the Jay Project and the effects of the discharge on Lac du Sauvage and Lac de Gras. The key changes made to the model as part of the reasonable estimate case included:

- reduced groundwater inflows to the Jay pit were estimated and incorporated into the site mass-balance water quality model;
- attenuation of nitrogen species in Jay waste rock storage area (WRSA) drainage during post-closure was included; and,
- average observed discharge concentrations were used to represent the effluent quality from the Diavik Mine to Lac de Gras.

A detailed description of the reasonable estimate case water quality model is provided in the Compendium of Supplemental Water Quality Modelling (Appendix B). In the reasonable estimate case, concentrations of nitrate are projected to be similar to the DAR projections when discharge begins; however, concentrations increase less rapidly during operations and are approximately 1.5 times less than the DAR projections at the end of operations (Figure 29-1). Additionally, with lower projected inflows to the Jay Pit to be managed in the reasonable estimate case, the requirement to discharge surface water from Misery Pit is delayed by a year.

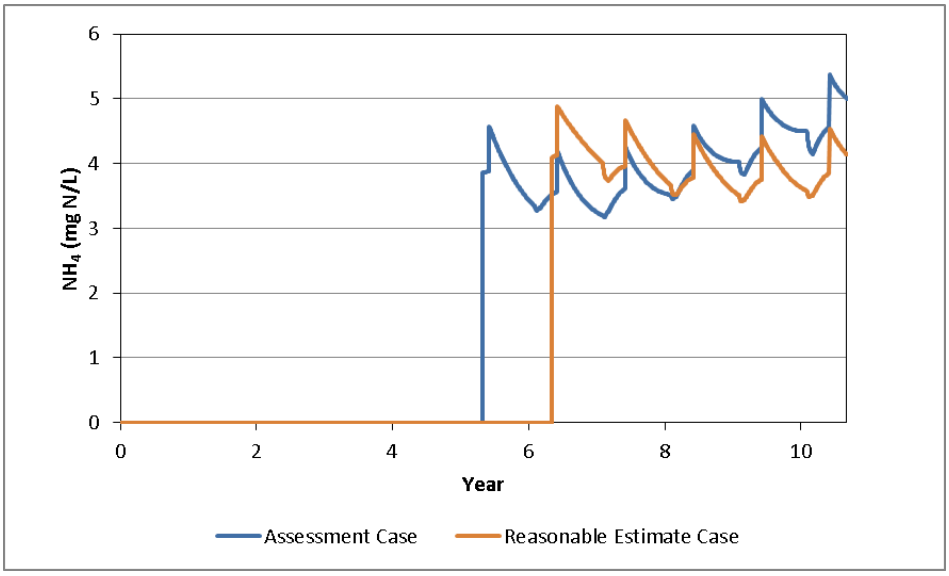
Figure 29-1 Projected Misery Pit Discharge Nitrate Concentrations - Operations



NO_3 = nitrate; mg N/L = milligrams nitrogen per litre.

Ammonium concentrations were projected to be similar in the reasonable estimate case in comparison to the DAR case (Figure 29-2). Water balance modelling indicates the upper layer of water stored in the Misery Pit is primarily composed of water pumped from the diked area in Lac du Sauvage and minewater pumped from the Jay Pit. Projected ammonium concentrations in the diked area, which include runoff from the Jay WRSA, range between are approximately 5.0 and 6.0 mg-N/L, similar to the input source term concentration applied to water pumped from the Jay Pit (i.e. 5.5 mg-N/L). Therefore, without reducing conservatism in the Jay WRSA source term, projected ammonium concentrations are less sensitive to the model updates made as part of the reasonable estimate case.

Figure 29-2 Projected Misery Pit Discharge Ammonium Concentrations - Operations



NH_4 = ammonium; mg N/L = milligrams nitrogen per litre.

It is recognized that water quality modelling is based on several inputs, all of which have inherent variability and uncertainty. Therefore, Dominion Diamond will develop an detailed operational monitoring program to validate water quality model predictions. If actual conditions deviate from predicted concentrations to a degree that represents a significant risk to the receiving environment, adaptive management strategies will be implemented. One of the key advantages of the water management strategy is the majority of the minewater will be managed through the Misery Pit during operations, precluding the need to discharge for the first five or more years of operations. This approach allows sufficient monitoring results to be collected to develop a key understanding of the controls on Misery Pit water quality, facilitating proactive design and implementation of mitigation strategies, should they be required.

DOMINION DIAMOND

Information Request Number: DAR-MVEIRB-IR-30

Source: MVEIRB Information Requests from Chuck Hubert

Subject: Site Discharge Water Quality Modelling Report

DAR Section(s): Appendix 8E

Preamble (MVEIRB):

The model simulates "the expected range of dissolved concentrations for the constituents considered". And yet the final simulated Misery Pit discharge concentrations in Table 8E4.1-1 give predictions for Total Metals.

Request (MVEIRB):

Although there is some rationale given, it still isn't clear why total metal data were not used since this data seems to be available for most or all of the source terms. Please provide additional rationale. Also, please describe how the simulations on dissolved metals were then transformed back into predictions for total metal concentrations as presented in Table 8E4.1-1.

Response:

The site water quality model for the Jay Project (Project) was designed to track the advective transport of dissolved mass from each flow that may potentially influence mine site discharge water quality. Advective transport of total metals was not considered for the following reasons:

- site water will be managed through several site collection/settling ponds and will ultimately be pumped to the Misery Pit during operations, which will settle solids in site water prior to being discharged to Lac du Sauvage (i.e., the water discharged from Misery Pit to Lac du Sauvage is not anticipated to possess greater than 15 milligrams per litre [mg/L] total suspended solids [TSS]); and
- The chemical signature of the suspended particulate matter (SPM) in site drainage from the Jay Project will be influenced by the solid-phase chemistry of the materials mined from the Jay Pit and the proportion of exposure/contact drainage water has with each material on site from its source to the receiving environment. The chemical composition of the exposed mine wastes will contribute particulate to site discharges that is of a different composition than baseline particulate. Therefore, applying observed particulate fractions to future site discharge is not appropriate since the solids composition is site-specific.

Therefore, modelling the advective transport of SPM in the site water quality model is not appropriate in the context of the Jay mine water and mine waste management plans (see Section 3 of the Developer's Assessment Report [DAR]).

As discussed in Section 8E3.8 in Appendix 8E of the DAR, advective transport of dissolved metals was considered in the site water quality model and the following two sources of SPM were directly added to projected dissolved concentrations to estimate total concentrations of each modelled constituent in each discharge:

- Natural particulate material; and
- A theoretical particulate component to account for changes to particulate composition as a result of exposing mine materials in mine site facilities.

Natural particulate concentrations were calculated as the difference between the total and dissolved constituent concentrations associated with the natural runoff source term. Theoretical SPM compositions were calculated according to Equation 30-1:

$$[Particulate_{Constituent}] = TSS \times [Solid - phase_{Constituent}] \qquad \text{[Equation 30-1]}$$

Where: *Particulate*$_{Constituent}$ equals the particulate concentration of a constituent in milligrams-solid per litre (mg-solid/L);

TSS equals the total suspended solids concentration of all of the solid constituents in mg-solid/L; and

Solid-phase$_{Constituent}$ equals the solid phase concentration of a constituent per unit mass of solid (i.e. mg-solid/kg-solid).

A TSS concentration of 15 mg/L (i.e., 15 mg-solid/L) was used to estimate theoretical SPM concentrations from exposed mine waste materials. A value of 15 mg/L was selected since this concentration represents the Metal Mining Effluent Regulation (MMER) maximum authorized monthly mean concentration (SOR/2002-222, Government of Canada 2014); in the absence of an effluent regulation specific to diamond mines, the MMER is often used as the de facto regulation when establishing effluent quality criteria for diamond mines. It is expected that Dominion Diamond Ekati Corporation will not be able to discharge, on average over the period of a month, water that contains TSS concentrations greater than 15 mg/L.

Solid-phase concentrations of each constituent were based on median solid-phase concentrations for each lithological unit (see Geochemistry Baseline, Annex VIII of the DAR) identified within the Project area. Median solid-phase concentrations were prorated based on the relative proportion of each lithological unit that is expected to influence the solid-phase composition of each discharge through contact (e.g., natural runoff, pit wall runoff). Relative proportions for each Project discharge source are provided in Section 8E3.8 of the DAR.

The natural and theoretical SPM source terms were directly added to the projected dissolved constituent concentrations to estimate total constituent concentrations in Project discharges from the following sources:

- Misery Pit to Lac du Sauvage during operations;
- Misery Pit to Lac de Gras during post-closure; and,
- Jay Waste Rock Storage Area to Lac du Sauvage during post-closure.

The SPM concentrations were assumed to be constant to conservatively estimate total constituent concentrations in each discharge (i.e., settling of TSS was not further considered). In the Lac du Sauvage and Lac de Gras lake water quality models, total constituent concentrations were mixed conservatively

with natural runoff and other discharge sources (e.g., Diavik and Ekati) to estimate total constituent concentrations in the lake. Details of this modelling are provided in Appendix 8F of the DAR.

References:

Government of Canada 2014. Metal Mining Effluent Regulation. SOR/2002-222. Current to February 16, 2015. Last amended on March 2, 2012. Published by the Minister of Justice at the following address: http://laws-lois.justice.gc.ca.

DOMINION DIAMOND

Information Request Number: DAR-MVEIRB-IR-31

Source: MVEIRB Information Requests from Chuck Hubert

Subject: Water Management, Operations Phase

DAR Section(s): Appendix 8E

Preamble (MVEIRB):

During operations, water will be collected near the Jay Pit in a sump, high TDS water will be directed to the bottom of the Misery Pit, and water will be discharged from Misery Pit to Lac du Sauvage. What are the physical controls in place to ensure this will occur?

Request (MVEIRB):

Please describe if there will be a valve that controls when high TDS water is released to the different strata within the Misery Pit and for release of water from the Misery Pit to Lac du Sauvage. Also, is there a contingency if the water in the Misery Pit is unsuitable for discharge and Misery is near capacity?.

Response:

Water transfers from the Jay Pit to the Misery Pit and then back to Lac du Sauvage will rely on active systems (i.e., pumping and pipelines), which will physically control water movement.

There will be two separate pipelines and pumping systems that transfer water from the Jay Pit area to the Misery Pit. The high total dissolved solids (TDS) water, which originates from groundwater that inflows into the Jay Pit, will be collected in sumps within the Jay Pit during operation. The location and number of the operational sumps within the Jay Pit will change over time as the pit is developed. Water will be pumped to the mine inflow sump, which is to be located in a natural depression adjacent to the pit and within the dewatered lakebed, downstream of the Jay Dike. The pumping system in the mine inflow sump will typically be operated to maintain low levels within the sump. Contingency storage capacity in the sump has been included in the design, and is described within the Mine Water Management Plan (Appendix 3A of the Developer's Assessment Report [DAR], Section 4.6). The pipeline used to transfer water from the mine inflow sump to Misery Pit will terminate approximately 10 metres (m) above the base of the Misery Pit. The diameter of the ultimate 10 m of the pipe will be increased, to reduce the velocity of the discharge water to reduce disturbance to any stratification of the high TDS water that already exists within the pit, due to ongoing water injection.

A separate pipeline, pumping system, and sump referred to as the Jay runoff sump will be utilized to collect runoff and precipitation water that flows into the diked area. Water collected in this sump will be pumped through a pipeline that discharges near the crest of the Misery Pit.

Once water levels within Misery Pit are within 10 m of the crest of the pit, and providing water quality is suitable for discharge, a separate pipeline and pumping system (barge) will be used to remove water from the upper portion of the Misery Pit and transfer it back to Lac du Sauvage, where it will be injected into the lake through a diffuser.

If water quality monitoring within the Misery Pit indicates conditions differ from the DAR predictions and represent a potential risk to the receiving environment, Dominion Diamond will implement adaptive management strategies that may involve improvement or modifications to the minewater management plan or temporary use of the contingencies included in the design of the water management structures (Section 8.3, Appendix 3A of the DAR). Possible adaptive management strategies that are available include the following:

- maintaining a storage contingency allowance in the existing King Pond throughout the construction and operations stage for use as an additional total suspended solids management facility during construction and operations phase, or for short-term emergency minewater storage;
- maintaining the contingency storage in the Misery Pit (approximately 3 million cubic metres) throughout the operations stage for use as emergency minewater storage (upper 10 m of the pit);
- maintaining pumping capacity and a pipeline between the Misery and Lynx pits throughout the operations stage to allow for lowering of the Lynx Pit water level to generate additional contingency minewater storage, if required;
- increasing storage capacity in the Jay runoff sump and mine inflows sump (e.g., constructing containment berms around the sumps) to augment temporary minewater storage capacity within the diked area;
- consideration of direct discharge to the environment from the Jay runoff sump, if water is found to meet established discharge criteria (the discharge locations used during the initial stages of dewatering would be used);
- use of storage capacity available at the Ekati site (e.g., construction of pumping and pipeline system from the Misery site to the Ekati site); and,
- treatment of parameters of concern prior to discharge to Lac du Sauvage.

DOMINION DIAMOND

Information Request Number:	DAR-MVEIRB-IR-32
Source:	MVEIRB Information Requests from Chuck Hubert
Subject:	Water Management
DAR Section(s):	8.3.4

Preamble (MVEIRB):

The plan is to have a 60 m cap of freshwater in the Misery Pit.

Request (MVEIRB):

How was 60 m determined for the freshwater cap in Misery? Is this a function of TDS, time?

Response:

A key component of the Jay Project (the Project) closure water management strategy is to permanently store minewater containing high concentrations of total dissolved solids (TDS) in the Misery Pit under a low TDS concentration freshwater cap. Dominion Diamond proposes to establish meromictic conditions (i.e., generating a pit lake that does not mix) in the Misery Pit at closure by pumping the upper 50 metres [m] of water stored in the Misery Pit at closure to the bottom of the Jay Pit, and then back-flooding the Misery Pit with freshwater pumped from Lac du Sauvage. This process will result in a 60 m freshwater cap overlying the high TDS water stored in the Misery Pit. The difference between the depth of water pumped from Misery Pit (50 m), and the depth of the back-flooding (60 m) is because during operations, Misery Pit is managed with a 10 m freeboard.

The morphology (shape) of the Misery Pit is ideal for the formation of meromictic conditions (i.e., very small surface area relative to deep depth). The successful development of meromictic conditions in the Misery Pit is dependent on a number of factors that will be unique to the Misery Pit, including:

- inflow water quantity post closure;
- inflow water quality post closure (including the effects of runoff over exposed pit walls);
- density gradient (i.e. TDS in the upper and lower layers of the pit);
- temperature gradient, and,
- pit hydrodynamics.

The above factors are site-specific and will be unique to the Misery Pit. While the development of meromictic conditions is projected to occur in Misery Pit, the site-specific factors in other pits at Ekati may not be ideal for developing and sustaining meromictic conditions. Therefore, other pits at the Ekati site do not necessarily represent analogues for the Misery Pit.

A hydrodynamic model (Appendix 8G of the DAR) was developed for the Misery Pit that conservatively considered the above influences on pit lake stratification (i.e., water column layering typically associated

with water density gradients). In the hydrodynamic model, several different freshwater cap depths were evaluated to determine the optimal elevation of the freshwater cap in the Misery Pit that would conservatively be required to develop and sustain meromictic conditions in the pit over a 200-year modelling period. The optimal depth of the freshwater cap was identified as the model scenario that would satisfy the following two objectives:

- establish and sustain meromictic conditions in the Misery Pit (i.e., maintain freshwater TDS concentrations in the upper layer of the pit over the model interval);
- minimize the volume of minewater that is to be pumped to the bottom of Jay Pit during closure; and,
- minimize the volume of water to be pumped from Lac du Sauvage to Misery Pit.

Model sensitivities were evaluated at 10 m intervals for freshwater cap depths between 20 and 100 m from the surface elevation of the pit lake. Based on this analysis, the 60 m freshwater cap was identified as the optimal depth required to achieve the above objectives, based on the conservative starting assumptions. Hydrodynamic modelling (Appendix 8G) indicates that meromictic conditions will develop in the Misery Pit and remain stable in the long-term if a 60 m freshwater cap is developed above minewater containing high concentrations of TDS. This is a conceptual estimate for project planning purposes that demonstrates the viability of the minewater management plan. The optimal depth of water cover would be subject to further study and refinement prior to closure of the Misery Pit as part of the Ekati Mine reclamation research program.

DOMINION DIAMOND

Information Request Number:	DAR-MVEIRB-IR-33
Source:	MVEIRB Information Requests from Chuck Hubert
Subject:	Mitigation of Effect on Water Quantity After Pit Back-Flooding
DAR Section(s):	8.4.2.2.5

Preamble (MVEIRB):

On pg 8-150 Dominion states that 87.1 million m^3 needs to be managed via the Misery Pit; however, this total doesn't appear to match the values provided in Table 3.5-3 which estimates a total of approximately 78 million m^3 to be managed throughout the Misery Pit.

Request (MVEIRB):

Please explain the discrepancy in the estimates.

Response:

Table 3.5-3 in Section 3 of the Developer's Assessment Report (DAR) summarizes the primary pumped, inflow and outflow volumes to Misery Pit while stripping and ore extraction occurs (i.e., operations only, does not include the full dewatering period) of the Jay Project (Project). Non-pumped, Misery Pit inflow and outflow volumes, such as runoff entering the pit, direct precipitation and evaporation were not included in the values shown in this table.

The values reported in Table 3.5-3 are based on the water balance modelling, which includes conservative assumptions as to the amount of groundwater that will inflow into the Jay Pit; during the operations phase (Year 1 to Year 10), the total estimated volume of water pumped into the Misery Pit is 73 million cubic metres (m^3). The total volume of water pumped into the Misery Pit (dewatering/stripping/ operation) is estimated to be 81.5 million m^3. The total volume pumped to Misery Pit during dewatering and stripping is about 8.7 million m^3. The total volume of water pumped out of Misery Pit, during operations, and discharged through the diffuser into Lac du Sauvage is estimated to be 44.6 million m^3.

In Appendix 3A (Mine Water Management Plan) of the DAR, Table 6-1 presents annual Misery Pit inflow and outflow volumes from the water balance model. Values are reported for three phases: dewatering/ stripping; operations (Year 1 through Year 10); and closure (Year 11 through Year 14). Inflow volumes into the Misery Pit, include water from:

- runoff from the catchment surrounding the Misery Pit which enters the pit and direct precipitation (continuously);
- Jay Pit minewater sump that is pumped to the base of Misery Pit, during stripping and operations;
- Jay Pit runoff sump that is pumped to the top of Misery Pit, during dewatering/stripping and operations;
- Lac du Sauvage that is pumped to the top of Misery Pit during closure; and,
- ice melt (annually that is offset by the a similar loss volume as ice freeze).

Outflow volumes from the Misery Pit, include water losses associated with:

- evaporation (continuously);
- pumped from the top of Misery Pit and discharged it into Lac du Sauvage through the diffuser, during operations (Year 5 through Year 10);
- natural overflow to Lac de Gras during closure (Year 12 onward);
- pumped to Jay Pit during closure (Year 11); and,
- ice accumulation (annually, offset by ice melt).

The value of 87.1 million m^3 provided in Section 8 of the DAR (page 8-150) included ice melt accumulation (modelled as inflow to Misery Pit) without subtracting the ice formation volumes (modelled as outflows of Misery Pit). As shown in Table 6-1 of Section 3A of the DAR, ice formation and ice melt accumulation are equal throughout the mine life. The estimated total volume of water that inflows (pumped, runoff, precipitation) into the Misery Pit during the 10 years of operation is 83.4 million m^3.

The text on page 8-150 of the DAR, could be confusing, as the value of 87.1 million m^3 does not represent total volume of water managed through the Misery Pit, through the Jay mine life. Table 6-1 of Appendix 3A provides more clarity on the overall water management volumes during dewatering/stripping, operations, and closure.

DOMINION DIAMOND

Information Request Number: DAR-MVEIRB-IR-34

Source: MVEIRB Information Requests from Chuck Hubert

Subject: Misery Pit flooding

DAR Section(s): 3.5.1.4

Preamble (MVEIRB):

The Misery Pit will be backflooded with water from the Jay Pit.

Request (MVEIRB):

Would flooding the Misery Pit potentially mobilize contaminants on the pit wall? If yes, is this accounted for in the water quality predictions? If not, what are the predictions for inflows from the Misery pit groundwater?

Response:

Flushing of the Misery Pit walls is expected to only mobilize readily soluble oxidation products produced from weathering of exposed wall rock. This process was accounted for in the site water quality model; details of the site water quality model are presented in Appendix 8E of the Developer's Assessment Report (DAR).

As discussed in Section 8E2.2 of Appendix 8E, each flow that could potentially influence site discharge water quality for the Jay Project (the Project) was identified and assigned a source term chemical profile based on:

- geochemical testing of waste rock materials;
- observed mine site facility drainage at the Ekati Mine operation; and,
- baseline surface and groundwater quality monitoring data.

Mobilization of oxidation products from exposed Misery Pit wall rock was accounted for in the wall rock runoff source term.

Each lithological unit exposed in the Misery Pit wall rock was assigned a freshet and steady-state chemical profile based on humidity cell tests for each lithology. Eleven, three, and nine samples of granite, metasediment, and kimberlite, respectively, were submitted for humidity cell testing. Each cell was run for a period of 17 to 130 weeks. Details of the geochemical testing program are provided in Annex VIII (Geochemistry Baseline) of the DAR. In each lithology, the median concentration observed in the first and last five weeks were selected to represent the freshet and steady-state model inputs, respectively.

During operations, at each timestep, the relative proportion of exposed wall rock units above the pit lake was calculated. The chemistry profile for each lithology (Table 8E3.5-2 of Appendix 8E) during freshet

(June) and steady-state runoff (July to October) were mixed in the relative proportions of exposed wall rock units to represent the quality of the wall rock runoff reporting to the Misery pit lake (the proportion of runoff that comes into contact with the pit wall was determined from the site water balance, which was built into the site water quality model). Additional conservatism was introduced into the model by assigning the wall rock runoff the maximum of the mixed humidity cell constituent concentrations or the waste rock storage area facility drainage chemistry profile (see Section 8E3.4 of the DAR). Wall rock units below the pit lake surface were assumed to be inert (i.e., cannot oxidize) and the wall rock source term was only applied to lithologies exposed in the Misery Pit walls above the surface elevation of the pit lake.

The reader is referred to Section 8E3.5 (Pit Wall Runoff Water Quality) of Appendix 8E of the DAR for additional details on the Misery Pit wall rock source term chemical profile.

DOMINION DIAMOND

Information Request Number:	DAR-MVEIRB-IR-35
Source:	MVEIRB Information Requests: Chuck Hubert
Subject:	Mitigation of Effects from PAG material to water and sediment quality
DAR Section(s):	8.4.2.3.4

Preamble (MVEIRB):

If necessary, the WRSA runoff will be directed to the Misery and/or Lynx Pit. The purpose of the Misery pit is to separate out the salts. It is unclear what the plan is if there are elevated metals concentrations.

Request (MVEIRB):

Please describe the mitigation if there are elevated metals in Misery Pit.

Response:

A comprehensive site water quality model (Appendix 8E of the Developer's Assessment Report [DAR]) was developed for the Jay Project (the Project). The model incorporated all mine water transfers, associated with the Project that have the potential to influence surface water in Lac du Sauvage and Lac de Gras during operations, closure, and post-closure. These inputs include runoff and seepage from the Jay waste rock storage area (WRSA) during operations and closure.

In the site water quality model, the contingency adaptive management plan for the Jay WRSA was modelled. In this scenario, it was assumed that all runoff and seepage from the Jay WRSA would be directed to the Jay sump within the diked off area and subsequently pumped to the surface of the Misery Pit during operations. In the last five years of operations, when excess surface water in the Misery Pit is pumped to Lac du Sauvage, any discharge during that time would include a small proportion of volume sourced from WRSA seepage and runoff. During post-closure, all of the seepage and runoff originating from the Jay WRSA was assumed to report directly to Lac du Sauvage.

The site water quality model incorporated several conservative assumptions so that projected constituent concentrations (including metals) would not be under-estimated. For example, humidity cell testing results of the mine waste material to be stored in the WRSA and empirical data from the operating Misery WRSA were used to characterize the potential runoff and seepage from the Jay WRSA used as an input to the site water quality model (for conservatism, the maximum constituent concentration from the two sources was used as the source term input to the model). The water quality projections carried forward into the DAR, therefore, represent a conservative estimate of the site discharge chemistry and resultant water quality downstream in Lac du Sauvage and Lac de Gras. Under the DAR assessment case, adverse effects to surface water quality in Lac du Sauvage and Lac de Gras as a result of Project activities (including Misery Pit discharge to Lac du Sauvage) are not expected (Section 8.5.4 of the DAR).

A subsequent case using less conservative assumptions that are considered closer to expected average conditions has also been developed since submission of the DAR, i.e., a reasonable estimate case. The results of this analysis are presented in Appendix B, Compendium of Supplemental Water Quality

Modelling, submitted to the Mackenzie Valley Impact Review Board with the Information Request responses. The actual Misery Pit discharge water quality is expected to be closer to the reasonable estimate case included in Appendix B.

It is recognized that water quality modelling is based on several inputs, all of which have inherent uncertainty. Therefore, to validate the water quality predictions included in the DAR, Dominion Diamond Ekati Corporation will develop a robust operational water monitoring plan. The plan will include sampling and analysis of Misery Pit water quality, including metal concentrations, which will commence with mine operations (well in advance of the planned pumping from Misery Pit to Lac du Sauvage). If the monitoring results indicate the actual Misery Pit water quality deviates from DAR projections to a degree that represents a significant risk to the receiving environment, several mitigation strategies are available to address increases in metal concentrations, or other water quality constituents, if required.

Proposed water management mitigations to reduce loads of constituents to the receiving environment for the Project were described in the DAR (e.g., Section 8.4, Section 9.3, Appendix 3A [Mine Water Management Plan]). They include:

- use of the Lynx and Misery pits as containment areas for settling water with elevated levels of total suspend solids generated during dewatering;
- use of Misery Pit during operations for storage of minewater generated during mining of the Jay pipe;
  - For the first five or more operational years, it is estimated that there will be sufficient volume in Misery Pit to store minewater. This is a key water management strategy because it limits the requirement to discharge minewater to the receiving environment to the last five years of open pit development, and therefore, the total volume of minewater that will be released. This storage strategy also allows time to monitor and assess the water quality in the pit, which will be compared to DAR predictions.
- a submerged, engineered diffuser outfall, will be used to release the minewater into Lac du Sauvage. The diffuser will enhance of the dispersion of released minewater and reduce peak plume concentrations; and,
- use of the Misery and Jay pits in closure to store water with elevated concentrations of total dissolved solids (TDS) and other constituents;
  - Meromictic conditions will be generated in the pits by capping the high TDS water in the lower portion of the pit with a 60 metre freshwater cap.

DOMINION DIAMOND

Information Request Number: DAR-MVEIRB-IR-36

Source: MVEIRB Information Requests from Chuck Hubert

Subject: Pathways with No Linkage

DAR Section(s): 8

Preamble (MVEIRB):

The proposed management plan for the WRSA depends on permafrost establishing a barrier between the WSRA water and the deeper groundwater regime. What happens if the permafrost cannot be established?

Request (MVEIRB):

If permafrost is not established, would the runoff from the WRSA be connected to the shallow groundwater regime? Are there studies confirming this methodology has worked with similar materials at Ekati such as the Misery waste rock? If so, please provide the documentation. What are the critical conditions (e.g., critical temperature and duration) needed to ensure permafrost is established in the waste rock pile? What would upset permafrost development and the long term management of the WRSA?

Response:

The Jay Project (Project) waste rock storage area (WRSA) does not need to be frozen to maintain physical stability or for geochemical management; however, a frozen condition within the WRSA is beneficial and will be promoted.

The ground within the footprint and surrounding the proposed Jay WRSA is currently permafrost with only a shallow active layer that thaws annually during the summer and re-freezes during the winter. The Jay WRSA is anticipated to freeze by permafrost aggradation into the pile. Permafrost aggradation into the WRSA can be promoted by placement of a basal layer of granitic rock, and by creating stepped side slopes, which are practices that have evolved from site-specific experience at the Ekati Mine. The 5-m-thick granitic cover will be placed on an ongoing basis on the sides and upper surface of the WRSA rather than waiting until final reclamation.

Recent (2014) thermal modelling for the design of the Pigeon WRSA at the Ekati Mine (Waste Rock and Ore Storage Management Plan [WROMP] Vers. 4.1) was provided to the Wek'èezhìi Land and Water Board (WLWB) as part of the Water Licence requirements for the Pigeon WRSA Design (Dominion Diamond 2014). This thermal modelling is also relevant for the design of the Jay WRSA. The thermal modelling validated that frozen conditions can be maintained within the pile below the 5 m granite cover under a 100-year climate change scenario. The climate change scenario was described as follows (excerpted from Section 4.5 of Tetra Tech EBA 2014):

Global warming was integrated into the model to help predict long-term thermal effects. Environment Canada's 2009 report from Adaptation and Impacts Research Section (AIRS) (Environment Canada 2009) reviewed the most recent modelling assessment for the Arctic. An ensemble approach (multi-model means/medians) was adopted by AIRS reduce the uncertainty associated with any individual model. Model validation over the historical period from 1971 to 2000 was first used to identify those models which best reproduced the mean annual temperature of this period against the National Centre for Environmental Prediction global gridded dataset. Subsequently, only the four best-agreement models were used to produce the final ensemble projections. The four best-ranking models within each sector were then used as an ensemble to produce projections of temperature changes in the 2020s, 2050s, and 2080s for both the A1B (balanced emission emphasis), and A2 (high emission) scenarios. CSA (2010) adopted the climate change projections from Environment Canada (Environment Canada, 2009). A moderate A1B greenhouse gas emission scenario was adopted in the thermal analyses, which represents a reasonably conservative case.

Ekati (64°43`N 110°37`W) is located in Arctic Sector C1 as classified in Environment Canada (Environment Canada, 2009) and CSA (CSA, 2010). The predicted mean temperature changes from 1971 to 2000 baseline under the moderate greenhouse gas emission scenario at the Arctic Sector C1 (CSA, 2010) are presented in Table 4. These rates of the predicted temperature change were applied in the thermal analyses.

Table 4 Predicted Seasonal Air Temperature Changes in Arctic Sector C1 (CSA 2010)

Period	Predicted Seasonal Air Temperature Changes from 1971-2000 Baseline under the Moderate (A1B) Green-house Gas Emission Scenario (°C)			
	Winter	Spring	Summer	Autumn
2011 to 2040	1.9	1	0.8	1.3
2041 to 2070	4.2	2.1	1.8	2.7
2070 to 2100	6.2	2.8	2.4	3.4

Source: Tetra Tech EBA (2014).

Thermistors will be installed in the Jay WRSA to monitor temperatures in the pile foundation and within the pile itself.

Operational mixing of potentially acid generating (PAG) and non-potentially acid generating (non-PAG) mine rock (on top of a basal layer of granite) will mitigate the acid generation potential of PAG rock in the Jay WRSA. Co-deposition of PAG and non-PAG rock during waste rock deposition minimizes the potential for formation of zones of PAG rock with a greater susceptibility for acid generation. Co-deposition of waste rock from the Jay Pit on an "as-mined" basis during operations is possible because of the simultaneous production of both metasediment and granite, with a predominance of granite, throughout the mine life.

According to the guidance in the Mine Environment Neutral Drainage prediction manual (MEND 2009), waste rock with a greater than two times more neutralization potential (NP) than acid potential (AP) is generally regarded to be non-PAG. The mine plan was used to calculate the NP/AP ratio of the waste rock material mined from the Jay Pit on a quarterly basis. The purpose of this evaluation was to confirm

that an NP/AP ratio greater than 2 can be achieved based on the amount of each rock type (metasediment, granite, and overburden) mined each quarter. The results of geochemical testing of samples collected from the Jay Pit were used to complete the calculation: NP/AP values greater than 2 are achieved when PAG rock accounts for less than approximately 40% of the total mine rock volume. An NP/AP ratio of at least 2 was achieved over the life of mine. Completion of the 5 m thick granite cover provides additional, long-term risk mitigation.

At the time of closure of the Jay WRSA, water quality monitoring will have been completed for approximately 10 years at the Jay WRSA and for up to 25 years at the other Ekati Mine WRSAs as part of the WROMP. The results of on-site seepage monitoring will be used to confirm the operational performance of waste rock mixing, and to identify potential issues related to metal leaching from the WRSAs. If water quality of seepage from the Jay WRSA does not meet requirements, adaptive management measures will be taken. Ekati has an adaptive management process in place for the existing WRSAs that is described in Section 7.7 of the WROMP Ver. 4.1. This adaptive management process will also apply to the Jay WRSA.

Water quality monitoring will continue for at least ten years after closure of the Jay Project, until closure objectives are met.

References:

CSA (Canadian Standards Association). 2010. Technical Guide – Infrastructure in Permafrost: A Guideline for Climate Change Adaptation. CSA Reference Number: Plus 4011-10.

Dominion Diamond (Dominion Diamond Ekati Corporation). 2014. Ekati Diamond Mine Waste Rock and Ore Storage Management Plan (WROMP). Version 4.1, May 2014.

Environment Canada. 2009. Arctic Ensemble Scenarios, 2009. Prepared by Adaptation and Impacts Research Section (AIRS) Climate Research Division, Environment Canada, 2009, 26 p.

MEND (Mine Environment Neutral Drainage). 2009. Prediction Manual for Drainage Chemistry from Sulphidic Geologic Materials. MEND Report 1.20.1. December 2009.

Tetra Tech EBA Inc. 2014. Pigeon Pit Waste Rock Storage Area Design – Revision 1, Ekati Diamond Mine, NWT, Canada. April 2014.

DOMINION DIAMOND

Information Request Number: DAR-MVEIRB-IR-37

Source: MVEIRB Information Requests from Chuck Hubert

Subject: Water Quality Modelling report

DAR Section(s): Appendix 8E

Preamble (MVEIRB):

This section states that the concentrations in the waste rock storage area (WRSA) for Misery seepage from 2001 – 2004 were used to represent input water quality in the Project site water quality with respect to the Jay WRSA. It is stated here that about 24% of the waste rock produced at Jay is expected to be metasediment which is potentially acid generating. Then it states that the Misery seepage data "represent WRSAs that contain a higher proportion of possibly acid-generating material".

Request (MVEIRB):

Please confirm that the percent of potentially acid generating metasediment in the Misery WRSA is approximately the same as predicted for Jay and provide a reference.

Response:

Approximately 25 percent (%) of the waste rock generated from the Jay Pit development is estimated to consist of metasediments. Although it is estimated that only 50% of the metasediments are potentially acid generating, experience from mining these materials at the Ekati Mine indicated that there is no practical means of distinguishing and separating them during handling and disposal; therefore, all metasediments will be classified and handled as potentially acid generating material (Section 3.5.6 of the Developer's Assessment Report).

According to the Waste Rock and Ore Storage Management Plan Vers. 4.1, (Dominion Diamond 2014), a total of 57,200,000 tonnes of waste rock was placed in the Misery waste rock storage area (WRSA) between 1997 and 2013. The relative proportion of each type of rock is presented in Table 37-1.

Table 37-1 Material Summary – Misery Waste Rock Storage Area, 1997 through 2013

Misery	Tonnage	Percentage of Total Material
Granite	29,200,000	51%
Metasediments	25,000,000	44%
Surficial Material	3,000,000	5%
Total	**57,200,000**	**100%**

% = percent.

Based on the similarity of rock types mined at the Misery Pit to those planned to be mined from the Jay Pit and the overall larger percent of metasedimentary rock contained in the Misery WRSA, applying seepage monitoring results from the Misery WRSA as the input source term for water quality modelling is considered to be conservative for the Jay WRSA.

References:

DDEC (Dominion Diamond Ekati Corporation) 2014: Ekati Diamond Mine Waste Rock and Ore Storage Management Plan Version 4.1, May 2014

DOMINION DIAMOND

Information Request Number:	DAR-MVEIRB-IR-38
Source:	MVEIRB Information Requests from Chuck Hubert
Subject:	Hydrodynamic and Water Quality Models of LdS and LdG
DAR Section(s):	Appendix 8F

Preamble (MVEIRB):

In this section, it states that "for future simulations, predicted water quality concentrations from Slipper Lake to Lac de Gras were provided by the Koala watershed model (ERM Rescan 2014, Attachment 8F3)".

Request (MVEIRB):

Are there expected to be any changes to the predictions of the total loadings of contaminants from Long lake Containment Facility (LLCF) discharges to Slipper Lake because of the Jay Project? Although effluent from the Jay Project will be discharged to Lac de Sauvage, presumably the length of time that processed kimberlite (and possibly wastewater from the processing) is deposited to the LLCF will be increased from several years over the Base Case. Has this been accounted for in the updated predictions for Slipper Lake discharges to Lac de Gras?

Response:

Dominion Diamond Ekati Corporation proposes to process kimberlite mined from the Jay Project (the Project) at the existing plant site, located at the main Ekati Mine operations. Fine processed kimberlite (FPK) from the Jay Pit will then be stored in the mined out Panda and Koala pits and underground workings. Once these pits are back-flooded, overflow from these pits will be directed to the Long Lake Containment Facility (LLCF) where it will subsequently be discharged to Lac de Gras via the Koala watershed. Therefore, the Project will have an influence on LLCF and Slipper Lake discharge quantity and quality to Lac de Gras.

The influence of storing Jay FPK in the mined out Panda and Koala pits was accounted for in the Lac de Gras water quality predictions in the Developer’s Assessment Report (DAR). ERM Rescan previously developed a water quality model for the Koala watershed to support Ekati Mine permitting activities and estimate their influence on Slipper Lake water quality. This model was updated to reflect changes to flows and water quality in discharges from the LLCF from storing FPK produced from the Project in the mined out Koala and Panda pits.

Updated projected Slipper Lake outlet flows and chemistry were provided by ERM Rescan (2014) and included in the Lac de Gras hydrodynamic water quality model. As presented in Section 8F2.2.2.3.2 of Appendix 8F of the DAR, from 2009 to 2012, Slipper Lake discharge water quality was represented by the median concentrations calculated based on observed Slipper Lake outlet water quality (BHP Billiton 2011, 2012, 2013) and the projected Slipper Lake outlet concentrations provided by ERM Rescan were used to represent the Slipper Lake outlet water quality from 2014 to 2060.

References:

BHP Billiton (BHP Billiton Canada Inc.). 2011. Ekati Diamond Mine 2010 Aquatic Effects Monitoring Program, Part 2 – Data Report. Prepared for BHP Billiton Canada Inc. by Rescan Environmental Services Ltd., Yellowknife, NWT, Canada, April 2011.

BHP Billiton. 2012. Ekati Diamond Mine 2011 Aquatic Effects Monitoring Program, Part 2 – Data Report. Prepared for BHP Billiton Canada Inc. by Rescan Environmental Services Ltd., Yellowknife, NWT, Canada, April 2012.

BHP Billiton. 2013. Ekati Diamond Mine 2012 Aquatic Effects Monitoring Program, Part 2 – Data Report, Version 1.1. Prepared for BHP Billiton Canada Inc. by Rescan Environmental Services Ltd., Yellowknife, NWT, Canada, September 2013.

ERM Rescan (ERM Rescan Environmental Services Ltd.). 2014. Predicted Slipper Lake Outlet Water Quality and Quantity Predictions. Provided via email from Eric J. Denholm (Dominion Diamond) to Michael Herrell (Golder Associates Ltd.) Fw: data request. Thursday, December 4, 2014 6:40 AM

DOMINION DIAMOND

Information Request Number:	DAR-MVEIRB-IR-39
Source:	MVEIRB Information Requests from Chuck Hubert
Subject:	Hydrodynamic and Water Quality Models of LdS and LdG
DAR Section(s):	Appendix 8F

Preamble (MVEIRB):

On page8F-34, it states: "The calibration was considered adequate if the observed specific conductivity profiles and the predicted TDS profiles followed the same vertical pattern, while recognizing that the absolute values would not be expected match."

Request (MVEIRB):

Why would the absolute values not be expected to match?

Response:

Specific conductivity is a measure of the resistance of a solution to electrical flow, generally measured in microSiemens per centimetre (µS/cm) (Wetzel 2001). The resistance of an aqueous solution to electrical flow is proportional to the concentration of major ions in the solution (Wetzel 2001). Solutions with higher concentrations of ions have a higher specific conductivity.

Total dissolved solids (TDS) is a measure of the mass of dissolved major ions in a solution, generally measured in parts per million (ppm) or milligrams per litre (mg/L). This parameter can be calculated by summing the concentrations of alkalinity, sodium, magnesium, potassium, calcium, sulphate, chloride, nitrate, fluoride, and silica (APHA 2005).

Since TDS and specific conductivity both vary according to the concentrations of major ions in a solution, trends in the two parameters are expected to match. However, these parameters are not identical, they are measures of different, but related, properties of water, and are presented in different units. Therefore, the absolute values of TDS and specific conductivity are not expected to match, despite trends in the two parameters matching.

References:

APHA (American Public Health Association). 2005. Standard Methods for the Examination of Water and Wastewater, 21st Edition. American Public Health Association. Washington, DC, USA.

Wetzel RG. 2001. Limnology. 3rd ed. Academic Press, New York, USA.

DOMINION DIAMOND

Information Request Number:	DAR-MVEIRB-IR-40
Source:	MVEIRB Information Requests from Chuck Hubert
Subject:	Hydrodynamic and Water Quality Models of LdS and LdG
DAR Section(s):	Appendix 8F (Section 8F3.1.1)

Preamble (MVEIRB):

In this section, it states that the Lac du Sauvage model was not sensitive to changes in the input water quality for the Misery discharge to Lac du Sauvage, however examples were given only for TDS and chloride. This makes sense given that Table 8E4.1-1 of the Site Discharge Model shows little difference in the mean and 99th percentile maximum predicted concentrations for TDS and Chloride. However there is a big difference in Table 8E4.1-1 in the mean and 99th percentile values for nitrate and ammonia (i.e., 20 vs 67 and 5.4 vs 34.8 mg/L respectively). Therefore, predicted concentrations of these parameters in Lac du Sauvage may not have been conservatively estimated by using the mean concentrations from the Site Discharge Model instead of the 99th percentile value.

Request (MVEIRB):

In light of these observations, please discuss why the choice was made to use the mean predicted Misery discharge concentrations rather than the 99th percentile values. Why not be as conservative as possible to clarify the worst case predicted?

Response:

It is standard practice in modelling future developments to use conservative assumptions in deriving water quality predictions so that projected constituent concentrations are not underestimated. It is equally important to not use overly conservative assumptions that would produce unrealistic model predictions. This was the philosophy applied in the development of the site discharge water quality projections for the Jay Project (Project). Therefore, the projections provided in the Project Developer's Assessment Report (DAR) represent a conservative estimate of water quality, and as a result, actual concentrations are expected to be less than predicted during operations.

As discussed in Section 8E2.2 of Appendix 8E of the DAR, a stochastic site water quality model was developed that was run iteratively for 200 realizations. Therefore, at each time step, a unique value was calculated based on randomly selected values for each of the stochastic inputs 200 times. Following the model run, average and 99th percentile discharge concentrations were calculated based on the 200 values calculated at each timestep to assess the range of conditions that could occur in each discharge source.

The projected water quality of the Misery Pit discharge (Table 8E4.1-1 of the Appendix 8E) indicates that the 99th percentile constituent concentrations are higher than the predicted mean constituent concentrations; however, concentrations are similar (i.e., in the same order of magnitude). This occurs because the groundwater input concentrations are deterministic (i.e., they do not vary in each realization) and groundwater inflows to the Jay Pit, which are subsequently pumped to the bottom of the Misery Pit,

represent the majority of the water that requires management through the Misery Pit during operations. The site model is therefore more sensitive to variations in groundwater flow and less sensitive to variations in source term chemistry inputs from pit wall and Jay waste rock storage area (WRSA) runoff.

Predicted groundwater inflow rates used in the DAR water quality predictions were based on several conservative inputs. Groundwater is modelled to account for approximately 65% of the total operational discharge from the Misery Pit to Lac du Sauvage. In reality, it is expected that the total discharge volumes to Lac du Sauvage will be less and assigning the projected average quality to the Misery Pit discharge inherently provides a conservative estimate of the discharge load as a result of the conservatism built into the groundwater quantity predictions (Appendix 8A of the DAR). Use of the 99th percentile would likely provide an overly conservative estimate of Misery Pit discharge loads to Lac du Sauvage.

Nevertheless, the sensitivity of Lac du Sauvage to the discharge water quality was evaluated in the DAR. Projected average and 99th percentile discharge concentrations of chloride and total dissolved solids (TDS) were evaluated in the Lac du Sauvage hydrodynamic model. The results of this analysis indicated that the Lac du Sauvage lake model was not sensitive to differences in the average and 99th percentile Misery Pit discharge concentrations for these parameters. For example, the model only reported numerical differences and not material differences in the projected water quality at assessment locations in Lac du Sauvage. Details of this sensitivity analysis, including a figure showing the location of the assessment nodes in Lac du Sauvage, are provided in Section 8F3.1.1 and 8F2.2.2.3.1, respectively, of Appendix 8F of the DAR.

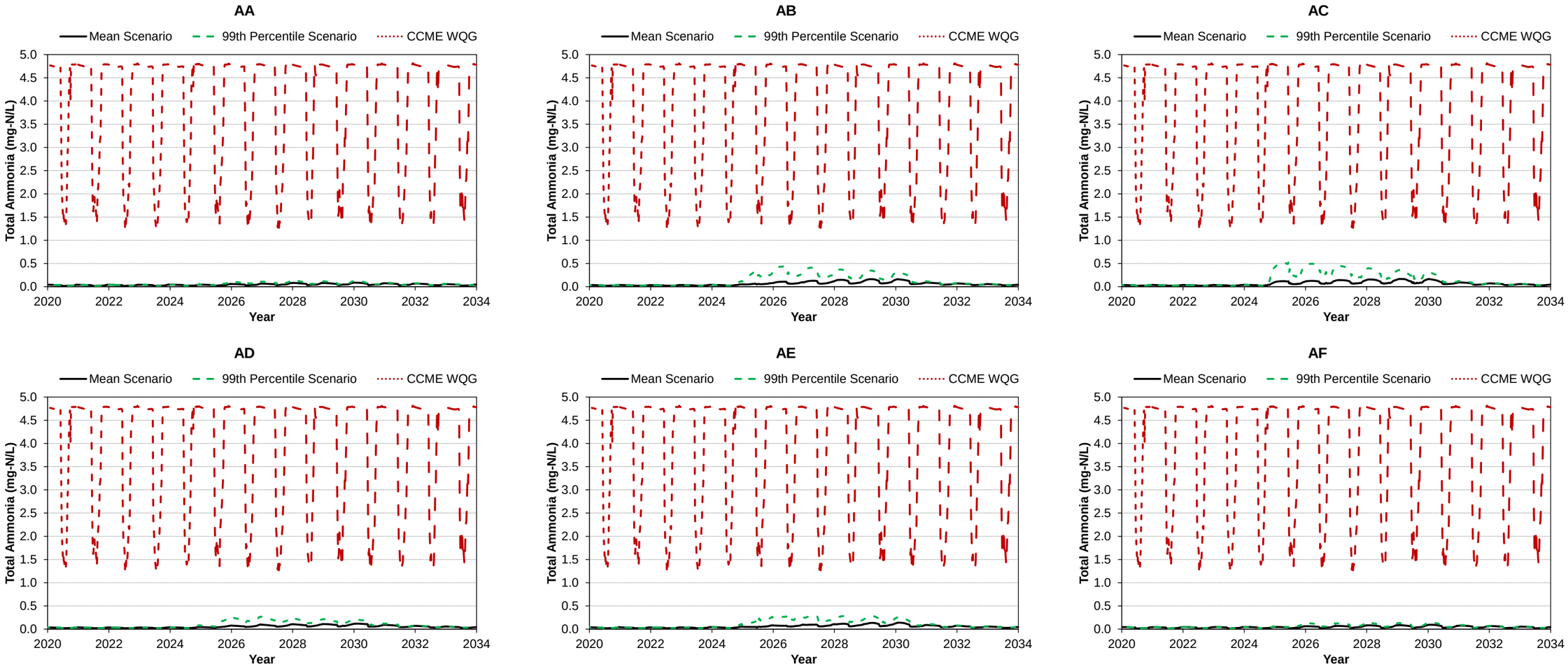
The sensitivity of the Lac du Sauvage model to average and 99th percentile ammonium and nitrate concentrations was not completed as part of the DAR, but has been completed as part of this response. Figures 40-1 and 40-2 provide projected ammonium and nitrate concentrations at the Lac du Sauvage assessment locations for the average and 99th percentile scenarios. Increases in ammonium and nitrate concentrations at the Lac du Sauvage assessment locations when the 99th percentile scenario compared to the mean scenario are used to represent the composition of the Misery Pit discharge (Figures 40-1 and 40-2). However, the concentrations do not increase to an extent that would change the overall conclusion of the DAR, which is mining of the Project will not result in significant adverse effects to surface water in Lac du Sauvage and Lac de Gras. For example, ammonia and nitrate predictions remain below guidelines.

Based on the conservatism included in the site water quality model, the modelled mean discharge concentrations carried forward into the DAR lake hydrodynamic models (see Appendix 8F) provide a conservative scenario for assessing impacts to downstream receptors. To provide a more realistic estimate of expected Project discharge water quality, Dominion Diamond retained Golder Associates Ltd. (Golder) to provide water quality projections for a reasonable estimate case that represents a more reasonable case of the expected discharge water quality from the Jay Project and the impacts of the discharge on Lac du Sauvage and Lac de Gras. Key changes were made to the model as part of the reasonable estimate case include:

- reduced groundwater inflows to the Jay pit were estimated and incorporated into the site mass-balance water quality model;
- attenuation of nitrogen species in Jay WRSA drainage during post-closure was included; and,

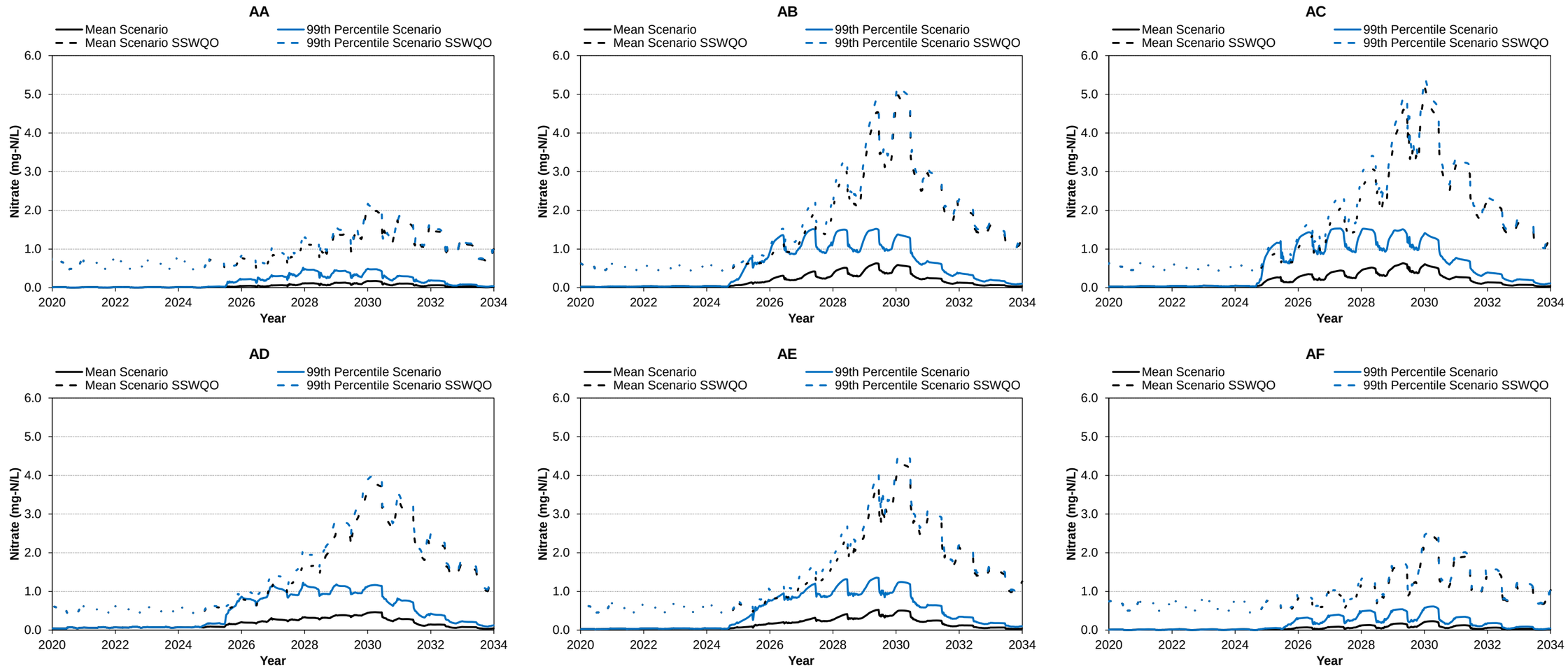
- mean observed discharge concentrations were used to represent the effluent quality from Diavik Mine to Lac de Gras.

Figure 40-1 Predicted Maximum Total Ammonia Concentrations in Lac du Sauvage - Operations



Note: The CCME ammonia WQG is pH and temperature dependent and was calculated based on the maximum monitored pH of 7.6 and predicted water temperatures in Lac du Sauvage.
mg-N/L = milligrams as nitrogen per litre; CCME = Canadian Council of Ministers of the Environment; WQG = water quality guideline.

Figure 40-2 Predicted Maximum Nitrate Concentrations in Lac du Sauvage - Operations



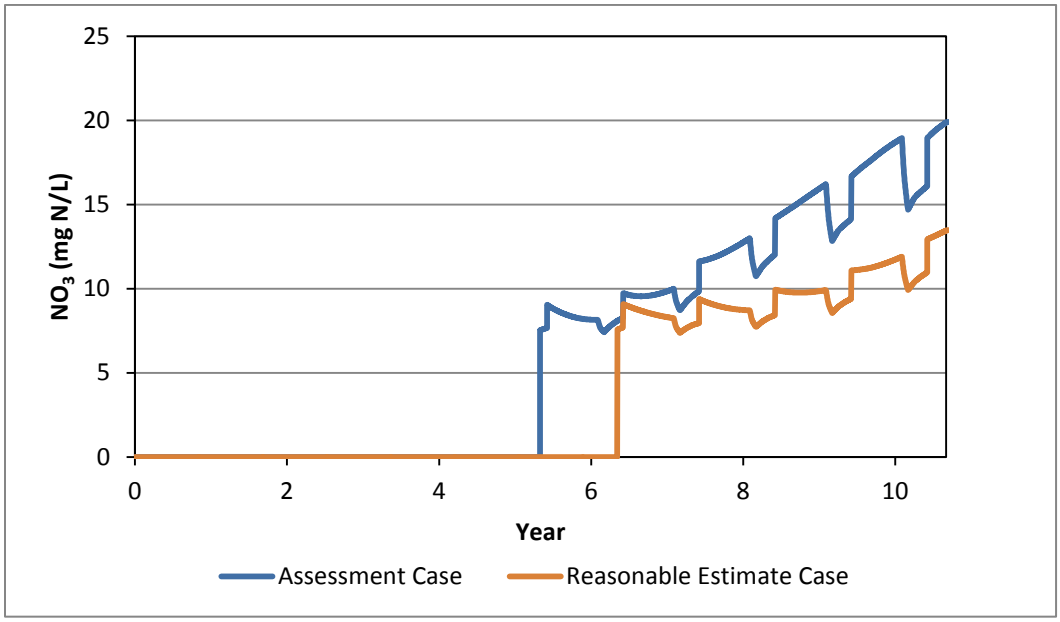
Note: The nitrate SSWQO is hardness dependent (Rescan 2012).
mg-N/L = milligrams as nitrogen per litre; SSWQO = site-specific water quality objective.

A detailed description of the reasonable estimate case water quality model is provided in Appendix B, Compendium of Supplemental Water Quality Modelling. In the reasonable estimate case, concentrations of nitrate are projected to be similar to the DAR projections when discharge begins; however, concentrations increase less rapidly during operations and are approximately 1.5 times less than the DAR projections at the end of operations (Figure 40-3). The reasonable estimate case also delays the requirement to discharge for a period of one year (Figure 40-3).

Ammonium concentrations on the other hand are projected to be similar in the reasonable estimate case compared to the DAR case (Figure 40-4). Water balance modelling indicates the upper layer of water stored in the Misery Pit is primarily composed of water pumped from the diked area of Lac du Sauvage and minewater pumped from the Jay Pit. Projected ammonium concentrations in the diked area, which include runoff from the Jay WRSA, range between approximately 5.0 and 6.0 milligrams nitrogen per litre (mg-N/L), similar to the input source term concentration applied to water pumped from the Jay Pit (i.e., 5.5 mg-N/L). Therefore, without reducing conservatism in the Jay WRSA source term, projected ammonium concentrations are less sensitive to the model updates made as part of the reasonable estimate case. It is also important to note, that the delay of one year prior to discharge being required from the Misery Pit will reduce the total life of mine ammonium load being directed to Lac du Sauvage.

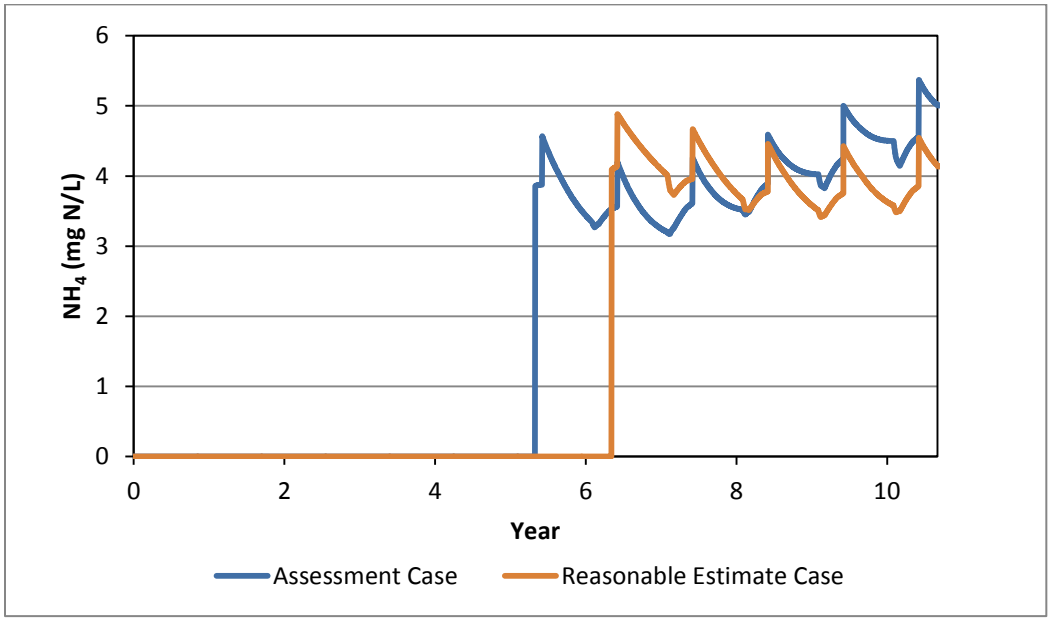
It is recognized that water quality modelling is based on several inputs, all of which have inherent variability and uncertainty. Therefore, Dominion Diamond will develop an detailed operational monitoring program to validate water quality model predictions. If actual conditions deviate substantively from predicted concentrations, adaptive management strategies will be implemented. One of the key advantages of the water management strategy is the majority of the minewater will be managed through the Misery Pit during operations, precluding the need to discharge for the first five or more years of operations. This approach allows sufficient monitoring results to be collected to develop a key understanding of the controls on Misery Pit water quality, facilitating proactive design and implementation of mitigation strategies, should they be required.

Figure 40-3 Projected Misery Pit Discharge Nitrate Concentrations - Operations



mg N/L = milligrams nitrogen per litre

Figure 40-4 Projected Misery Pit Discharge Ammonium Concentrations - Operations



mg N/L = milligrams nitrogen per litre

Reference:

Rescan (Rescan Environmental Services Ltd). 2012. EKATI Diamond Mine: Site-Specific Water Quality Objective for Nitrate, 2012. Prepared for BHP Billiton Canada Inc. Yellowknife, NWT, Canada.

DOMINION DIAMOND

Information Request Number:	DAR-MVEIRB-IR-41
Source:	MVEIRB Information Requests from Chuck Hubert
Subject:	Near-Field Modelling of the Misery Discharge into Lac du Sauvage
DAR Section(s):	Appendix 8F

Preamble (MVEIRB):

In section 8F 1-2.3.1, it states that an ice cover thickness of 1 m was assumed for the mixing model. However, Table 8.2-25 of Section 8 lists the measured ice thickness in Lac du Sauvage of 1.25 to 1.56 m.

Request (MVEIRB):

What is the effect on mixing predictions of under-estimating the ice thickness in winter? Would this have any meaningful effect on the hydrodynamic model results?

Response:

Near-field mixing was modelled using CORMIX to estimate dilution, relative concentration, and plume geometry from a diffuser placed in Lac du Sauvage to discharge water from the back-flooded Misery Pit. The simulations presented in Appendix 8F (Attachment 8F1) of the Developer's Assessment Report (DAR) assumed an ice thickness of 1 metre (m). An ice thickness of 1 m was assumed in the CORMIX model since the model represents a snapshot of a single point in time. Therefore, unlike the lake hydrodynamic models, which assume the average annual ice thickness of 1.5 m forms over a period of 90 day period and melts over a 60 day period (i.e., has variable thickness), a 1 m thickness was selected to represent an "average" ice thickness over the entire under-ice period, while still maintaining some conservatism in the model inputs.

To evaluate the sensitivity of model results to a thicker ice cover, under-ice scenarios were re-run using the noted range of ice thicknesses in Lac du Sauvage: minimum observed ice thickness, 1.25 m; and maximum observed ice thickness, 1.56 m. The same port spacing and ambient flow characteristics as those in the DAR were applied for a total of 20 new simulations. The dilution and relative concentration at 16 m for each of these simulations are compared to the DAR (Table 8F1-3.1-1) results in Table 41-1.

Results of these new simulations show that the model is not sensitive to changes in ice thickness. The dilution and concentration of effluent at 16 m is similar to the DAR results in both the minimum and maximum ice thickness scenarios. Therefore, using the noted range in ice thickness assumed in the near-field model would have negligible effect on the hydrodynamic model results.

Table 41-1 Comparison of Under-Ice Near-Field Modelling Results

Simulation (numbered to be consistent with DAR)	Port Spacing	Lake Condition	Flow Condition	DAR Results 1 m Ice Thickness		Minimum Ice Thickness 1.25 m		Maximum Ice Thickness 1.56 m	
				Concentration (%) at 16 m	Dilution at 16 m	Concentration (%) at 16 m	Dilution at 16 m	Concentration (%) at 16 m	Dilution at 16 m
3	2.5 m	Ice Cover	Coflow	6.1	17	6.2	16	6.3	16
6	2.5 m	Ice Cover	Crossflow	6.3	16	6.4	16	6.6	15
9	5 m	Ice Cover	Coflow	5.3	19	5.4	19	5.5	18
12	5 m	Ice Cover	Crossflow	5.3	19	5.4	19	5.5	18
15	7.5 m	Ice Cover	Coflow	5.2	19	5.3	19	5.5	18
18	7.5 m	Ice Cover	Crossflow	4.9	20	5.4	19	5.5	18
21	10 m	Ice Cover	Coflow	5.3	19	5.3	19	5.5	18
24	10 m	Ice Cover	Crossflow	5.3	19	5.4	19	5.5	18
27	15 m	Ice Cover	Coflow	5.3	19	5.4	19	5.4	19
30	15 m	Ice Cover	Crossflow	5.3	19	5.4	19	5.4	19

DAR = Developer's Assessment Report; % = percent; m = metre

DOMINION DIAMOND

Information Request Number: DAR-MVEIRB-IR-42

Source: MVEIRB Information Requests from Chuck Hubert

Subject: Near-Field Modelling of the Misery Discharge into Lac du Sauvage

DAR Section(s): Appendix 8F

Preamble (MVEIRB):

"Maximum discharge concentrations" are reported in column 4 of tables 8F1-3.2-1 through 8F1-3.2-5 and used to determine what the end of near-field concentrations could be under different mixing scenarios. However, there is no reference as to where those numbers were obtained and they do not correlate exactly to the values presented in Table 8E4.1-1 of Appendix 8E as one would expect.

Request (MVEIRB):

Please confirm where the "maximum discharge concentration" values were obtained from and that they are correct. If values from Table E4.1-1 of Appendix E were uses, please indicate which condition (or column) was used - that is, maximum mean or 99th percentile, under ice versus open water.

Response:

The maximum discharge concentrations and calculated near-field concentrations presented in Tables 8F1-3.2-1 to 8F1-3.2-5 of Attachment 8F1, Appendix 8F of the Developer's Assessment Report (DAR) are incorrect. These values reflect predictions of an earlier site water quality model iteration. Correct Misery Pit discharge concentrations were presented in Table 8E4.1.1 in Appendix 8E.

Modelled near-field dilution values presented in Tables 8F1-3.1-1 to 8F1-3.2-5 were not affected by this correction because the correct discharge concentrations were used in the CORMIX modelling used to derive these dilution results.

Table 42-1 of this response presents the corrected maximum discharge concentrations, using the maximum concentrations in Misery Discharge – mean daily values, as presented in Table 8E4.1.1 in the DAR. Tables 42-2 to 42-6 present the updated end-of-near-field concentrations based on these corrected discharge concentrations.

Calculated end-of-near-field concentrations increased when the correct discharge concentrations were used (Tables 42-2 to 42-6 below) compared to those listed in the DAR. However, the only parameter calculated to exceed the guideline concentration is total phosphorus. Total phosphorus also exceeded this guideline concentration in the near field concentrations presented in the DAR, and the corrected calculated concentrations are similar to those presented in the DAR.

Since the predicted dilution at 16 m, the guideline exceedances and the final concentrations are the same or similar in the near field when corrected discharge concentrations are used, the conclusions of near-field modelling in the DAR are unchanged.

Table 42-1 Comparison of Maximum Discharge Concentrations presented in the DAR to Corrected Concentrations

Parameter	Maximum Discharge Concentration as Presented in DAR (mg/L)	Corrected Maximum Discharge Concentration (mg/L)
Under Ice		
Total Dissolved Solids	1850	2925
Chloride	1042	1712
Total Phosphorus (as P)	0.2	0.22
Nitrate (as N)	16	20
Strontium	7	11
Open Water		
Total Dissolved Solids	1723	2091
Chloride	964	1196
Total Phosphorus (as P)	0.18	0.16
Nitrate (as N)	15	16
Strontium	6.4	8.0

mg/L = milligrams per litre; P = phosphorus; N = nitrogen.

DOMINION DIAMOND

Table 42-2 Maximum Concentration During Operations Assuming 2.5 m Port Spacing

Parameter	Guideline Concentration	Maximum Lake Concentration	Maximum Discharge Concentration as Presented in DAR	Dilution[a]	End of Near Field Concentration as Presented in DAR	Corrected Maximum Discharge Concentration	Dilution[a]	Corrected End of Near Field Concentration
	mg/L	mg/L	mg/L	x	mg/L	mg/L	x	mg/L
Under Ice								
Total Dissolved Solids	1000	95	1850	16	205	2925	16	272
Chloride	388	49	1042	16	112	1712	16	153
Total Phosphorus (as P)	0.011	0.011	0.2	16	0.022	0.22	16	0.024
Nitrate (as N)	10	0.81	16	16	1.8	20	16	2.0
Strontium	11	0.34	7	16	0.7	11	16	1.0
Open Water								
Total Dissolved Solids	1000	65	1723	6	367	2091	6	434
Chloride	388	33	964	6	202	1196	6	244
Total Phosphorus (as P)	0.011	0.0075	0.18	6	0.039	0.16	6	0.035
Nitrate (as N)	10	0.57	15	6	3.3	16	6	3.4
Strontium	11	0.22	6.4	6	1.35	8.0	6	1.64

a) Dilution Factor at End of Near Field, 16 m; assuming 10 port diffuser.

123 Highlighted Lake Concentrations and End of Near Field Concentrations Exceed Guideline Values.

mg/L = milligrams per litre; x = times; P = phosphorus; N = nitrogen.

DOMINION DIAMOND

Table 42-3 Maximum Concentration During Operations Assuming 5 metre Port Spacing

Parameter	Guideline Concentration	Maximum Lake Concentration	Maximum Discharge Concentration as Presented in DAR	Dilution[a]	End of Near Field Concentration as Presented in DAR	Corrected Maximum Discharge Concentration	Dilution[a]	Corrected End of Near Field Concentration
	mg/L	mg/L	mg/L	x	mg/L	mg/L	x	mg/L
Under Ice								
Total Dissolved Solids	1000	95	1850	19	188	2925	19	244
Chloride	388	49	1042	19	102	1712	19	137
Total Phosphorus (as P)	0.011	0.011	0.2	19	0.02	0.22	19	0.022
Nitrate (as N)	10	0.81	16	19	1.6	20	19	1.8
Strontium	11	0.34	7	19	0.7	11	19	0.9
Open Water								
Total Dissolved Solids	1000	65	1723	7	302	2091	7	355
Chloride	388	33	964	7	166	1196	7	199
Total Phosphorus (as P)	0.011	0.0075	0.18	7	0.032	0.16	7	0.029
Nitrate (as N)	10	0.57	15	7	2.7	16	7	2.8
Strontium	11	0.22	6.4	7	1.11	8.0	7	1.33

a) Dilution Factor at End of Near Field, 16 m; assuming 10 port diffuser.

123 Highlighted Lake Concentrations and End of Near Field Concentrations Exceed Guideline Values.

mg/L = milligrams per litre; x = times; P = phosphorus; N = nitrogen.

DOMINION DIAMOND

Table 42-4 Maximum Concentration During Operations Assuming 7.5 m Port Spacing

Parameter	Guideline Concentration	Maximum Lake Concentration	Maximum Discharge Concentration as Presented in DAR	Dilution[a]	End of Near Field Concentration as Presented in DAR	Corrected Maximum Discharge Concentration	Dilution[a]	Corrected End of Near Field Concentration
	mg/L	mg/L	mg/L	x	mg/L	mg/L	x	mg/L
Under Ice								
Total Dissolved Solids	1000	95	1850	16	188	2925	19	244
Chloride	388	49	1042	16	102	1712	19	137
Total Phosphorus (as P)	0.011	0.011	0.2	16	0.02	0.22	19	0.022
Nitrate (as N)	10	0.81	16	16	1.6	20	19	1.8
Strontium	11	0.34	7	16	0.7	11	19	0.9
Open Water								
Total Dissolved Solids	1000	65	1723	6	273	2091	8	319
Chloride	388	33	964	6	149	1196	8	178
Total Phosphorus (as P)	0.011	0.0075	0.18	6	0.029	0.16	8	0.027
Nitrate (as N)	10	0.57	15	6	2.4	16	8	2.5
Strontium	11	0.22	6.4	6	1.0	8.0	8	1.2

a) Dilution Factor at End of Near Field, 16 m; assuming 10 port diffuser.

123 Highlighted Lake Concentrations and End of Near Field Concentrations Exceed Guideline Values.

mg/L = milligrams per litre; x = times; P = phosphorus; N = nitrogen.

DOMINION DIAMOND

Table 42-5 Maximum Concentration During Operations Assuming 10 m Port Spacing

Parameter	Guideline Concentration	Maximum Lake Concentration	Maximum Discharge Concentration as Presented in DAR	Dilution[a]	End of Near Field Concentration as Presented in DAR	Corrected Maximum Discharge Concentration	Dilution[a]	Corrected End of Near Field Concentration
	mg/L	mg/L	mg/L	x	mg/L	mg/L	x	mg/L
Under Ice								
Total Dissolved Solids	1000	95	1850	19	188	2925	19	244
Chloride	388	49	1042	19	102	1712	19	137
Total Phosphorus (as P)	0.011	0.011	0.2	19	0.02	0.22	19	0.022
Nitrate (as N)	10	0.81	16	19	1.6	20	19	1.8
Strontium	11	0.34	7	19	0.7	11	19	0.9
Open Water								
Total Dissolved Solids	1000	65	1723	9	260	2091	9	304
Chloride	388	33	964	9	142	1196	9	170
Total Phosphorus (as P)	0.011	0.0075	0.18	9	0.028	0.16	9	0.025
Nitrate (as N)	10	0.57	15	9	2.3	16	9	2.4
Strontium	11	0.22	6.4	9	0.95	8.0	9	1.14

a) Dilution Factor at End of Near Field, 16 m; assuming 10 port diffuser.

123 Highlighted Lake Concentrations and End of Near Field Concentrations Exceed Guideline Values.

mg/L = milligrams per litre; x = times; P = phosphorus; N = nitrogen.

DOMINION DIAMOND

Table 42-6 Maximum Concentration During Operations Assuming 15 m Port Spacing

Parameter	Guideline Concentration	Maximum Lake Concentration	Maximum Discharge Concentration as Presented in DAR	Dilution[a]	End of Near Field Concentration as Presented in DAR	Corrected Maximum Discharge Concentration	Dilution[a]	Corrected End of Near Field Concentration
	mg/L	mg/L	mg/L	x	mg/L	mg/L	x	mg/L
Under Ice								
Total Dissolved Solids	1000	95	1850	19	188	2925	19	244
Chloride	388	49	1042	19	102	1712	19	137
Total Phosphorus (as P)	0.011	0.011	0.2	19	0.02	0.22	19	0.022
Nitrate (as N)	10	0.81	16	19	1.6	20	19	1.8
Strontium	11	0.34	7	19	0.7	11	19	0.9
Open Water								
Total Dissolved Solids	1000	65	1723	9	250	2091	9	290
Chloride	388	33	964	9	136	1196	9	162
Total Phosphorus (as P)	0.011	0.0075	0.18	9	0.027	0.16	9	0.024
Nitrate (as N)	10	0.57	15	9	2.2	16	9	2.3
Strontium	11	0.22	6.4	9	0.91	8.0	9	1.09

a) Dilution Factor at End of Near Field, 16 m; assuming 10 port diffuser.

123 Highlighted Lake Concentrations and End of Near Field Concentrations Exceed Guideline Values.

mg/L = milligrams per litre; x = times; P = phosphorus; N = nitrogen.

DOMINION DIAMOND

Information Request Number: DAR-MVEIRB-IR-43

Source: MVEIRB Information Requests from Chuck Hubert

Subject: Near-Field Modelling of the Misery Discharge into Lac du Sauvage

DAR Section(s): Appendix 8F

Preamble (MVEIRB):

This document concludes that the dilution rate at 16 m from the diffuser should be in the range of 5 to 19 times. But it also says that the distance of 16 m is based on the limitations of the model and should not be assumed to be the final mixing zone size.

Request (MVEIRB):

Has Dominion yet proposed a mixing zone for the project? Based on the stated limitations of the Cormix program, is Dominion proposing to use information from the hydrodynamic model to predict concentrations at the edge of a mixing zone?

Response:

In the Developer's Assessment Report (DAR), Dominion Diamond suggested a mixing zone for the Jay Project (the Project) of 200 metres (m) from the proposed diffuser for Misery Pit minewater discharge to Lac du Sauvage (Section 8.5.4 and Appendix 8F). The extent of this mixing zone is consistent with other northern mining operations with discharge licences for submerged diffusers (e.g., Snap Lake and Gahcho Kué diamond mines). For the near-field modelling, near-field concentrations, dilutions, and plume geometries were based on model results at 16 m from the diffuser. This shorter distance was not meant to infer the extent of a mixing zone, but rather was based on the furthest extent of the CORMIX model (Cornell Mixing Zone Expert System; Doneker and Jirka 2007) where model results exhibited a reasonable degree of near-field dispersion of the discharge.

A mixing zone as part of the water licence application to the Wek'èezhìı Land and Water Board (WLWB) will be defined for the Project during the permitting phase of the project. The CORMIX modelling presented in the DAR will be used to define the mixing zone boundary at which point the water chemistry will be determined. Mixing zones are established as part of the water licencing permitting process in conjunction with the development of effluent quality criteria (EQC) and site specific water quality objectives (SSWQO). The SSWQOs and the proposed EQC will also be used to inform the final diffuser design.

Reference:

Doneker RL, Jirka GH. 2007. CORMIX User Manual. U.S. Environmental Protection Agency: EPA-823-K-07-001, Washington, DC, USA.

DOMINION DIAMOND

Information Request Number:	DAR-MVEIRB-IR-44
Source:	MVEIRB Information Requests from Chuck Hubert
Subject:	Water
DAR Section(s):	Adequacy Review Response DAR-MVEIRB-17

Preamble (MVEIRB):

The comparisons of the Reference Condition concentrations in Lac de Gras to the 2014 Base Case and to the Application Case in Tables 17-2 to 17-7 are quite helpful. However as noted on page 4 of this response, there is only limited Reference Condition data for Lac de Gras so the comparison is missing for most of the major ions. There is another source of information to fill in these gaps though, from DDMI's 2011 to 2013 AEMP Summary Report which was submitted in October 2014. In Table 5-4 of this report, DDMI lists the "normal ranges" for substances of interest including, hardness, TDS, chloride, sulphate, ammonia, nitrate, and several total metals and could be considered the equivalent to Dominion's Reference Condition. These normal ranges have been calculated from data in the far-field regions of Lac de Gras before those regions experienced any of the effluent plume and have been developed for both open water and under ice conditions. Dominion's response to the Review Board's adequacy review item 9.1 (DAR-MVEIRB-17 in Dominion's Jan 19, 2015 response) meets adequacy requirements. The following is an information request.

Request (MVEIRB):

It would be very helpful to have a single table that listed the normal ranges of at least the "substances of interest" from DDMI's AEMP compared to the 2014 Base Case concentrations versus the maximum predicted concentrations at any location in Lac de Gras (i.e., no need to list individual stations, just choose the "worst-case" concentrations predicted) to water quality objectives. This would give reviewers a simple snapshot of the very worst-case potential water quality changes from baseline and existing conditions. Could Dominion produce such a table? The normal range information is in Table 5-4 of DDMI's 2011-2013 AEMP Summary Report dated October 15, 2014 (see: http://www.mvlwb.ca/Boards/WLWB/Registry/2007/W2007L2-0003/W2007L2-0003%20-%20Diavik%20%20-%20AEMP%20-%202011%20to%202013%20Summary%20Report%20-%20Oct%2015_14.pdf

Response:

An updated summary table (Table 44-1) has been developed for the Lac de Gras water quality baseline and assessment dataset. This table includes the following:

- Reference Condition data (Base Case, pre-2000; from Table 8.2-50 in the DAR);
- Normal ranges[1] for the reference area for the Diavik Aquatic Effects Monitoring Program (Table 5-4 from Golder 2014);

[1] Normal range is defined as the reference area mean ± 2 standard deviations (Golder 2014).

- 2014 Existing Condition data (Base Case, 2010 to 2014; from Tables 8.2-51 and 8.2-52 in the DAR, with updates from data collected in 2014 [Dominion Diamond 2015]); and,
- Maximum modelled constituent concentrations in Lac de Gras (2019 to 2060 [Golder 2015]).

There are Reference Condition (Base Case) data for 11 constituents, normal range data for 20 constituents (Golder 2014), and 2014 baseline data for 37 constituents (Dominion Diamond 2015). For each of the presented group of constituents, normal range data were typically the lowest concentrations, and the 2014 baseline data or the maximum predicted data were typically the highest concentrations.

Table 44-1 Lac de Gras Updated Summary Water Quality Screening Table

Parameter	Unit	Lac de Gras												
		Reference Condition [a]		Normal Range [b]				Measured Baseline Maximum [e]						Predicted Maximum [f]
		Whole Lake		Far Field Reference Areas				(Far Field 2)		(Far Field A)		(Slipper Bay)		Maximum of all Predicted Concentrations (open-water and under-ice; all assessment nodes)
		Open-Water and Under-Ice		Under-Ice		Open-Water								
		Median	Range (25th to 75th %ile)	Lower Limit [c]	Upper Limit [d]	Lower Limit [c]	Upper Limit [d]	Under-Ice	Open-Water	Under-Ice	Open-Water	Under-Ice	Open-Water	
Conventional Parameters														
Hardness	mg/L	-	-	4.4	7	4.5	6.3	14	<10	7.1	<10	14	11	11
Total dissolved solids	mg/L	-	-	2.2	8.4	3.6	6.2	22	30	21	30	30	35	24
Total suspended solids	mg/L	2	<1.0 to 3.0	-				3	<3	<3	3	<3	3.5	2.0
Major Ions														
Calcium	mg/L	-	-	0.91	1.2	0.83	1.1	3.9	1.7	1.3	1.1	2.6	2.2	3.0
Chloride	mg/L	-	-	0.32	1.2	0.54	0.99	2.5	2.6	1.2	1.7	5.5	5.8	6.9
Fluoride	mg/L	-	-	-	-	-	-	<0.05	<0.05	<0.05	<0.05	-	0.026	0.02
Magnesium	mg/L	-	-	0.58	0.8	0.55	0.75	1.3	0.93	0.92	0.76	1.9	1.5	1.3
Potassium	mg/L	-	-					1.2	0.95	0.75	0.7	1.7	1.6	1.3
Sodium	mg/L	-	-	0.54	0.81	0.5	0.83	1.8	1.9	<1	<1	3.7	4.7	2.6
Sulphate	mg/L	-	-	0.61	3.3	1.5	2.6	3.4	3.4	2.8	3.2	7.2	7.2	4.8
Nutrients														
Nitrate	mg-N/L	-	-	0[g]	0.018	0[g]	0.0043	0.19	0.03	<0.02	<0.02	0.082	0.01	0.082
Total ammonia	mg-N/L	0.007	0.005 to 0.010	0.0077	0.03	0[g]	0.009	0.049	0.042	0.046	0.042	0.021	0.015	0.040
Total nitrogen	mg-N/L	-	-					0.197	0.197	0.158	0.158	-	-	
Total phosphorus	mg-P/L	0.003	<0.002 to 0.0042					<0.005	0.01	<0.005	<0.005	0.0029	0.0086	0.004
Dissolved orthophosphate	mg-P/L							<0.005	<0.005	<0.005	0.006	0.001	0.001	0.002
Total Metals														
Aluminum	µg/L	7.95	3.2 to 18.8	1.8	4.3	2.8	6.3	12	7.7	4.6	7.2	7.7	84	29
Arsenic	µg/L	0.2	0.18 to 0.21					0.39	0.3	0.19	0.23	0.22	0.43	0.41
Barium	µg/L	-	-	1.7	2.2	1.6	2	3.6	3.1	2.3	2.8	4.2	4.8	7.9
Beryllium	µg/L							<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	0.12
Bismuth	µg/L							<0.005	<0.005	<0.005	<0.2	<0.005	<0.01	0.013
Cadmium	µg/L	**<0.05** [(DL>C)]	**<0.05** [(DL>C)] to <**0.2** [(DL>C)]					<0.05	<0.05	<0.05	<0.05	<0.01	0.017	0.037
Chromium	µg/L	0.33	0.185 to **1.2** [(C)]	0.014	0.092	0[g]	0.06	0.2	0.28	<0.1	0.21	<0.2	0.49	0.12
Cobalt	µg/L							<0.1	<0.1	0.19	<0.1	<0.1	0.32	0.09
Copper	µg/L	0.7	<0.6 to 1.0					0.97	0.75	0.67	1	0.75	1.8	0.44
Iron	µg/L							10	24	9.1	9.5	<10	164	38
Lead	µg/L	<0.05	<0.05 to 0.07					0.38	0.051	0.074	0.056	<0.05	0.07	0.038
Manganese	µg/L	-	-	0.15	2.6	0.76	4.5	1.2	4	1.6	4.2	2.9	41	5.7
Mercury	µg/L	-	-					<0.02	<0.02	<0.02	0.02	<0.02	<0.02	0.013
Molybdenum	µg/L	-	-	0.038	0.14	0.051	0.14	0.49	0.59	0.15	0.73	1.2	1.3	3.8
Nickel	µg/L	0.69	0.5 to 1.4					0.82	0.77	1.7	1.3	1.1	2.5	1.4

Table 44-1 Lac de Gras Updated Summary Water Quality Screening Table

Parameter	Unit	Lac de Gras												
		Reference Condition [a]		Normal Range [b]				Measured Baseline Maximum [e]						Predicted Maximum [f]
		Whole Lake		Far Field Reference Areas				(Far Field 2)		(Far Field A)		(Slipper Bay)		Maximum of all Predicted Concentrations (open-water and under-ice; all assessment nodes)
		Open-Water and Under-Ice		Under-Ice		Open-Water								
		Median	Range (25th to 75th %ile)	Lower Limit [c]	Upper Limit [d]	Lower Limit [c]	Upper Limit [d]	Under-Ice	Open-Water	Under-Ice	Open-Water	Under-Ice	Open-Water	
Selenium	µg/L	-	-					<0.1	<0.1	0.1	<0.1	<0.2	<0.1	0.15
Silver	µg/L	-	-					<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.06
Strontium	µg/L	-	-	0[g]	9	0[g]	8.6	18	20	10	9.8	36	29	105
Uranium	µg/L	-	-	0[g]	0.05	0[g]	0.05	0.12	0.096	0.05	<0.05	0.033	0.087	0.45
Vanadium	µg/L							<0.2	<0.2	<0.2	<0.2	<0.05	0.13	0.62
Zinc	µg/L	1	<0.8 to 6.5					4.1	4.4	2.3	3.3	11	3.1	1.4

Note: **Bolded** concentrations are higher (or lower for pH) than relevant water quality guidelines.

a) reference condition data as reported in DAR Table 8.2-50.

b) the normal range describes the natural variability of Lac de Gras and is based on data collected from 2007 to 2013 during the Diavik AEMP programs (Golder 2014).

c) the lower limit represents the minimum of two standard deviations from the mean.

d) the upper limit represents the maximum of two standard deviations from the mean.

e) measured baseline maximum used for screening; where the maximum value was less than the detection limit, a value equal to the detection limit was used as the maximum. Source for FF2: DDMI 2011, 2012, 2013 (FF2-1M, FF2-2B, FF2-2M, FF2-2, FF2-3M, FF2-4M, FF2-5B, FF2-5M, and FF2-5T sampled in 2010, 2011, and 2012) and Dominion Diamond 2015 (FF2-1, FF2-2, FF2-3, FF204, and FF2-5 sampled in 2014).Source for FFA: DDMI 2011 and 2012 (FFA-1, FFA-2, FFA-3, FFA-4, and FFA-5 sampled in 2010 and 2011).
Source for Slipper Bay: Rescan 2011, 2012; ERM Rescan 2013 (S2 and S3 sampled in 2010, 2011, and 2012) and Dominion Diamond 2015 (S2, S3, S5, and S6 sampled in 2014).

f) maximum predicted concentrations for under-ice and open-water conditions at Lac de Gras as reported in adequacy response DAR-MVEIRB-17, Tables 17-2 to 17-6

g) In cases where all values in the reference areas were below the DL, the lower limits of the normal range were considered to be equal to zero (Golder 2014).

>= greater than; <= less than; - = no guideline or data; %ile = percentile; µg/L = microgram per litre, mg/L = milligrams per litre, mg-N/L = milligrams of nitrogen, per litre, mg-P/L = milligrams of phosphorus per litre; (C) = concentration higher than the relevant chronic aquatic life guideline or beyond the recommended pH range. (DL>C) = analytical detection limit was higher than the relevant chronic aquatic life guideline.

References:

DDMI (Diavik Diamond Mines Inc.). 2011. Diavik Diamond Mine Aquatic Effects Monitoring Program 2010 Annual Report. Submitted to Wek'èezhìi Land and Water Board. Yellowknife, NWT, Canada.

DDMI. 2012. Diavik Diamond Mine Aquatic Effects Monitoring Program 2011 Annual Report. Submitted to Wek'èezhìi Land and Water Board. Yellowknife, NWT, Canada.

DDMI. 2013. Diavik Diamond Mine Aquatic Effects Monitoring Program 2012 Annual Report. Submitted to Wek'èezhìi Land and Water Board. Yellowknife, NWT, Canada.

Dominion Diamond (Dominion Diamond Ekati Corporation). 2015. 2014 Water and Sediment Quality Supplemental Baseline Report for the Jay Project. Prepared by Golder Associates Ltd., April 2015. Yellowknife, NWT, Canada.

ERM Rescan (ERM Rescan Environmental Services Ltd.). 2013. Ekati Diamond Mine 2012 Aquatic Effects Monitoring Program Annual Report. Prepared for BHP Billiton Canada Inc. Yellowknife, NWT, Canada.

Golder (Golder Associates Ltd.) 2014. AEMP Version 3.0 (2011 to 2013) Summary Report for Diavik Diamond Mine, NT. Prepared for Diavik Diamond Mines Inc. Yellowknife, NT. October 2014.

Golder. 2015. Jay Project – Lac de Gras Hydrodynamic Model Updates. Submitted to Dominion Diamond Ekati Corporation. January 2015. Submitted to the Mackenzie Valley Environmental Impact Review Board on January 19, 2015. http://www.reviewboard.ca/upload/project_document/EA1314-01_Adequacy_Review_responses_Vol_4_Lac_de_Gras_Hydrodynamic_Model_Updates.PDF

Rescan (Rescan Environmental Services Ltd.). 2011. Ekati Diamond Mine 2010 Aquatic Effects Monitoring Program Annual Report. Prepared for BHP Billiton Canada Inc. Yellowknife, NWT, Canada.

Rescan. 2012. Ekati Diamond Mine 2011 Aquatic Effects Monitoring Program Annual Report. Prepared for BHP Billiton Canada Inc. Yellowknife, NWT, Canada.

DOMINION DIAMOND

Information Request Number:	DAR-MVEIRB-IR-46
Source:	MVEIRB Information Requests from Chuck Hubert
Subject:	Water Management and Closure
DAR Section(s):	3, 8.5.3.3.4

Preamble (MVEIRB):

For the regional assessment of the effect on Lac de Gras, consideration was given to the existing Diavik and Ekati operations. Does Diavik include the A21 pit?

Request (MVEIRB):

Does the closure backfilling assessment account for the Diavik A21 pit? If not, please provide how the net annual water transfers will change with the addition of A21. This should include an expansion of Table 8.5-4.

Response:

Section 8.5.3.3.2 of the Developer's Assessment Report (DAR) provides an assessment of the Ekati and Diavik Mine operations and closure activities potentially overlapping with the Jay Project, including the back-flooding of pits. As described in this section, effects to surface hydrology within the Lac de Gras basin are based on information provided in the Diavik Mine Environmental Assessment (DDMI 1998). As the Environmental Assessment was based on three pits (A154, A418, and A21) being part of the Diavik Mine, the water transfers associated with Diavik Mine in Table 8.5-4 also account for the A21 pit back-flooding volumes (in year 2017).

The timing of the Diavik pit back-flooding events has changed since the 1998 reference document was developed. The actual timeframe for back-flooding the A21 pit from Lac de Gras is likely to be immediately following the end of mining operations, currently scheduled for 2023 (Rio Tinto 2014). However, the range of maximum effects to hydrology within Lac de Gras (DAR Section 8.5.3.3.5) remains valid because Diavik pit back-flooding woud not occur concurrently with Jay and Misery pit back-flooding, which takes place from 2030 to 2033.

The maximum predicted cumulative effects to Lac de Gras mean annual water levels and mean annual cumulative discharges for an average climate year (all statements assume that Diavik pits are re-filled during concurrent years and do not overlap with Misery Pit and Jay Pit and diked area back-flooding) include:

- Reduction in mean annual water levels in Lac de Gras of 0.03 metres (m) during Diavik pit re-filling;
- Reduction in mean annual cumulative discharge from Lac de Gras of 4 percent (%) during Diavik pit re-filling;
- Reduction in mean annual water levels in Lac de Gras of 0.04 m during Misery Pit and Jay Pit and diked area back-flooding; and

- Reduction in mean annual cumulative discharge from Lac de Gras of 5% during Misery Pit and Jay Pit and diked area back-flooding.

References:

DDMI (Diavik Diamond Mines Inc.). 1998. Diavik Diamonds Project Environmental Assessment – Environmental Effects Report on Fish and Water Quality. Diavik CD-ROM series, second edition. Yellowknife, NWT, Canada.

Rio Tinto. 2014. Diavik Diamond Mine – development of the A21 pipe. November 27, 2014. http://www.riotinto.com/media/media-releases-237_13678.aspx.

DOMINION DIAMOND

Information Request Number:	DAR-MVEIRB-IR-47
Source:	MVEIRB Information Requests from Chuck Hubert
Subject:	Effects to surface hydrology due to project activities and potentially overlapping Ekati and Diavik operations
DAR Section(s):	8.5.3.3.5

Preamble (MVEIRB):

The effect on Lac de Gras water levels was described for the average climate year.

Request (MVEIRB):

Please describe how non-average years would be propagated in Lac de Gras. This estimate should account for the A21 pit.

Response:

As described in the preamble, the predicted cumulative effects to water levels and flows at Lac de Gras for the average climate year were presented in Section 8.5.3.3 of the Developer's Assessment Report (DAR). This section provides continuous modelling through all phases of the entire Jay Project. The use of an average climate year is appropriate to estimate the most probable effects to water levels and flows at Lac de Gras when completing continuous year over year modelling. It should be noted that Diavik Mine water transfer volumes in Section 8.5.3.3 included the A21 pit.

In addition to providing an assessment of predicted effects during the average climate year, the DAR included a detailed analysis of discrete annual snapshots, representing the annual period with the greatest effects on surface hydrology within each phase of the Jay Project, and considered the natural climatic variability. The methods for this assessment are provided in Section 8.5.3.1 and the results are provided in Section 8.5.3.2 of the DAR.

To describe how the effects to Lac de Gras would be propagated for non-average years, the predicted effects in Lac de Gras for average and non-average climate years will be discussed for the Jay Project phase that has the greatest cumulative effects to Lac de Gras water levels and flows. This provides an understanding how the predicted cumulative effects for average climate conditions relate to predicted effects for non-average climate conditions and also provides a range of predicted effects. The effects below are based on continuous pumping, and therefore, represent maximum expected effects, without accounting for mitigation measures, including adaptive management plans, that may include reduced pumping rates or cessation of pumping during specified conditions.

Section 8.5.3.3 of the DAR provides the predicted effects to mean annual water levels and mean annual cumulative discharges from Lac de Gras for the average climate year, considering Jay Project activities and Diavik and Ekati Mine activities. The inclusion of the Diavik A21 pit back-flooding is described in the response to DAR-MVEIRB-IR-46. This section of the DAR assumed no overlap of Misery Pit, Jay Pit and diked area back-flooding (scheduled for 2030 to 2033) with Diavik pit back-flooding, as Diavik Mine

operations are scheduled to end in 2023 (DDMI 1998). The end of Diavik operations schedule was also confirmed in a recent media release (Rio Tinto 2014).

The maximum effects to water levels and discharges for an average year at Lac de Gras (considering the back-flooding of Diavik and Ekati pits, and the Jay pit and diked area) are expected to occur during the back-flooding of the Jay Pit and diked area (in 2032). Effects during an average climate year in Lac de Gras were predicted as:

- The largest decrease in discharge from baseline conditions would be due to back-flooding the Jay Pit and diked area during closure in 2032, and would result in a cumulative 5 percent (%) reduction in the mean annual discharge.
- The largest decrease in water level from baseline conditions would be due to back-flooding of the Jay Pit and diked area during closure in 2032, and would result in a cumulative 0.04 metre (m) reduction in the mean annual water levels.

Effects to Lac de Gras from Misery Pit and Jay Pit and diked area back-flooding for non-average climate events are described in Section 8.5.3.2.4 – Effects Analysis – Closure Year 3, Figure 8.5-62 and Figure 8.5-63 of the DAR and Section 8D5.5.4.7 of Appendix 8D. Effects tables for median and wet and dry 10-year and 100-year events (including monthly discharge, peak daily, 7-day and 14-day events, and 30-, 60-, and 90-day low flow events) for both water levels and discharges. A summary of annual water yields during non-average climate years is provided in Table 8D5-300 of Appendix 8D, and in Table 47-2 below, including the percent difference from baseline.

Table 47-1 Changes to Annual Water Yield for Non-Average Climate Conditions during Jay Pit and Diked Area Back-flooding

Condition	Return Period (years)	Annual Water Yield (mm)		Percent Change from Baseline (%)
		Baseline	Closure Year 3	
		Lac de Gras	Lac de Gras	
Wet	100	234	226	-3%
	50	221	213	-4%
	20	203	195	-4%
	10	188	181	-4%
	5	173	165	-5%
Median	2	148	140	-5% (Average Climate Conditions)
Dry	5	128	120	-6%
	10	119	112	-6%
	20	113	105	-7%
	50	106	99	-7%
	100	102	95	-7%

mm = millimetre; % = percent.

Relative volumes and timing of back-flooding events for the Diavik Mine and the Jay Project are discussed to provide context into the potential effects during back-flooding of the Diavik pits. The volume of water sourced from Lac de Gras for the back-flooding of the Diavik pits (A154, A418, and A21), is

expected to be approximately 20 to 26 million m^3 per year over three years (DDMI 1998), and the volume of water sourced from Lac du Sauvage for the back-flooding of the Misery Pit, Jay Pit and diked area is expected to be approximately 31.5 million m^3 per year over an expected period of three years and 9 months. Effects to Lac de Gras water levels and discharges due to Diavik activities are expected to be within the range of effects due to Jay Project activities (for both average climate and non-average climate conditions).

Table 47-1 summarizes the effects to Lac de Gras watershed annual water yields for an average climate year and for non-average, extreme climate conditions. The predicted effects to annual water yields during the back-flooding of the Jay Pit and diked area (predicted to be the greatest during the Jay Project) are a 5% reduction for average climate years, a 3% reduction during wet climate years with a 100 year return period, and a 7% reduction during dry climate years with a 100 year return period. Therefore, the predicted reduction to the annual water yields, and therefore, flows from Lac de Gras into the Coppermine River, are expected to be within a range of 3 to 7% during the period of back-flooding with greatest water withdrawals.

References:

DDMI (Diavik Diamond Mines Inc.). 1998. Diavik Diamonds Project Environmental Assessment – Environmental Effects Report on Fish and Water Quality. Diavik CD-ROM series, second edition. Yellowknife, NWT, Canada.

Rio Tinto. 2014. Diavik Diamond Mine – development of the A21 pipe. November 27, 2014. http://www.riotinto.com/media/media-releases-237_13678.aspx.

DOMINION DIAMOND

Information Request Number:	DAR-MVEIRB-IR-48
Source:	MVEIRB Information Requests from Chuck Hubert
Subject:	Regional Water Balance Model
DAR Section(s):	Appendix 8D

Preamble (MVEIRB):

The hydrologic model of the Desteffany lake system matches the observed stages well; however, there is a second lag peak which was not observed in the environment.

Request (MVEIRB):

Could the lack of this second peak be related to shallow groundwater losses? Could higher groundwater losses in the system alter the overall predicted effects on the Desteffany system.

Response:

Based on hydrometric data for the Desteffany Lake outlet (Station 10PA001) (Environment Canada 2014), as presented in Section 8D3.1.5.4 of Appendix 8D of the Developer's Assessment Report (DAR), a detailed inspection of hydrographs for individual years shows that over the period of record, about half of the years (11 of 20) do not exhibit secondary peaks in autumn / early winter. For those where secondary peaks occur, the peaks typically occur in September or October, and coincide with higher monthly rainfall in August and September.

The baseline meteorology is intended to represent the long-term mean and variability at the Project, but is not intended to represent specific conditions at specific dates. However, over the long term, mean, and extreme rainfall characteristics should be represented. Measured Desteffany Lake discharge data contain secondary peaks in autumn / early winter for years on record. The late-summer rainfall and some contribution of autumn snowmelt result in an increase in autumn/early winter discharge.

The Desteffany Lake modelled discharge is better correlated to measured data than the modelled stage, which has a more prevalent secondary peak. The modelled stage secondary peak may be due in part to the transition from the open water conditions at the lake outlet to early ice effects in the fall. An early ice-related constriction in the lake outlet flows would contribute to a stage-up in the fall as observed in the modelled results. This would not change the assessment conclusions for Desteffany Lake which have been demonstrated to be minor for all Project phases (Section 8.5.3.2 of the DAR).

Higher groundwater losses in the system are not expected to alter the overall predicted effects. The volume of Desteffany Lake outlet surface discharge, was calibrated to long term monitoring data (Environment Canada 2014). Groundwater losses are implicitly included in this calculation. The measured and modelled discharge data match well and effects predictions at the Desteffany outlet are small in magnitude.

References:

Environment Canada. 2014. Water Survey of Canada. Retrieved from Hydrometric Data – Coppermine River at Outlet of Desteffany Lake: Available at: http://www.wsc.ec.gc.ca/applications/H2O/HydromatD-eng.cfm. Accessed on March 3, 2014.

DOMINION DIAMOND

Information Request Number:	DAR-MVEIRB-IR-49
Source:	MVEIRB Information Requests from Chuck Hubert
Subject:	Water balance model and water management for FPK
DAR Section(s):	3

Preamble (MVEIRB):

The ore from the Jay pit will be processed at the Ekati main camp.

Request (MVEIRB):

Will the processed kimberlite for the Jay Pit differ from other pits on site? And if so, what are the consequences.

Response:

Two kimberlite samples were collected from the Jay pipe area in 2014 (Geochemistry Baseline Report, Annex VIII of the Developer's Assessment Report [DAR]). The kimberlite samples underwent acid base accounting (ABA), net acid generation testing, and bulk metal composition analysis. One sample was submitted for short-term leach testing.

The total sulphur content of kimberlite samples from the Jay pipe area (greater than [<] 0.005 percent [%] to 0.83%; 2 samples) was within the range of total sulphur content of kimberlite samples collected from the other open pits at the Ekati Mine (<0.005% to 1.94%; 359 samples). Both samples of Jay kimberlite were classified as non-potentially acid generating (non-PAG) according to the results of ABA. One kimberlite sample from the Jay pipe had a lower neutralization potential (2.5 kilograms of calcium carbonate equivalent per tonne of material [kg $CaCO_3$/t]) than any kimberlite samples from the other locations (9 kg $CaCO_3$/t to 176 kg $CaCO_3$/t). The other sample had a neutralization potential within the range of the other locations (121 kg $CaCO_3$/t).

Jay pipe kimberlite samples had lower concentrations of some solid phase metals in comparison to the range of concentrations of kimberlite samples collected from the Ekati Mine, including arsenic, barium, mercury, magnesium, nickel, antimony, strontium, and tungsten. Kimberlite from the Jay pipe reported concentrations of silver, bismuth, chromium, molybdenum, magnesium, nickel, and thorium that were similar to those in samples collected from other pits.

No coarse processed kimberlite (CPK) or fine processed kimberlite (FPK) was available from the Jay pipe area at the time of the 2014 geochemical testing program, but similar to the kimberlite, CPK and FPK samples from the Ekati Mine were classified as non-PAG.

Although the Jay sample dataset does not include CPK and FPK samples, the geochemical characteristics of CPK and FPK are expected to be similar to those of kimberlite. The diamond beneficiation process is physical, and relies largely on grain size reduction to recover diamonds from kimberlite ore. The kimberlite from the Ekati Mine has similar geochemical characteristics to CPK and FPK, according to the evaluation presented in the Geochemistry Baseline Report for the Jay Project

(Annex VIII). Furthermore, as stated in the Geochemical Characterization and Metal Leaching Management Plan, the general composition of kimberlite is predictable at the Ekati Mine (BHP Billiton 2007). Therefore, the composition of Jay pipe kimberlite is not expected to vary from the known range of composition of kimberlite from the Ekati Mine.

References:

BHP Billiton (BHP Billiton Canada Inc.). 2007. Geochemical Characterization and Metal Leaching (ML) Management Plan. EKATI Diamond Mine. August 2007.

DOMINION DIAMOND

Information Request Number: DAR-MVEIRB-IR-50

Source: MVEIRB Information Requests from Chuck Hubert

Subject: Regional Water Balance

DAR Section(s): Appendix 8B

Preamble (MVEIRB):

The regional water balance study of Desteffany lake used a 4 hr timestep where as the site water balance model used a 1 day timestep. This was apparently done to correspond with the long-term climate data; however, the timestep can be set independently of the daily climate data.

Request (MVEIRB):

Please elaborate on why there was a difference in the timestep used.

Response:

The regional water balance model, including the Desteffany Lake, Lac de Gras, and Lac du Sauvage watersheds, used 4-hour time step to allow a higher frequency of lake outlet discharge calculations. The regional water balance model has approximately 500 lake outlets modelled in parallel and in series. At each lake outlet, the volume of water and corresponding water depth of the lake reservoir during the computation time step, is applied to the lake outlet stage-discharge rating curve and discharged accordingly. Based on manual optimization runs of the model, using a 1-day time step artificially attenuated water within the system of lake reservoirs, especially at smaller modelled lake outlets. A 4-hour time step was observed to improve the lake outlet discharge hydrographs, in particular the peak freshet flows at inlets to Lac du Sauvage. A further reduction to a 1 hour time step did not noticeably improve the results and greatly increased the model runtime.

The site water balance model is based on direct volume transfers, which do not depend on reservoir stage-discharge relationships. A 1-day time step was considered appropriate for the site water balance model.

The site water balance model does not depend on the results of the regional water balance model, and all inputs into the regional water balance model from the site water balance model are transfers into Lac du Sauvage or Lac de Gras. In these large reservoirs, where water level changes from daily site water transfers are small, inputs based on a one day time step were determined to be appropriate.

DOMINION DIAMOND

Information Request Number: DAR-MVEIRB-IR-51

Source: MVEIRB Information Requests from Chuck Hubert

Subject: Water Quantity

DAR Section(s): Appendix 8D

Preamble (MVEIRB):

A rainfall runoff coefficient of 0.20 is assumed for the WRSA; however, the DAR has assumed that infiltration of the WRSA will be minimal and will likely not penetrate into the groundwater.

Request (MVEIRB):

Please explain the basis of that assumption if it is assumed through the runoff coefficient that 80% of rainfall over the WRSA will infiltrate the pile.

Response:

The waste rock storage area (WRSA) runoff coefficient of 0.20 was applied to the Lynx Waste Rock and Overburden Stockpile Area in sub-basin B. This runoff coefficient was tested and calibrated using measured runoff rates from the Misery WRSA, which is situated next to the Lynx facility. The runoff coefficient was estimated from the Ekati Mine site water balance model (ERM Rescan 2014).

The design of the Jay WRSA was included in the scope of the site water management model, which used an effective runoff coefficient of 0.52 during operations, including consideration of water storage in the rock during deposition. The Jay WRSA runoff coefficient is conservative compared to the runoff coefficient of 0.2 which was calibrated to observed runoff rates from the Misery WRSA . It was chosen conservatively as the runoff volumes from the Jay WRSA were used as inputs into the preliminary design of the Jay water management facilities and into the water quality model.

WRSAs have water losses that include evaporation, storage of water in the rock void spaces, and losses to groundwater. Runoff coefficients are a method of estimating the bulk proportion of precipitation that will be conveyed to the toes of the WRSAs. The runoff coefficient is a function of rock type, local topography, grain size distributions, and zones of impermeability within the pile. The runoff coefficient accounts for all water losses, as well as storage within the WRSA. It is not anticipated that precipitation will infiltrate through the WRSA and connect to the groundwater. The majority of precipitation within the WRSA will be stored within the pile and frozen in void spaces, until the storage capacity is reached. Permafrost beneath the WRSA will be maintained, and as a result, there is no connection to the deep groundwater regime.

The WRSAs at the Ekati Mine are constructed to minimize runoff and encourage permafrost formation. The intent is that water infiltrating the WRSA will encounter permafrost and freeze within the pile, restricting long-term runoff and seepage to the active layer.

There is also a temporal aspect to the runoff coefficients used for the WRSA. As the Jay WRSA and Lynx Waste Rock and Overburden Stockpile Area are being built, the runoff coefficient will be lower due to void space in the rock allowing infiltration and storage of water and ice. In post-closure, there is assumed to be

no additional void space for water and ice storage and negligible infiltration will occur at the WRSA. The post-closure runoff coefficients for the the Lynx Waste Rock and Overburden Stockpile Area and the Jay WRSA are returned to a range reflective of coefficients acceptable for disturbed areas.

References:

ERM Rescan (ERM Rescan Environmental Services Ltd.). 2014. Updated Koala Watershed Water Quality Model Report. Prepared for Dominion Diamond Ekati Corporation. Yellowknife, NWT, Canada.

Information Request Number: DAR-MVEIRB-IR-52

Source: MVEIRB Information Requests from Chuck Hubert

Subject: Effects of Construction

DAR Section(s): 8.5.3.2

Preamble (MVEIRB):

The numbers presented in Figure 8.5-8 do not appear to match the values reported in Table 8D5-47. The values for the 1 in 100 yr peak event indicate a 5.5% increase in the peak flow rate from Lac Ac35.

Request (MVEIRB):

Please confirm the values in Figure 8.5-8.

Response:

The values used to create Developer's Assessment Report (DAR) Figure 8.5-8 - *Effects on Lake Ac35 Outlet Discharges – Project Infrastructure and Dike Construction* (reproduced below as Figure 52-1) are from DAR Table 8D5-47 - *Derived Representative Discharges at Lake Ac35 Outlet – Construction* (also reproduced below as Table 52-1) (Appendix 8D of the DAR). These are shown below as reported in the Jay Project DAR without modification.

Figure 52-1 Effects on Lake Ac35 Outlet Discharges – Project Infrastructure and Dike Construction (DAR Figure 8.5-8)

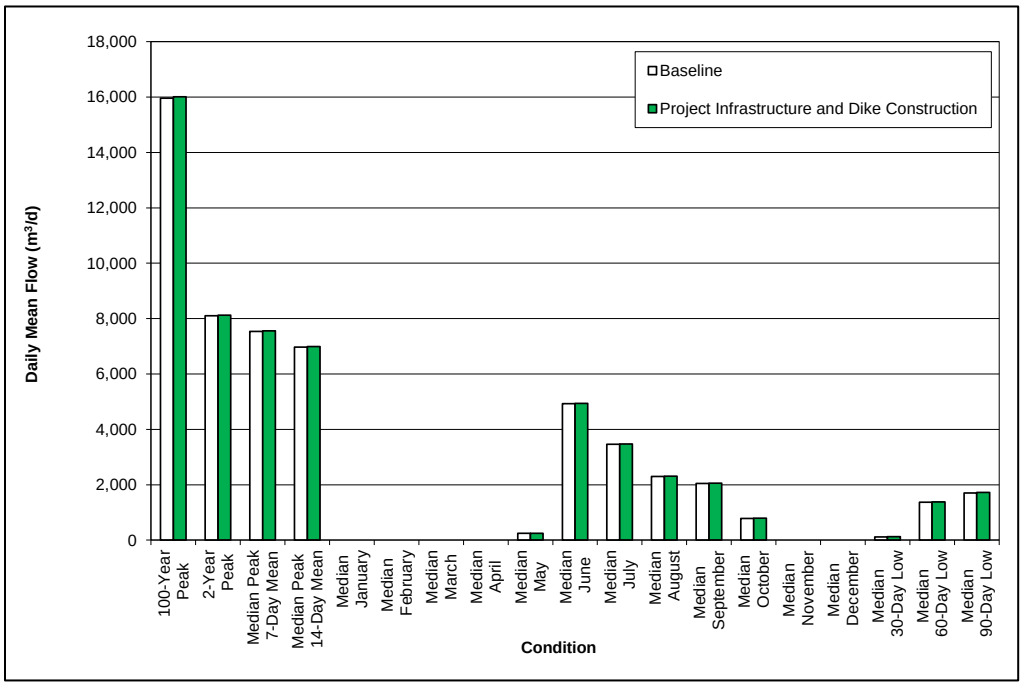


Table 52-1 Derived Representative Discharges at Lake Ac35 Outlet – Construction (DAR Table 5D5-47)

Condition	Return Period (years)	Phase	Peak Daily Q (m^3/s)	7-Day Mean Peak Q (m^3/d)	14-Day Mean Peak Q (m^3/d)	30-Day Low Flow Q (m^3/d)	60-Day Low Flow Q (m^3/d)	90-Day Low Flow Q (m^3/d)
Wet	100	Baseline	0.18	14,514	13,001	1,500	3,309	3,683
		Construction	0.19	14,556	13,039	1,508	3,330	3,710
	10	Baseline	0.14	10,904	9,926	709	2,223	2,561
		Construction	0.14	10,935	9,954	713	2,238	2,579
Median	2	Baseline	0.09	7,533	6,974	120	1,367	1,707
		Construction	0.09	7,554	6,993	121	1,377	1,719
Dry	10	Baseline	0.06	5,042	4,723	-	844	1,183
		Construction	0.06	5,057	4,737	-	850	1,192
	100	Baseline	0.04	3,501	3,291	-	571	887
		Construction	0.04	3,513	3,302	-	576	895

Q= discharge; m^3/s = cubic metres per second; m^3/d = cubic metres per day; - = zero discharge due to ice conditions.

Table 52-1 provides peak 1 in 100 year flows under wet conditions that are rounded to the nearest 0.01 cubic metres per second (m^3/s). In review of the calculated peak flows, the 1 in 100 year peak flows under wet conditions (with increased precision) were estimated as 0.1847 m^3/s (15,959 cubic metres per day [m^3/d]) for baseline conditions and 0.1853 m^3/s (16,006 m^3/d) for the construction phase. Rounding these values to 0.18 m^3/s (baseline) and 0.19 m^3/s (construction) would appear to indicate a 5.5 percent (%) increase in flow, but using the actual, un-rounded values indicates an increase from baseline conditions of just 0.30%. The un-rounded values, and the corresponding calculated increase in peak flows are consistent with those shown in Figure 52-1.

DOMINION DIAMOND

Information Request Number: DAR-MVEIRB-IR-53

Source: MVEIRB Information Requests from Chuck Hubert

Subject: Effects of Construction

DAR Section(s): 8.5.3.2, Appendix 8D

Preamble (MVEIRB):

The narrows width does not consistently increase for the dewatering case relative to the baseline conditions. In addition, the peak width for Narrows the 1 in 100 yr event decreases while the average event has the width increasing.

Request (MVEIRB):

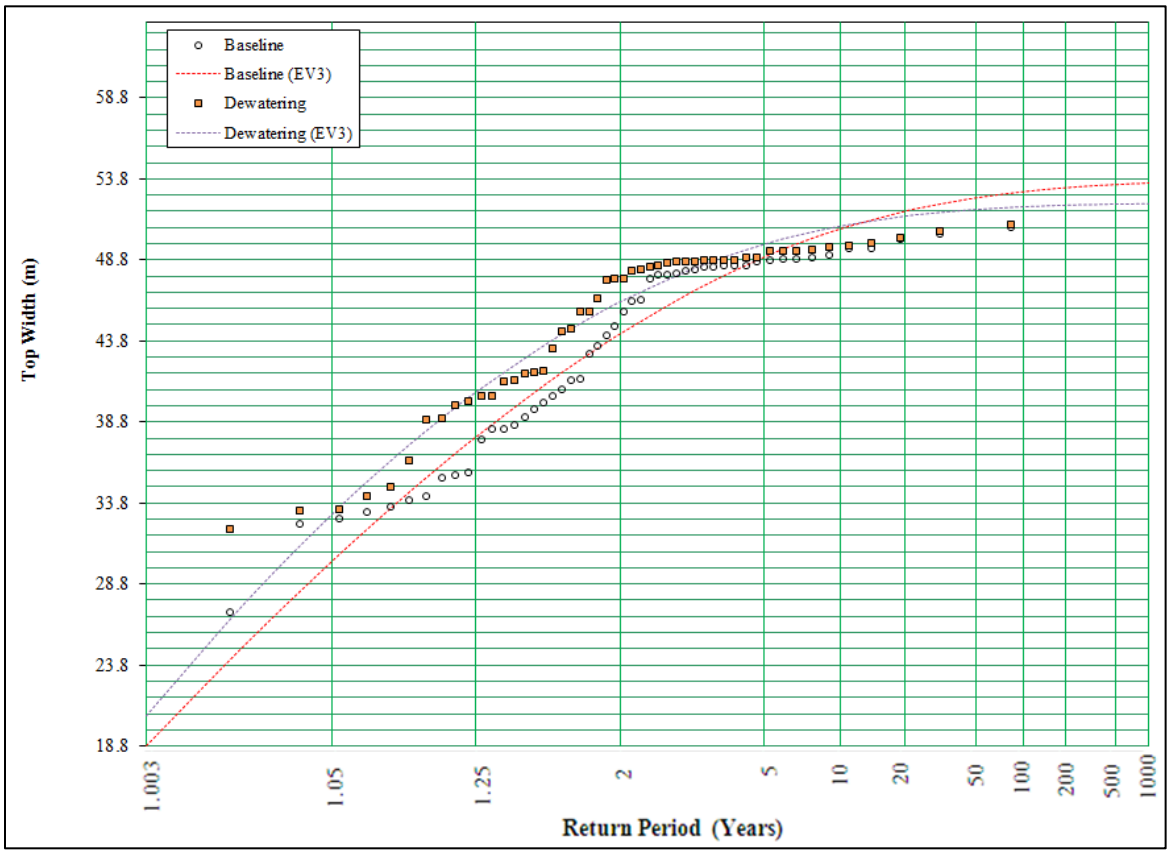
For the Narrows, why does the width not consistently increase for the dewatering case relative to the baseline? Why does the width of the narrows decrease for the larger (1 in 100 yr wet) event?

Response:

The channel top width of the Lac du Sauvage Narrows is expected to increase from baseline values during dewatering. The prediction of channel top width for the 1 in 100 wet year event is based on a frequency analysis using the general extreme value method (EV3 density distribution). The results of this analysis are presented in Figure 53-1, which shows the ranked annual maximum channel top widths corresponding to both baseline conditions and those expected for dewatering conditions. The dewatering case decrease for the 1 in 100 year wet event compared to baseline is a function of the distribution curve and statistical method used.

The statistically predicted effect on the channel top width at the Lac du Sauvage Narrows due to dewatering is small for the 1 in 100 year wet event. Furthermore, Figure 53-1 shows that during high return period events greater than 10 years, the calculated increase in channel top width due to dewatering above baseline is negligible

Figure 53-1 Statistical Comparison of Dewatering and Baseline Case for the Lac du Sauvage Narrows



m = metre; EV3 = extreme value method.

DOMINION DIAMOND

Information Request Number:	DAR-MVEIRB-IR-54
Source:	MVEIRB Information Requests from Chuck Hubert
Subject:	Water Quantity
DAR Section(s):	8.5.3.1.1 and Appendix 8D

Preamble (MVEIRB):

The DAR references rating curves for Lac du Sauvage and Lac de Gras; however, rating curves were only provided for Desteffany Lake.

Request (MVEIRB):

Please indicate where the rating curves are or provide the rating curves used and referenced in the DAR, including the HEC-RAS cross-section for the Narrows.

Response:

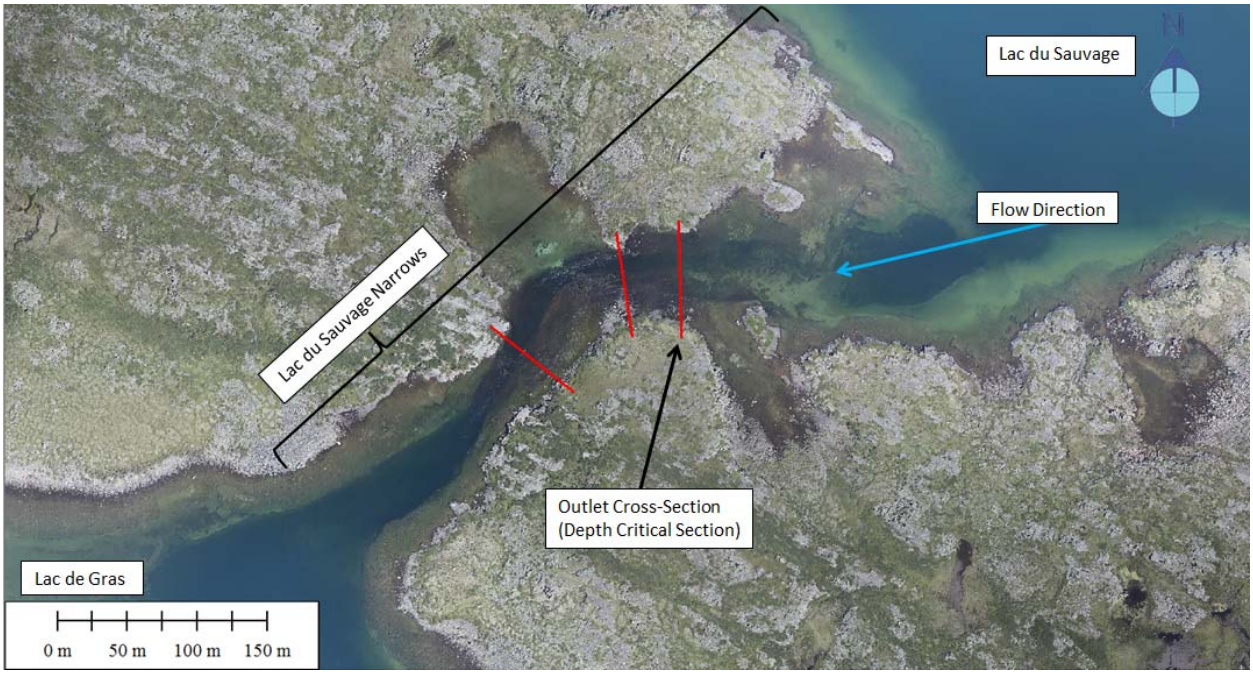
This response is separated into two sections, the first for Lac du Sauvage, and the second for Lac de Gras.

Lac du Sauvage

The Lac du Sauvage stage-discharge rating curve and HEC-RAS cross-sections for the Narrows are provided in Appendix E of Annex X, Hydrology Baseline Report, pages E-338 to E-342 of the Developer's Assessment Report (DAR). Brief descriptions of the Lac du Sauvage rating curve and of the Narrows outlet cross-section are provided here.

Lac du Sauvage conveys flow to Lac de Gras through an area described as the Narrows. This is depicted in Figure 54-1.

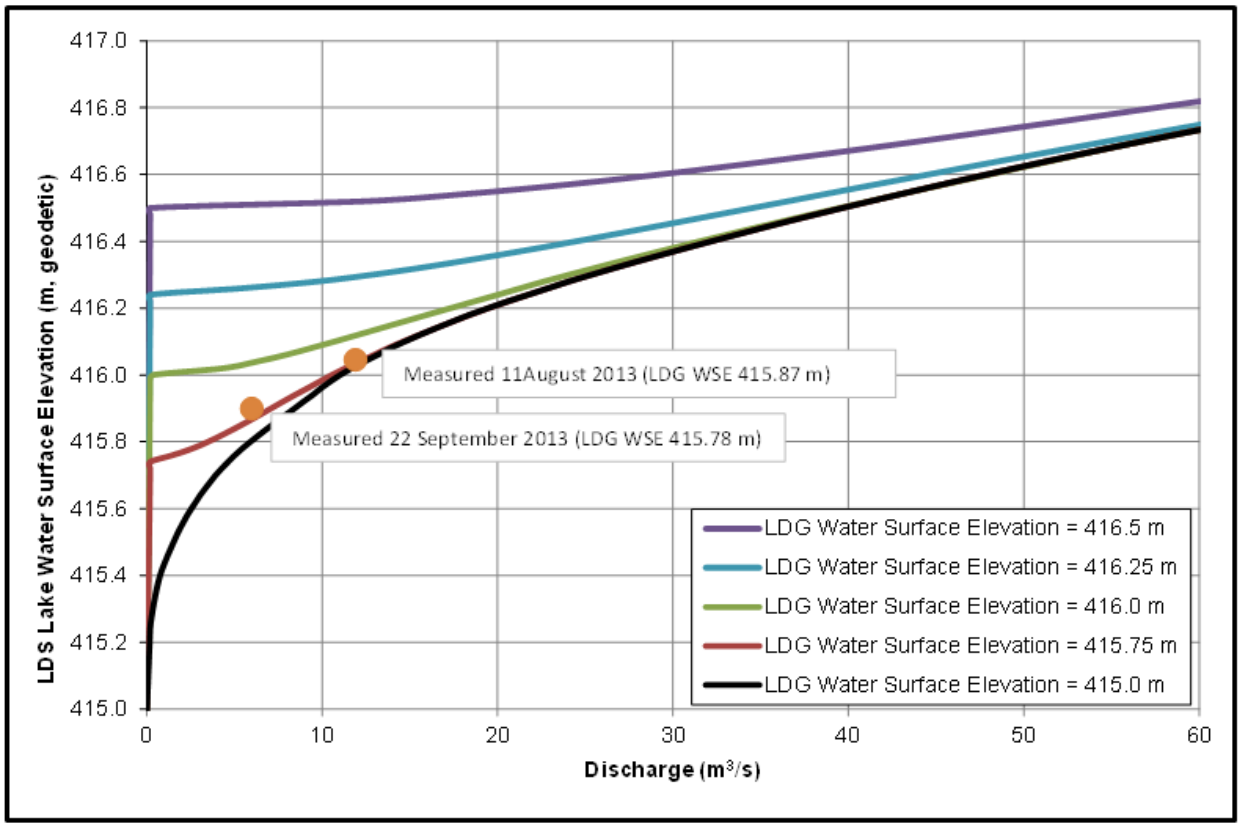
Figure 54-1 Lac du Sauvage Narrows 2013 Cross-Section Survey Locations



Discharge at Lac du Sauvage is estimated as a function of both the Lac du Sauvage and Lac de Gras water levels. Backwater effects are estimated due to measured elevation differences of less than 0.3 metres between the two lakes and because the elevation of Lac de Gras is above the Lac du Sauvage lake sill (zero discharge elevation).

A HEC-RAS model of the Lac du Sauvage outlet, calibrated to 2013 baseline surveys, was used to generate a Lac du Sauvage open-water stage-discharge rating curve for varying Lac de Gras lake levels. This is presented in Figure 54-2 below, which is identical to Figure E4-12 in Appendix E of Annex X, Hydrology Baseline Report.

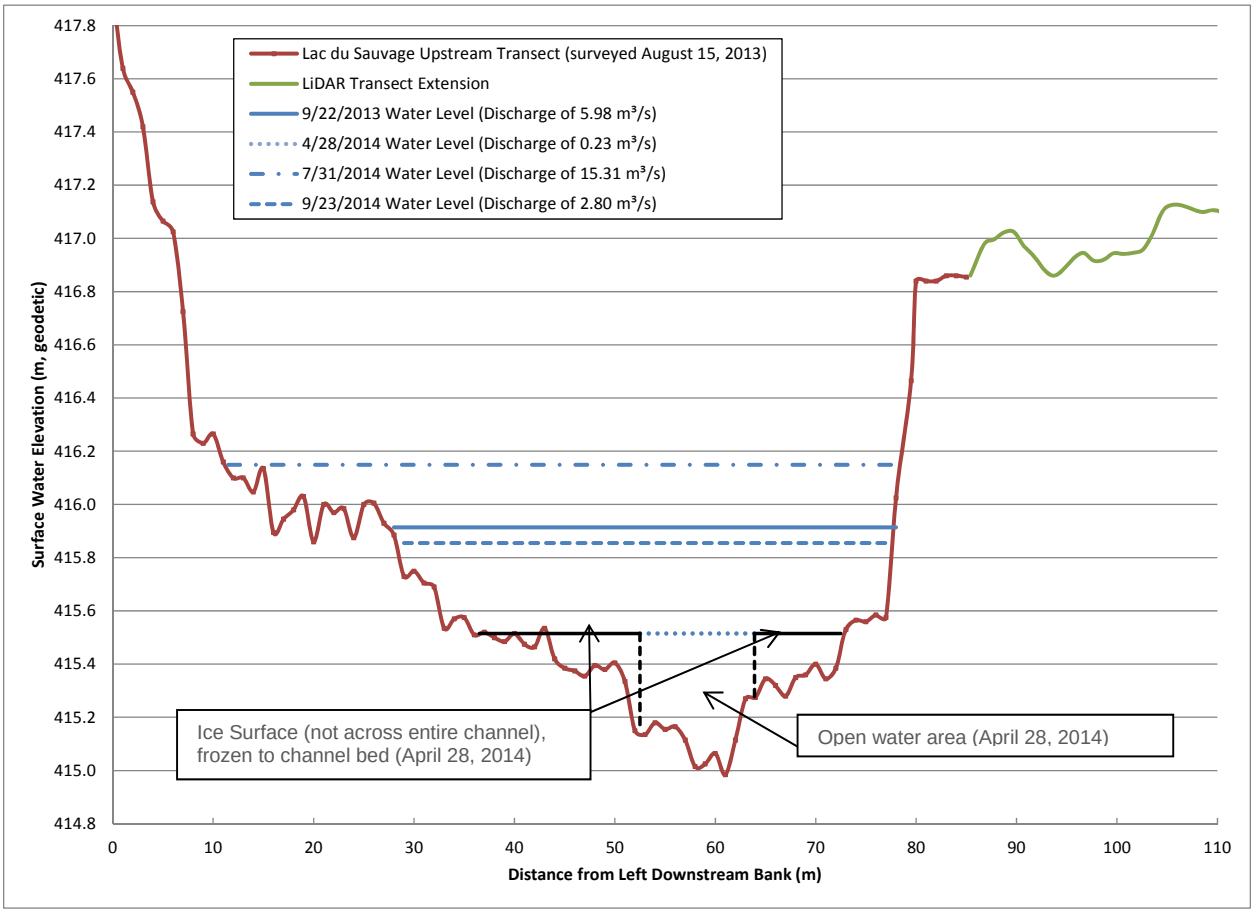
Figure 54-2 Lac du Sauvage Open-water Stage-Discharge Rating Curve



m = metre; m^3/s = cubic metres per second.

The outlet cross-section is the section with the shallowest depths, as it contains the Lac du Sauvage lake sill. The Lac du Sauvage Narrows outlet cross-section and several surveyed water levels are presented in Figure 54-3.

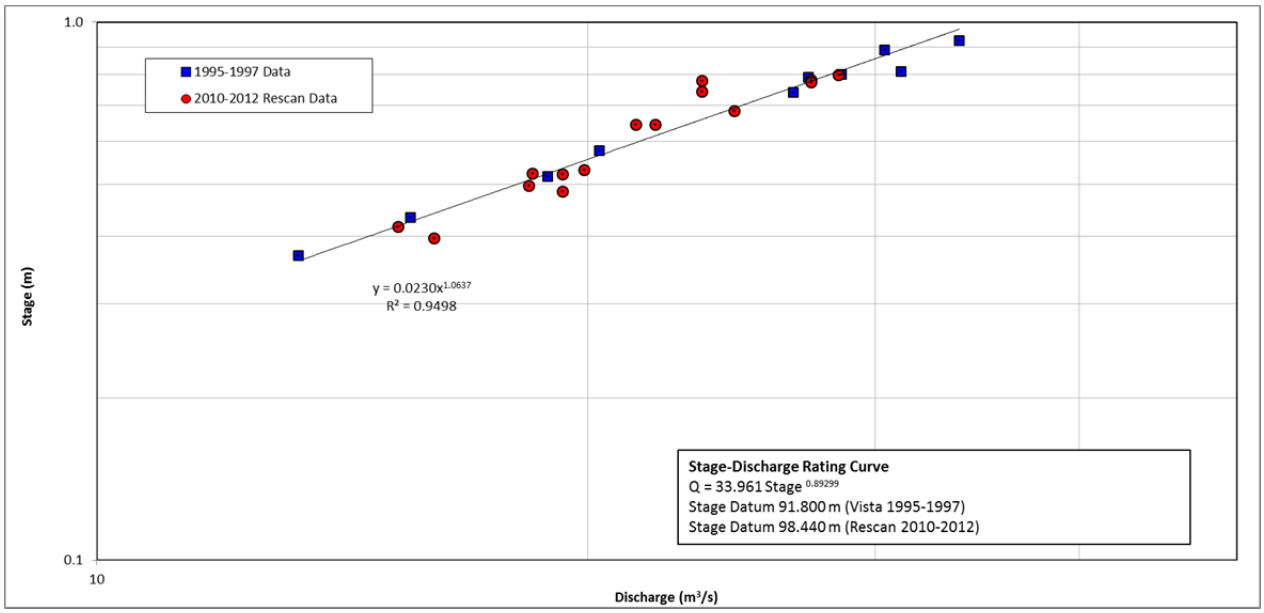
Figure 54-3 Lac du Sauvage Narrows Outlet Cross-Section and Surveyed Water Levels (full range of all measured discharges during 2013 and 2014 field seasons)



Lac de Gras

The Lac de Gras stage-discharge data were presented in Figure 5.4-11 of Annex X and in Figure C2-15 of Appendix C of Annex X, along with tabular data in Table C2-7 in Appendix C of Annex X . Missing from these is the rating curve equation used in the regional water balance model. The Lac de Gras open-water stage-discharge rating curve is derived from historic monitoring data and is presented in Figure 54-4, for stage above the zero-flow datum.

Figure 54-4 Lac de Gras Open-water Stage-Discharge Rating Curve



The Lac de Gras stage-discharge curve required an elevation datum to be used in the GoldSim model. This was completed with a best-fit adjustment based on the Lac de Gras reported water levels from DDMI (2013). The result of this adjustment was presented in Figure F3-12 in Appendix F of Annex X.

An ice effect adjustment was applied to the outlet rating curves of Lac du Sauvage and Lac de Gras under winter low flow conditions. This was discussed in Section F3.1.3. in Appendix F of Annex X.

References:

DDMI (Diavik Diamond Mines Inc.). 2013. Water Level Data for Lac de Gras at the East Island North Inlet. Spreadsheet provided to Golder Associates Ltd. by Dan Guigon, Diavik Diamond Mines Inc.

DOMINION DIAMOND

Information Request Number: DAR-MVEIRB-IR-55

Source: MVEIRB Information Requests from Chuck Hubert

Subject: Fish and Aquatics - Environmental conditions

DAR Section(s): 9.2.1.2.2, 9.4.1.2.1

Preamble (MVEIRB):

Section 9.2.1.2.2. p. 9-16 Baseline water quality for Lac de Gras is taken from Ekati/Diavik AEMP reports from 2010 to 2012. These data therefore represent at least 10 years of mining activity, do not represent baseline conditions and are not adequate for assessment of cumulative effects. Although data from far field sites are used, DDMI AEMP reports show that TDS has increased at some sites. As the Ekati and Diavik mines are currently on the landscape as existing and approved projects, the 2014 baseline of existing conditions include the effects of these developments under the base case. “The Base Case represents a range of conditions over time …before application of the Project …environmental conditions before human development, which represent reference conditions, were considered…where possible.”

Request (MVEIRB):

Please explain why environmental conditions before human development, which represent reference conditions, were only considered …"where possible.” when baseline data on water quality and aquatic life are available from the Diavik EA process. The approach proposed does not allow assessment of cumulative effects from Diavik + Ekati+ Jay but only the effects of the Jay project on a baseline of alteration produced by Ekati and Diavik. Please provide true baseline data for Lac de Gras using EIS data for Ekati and DDMI. This should include water quality, sediment quality, zooplankton and phytoplankton.

Response:

A summary of the cumulative effects assessment completed for water quality in the Developer’s Assessment Report (DAR) and the pre-development condition (referred to as the Reference Condition; i.e., pre-Ekati discharge and pre-Diavik Mine) was provided in the adequacy review response DAR-MVERIB-17 (i.e., the response to adequacy review item 9.1 submitted to Mackenzie Valley Environmental Impact Review Board [MVEIRB] on January 19, 2015).

Water and sediment quality conditions in Lac du Sauvage, Lac de Gras, and other waterbodies in the study area under the Base Case (both Reference Condition and 2014 Baseline Condition) were presented in the DAR (Section 8.2.5.2), and in more detail in the baseline water quality and sediment quality report (DAR Annex XI, Appendix A, Sections A3 and A4). For Lac de Gras, water quality data collected prior to 2000 (DDMI 2001) were used to describe the Reference Condition, while data collected from 2010 to 2012 (DDMI 2011, 2012, 2013; ERM Rescan 2013; Rescan 2011, 2012) were used to describe the 2014 Baseline Condition. Although data are available for the period before 2010, the most recent data were used to reduce the variability in analytical detection limits, which changed over time.

Summaries of zooplankton and phytoplankton plankton community data for the Reference Condition and Baseline Condition were provided in Annex XII, Plankton Baseline Report for the Jay Project (Project).

Plankton data collected before 2000 were considered to be representative of the Reference Condition, while data collected in 2013 were used to describe Baseline Conditions. Although data collected from 2000 to 2012 are not considered true reference data, these data were considered important for characterizing the current and historical conditions and were therefore included in the historical review. The historical plankton data included in the review were obtained from the following sources:

- baseline and long-term Aquatic Effects Monitoring Program (AEMP) data from 1995 to 2012 for the Ekati Mine (Rescan 2012; ERM Rescan 2013);
- baseline data from the 2006 baseline program for the proposed development of the Jay pipe as part of the Ekati Mine (Rescan 2007); and,
- baseline and long-term AEMP data from 1997 to 2012 for the Diavik Mine (Golder 2011; DDMI 2012, 2013).

All of the relevant zooplankton and phytoplankton community data for the Reference Condition and Baseline Condition that we are aware of have been included in the historical review portion of the Plankton Baseline Report for the Project.

As indicated in Section 2.1 of the Plankton Baseline Report for the Project, data from sampling stations in areas exposed to treated effluent were excluded, regardless of whether mine-related effects have been observed (with some exceptions). There were two additional exclusionary criteria used to evaluate the historical data, they were:

1) Notable differences in field sampling methods or laboratory methods, rendering the results to be incomparable to the other datasets; or,
2) A station was sampled only once during the pre-development period, but no further sampling was conducted at this station, rendering the results to be of limited value due to the inability to track changes over time.

We are aware that phytoplankton and zooplankton data were collected in 1997, as part of the baseline sampling program for the Diavik Mine (Golder 1998; Golder 2011). 1997 data from stations WQ-05, WQ-06, and WQ-13 overlapped with existing stations (MF-3, NF, and FFA) currently monitored as part of the Diavik AEMP. However, two of these stations (WQ-05/MF-3 and WQ-06/NF) were considered exposure stations, and were therefore, excluded from the historical review for the Project. The third station (WQ-13/FFA) was included in the historical review for the Project. The remainder of the stations (WQ-10 and WQ-14) did not overlap with existing Diavik AEMP stations; therefore, no further sampling was conducted at these stations after 1997. As a result, 1997 data collected at stations WQ-10 and WQ-14 were considered to be of limited value and were excluded from the historical review for the Project.

References:

DDMI (Diavik Diamond Mines Inc.). 2001. 2000 Aquatic Effects Monitoring Program Technical Report. Yellowknife, NWT, Canada.

DDMI. 2011. Diavik Diamond Mine Aquatic Effects Monitoring Program 2010 Annual Report. Yellowknife, NWT, Canada.

DDMI. 2012. Diavik Diamond Mine Aquatic Effects Monitoring Program. 2011 Annual Report. Diavik Diamond Mines Inc. Yellowknife, NWT, Canada.

DDMI. 2013. Diavik Diamond Mine Aquatic Effects Monitoring Program. 2012 Annual Report. Diavik Diamond Mines Inc. Yellowknife, NWT, Canada.

ERM Rescan (ERM Rescan Environmental Services Ltd.). 2013. Ekati Diamond Mine 2012 Aquatic Effects Monitoring Program Annual Report. Prepared for BHP Billiton Canada Inc. Yellowknife, NWT, Canada.

Golder (Golder Associates Ltd.). 1998. 1997 Aquatic Resources Baseline Program Report. Prepared for Diavik Diamond Mines Inc. Yellowknife, NWT, Canada.

Golder. 2011. 2007 to 2010 AEMP Summary Report. Prepared for Diavik Diamond Mines Inc. Yellowknife, NWT, Canada. 251 pp.

Rescan (Rescan Environmental Services Ltd.). 2007. Ekati Diamond Mine 2006 Jay Pipe Aquatic Baseline. Prepared for BHP Billiton Canada Inc. Yellowknife, NWT, Canada.

Rescan. 2011. Ekati Diamond Mine 2011 Aquatics Effects Monitoring Program. Prepared for BHP Billiton Canada Inc. Yellowknife, NWT, Canada.

Rescan. 2012. Ekati Diamond Mine 2011 Aquatic Effects Monitoring Program Summary Report. Prepared for BHP Billiton Canada Inc. Yellowknife, NWT, Canada.

DOMINION DIAMOND

Information Request Number: DAR-MVEIRB-IR-56

Source: MVEIRB Information Requests from Chuck Hubert

Subject: Fish and Aquatics

DAR Section(s): 9.3.2.1.3

Preamble (MVEIRB):

The DAR states that "the following maintenance activities will be considered for the life of the mine to further support the success of the diversion channel in providing fish passage: regular inspection and maintenance of outlet channels and culverts to remove accumulated sediment and soil/rock fall material; inspection of culvert inlets and outlets for ice and snow build-up before freshet, and removal of any accumulated ice and/or snow; and, repair of damaged channel linings immediately to limit the potential for erosion and breach of channels".

Request (MVEIRB):

Please provide a commitment to the actually carrying out the listed maintenance activities over the life of mine to ensure safe fish passage to the diversion channel, instead of just considering them in the future.

Response:

As described in Section 3.5.3.2 and Section 9.3.2.1.3 of the Developer's Assessment Report, the Sub-Basin B Diversion Channel will be designed to facilitate fish passage to upstream locations during operations and Dominion Diamond will conduct the necessary maintenance work on the channel that may be required to sustain this objective. The exact nature of the maintenance work that may be required cannot be known at this time, but is likely to include the following tasks, or other tasks identified at the time through monitoring and adaptive management:

- regular inspection and maintenance of outlet channels and culverts to remove accumulated sediment and soil/rock fall material;
- inspection of culvert inlets and outlets for ice and snow build-up prior to freshet, and removal any accumulated ice and/or snow; and,
- repairing damaged channel linings immediately to limit the potential for erosion and breach of the channels.

DOMINION DIAMOND

Information Request Number:	DAR-MVEIRB-IR-57
Source:	MVEIRB Information Requests from Chuck Hubert
Subject:	Record of Spills
DAR Section(s):	9

Preamble (MVEIRB):

Spills are classified as a pathway with no linkage to surface water because of mitigation.

Request (MVEIRB):

Please provide a summary record of any spills that have occurred during operation of the Ekati mine and any resulting interactions with surface water to support the classification of spills as a pathway with no linkage to surface water because of mitigation.

Response:

A summary and analysis of spills at the Ekati Mine is presented in Section 1.2.4 of the Developer's Assessment Report. Dominion Diamond will utilize the Spill Contingency Management Plan (the Plan established for the Ekati Mine), as a basis to derive the Plan for the Jay Project. The Plan for the Ekati Mine is a requirement of the Water Licence (W2012L2-0001) for the mine, that is reviewed annually with updates approved by the Wek'èezhìi Land and Water Board. It was developed specifically to establish and document practices for responsible management of controlled substance spills at the Ekati Mine, and to address any environmental spill emergency that may occur at the mine's operating sites (including satellite facilities, such as Misery Camp and Exploration activities), which includes the planned region for the Jay Project (identified as a 2014 Exploration Work Area). This Plan identifies spill prevention processes, and actions and measures to be taken in the event of a spill at any of the Ekati Mine operating sites.

As described in Section 8.4.2.4.2 of the Developer's Assessment Report, the spill contingency plan will be extended for the Project, and will include information on actions that will be followed to respond to spills in the Project area. Complementary plans under the Water Licence and Land Use Permit for Ekati Mine will also be extended to detail storage, handling and spill clean-up of hazardous and non-hazardous material specific to the Project (e.g., Emergency Response Plan, Waste Management Plan, Hazardous Waste Management Plan, Hydrocarbon Impacted Material Management Plan). These plans include Project activities at the main site and the satellite facilities (e.g., Misery and Fox pits), and roads.

DOMINION DIAMOND

Information Request Number: DAR-MVEIRB-IR-58

Source: MVEIRB Information Requests from Chuck Hubert

Subject: Fish and Aquatics

DAR Section(s): 9 (Page 9-154)

Preamble (MVEIRB):

Turbidity curtains are proposed as a means of mitigating TSS/turbidity transport to Lac du Sauvage during dike construction and the Meadowbank project is cited as an example.

Request (MVEIRB):

Will turbidity curtains extend to the lake bed and be weighted to ensure contact with the lake bed, to prevent leakage of very high TSS concentrations into the bottom areas as occurred at Meadowbank?

Response:

Curtains will generally extend to the lake bed surface and will be anchored to maintain the curtain alignment.

The proposed turbidity management system for the Jay Dike is analogous to that implemented during construction of the southern portion of the Bay-Goose Dike at the Meadowbank Mine in Nunavut which, to Dominion Diamond's understanding, did not experience leakage of high total suspended solids concentrations. Additional details regarding turbidity management for the Jay Dike are described within Appendix E, Jay Project Pre-Feasibility Dike Design.

DOMINION DIAMOND

Information Request Number:	DAR-MVEIRB-IR-59
Source:	MVEIRB Information Requests from Chuck Hubert
Subject:	Fish and Fish Habitat – Definitions for Reference, Base Case, and Baseline conditions
DAR Section(s):	9.4.1

Preamble (MVEIRB):

This section states that: "The temporal scale includes natural and development-related changes from reference conditions (i.e., before any regional development) through application of the Project, and reasonably foreseeable developments (where applicable). Base Case conditions represent a range of temporal values on the landscape from reference (little or no development) to 2014 (current or existing) baseline conditions. Environmental conditions on the landscape before industrial development (i.e., reference conditions) are considered part of the baseline conditions. This is because the baseline represents a range of conditions over time, and not just a single point in time. Comparison to a reference condition may allow for a further understanding of the cumulative effects of increases in development on the VCs."

Request (MVEIRB):

Please clearly explain the difference between Reference Conditions, Base Case Conditions and Baseline conditions. Describe what time lines are encompassed by each definition and how this influences the assessment of cumulative effects.

Response:

To clarify, the approach to the analysis of cumulative effects used three assessment cases: Base Case, Application Case, and Reasonably Foreseeable Development (RFD) Case (Section 6.5.2.2 of the Developer's Assessment Report [DAR]). However, to provide a fuller understanding of cumulative effects, the Base Case contained two assessment periods that capture the range of baseline conditions from little or no development to previous and existing developments prior to the Jay Project (including approved but not yet constructed projects). Reference conditions represent the earliest assessment period (temporal snapshot) of the Base Case for which data and information are available for describing the environment prior to all industrial development. Thus, reference conditions provide the initial baseline for calculating the cumulative changes from development on the physical and biological measurement indicators of valued components.

For the assessment of available habitat for fish (Section 9.4.3.1), data on reference conditions pre-date the development of the Ekati and Diavik mines. The data were based on spatially-explicit lake and stream habitat features (e.g., polygons and polylines) defined by CanVec (NRC 2011), where CanVec is a digital vector reference product derived mainly from the Natural Topographic Data Base (NTDB) at a scale of 1:50,000. Prior to the application of CanVec data, all features in close proximity to the Ekati and Diavik mines were visually inspected in a Geographic Information System (GIS) to verify that the files represent pre-development conditions in the effects study area (ESA)

Cumulative effects were also considered for all assessment cases for evaluating potential effects on fish and other aquatic life through changes to surface hydrology and water quality (Section 8.5 of the DAR). As the Ekati and Diavik mines are currently on the landscape as existing and approved projects, the 2014 baseline or existing conditions for water quality and hydrology included the effects of these developments under the Base Case. Similarly, as the Application Case is the existing and approved projects plus the Jay Project (Project), this case also includes the cumulative effects of these developments. This is the same approach applied for calculating changes in lake area and stream length for fish habitat. Additional clarity on the assessment cases, including Reference Conditions, used in Section 8 are summarized in the Adequacy Review Response DAR-MVEIRB-17.

To provide further context for the Base Case, baseline field studies were completed to develop an understanding of the existing physical and biological conditions that may be influenced by the Project. Other sources of existing and historical information were also included (e.g., over 38 documents were reviewed in Annex XIV, Fish and Fish Habitat Baseline Report, such as earlier baselines and monitoring programs at the Ekati and Diavik mines). In the DAR, a second assessment period for the Base Case was selected to describe the existing or current baseline conditions prior to application of the Project (i.e., 2014 baseline conditions). Where possible, quantitative and qualitative analyses of changes in habitat-related measurement indicators from reference to 2014 baseline conditions were considered (e.g., quantitative changes in lake area measured in hectares, qualitative predictions for lower trophic organisms based on changes in water quality) to predict the cumulative effects from human-related environmental selection factors on valued components for the Base Case. Total estimated effects at the Base Case provides important context for evaluating the significance of the incremental and cumulative effects from the Project and other developments at the Application (Base Case plus Project) and RFD (Application plus future developments, if applicable) cases.

References:

NRC (Natural Resources Canada) 2011. CanVec Data Product Specifications, Edition 1.2. Natural Resources Canada, Sherbrooke, Quebec. 19 pp.

DOMINION DIAMOND

Information Request Number: DAR-MVEIRB-IR-60

Source: MVEIRB Information Requests from Chuck Hubert

Subject: Fish and Aquatics

DAR Section(s): 9.4.2.3

Preamble (MVEIRB):

The DAR states that total phosphorus will exceed the CCME (2004) trigger range of 4-10 ug/L for oligotrophic lakes but will remain within the ranges characteristic of oligotrophic lakes (3-17.7 ug/L, Wetzel 2001). This statement is contradictory and a textbook reference should not supersede CCME as a reference point for oligotrophic status in Canada.

Request (MVEIRB):

Please conduct the nutrient assessment using the CCME guidelines to assess the magnitude of change.

Response:

The ranges of total phosphorus concentrations provided in Wetzel (2001) were based on analyses of over 200 waterbodies from data collected as part of an international eutrophication program and modified from Vollenweider (1979). These ranges were provided as context, to illustrate the variability in total phosphorus concentrations in lakes of similar trophic status, but did not form the basis of the assessment of effects on trophic status.

Evaluation of trophic status in the DAR considered predicted concentrations of total phosphorus and nitrogen, as well as phytoplankton biomass (as chlorophyll *a*), using the approach described in Section 9.4.2.2 of the DAR. Effects on lower trophic communities from changes in water quality were predicted using qualitative methods, including an assessment of trophic status based on nutrient concentrations (CCME 2004; Environment Canada 2004; Wetzel 2001). The assessment of trophic status using total phosphorus was based on trigger values defined by CCME (2004) as shown in Table 9.4-2 of the DAR; this table has been reproduced as Table 60-1 below, with additional notes identifying sources.

Table 60-1 A General Trophic Classification of Lakes (CCME 2004; Wetzel 2001)

Trophic Classification	Total Phosphorus[(a)] (TP; µg/L)	Total Nitrogen[(b)] (TN; µg/L)	Chlorophyll *a* [(b)] (µg/L)
Oligotrophic	4.0 – 10	307 – 1630	0.3 – 4.5
Mesotrophic	10 – 20	361 – 1387	3.0 – 11
Eutrophic	35 – 100	393 – 6100	3.0 – 78

a) Based on CCME (2004).
b) Based on Wetzel (2001).
µg/L = micrograms per litre.

References:

CCME (Canadian Council Of Ministers of the Environment). 2004. Canadian Water Quality Guidelines for the Protection of Aquatic Life: Phosphorus: Canadian Guidance Framework for the Management of Freshwater Systems. Canadian Environmental Quality Guidelines, 2004. Winnipeg, MB, Canada.

Environment Canada. 2004. Canadian Guidance Framework for the Management of Phosphorous in Freshwater Systems. Ecosystem Health: Science-based Solutions Report No. 1-8. National Guidelines and Standards Office, Water Policy and Coordination Directorate, Environment Canada, pp. 114.

Vollenweider RA. 1979. Das Nährstoffbelastungskonzept als Grundlage für den externen Eingriff in den Eutrophierungsprozess stehender Gewässer und Talsperren. Z. Wasser-u. Abwasser-Forschung. 12:46-56.

Wetzel RG. 2001. Limnology, 3rd Edition. Elsevier Science Academic Press, New York. 1,006 pp.

DOMINION DIAMOND

Information Request Number: DAR-MVEIRB-IR-61

Source: MVEIRB Information Requests from Chuck Hubert

Subject: Fish

DAR Section(s): 9

Preamble (MVEIRB):

"Mean concentrations of phosphorus in Lac de Gras are expected to increase …. largely reflecting inputs from sources other than the Project."

Request (MVEIRB):

What are the other sources referred to? How much of the increase comes from the Project?

Response:

For the Developer's Assessment Report (DAR), concentrations of phosphorus in Lac de Gras were predicted using a hydrodynamic model (Golder 2015); the in-lake concentrations of total phosphorus were calculated by summing the predicted in-lake orthophosphate concentrations with the 2009 median total organic phosphorus concentration in Lac de Gras. The in-lake predictions relied upon inputs of orthophosphate from identified sources (as these were the sources that were assumed to vary as a result of the Project and other mining activities). The sources of orthophosphate to Lac de Gras were modelled as follows:

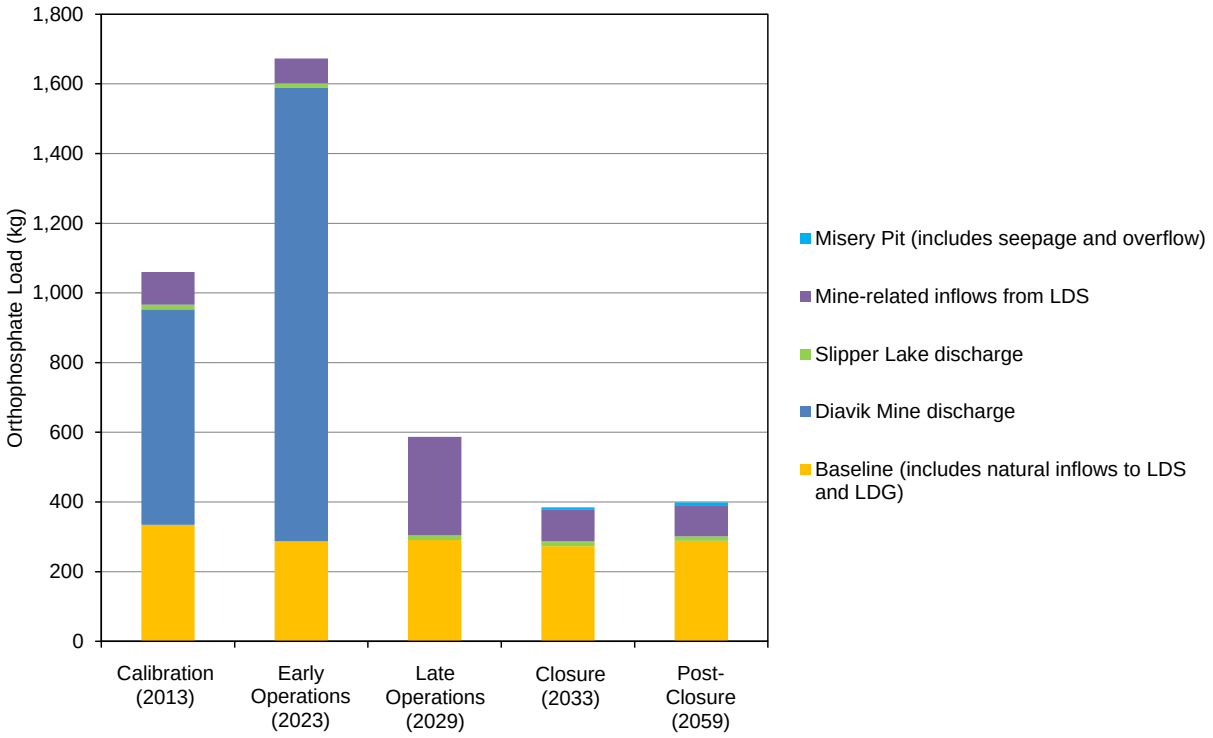
- Baseline: includes tributary and non-point source inflows from the Lac de Gras and Lac du Sauvage watersheds. Baseline contributions were represented by median orthophosphate concentrations from water quality monitoring results for Lac du Sauvage collected between 2004 and 2013 for the open-water season (Appendix 8F, Table 8F2.2-2 in the DAR). This input source is not Project related and is applied in the Base Case and the Application Case.
- Diavik Mine discharge: includes predicted effluent discharge rates from 2014 to 2023 from version 13 of the water management plan for the Mine (DDMI 2014). It was assumed that the Diavik Mine discharge is active during the calibration and early operations periods. Note that modelling of these inputs was developed under conservative assumptions for source term inputs (e.g., nitrogen source terms, geochemistry inputs, groundwater flows), so it is expected that the modelled results are overestimated. This input source is not Project related and is applied in the Base Case and the Application Case.
- Slipper Lake discharge: includes baseline inflows and mine-related inflows from the Ekati mine operations in the Koala watershed (ERM Rescan 2014). It was assumed that the Slipper Lake discharge is active during the calibration, early operations, late operations, closure, and post-closure periods. This input source is not Project related in the Base Case and is Project related in the Application Case.

- Mine-related inflows from Lac du Sauvage (Appendix 8F, Section 2.2.2.3), includes:
  - Load from the Christine Lake discharge that includes baseline inflows and mine-related inflows from the Ekati Mine operation in the King-Cujo watershed. It was assumed that the Christine Lake discharge is active during the calibration, early operations, late operations, closure, and post-closure periods. This input source is not Project related in the Base Case and is Project related in the Application Case.
  - Load from the Misery Pit minewater discharge to Lac du Sauvage. The Misery Pit discharge to Lac du Sauvage is active during the late operations period. During late operations, the Misery Pit discharge includes runoff from the waste rock storage area (WRSA) to the Jay sump. This input source is only Project related and is only applied in the Application Case.
  - Load from the Jay waste rock storage area (WRSA) runoff to Lac du Sauvage. The WRSA runoff is active during the post-closure period. This input source is only Project related and is only applied in the Application Case.
  - Load from the movement of mass from the Jay Pit monimolimnion upward into Lac du Sauvage. The Jay Pit monimolimnion load is active during the post-closure period. This input source is only Project related and is only applied in the Application Case.
- Misery Pit (seepage and overflow): includes seepage and overflow to Lac de Gras during the closure and post-closure periods. This input source is only Project related and is only applied in the Application Case.

The relative loadings of orthophosphate to Lac de Gras from these five sources (i.e., baseline, Diavik Mine, Slipper Lake, mine-related inflows from Lac du Sauvage, and Misery Pit) are included in Figure 61-1 and Table 61-1 for individual years representative of the model calibration period (2013), early operations (2023), late operations (2029), closure (2033), and post-closure (2059).

During early operations, the largest sources of orthophosphate load to Lac de Gras are predicted to be from the Diavik Mine discharge followed by baseline inflows. Diavik is the main source during the early operations phase of the Project because they are discharging effluent, while for the Project, effluent is stored within Misery Pit (i.e., no discharges from Misery during the early operations phase). During late operations, closure, and post-closure, the largest sources of orthophosphate load to Lac de Gras are predicted to be from baseline inflows followed by the Project mine-related inflows from Lac du Sauvage (Figure 61-1 and Table 61-1). During the late operations phase, Diavik will no longer be releasing effluent but there will be discharge of effluent from Misery Pit into Lac du Sauvage; this is captured as input to Lac de Gras by the “mine-related inflows from Lac du Sauvage”. As mentioned above, and discussed in the DAR, the loads of orthophosphate to Lac de Gras were used to predict concentrations of orthophosphate and total phosphorus in the lake.

Figure 61-1 Annual Orthophosphate Load to Lac de Gras for the Updated Assessment Case



kg = kilograms; LDS = Lac du Sauvage; LDG = Lac de Gras.

Note: Mine-related inflows from Lac du Sauvage include contributions from the Ekati Mine operation in the King-Cujo watershed and from the Jay Project.

Table 61-1 Annual Orthophosphate Load to Lac de Gras for the Updated Assessment Case

Source	Annual Orthophosphate Load (kg)				
	Calibration (2013)	Early Operations (2023)	Late Operations (2029)	Closure (2033)	Post-Closure (2059)
Baseline (includes natural inflows to Lac du Sauvage and Lac de Gras)	334	287	290	273	288
Diavik Mine discharge	619	1,301	0	0	0
Slipper Lake discharge	13	13	13	14	13
Mine-related inflows from Lac du Sauvage	94	71	283	91	90
Misery Pit (includes seepage and overflow)	0	0	0	7	8
Total	1,060	1,673	587	385	399

kg = kilograms.

References:

DDMI (Diavik Diamond Mines Inc.). 2014. Diavik Diamond Mine Water Management Plan Version 13. Submitted to Wek'èezhìi Land and Water Board. Wekweeti, NWT, Canada.

ERM Rescan (ERM Rescan Environmental Services Ltd.). 2014. Predicted Slipper Lake Outlet Water Quality and Quantity Predictions. Provided via email from Eric J. Denholm (Dominion Diamond) to Michael Herrell (Golder Associates Ltd.) Fw: data request. Thursday, December 4, 2014 6:40 AM

Golder (Golder Associates Ltd.). 2015. Jay Project – Lac de Gras Hydrodynamic Model Updates. Technical Memorandum. Prepared by Golder Associates Ltd. For Dominion Diamond. January 2015.

DOMINION DIAMOND

Information Request Number: DAR-MVEIRB-IR-62

Source: MVEIRB Information Requests from Chuck Hubert

Subject: Fish and Aquatics

DAR Section(s): 9.4.3.1.2

Preamble (MVEIRB):

On page 9-189, it states: "Higher concentrations of TDS (in particular calcium) may stimulate growth of Daphnia species and potentially cause a shift in community structure towards larger-sized zooplankton. Calcium limitation may explain the observation that high TDS lakes are associated with higher zooplanton productivity".

Request (MVEIRB):

Please provide a reference for this (e.g. Snap Lake?) as was done for benthos on p. 9-190.

Response:

Although biotic factors (e.g., predation) are most commonly cited as influencing the size structure of zooplankton assemblages, several researchers have demonstrated that abiotic characteristics, such as water hardness, and calcium and total dissolved solids (TDS) concentrations, can also play an important role in influencing the size structure of zooplankton assemblages (Tessier and Horwitz 1990; Shuter et al. 1998; Hessen et al. 2000; Waevagen et al. 2002). Tessier and Horwitz (1990) observed a shift in size structure of zooplankton in response to changes in water hardness. In their study of 146 lakes in northeastern United States, decreasing water hardness resulted in a loss of large-bodied zooplankton and an increase in the abundance of smaller rotifers. Large-bodied zooplankton, including *Daphnia pulex, D. pulicaria, D. schodleri,* and *D. galeata mendotae,* were found to be notably absent from lakes with low water hardness (Tessier and Horwitz 1990). The distribution of *Daphnia* species is often related to the calcium concentration in lakes, as calcium is an essential element for zooplankton growth and the development of their carapace (Waevagen et al. 2002). Hessen et al. (2000) found increases in calcium concentrations to be associated with increased growth and egg production of *Daphnia magna*. Shuter et al. (1998) attributed increased growth of Lake Trout in high TDS lakes to higher zooplankton productivity at higher TDS levels, which may have contributed to greater food availability for Lake Trout (Shuter et al. 1998).

References:

Hessen DO, Alstan NEW, Skardal L. 2000. Calcium Limitation in *Daphnia magna.* J Plankton Res. 22(3): 553-568.

Shuter BJ, Jones ML, Korver RM, Lester NP. 1998. A general, life history based model for regional management of fish stocks: the inland lake trout (*Salvelinus namaycush*) fisheries of Ontario. Can J Fish Aquat Sci. 55: 2161–2177.

Tessier AJ, Horwitz RJ. 1990. Influence of water chemistry on size structure of zooplankton assemblages. Can J Fish Aquat Sci. 47: 1937–1943.

Waevagen SB, Rukke NA, Hessen DO. 2002. Calcium content of crustacean zooplankton and its potential role in species distribution. Freshwater Biol. 47: 1866-1878.

DOMINION DIAMOND

Information Request Number: DAR-MVEIRB-IR-63

Source: MVEIRB Information Requests from Chuck Hubert

Subject: Fish and Aquatics

DAR Section(s): 9 (Page 9-15)

Preamble (MVEIRB):

Lac du Sauvage is described as thermally stratified throughout the summer period. Is this periodically broken down by wind events as in Lac de Gras? Was this accounted for in modelling?

Request (MVEIRB):

Please confirm the stratification status of Lac du Sauvage and how that was addressed in the whole lake water quality model.

Response:

Thermal stratification in the open-water season was accounted for in both the Lac du Sauvage and Lac de Gras hydrodynamic models. Thermal stratification and mixing is driven by meteorological inputs, including wind speed and wind direction. As described in Appendix 8F, Section 8F2.2.2.1 of the Developer's Assessment Report, the following meteorological input data were required for the Lac du Sauvage and Lac de Gras models:

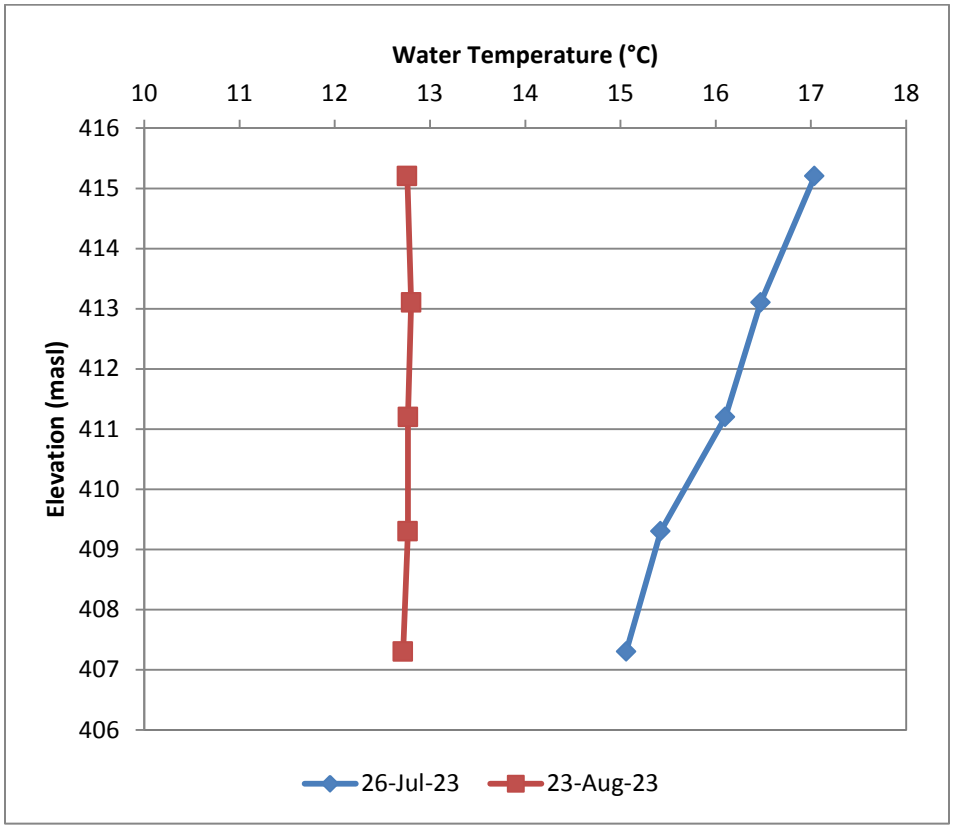
- air temperature;
- dew point temperature;
- wet bulb temperature;
- atmospheric pressure;
- wind direction;
- wind speed; and
- solar radiation.

An hourly time series was constructed for each of these inputs during the calibration time period based on measured data from an on-site meteorological station at the Diavik Mine, with the exception of atmospheric pressure. An hourly time series of atmospheric pressure was constructed from the Environment Canada meteorological station at the Yellowknife Airport. Hourly time series of dew point and wet bulb temperatures were calculated based on recorded air temperature, relative humidity, and atmospheric pressure. Where gaps existed in the data from the Diavik Mine, data from an on-site meteorological station at the Ekati Mine were used. The climate data variability over the model calibration time period was assumed to be representative of the range of meteorological conditions that could be reasonably expected to occur over the modelled timeframe. Therefore, for the prediction of future

conditions, the time series used to calibrate the model was repeated. The same meteorological inputs were used for the Lac du Sauvage and Lac de Gras models.

Lac du Sauvage was predicted to thermally stratify early in the open-water season and then to become completely mixed later in the open-water season (Figure 63-1).

Figure 63-1 Predicted Temperature (°C) Profiles in Lac du Sauvage for the Early Open-water Period (i.e., July and August)



masl = metres above sea level; °C = degrees Celsius.

DOMINION DIAMOND

Information Request Number: DAR-MVEIRB-IR-64

Source: MVEIRB Information Requests from Chuck Hubert

Subject: Lake Modelling

DAR Section(s): 2 (Page 2-6), 9 (Page 9-13 and Page 9-83)

Preamble (MVEIRB):

These sections variously describe the narrows between Lac de Sauvage and Lac de Gras as "it is expected that flow is maintained year round", "swift currents may keep waters open in the winter", "It is expected that year-round flows are maintained" and "open water remains in the narrows year round".

Request (MVEIRB):

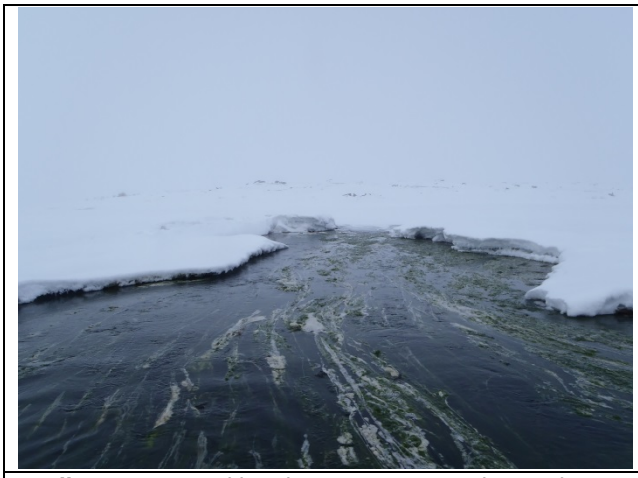
Please confirm if year round flow and open water has been confirmed and how this status is addressed in modelling. Were the lakes modelled assuming that there is year-round flow between the lakes?

Response:

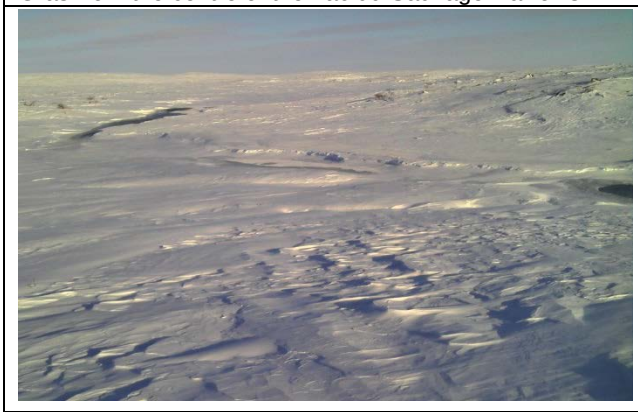
Traditional Knowledge regarding the Lac du Sauvage Narrows indicate that the surface of the Lac du Sauvage Narrows remains open due to swift currents present in areas of the channel (Weledeh Yellowknives Dene 1997). During recent winter season visits to the Lac du Sauvage Narrows, as part of the Jay hydrology baseline program (April 28, 2014) and a subsequent visit by Ekati Mine Site staff (February 25, 2015), partial open water has been observed over areas of the Lac du Sauvage Narrows. During these visits, the channel was constricted due to ice formation along channel banks and the lake ice also extended into portions of the Lac du Sauvage Narrows. Photos from the 2014 and 2015 winter field visits are provided in Table 64-1. The presence of open-water and flow throughout the Lac du Sauvage Narrows during these visits supports Traditional Knowledge regarding the Lac du Sauvage Narrows, and therefore, year-round flow and partial open-water are expected at the Lac du Sauvage Narrows.

Table 64-1 Winter Conditions at the Lac du Sauvage Narrows

	
April 28, 2014: Looking upstream towards Lac du Sauvage from the north side of the Lac du Sauvage Narrows	**April 28, 2014:** Looking upstream towards Lac du Sauvage from the north side of the Lac du Sauvage Narrows
	
April 28, 2014: Looking across the Lac du Sauvage Narrows to the left downstream bank from the right downstream bank	**April 28, 2014:** Looking upstream towards Lac du Sauvage from the centre of the Lac du Sauvage Narrows



April 28, 2014: Looking downstream towards Lac de Gras from the centre of the Lac du Sauvage Narrows



February 25, 2015: Looking upstream towards Lac du Sauvage from the north side of the Lac du Sauvage Narrows (ENE direction from 546695 E, 7159539 N)



February 25, 2015: Looking across the Lac du Sauvage Narrows to the left downstream bank from the right downstream bank (SE direction from 546695 E, 7159539 N)

Lac du Sauvage was modelled assuming year-round flow through the Lac du Sauvage Narrows into Lac de Gras. It was assumed that the formation of ice in winter constricts outflow channels and reduces lake discharge rates. In the regional water balance model, the Lac du Sauvage outlet flows were reduced during the period of ice cover due to increased boundary friction and the physical blocking of the channel from ice formation, by applying a reduction factor to the Lac du Sauvage open-water stage discharge rating curve. The detailed discussion of the modelling methods are included in the Developer's Assessment Report (DAR) Annex X, Appendix F, Section F3.1.3.2.2. Year-round flow through the Lac du Sauvage Narrows was considered in the assessment of fish and fish habitat (Section 9 of the DAR). The baseline description identified the Narrows as an important corridor for fish movement between the two lakes, in part, because open water can remain in the Narrows year-round (Section 9.2.4.1.1). The flow characteristics of the Narrows may provide productive areas for spawning, rearing, and forage habitats for fish valued components.

References:

Weledeh Yellowknives Dene. 1997. Weledeh Yellowknives Dene: A Traditional Knowledge Study of Ek'ati. Yellowknives Dene First Nation Council, Dettah, NWT, Canada.

DOMINION DIAMOND

Information Request Number: DAR-MVEIRB-IR-65

Source: MVEIRB Information Requests from Chuck Hubert

Subject: Fish and Aquatics

DAR Section(s): 9.2.3

Preamble (MVEIRB):

The proposed horseshoe dike around the Jay Pipe is tied into a small island and 2 small islands are located within the dike perimeter, yet no fisheries or benthic surveys were made along these islands.

Request (MVEIRB):

Given the importance of littoral areas and that the location of these islands adjacent to major physical disturbances changes the specific characteristics of habitat and usage, the predevelopment status should be documented to inform a) compensation and b) a baseline for any changes to habitat with dike construction. Please provide data on habitat characteristics and usage by fish for the islands in the footprint of the dike.

Response:

Dominion Diamond provided detailed information on habitat characteristics, including littoral areas, for Lac du Sauvage in the Fish and Fish Habitat Baseline Report (Annex XIV) of the Developer's Assessment Report (DAR). This information was then summarized in Section 9.2.4.1 of the DAR, and in Section 9A4.1 of the Conceptual Offsetting Plan (Appendix 9A). Detailed habitat maps of littoral areas of Lac du Sauvage were presented and described in the Fish and Fish Habitat Baseline Report (Maps 3.2-1A to 3.2-1C in Annex XIV), in the Fish and Fish Habitat Section 9 of the DAR (Map 9.2-6, Map 9.4-2), and in the Conceptual Offsetting Plan (Map 9A4.1-2 in the Appendix 9A).

The shoreline (or littoral) habitat maps were created by digitizing habitat from high-quality georeferenced orthophotographs in a Geographic Information System (GIS) combined with 'ground-truthed' observational data collected during shoreline/littoral surveys by boat in 2013 (Figure 65-1). All substrate habitat types within littoral (depth of 0 to 5 metres [m]) areas of Lac du Sauvage, including islands, were described. Substrate types included fines (Fi), boulder dominated by fines (Fi/Bo), fines dominated by boulder (Bo/Fi), cobble dominated by fines (Fi/Co), fines dominated by cobble (Co/Fi), cobble dominated by boulder (Bo/Co), boulder dominated by cobble (Co/Bo), and bedrock (Br). These maps cover the area of shoreline and the islands near the proposed dike location. A complementary analysis describing substrate (as coarse, fines, or mix) at shallow and deep water locations using hydroacoustic data for the entire area of Lac du Sauvage was also performed and summarized in the DAR (Section 9.2.3.3).

Figure 65-1 An Example of Digitized Shorelines and Visible Extent of Substrate Zone (Black and Yellow Lines) using Georeferenced Orthophotos in a Geographic Information System



Historical sampling of benthic invertebrate communities was performed around the islands to be affected by the dike. Sampling locations included in the historical data review are provided in Map 1.3-1 of the Benthic Invertebrate Baseline Report for the Jay Project (Annex XIII), and Map 9.2-4 in Section 9.2 of the DAR. Benthic invertebrate community data from these locations are presented in Appendix A of Annex XIII.

In addition, there have been multiple fisheries surveys conducted in the littoral zones and near shorelines of the islands in the proposed diked area from 2006 to 2013 including a hydroacoustic survey conducted in 2013. Please refer to Map 3.1-1 of the Fish and Fish Habitat Baseline Report (Annex XIV) for sampling locations of previous fisheries surveys conducted between 2006 and 2012, and Map 3.1-2 for sampling locations visited in 2013. Sampling activities within the proposed diked area in 2014 included shoreline electrofishing near the mouth of Stream B0 (see Map 2.1-1A in Dominion Diamond 2015).

Littoral Habitat

Based on habitat maps created in a GIS, statistics on habitat characteristics for littoral areas, including islands, within both Lac du Sauvage and the diked area were derived and summarized in the DAR. As reported in Section 9.2.4.1.1, page 9-33:

> "*Most of the visible substrate identified on geo-referenced orthophotos in Lac du Sauvage was fines (2,712 ha or 71.9% of the shoreline area evaluated in Lac du Sauvage), followed by boulder/cobble (699 ha or 18.5%), with fines/boulder (206.7 ha or 5.5%) and boulder/fines (126.3 ha or 3.4%) representing smaller portions of shoreline habitat (Map 9.2-6). Typically, fines (50.7%) and boulder/cobble (33.1%) were prevalent at shallow depths (0 to 2 m), with fines (89.7%) dominating within the 2 to 5 m depth stratum.*
>
> *Other substrate types visually identified and quantified in shoreline habitats of Lac du Sauvage included boulder (less than 0.1%), bedrock (0.2%), cobble/boulder (0.2%), cobble/fines (less than 0.1%), and fines/cobble (0.2%). Substrates identified as cobble in the field often included small areas of gravel that could be used as potential spawning locations by whitefish species, Lake Trout, and Cisco*."

Relative and absolute change in the area of habitat types from the proposed Jay Project were then reported in Section 9.4.3.1.1 (see Table 9.4-4) in the DAR and in Section 9A4.1.1 in Appendix 9A (see Table 9A4.1-3). For example, from page 9-165:

> "*An assessment of habitat losses along the shoreline was conducted using the more detailed habitat data derived from orthophotos and ground-truthed substrate delineations (Table 9.4-4). Losses of shallow and moderate depth (i.e., less than 5 m water depth) habitat types delineated using orthophotos will include fines (110.6 ha) and boulder/cobble (43.2 ha), resulting in a relative loss of 4.1% of the fines substrate, and 6.2% of the boulder/cobble substrate in the shallow and moderate depth habitats of Lac du Sauvage (Table 9.4 4). The other substrate types for which shallow and moderate depth habitat will be lost are boulder/fines and fines/boulder (2.1% and 0.3% for the boulder/fines and fines/boulder habitat, respectively*)."

In response to the information request, an evaluation of direct effects to littoral habitat around islands is provided below. Using the same methods for the analysis of all littoral habitats (waters less than 5 m deep), the areas of the littoral habitat types adjacent to islands within Lac du Sauvage and within the proposed diked area were calculated (Table 65-1). Boulder mixed with cobble (Bo/Co) and fines (Fi) are the predominant habitat types found in the island littoral areas within Lac du Sauvage and are the only habitat types observed adjacent to the islands within the proposed footprint of the dike and dewatered area. A total of 6.01 hectares (ha) of Bo/Co and 11.71 ha of Fi related to island littoral habitat will be lost because of the dike footprint, and a further 13.21 ha of Bo/Co and 40.82 ha of Fi will be lost in the dewatered area footprint. The littoral areas around islands were included in the littoral areas assessed in the DAR and were accounted for in the residual impact classification.

Table 65-1 Absolute Habitat Loss of Island Littoral Habitat Types within Proposed Dike and Dewatered Areas

Depth of Habitat	Substrate Type	Area within the Proposed Dike (ha)	Area within Proposed Dewatered Area (ha)
0-2 m	Bo/Co	4.72	9.13
	Fi	0.48	1.15
2-5 m	Bo/Co	1.29	4.08
	Fi	11.23	39.67
Total (0-5 m)	Bo/Co	6.01	13.21
	Fi	11.71	40.82
Total Habitat Loss by Area (ha)		17.72	54.03
Total Habitat Loss (ha)		71.75	

m = metre; ha = hectare; Bo/Co = cobble dominated by boulder; Fi = fines.

Using shoreline length of islands as a surrogate for available littoral habitat near islands, the relative loss of island littoral habitat is predicted to be 9.6% in Lac du Sauvage and 1.4% in the Effects Study Area (Lac de Gras and Lac du Sauvage combined) (Table 65-2). These estimates conservatively assume that losses represent not only all island littoral habitats within the diked area, but also island littoral habitat that intersect with the dike footprint (i.e., includes shoreline length for islands that extend outside the diked area into Lac du Sauvage).

Table 65-2 Island Statistics for Lac du Sauvage and Lac de Gras

Lake	Total Number of Islands	Total Island Shoreline Length (m)	Island Shoreline Length Affected by Mine Footprint (m)[(a)]	Relative Loss of Island Shoreline (%)
Lac du Sauvage	132	68,853	6,628	9.6
Effects Study Area	755	480,911	6,628	1.4

a) Based on 14 islands that lie within the diked area and intersect with the dike footprint.

m = metre; ha = hectare; Bo/Co = boulder dominated by cobble; Fi = fine;% = percent.

Littoral Fish Community

In response to the information request, additional information on the littoral fish community around the affected islands is also provided. Fisheries surveys conducted around the islands near the proposed footprint included minnow traps and gill nets. Between 2006 and 2013, a total of 59 minnow traps and 5 gill nets were set in littoral areas and near the shorelines around islands within the footprint of the proposed dike and dewatered area footprint. The mainland littoral and shoreline areas within the proposed footprint were also surveyed using a combination of backpack electrofishing, minnow traps, and gill nets.

Fish species captured in the littoral areas and near shorelines of the islands located within the proposed footprint included Lake Trout, Round Whitefish, Lake Whitefish, and Burbot. The gill netting effort yielded an average catch-per-unit-effort (CPUE; fish per 100 square metres of net set for 1 hour) of 1.30 fish/net effort of Lake Trout, 1.01 fish/net effort of Round Whitefish, and 0.33 fish/net effort of Lake Whitefish. Comparatively, average Lake Trout (0.68 fish/net effort) and Round Whitefish (0.30 fish/net effort) CPUEs for gill net sets throughout Lac du Sauvage were lower compared to island littoral/shoreline areas found within the dike and dewatered area footprint area but were higher than CPUEs recorded for Lake Whitefish (0.42 fish/net effort). This suggests that Lake Trout and Round Whitefish may prefer the habitat surrounding the islands, likely selecting the habitats for foraging.

Of the 59 minnow traps set in the island littoral areas between 2006 and 2013 for a total of 771 hours, only 1 Burbot was captured. Other species detected in the shoreline littoral areas falling within the proposed footprint of the dike and dewatered area, included Arctic Grayling, Ninespine Stickleback, and Slimy Sculpin. All species were captured using backpack electrofishing, and therefore, it is likely that these species also occur in areas adjacent to the islands where electrofishing was not performed. Northern Pike and Cisco were not recorded within the proposed footprint area but were recorded at other locations in Lac du Sauvage.

Summary

The DAR provided an assessment of fish habitat, including littoral habitat, the results of which are summarized in Section 9 and Appendix 9A. This response provides a supplemental analysis of the littoral habitat mapped around the affected islands. The amount of incremental change to island littoral habitat during operations is expected to result in no measurable effects to self-sustaining and ecologically effective populations to the valued components (VCs) of Arctic Grayling, Lake Trout, and Lake Whitefish. The effects, if any, will be limited to a negligible change in the distribution of fish with no effects on the assessment endpoints. Any re-distribution of fish would be within the range of baseline conditions that characterizes populations in Lac du Sauvage. Fish species, such as Lake Trout, can be resilient to changes in habitat and have been shown to actively seek out alternate habitats when their traditional habitat is lost (McAughey and Gunn 1995; Gunn and Sein 2000).

The conclusions in this response are consistent with those reported in the residual impact classification section of the DAR (Section 9.6.2). The effects from the proposed development are predicted to not have a significant adverse impact on the ability of Arctic Grayling, Lake Trout, and Lake Whitefish populations to be self-sustaining and ecologically effective, where self-sustaining and ecologically effective

populations of fish VCs are the foundation for ongoing fisheries productivity. Furthermore, a final offsetting plan (based on the conceptual plan in the DAR) will include offsetting measures to counterbalance the residual effects to fish from the Project. The final offsetting plan will be submitted with the application for a *Fisheries Act* Authorization during the regulatory phase of the Project

References:

McAughey SC, Gunn JM. 1995. The behavioural response of lake trout to a loss of traditional spawning sites. J Great Lakes Res. 21(Suppl 1): 375-383.

Gunn JM, Sein R. 2004. Effects of Forestry roads on Reproductive Habitat and Exploitation of Lake Trout. In Boreal Shield Watersheds: Lake Trout Ecosystems in a Changing Environment. Gunn JM, Steedman RJ, Ryder RA, (Eds). Lewis Publishers. CRC Press. 2004. pp. 265-278.

Dominion Diamond (Dominion Diamond Ekati Corporation). 2015. 2014 Fish and Fish Habitat Supplemental Baseline Report for the Jay Project. Prepared by Golder Associates Ltd., March 2015. Yellowknife, NWT, Canada.

DOMINION DIAMOND

Information Request Number:	DAR-MVEIRB-IR-66
Source:	MVEIRB Information Requests from Chuck Hubert
Subject:	Fish and Fish Habitat – Valued component selection
DAR Section(s):	9.1.3 and 9.2.5.4

Preamble (MVEIRB):

The species specific approach was used to choose VCs for the assessment of fish and fish habitat and p. 9-4 makes specific reference to "…species that support the fishery and "…the sustainability of the population(s) depends on the quantity and quality of the habitats required for each life history stage, and on interactions with other species." Section 9.2.5.4 states "Forage fish species are an important component of the diets of predatory fish species …the availability of forage fish species as a food source in lakes and rivers of the BSA is therefore essential in assessing aquatic health and viability of VC species populations." Why was a forage fish species not included in the choice of VCs? - lake whitefish are chosen to represent planktivores, arctic grayling for insects and plankton and lake trout for piscivores with explicit recognition that changes to forage fish will ultimately affect lake trout. Cisco or slimy sculpin would be good as they are already being used as sentinel/monitoring species in AEMP programs - for example p. 9-115 reports elevated Hg in Slimy sculpin related to mine activities in Lac de Gras. The Residual Effects Summary states "At closure, the Jay Pit represents a permanent loss of approximately 65 ha of lake bottom substrate habitat for benthic feeding or bottom dwelling species such as lake whitefish and forage species such as slimy sculpin …Thus the amount of permanent change to habitat in the ESA is expected to result in no measurable effects to ….Arctic Grayling, Lake Trout and Lake Whitefish " This approach essentially accepts permanent losses to habitat for forage species but accepts them because of no changes to habitat for the VC indicator species.

Request (MVEIRB):

Please include a forage fish species as a VC or provide a strong rationale for why this is not required.

Response:

The criteria for the selection of valued components (VCs) for fish and fish habitat are presented in Section 9.1.3 of the Developer's Assessment Report (DAR). All 11 species recorded during baseline studies (Annex XIV, Fish and Fish Habitat Baseline) have a role in the ecosystem, the purpose for limiting the assessment on VCs is to focus on those species that were identified as most valuable based on the following factors:

- cultural, social, or economic importance to traditional and non-traditional users;
- relative abundance in Lac du Sauvage;
- trophic position;
- unique life history requirements; and,
- territorial and federal listed species (e.g., COSEWIC 2014; NWT Infobase 2014).

The three fish species selected as VCs were Arctic Grayling, Lake Trout, and Lake Whitefish. These species represent important ecosystems processes (e.g., they are relatively abundant and occupy various trophic positions in their respective food web), and more importantly, they represent species of economic and cultural importance to traditional users in the NWT and Nunavut. The three species are considered part of a Commercial, Recreational, or Aboriginal (CRA) fishery, as defined by Fisheries and Oceans Canada (DFO) (Kenchington et al. 2013; DFO 2013). Furthermore, Arctic Grayling is classified as a sensitive species in the Northwest Territories (NWT) (NWT Infobase 2014), and therefore, inclusion in an environmental assessment is highly recommended.

Other species that support fisheries (e.g., forage species) are included in the assessment, which is explained in Section 9.1.3, page 9-6 of the DAR. Forage species were included as a measurement indicator for Arctic Grayling, Lake Trout, and Lake Whitefish, and tributaries that may support forage fish for VCs in Lac du Sauvage and Lac de Gras were included in the effects study area. Any measurable changes to the measurement indicator were then assessed for the VC species, if applicable (e.g., habitat for key prey species that the VC requires to complete its life cycle and contribute to the ongoing productivity of the fisheries). Analysis of fish and fish habitat VCs also captures effects to other species with similar habitat requirements and sensitivities that were not selected as VCs, such as Cisco and Slimy Sculpin. For example, both foraging Lake Trout and Cisco are commonly found in pelagic zones at depths from 10 m to 60 m throughout most of the year (see life history Sections 9.2.5.1.1 and 9.2.5.4.2). By evaluating the effects to available habitat at various depths (see methods in Section 9.4.2.1.1), the DAR provides information helpful for determining the potential effects of the Jay Project (Project) on both fish species. Another example of the robustness of the assessment approach includes the quantification of changes to coarse habitats in Lac du Sauvage (see methods in Section 9.4.2.1.1), which not only measured changes in habitat for spawning and rearing Lake Trout and Lake Whitefish, but also year-round habitat for Slimy Sculpin that can prey on the eggs and fry of Lake Trout and Lake Whitefish (see Section 9.2.5.4.3; also see Fitzsimons et al. 2007).

The use of fish species as VCs for fish and fish habitat was one of the two approaches considered in the DAR. Aquatic life other than fish was also selected as a VC (see Table 9.1-2 in Section 9.1.3 of the DAR). The measurement indicators for aquatic life other than fish included species composition, abundance and biomass of plankton and invertebrates, and any changes in these measurement indicators would be expected to have a direct effect on the ongoing support of fisheries productivity, which includes forage fish species.

Dominion Diamond Ekati Corporation is confident that by using a suite of VCs representing various components of the lake ecosystems, the DAR provides a reliable assessment of effects to fish and fish habitat, or more specifically, to the ongoing productivity of fisheries important to the Aboriginal groups in the region. In other words, the consideration of Cisco or Slimy Sculpin as a VC in the DAR would not change the outcome of the assessment. The magnitude and duration of residual impacts would not exceed current predictions, rather, impacts would be less than what is currently reported in the DAR given the species life history characteristics of forage species (e.g., they mature quicker and have shorter lifespans relative to the selected VCs).

As described in Appendix 9C of the DAR, it is recognized that an Aquatic Effects Monitoring Program (AEMP) and an associated Response Framework will be required of the Project through the Water Licence which will include monitoring for fish and ongoing assessment of results. The existing AEMP for

the Ekati Mine will be expanded to incorporate the Project area. The target fish species will be determined during the development of the AEMP and will take into account presence in the Project area, relevance for monitoring for potential Project-related effects, as well as use in other AEMPs.

References:

COSEWIC (Committee on the Status of Endangered Wildlife in Canada). 2014. Wildlife Species Search. Available at: http://www.cosewic.gc.ca/eng/sct1/searchform_e.cfm. Accessed: May 23, 2014.

DFO (Fisheries and Oceans Canada). 2013. Fisheries Protection Policy Statement. Published by Ecosystem Programs Policy, Fisheries and Oceans Canada. Ottawa, ON, Canada.

Fitzsimons JD, Jonas JL, Claramunt RM, Williston B, Marsden JE, Ellrott BJ, Honeyfield DC. 2007. Influence of egg predation and physical disturbance on lake trout Salvelinus namaycush egg mortality and implications for life-history theory. J Fish Biol 71:1–16.

Kenchington E, Duplisea DE, Curtis JMR, Rice JC, Bundy A, Koen-Alonso M, Doka SE. 2013. Identification of species and habitats that support commercial, recreational or aboriginal fisheries in Canada. DFO Can Sci Advis Sec Res Doc. 2012/110. iv + 68 p.

NWT Infobase. 2012. NWT Species Monitoring Infobase. Available at: http://nwtspeciesatrisk.ca/tiki/tiki-index.php?page=Infobase. Accessed: August 23, 2014.

DOMINION DIAMOND

Information Request Number: DAR-MVEIRB-IR-67

Source: MVEIRB Information Requests from Chuck Hubert

Subject: Fish and Aquatics

DAR Section(s): 9.2.3.3

Preamble (MVEIRB):

Map 9-2.6 appears to show a lake trout spawning shoal S2 in the footprint of the North end of horseshoe dike - is this identified later as map does not show dike outline?

Request (MVEIRB):

Please provide explicit consideration of loss of this spawning shoal as the effects assessment does not appear to include loss of lake trout spawning shoals.

Response:

Residual effects to potential spawning shoals for Lake Trout and Lake Whitefish, and forage species, such as Cisco and Round Whitefish, were assessed in Section 9.4.3.1.1 of the Developer's Assessment Report (DAR). The assessment compared known shoal locations relative to the location of the dike and dewatered area in Section 9.4.3.1.1 of the DAR and by quantifying potential spawning habitat within the diked area relative to available habitat in the Effects Study Area (ESA) (DAR Table 9.4-3). Habitat information collected from 2013 baseline field studies and other sources of existing and historical information (e.g., over 38 documents were reviewed in Annex XIV, such as earlier baseline and monitoring programs at the Ekati and Diavik mines) were used to develop an understanding of potential effects from the Jay Project (Project). Existing baseline fish habitat conditions in Lac du Sauvage, including spawning habitat, are provided in Section 9.2.4.1.1 in the DAR and Annex XIV (Fish and Fish Habitat Baseline Report). Shoal locations were provided in Map 9.4-2 in the DAR, and in Maps 2.2-1 to 2.2-3 in Annex XIV (Fish and Fish Habitat Baseline Report). A modified version of Map 9.4-2 was also created to assist with this Information Request and this new map is provided below (Map 67-1).

Generally, shoals in Lac du Sauvage are not as deep or numerous, and have been found to provide less potential spawning habitat of good to fair quality for Lake Trout, Cisco, and Round Whitefish relative to shoal habitat in Lac de Gras (Golder 1997a; DDMI 1998). Most of the high-quality shoal habitats in the ESA are located in Lac de Gras (Golder 1997a,b,c). Rescan (2007) concluded that less than 5 percent of all shoals examined along 61 transects in the Jay Pipe area were 'good' habitat for spawning activity by Lake Trout, Lake Whitefish, and Round Whitefish. All but one (shoal S2) of the 21 shoals previously identified by Golder (1997a) in Lac du Sauvage fall outside of the proposed diked area. Shoal S2 is located adjacent to the dike, but is classified as an unsuitable shoal for spawning by Lake Trout, Cisco, and Round Whitefish based on substrate (primarily silt/clay with some gravel) characteristics. Map 9.4-2 in the DAR shows the location of shoal S2 relative to the Jay Project dike and dewatered area (also see Map 67-1 provided in this response). The next closest spawning shoal in proximity to the dike is shoal S4, a fair quality shoal for Lake Trout and Cisco that is approximately 315 metres (m) northeast of the edge of

the dike. Other known suitable shoals for spawning in Lac du Sauvage are over 1,500 m from the edge of the dike location.

The results of the 2013 baseline habitat survey in Lac du Sauvage were consistent with previous studies (Golder 1997a; Rescan 2007) that identified limited, mostly low quality or unsuitable spawning habitat for the fish Valued Component (VC) species, based on water depths and substrate in the proposed diked area (Annex XIV, Section 3.2.3 and Section 4). The amount of cumulative change to spawning shoal habitat for the Application Case is expected to result in no measurable effect to population abundance and distribution for fish VCs. Effects, if any, would be limited to a negligible change in the distribution of fish with no effects on the ongoing productivity of fisheries. Losses to fish habitat associated with the dike will be included in the final offsetting plan (based on the Conceptual Offsetting Plan in the DAR) submitted with the application for a *Fisheries Act* Authorization during the regulatory phase of the Project.

538000 540000 542000 544000

7168000 7166000 7164000

Ad Ac Ab

Lake Ad4 Lake Ad3 Lake Ad1 Lake C16 Lake C1 Lake C15 Lake C14 Lake C13 Lake C12 Lake C9 Lake C17 Lake C10 Lake C11 Lake Ac10 Lake Ac11 Lake C8 Lake Ac9 Lake Ac8 Lake Ac7 Lake Ac6 Lake Ac5 Lake Ac13 Lake Ac4 Lake Ac12 Lake Ac14 Lake B19 Lake B22 Lake Ac15 Lake B21 Lake B20 Lake Ac16 Lake B28 Lake B15 Lake B0 Lake B1 (Christine Lake) Lake B29 Lake B24 Lake B2 Lake B14 Lake B3 Lake B13 Lake B4 (Cujo Lake) Lake B25 Lake Ac36 Lake Ac35 Lake Ac2 Lake Ac3 Lake Ab7 Lake Ab1 Lac du Sauvage Lake Ac1

Cisco: Unsuitable
Lake Trout: Unsuitable
Round Whitefish: Unsuitable
S3

Cisco: Unsuitable
Lake Trout: Unsuitable
Round Whitefish: Unsuitable
S5

Cisco: Fair
Lake Trout: Fair
Round Whitefish: Poor
S4

Cisco: Unsuitable
Lake Trout: Unsuitable
Round Whitefish: Unsuitable
S2

Cisco: Fair
Lake Trout: Fair
Round Whitefish: Fair
S7

Cisco: Good
Lake Trout: Good
Round Whitefish: Fair
S8

Proposed Jay Dike Alignment
Drawdown Area
Proposed Jay Waste Rock Storage Area
Proposed Laydown
Proposed Jay Pit
Proposed Misery Discharge Diffuser Location
Proposed Jay Project Magazine
Proposed Mine Inflows Pumping System
Proposed Runoff Pumping System
Proposed Sub-basin B Diversion Channel
Proposed Ore Transfer Pad
Proposed Jay Road, Pipeline and Power Line

N

LEGEND

- WATERCOURSE
- WATERBODY
- BATHYMETRY CONTOUR (5 M INTERVAL)
- ELEVATION CONTOUR (10 M INTERVAL)
- INTERNAL BASIN DIVIDE
- SPAWNING HABITAT

SPAWNING SHOALS (S)

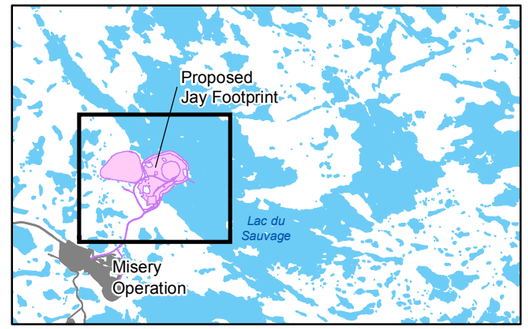
- *CISCO: SUITABILITY*
- *LAKE TROUT: SUITABILITY*
- *ROUND WHITEFISH: SUITABILITY*

JAY PROJECT FOOTPRINT

- EXISTING SHORELINE OF DEWATERED AREA
- POWER LINE
- PROPOSED JAY PROJECT INFRASTRUCTURE
- PROPOSED JAY ROAD NORTH (HAUL ROAD)
- PROPOSED JAY ROAD (HAUL ROAD, PIPELINE AND POWER LINE)
- PROPOSED OPERATION ROADS

SUBSTRATE TYPE (0-5 METRES)

- BO/CO - BOULDER/COBBLE
- BO/FI - BOULDER/FINES
- BR - BEDROCK
- FI - FINES
- FI/BO - FINES/BOULDER
- FI/CO - FINES/COBBLE



REFERENCE

1. GOLDER. 1997. TECHNICAL MEMORANDUM #12-2, SHOAL HABITAT SURVEY, LAC DE GRAS AND LAC DU SAUVAGE, SUMMER 1996. ENVIRONMENTAL BASELINE PROGRAM. SUBMITTED TO DIAVIK DIAMOND MINES INC. YELLOWKNIFE, NWT, CANADA. DOC NO. TM12-2.
2. CANVEC © NATURAL RESOURCES CANADA, 2012
3. NATURAL RESOURCES CANADA, CENTRE FOR TOPOGRAPHIC INFORMATION, 2012
4. BATHYMETRIC DATA OBTAINED FROM AURORA, 2013

DATUM: NAD83 PROJECTION: UTM ZONE 12N

DOCUMENT

DAR-MVEIRB-IR-67

500 0 500
SCALE 1:25,000 METRES

PROJECT
DOMINION DIAMOND™
JAY PROJECT
NORTHWEST TERRITORIES, CANADA

TITLE
SHORELINE HABITAT AND SPAWNING SHOALS NEAR THE PROPOSED JAY PROJECT IN LAC DU SAUVAGE

Golder Associates

PROJECT		1419751	FILE No. POSTDAR_IR_Aqua_001_GIS	
DESIGN	CS	10/03/15	SCALE AS SHOWN	REV 0
GIS	ANK	11/03/15		
CHECK	CS	11/03/15	MAP 67-1	
REVIEW	KM	11/03/15		

G:\CLIENTS\DOMINION\DDEC Jay and Lynx Projects\Figures\13-1328-0041 Jay & Lynx EA\Aquatics\POST-DAR IRs\POSTDAR_IR_Aqua_001_GIS.mxd

References:

DDMI (Diavik Diamond Mines Inc.). 1998. Diavik Diamonds Project Environmental Assessment – Environmental Effects Report on Fish and Water Quality. Diavik CD-ROM series, second edition. Yellowknife, NWT, Canada.

Golder. 1997a. Technical Memorandum #12-2, Shoal Habitat Survey, Lac de Gras and Lac du Sauvage, Summer 1996. Environmental Baseline Program. Submitted to Diavik Diamond Mines Inc. Yellowknife, NWT, Canada. Doc No. TM12-2.

Golder. 1997b. Technical Memorandum #13-3, Inland Lake Survey Report. 1996 Environmental Baseline Program. Submitted to Diavik Diamond Mines Inc. Yellowknife, NWT, Canada. Doc No. TM13-3.

Golder. 1997c. Technical Memorandum #14-2, Intensive Shoreline Habitat Survey. 1996 Environmental Baseline Program. Submitted to Diavik Diamond Mines. Yellowknife, NWT, Canada. Doc No. TM14-2.

Rescan. 2007. Ekati Diamond Mine. 2006 Jay Pipe Aquatic Baseline. Prepared for BHP Billiton Diamonds Inc. Yellowknife, NWT, Canada, 325 pp.

DOMINION DIAMOND

Information Request Number: DAR-MVEIRB-IR-68

Source: MVEIRB Information Requests from Chuck Hubert

Subject: Fish and Aquatics

DAR Section(s): 9.2.5.3.2

Preamble (MVEIRB):

There is relatively more uncertainty associated with use of the channel by other species (e.g., Lake Trout) or juvenile life stages, which may depend on instream cover, and rates of colonization by fish and other aquatic organisms.

Request (MVEIRB):

Please provide commentary on the feasibility of including instream cover in the design of the diversion channel and rates of channel colonization, based on experience with the Panda diversion channel.

Response:

The mine plan utilizes a number of environmental design features and mitigation to eliminate or reduce the potential for Jay Project (Project) activities to result in adverse environmental effects to fish and fish habitat. The effectiveness of mitigation related to diversion channels specific to fish and fish habitat is discussed in Section 9.3.2.1.3 of the Developer's Assessment Report (DAR). The proposed Sub-Basin B Diversion Channel will be designed as a mitigation measure to convey water during operations from two fish-bearing streams (Stream B0 and Stream Ac35) that would otherwise enter the dewatered area, and also to facilitate passage of fish from Lac du Sauvage to these upstream locations. The design features will reduce indirect effects from the isolation of the dewatered area, and direct effects from stream diversions related to the construction of the Sub-Basin B Diversion Channel. The residual effects from the diversion channel on tributary habitat for fish in Lac du Sauvage are assessed in Section 9.4.3.1.3 of the DAR. The temporary losses associated with the diversion of waters from Stream Ac35 (112 metres [m]) and Stream B0 (355 m) below the diversion channel location are considered in the Conceptual Offsetting Plan (Appendix 9A), and will be considered in the Final Offsetting Plan to be submitted to Fisheries and Oceans Canada (DFO) during the regulatory phase of the Project. The Sub-Basin B Diversion Channel described in the DAR and in this response reasonably mitigates against significant adverse effects for the purpose of the Environmental Assessment of the Jay Project. The detailed design of the channel is a fisheries issue that will be resolved with DFO, including community engagement, through a *Fisheries Act* Authorization.

As described in Section 9.3.2.1.3 of the DAR, passage structures and channels that attempt to mimic natural stream morphology and hydraulics are effective means of allowing upstream and downstream passage of a wide range of species in Canada, including Arctic Grayling (Katopodis 2005; Rescan 2012; Tonn et al. 2012; Scrimgeour et al. 2014). Within the baseline study area, the previously constructed Panda Diversion Channel at the Ekati Mine has been effective in providing a passage corridor for fish (BHP Billiton 2010; Rescan 2012). However, comparisons to the Panda Diversion Channel are of limited applicability to the Sub-Basin B Diversion Channel. In its response to information request

DAR-IEMA-IR-48, Dominion Diamond Ekati Corporation (Dominion Diamond) described that the purpose, and therefore, the detailed features, of the Panda Diversion Channel is to provide a permanent stream channel containing permanent instream habitat for all life stages of relevant fish species, which is fundamentally different than the purpose of the Sub-Basin B Diversion Channel.

The purpose of the proposed Sub-Basin B Diversion Channel is to create a temporary fish passage corridor to facilitate movement of spawning Arctic Grayling from Lac du Sauvage to upstream tributary reaches in Stream B1 (above Lake B0 and Stream B0) and in Stream Ac35 during the period of mine operations (i.e., 10 years). It is expected that this design will also provide a corridor for other species that use habitat in Lake B0 and Stream B1. Although limited functions will be provided to upstream sections of Stream Ac35 because of the ephemeral nature of the stream, it is expected that the design will provide a corridor for spawning Arctic Grayling to access upstream sections during the spring.

A key design feature of the diversion channel is the positioning of the channel, crossing relatively flat topography along a sinuous path similar to other streams in the area. This design will maintain relatively low water velocities that facilitate upstream passage of target species (Jones et al. 1974; Katopodis 1994; Peake 2008; Katopodis and Gervais 2012). Estimated velocities in the channel for the 1 in 2-year design flow (1.37 cubic metres per second) are 0.53 metres per second (m/s) along the minimum channel slope (0.1 percent [%]) and 1.70 m/s along the steepest 50 m section of the channel near the mouth at Lac du Sauvage (2.5%). Another important feature of the channel will be the 0.15 m thick drainage layer of cobble-sized substrate held by rip-rap. Variability (or unevenness) in the streambed and banks of the channel will result from the sinuous shape of the diversion channel and the use of substrate of varying size, creating varied flow conditions (i.e., water depths and velocities) that may be appropriate for a range of fish species. Thus, the channel will be constructed such that velocities and slopes are similar to natural streams in the area, adequate resting areas are provided, and water velocities are within the swimming capabilities of the main target species, adult Arctic Grayling. Furthermore, maintaining minimal flows that coincide with other life history stages (e.g., young-of-year migrations) will be considered in channel design.

Arctic Grayling have been documented to use constructed diversion channels as migration corridors in the Northwest Territories immediately after they become connected to natural habitats (Jones et al. 2003). Similarly, most of the adult Arctic Grayling in Lac du Sauvage associated with streams B1 and Ac35 are expected to respond by selecting the diversion channel as the new location for accessing upstream spawning areas. Arctic Grayling can exhibit strong philopatry (i.e., reproductive homing) to upstream locations (Tack 1980; Lucas and Baras 2001), and the diversion channel will be designed to facilitate this response. The reproductive homing behaviour is common among members of the Salmonidae family (which includes Arctic Grayling), with spatial mapping by reference to ‘landmarks’ and chemical cues believed to be important factors during navigation (Lucas and Baras 2001). The cues for Arctic Grayling should be maintained because the outlet of the diversion into Lac du Sauvage is relatively close to the natural stream. However, there may be a delay (anywhere from a few days to longer delays) in the response by some fish in Lac du Sauvage and Lac de Gras as adults adapt, eventually selecting the new location where diverted flows enter the lake (for more details see the response to DAR-KIA-IR-99). If Arctic Grayling are unable to locate or access their intended spawning habitat, they are expected to continue to mature, eventually selecting alternate spawning locations (Walker 2005; Stewart et al. 2007). A small number of fish may select other tributaries for spawning and the uncertainty in ‘colonization rates’ applies to other fish species that may use Stream B1 and Ac35 during the spring and summer. As a

mitigation strategy to attract fish that might be wary of entering the new stream location, in-stream cover (e.g., boulder placements) near the mouth of the diversion channel may be considered.

Dominion Diamond is confident that the proposed channel design is appropriate for a temporary channel that will be reclaimed at closure when the dike is breached, allowing the natural channels to be reconnected to Lac du Sauvage. Operational monitoring of fish use of the channel will inform any new mitigation strategies as they are required in the future. Thus, the effects on fish use of Stream B1 (upstream of B0) and Ac35 for spawning are expected to be minor and of a short-duration. Minor changes, if any, are expected to have no significant adverse effect on ongoing fisheries productivity.

References

BHP Billiton (BHP Billiton Canada Inc.). 2010. Ekati Diamond Mine, Environmental Agreement and Water Licences Annual Report 2009. April 2010.

Jones DR, Kiceniuk JW, Bamford OS. 1974. Evaluation of the swimming performance of several fish species from the Mackenzie River. J Fish Res Board Can, 31(10): 1641-1647.

Jones NE, Tonn WM, Scrimgeour GJ, Katapodis C. 2003. Ecological characteristics of stream in the Barrenlands near Lac de Gras, NWT, Canada. Arctic, 56, 249-261.

Katopodis C. 1994. Analysis of ichthyomechanical data for fish passage or exclusion system design. In Proceeding of an International Fish Physiology Symposium, Vancouver, BC, Canada, p. 318.

Katopodis C. 2005. Developing a toolkit for fish passage, ecological flow management and fish habitat works. J Hydraul Res 43.5 (2005): 451-467.

Katopodis C, Gervais R. 2012. Ecohydraulic analysis of fish fatigue data. River Res Appl, 28(4), 444-456.

Lucas MC, Baras E. 2001. Migration of Freshwater Fishes. Oxford: Blackwell Science Ltd.

Peake SJ. 2008. Swimming performance and behavior of fish species endemic to Newfoundland and Labrador: a literature review for the purpose of establishing design and water velocity criteria for fishways and culverts. Can Manuscr Rep Fish Aquat Sci 2843: v + 52p.

Rescan (Rescan Environmental Services Ltd.). 2012. EKATI Diamond Mine: Panda Diversion Channel Monitoring Program Final Report. Prepared for BHP Billiton Canada Inc. by Rescan Environmental Services Ltd.: Yellowknife, NWT, Canada.

Scrimgeour GJ, Tonn WM, Jones NE. 2014. Quantifying effective restoration: reassessing the productive capacity of a constructed stream 14 years after construction. Can J Fish Aquat Sci, 71(4): 589-601.

Stewart DB, Mochnacz NJ, Reist JD, Carmichael TJ, Sawatzky, CD. 2007. Fish life history and habitat use in the Northwest Territories: Arctic grayling (*Thymallus arcticus*). Can Manuscr Rep Fish Aquat Sci. 2797: vi + 55 p.

Tack SL. 1980. Migrations and distributions of Arctic grayling, *Thymallus arcticus* (Pallus). Interior and Arctic Alaska. Annual performance report, 21.

Tonn WM, Scrimgeour GJ, Landry F. 2012. A preliminary assessment of short-term vs. 14-year changes in the ecological attributes and productive capacity of a constructed Arctic stream, the Panda Diversion Channel. Report submitted to Bruce Hanna, DFO, Yellowknife, NWT.

Walker J. 2005. Status of the Arctic Grayling (*Thymallus arcticus*) in Alberta. Prepared for Alberta Sustainable Resource Development and the Alberta Conservation Association. Alberta Wildlife Status Report No, 57.

DOMINION DIAMOND

Information Request Number:	DAR-MVEIRB-IR-69
Source:	MVEIRB Information Requests from Chuck Hubert
Subject:	Fish and Aquatics
DAR Section(s):	9.3.2.2 and 9.3.2.2.1

Preamble (MVEIRB):

Table 9-3.1 classifies the pathway "The dike isolating the Jay pipe may provide spawning habitat for fish where any potential contaminants within interstitial spaces may affect survival of eggs or fry in Lac du Sauvage" as a secondary pathway because the dike will be constructed using granite rock and will not contain any potentially acid-generating rock or metal leaching material.

Request (MVEIRB):

Please provide a summary of the results of Special Effects Studies completed at Diavik to substantiate this conclusion.

Response:

As described in Section 3.3.2 of the Developer's Assessment Report (DAR) and the Geochemistry Baseline Report (Annex VIII), the granitic rock at the Ekati Mine has been characterized as non-potentially acid generating (non-PAG). This is the reason that granite is used, commonly as a requirement of the Water Licence or the Inspector, for all construction activities at the Ekati Mine. As such, the dike isolating the Jay kimberlite pipe in Lac du Sauvage will be constructed of granite rockfill which geochemical testing determined to be non-PAG (Section 8.2.2.3, Annex VIII). Based on the placement of the dike and associated fetch in Lac du Sauvage, wind and wave action along the dike will allow for flushing and movement of water into the interstices of the dike. As a result, the water chemistry within the interstitial spaces of the dike is not expected to deviate substantially from ambient lake water, or from interstitial water at natural spawning habitat. Furthermore, monitoring at two dikes at the Diavik Mine (i.e., Dikes A154 and A418), which are located near the East Island in Lac de Gras, determined that the dikes have little effect on water quality, sediment quality, and benthic invertebrate communities (DDMI 2011). Given the close proximity of the Jay Project to the Diavik Mine, it is anticipated that the rockfill material used to construct the dike for the Jay Project would be of similar composition to that of the dikes at the Diavik Mine. Therefore, parameter concentrations (e.g., metals) are not expected to increase to levels harmful to developing embryos as a result of leaching from the dike material.

Diavik Diamond Mines Inc. (DDMI; 2003, 2005, 2007, 2011) investigated the potential effects of the two dikes on water quality, sediment quality, and benthic invertebrate communities in Lac de Gras, while taking into account the confounding factor provided by mine water discharge. The study design compared samples from several radial transects extending from the dikes to control locations in Lac de Gras. The water quality investigation included samples from near the lake bottom, and samples collected from interstitial spaces in the dike material using passive diffusion samplers. The only parameter to exceed the Canadian Council of Ministers of the Environment (CCME) *Canadian Water Quality Guidelines for the Protection of Aquatic Life* was pH, which was naturally below the guideline's lower limit in samples collected from control locations (DDMI 2011).

Similarly, DDMI (2011) found that the potential for effects on sediment quality from the dikes was low. Concentrations of arsenic, chromium, and copper frequently exceeded CCME Sediment Quality Guidelines at both locations near the dikes and at control locations, indicating naturally elevated concentrations in Lac de Gras and the absence of elevated concentrations originating from the granite rock. Benthic invertebrate communities also showed no negative responses to the dikes. With the exception of the sampling locations nearest to the mine water discharge, all sampling transects nearest to the A154 dike had higher benthic invertebrate densities when compared to control stations. DDMI (2011) suggested that the dike may have a "positive effect in invertebrate density". The response was opposite of what would be expected if toxic metals were leaching from the dike. Proximity to the dike did not appear to have an effect on benthic invertebrate diversity and richness.

Fisheries and Oceans Canada recently reviewed the results from these multi-year monitoring programs and confirmed that they have been completed to their satisfaction and no that further A154/A418 dike monitoring was required (Fisheries and Ocean Canada 2014).

In summary, the potential for fish eggs or fry to be affected by contaminants coming off of, or within, the interstitial spaces of the dike is predicted to be negligible based on the extensive Ekati Mine geochemical data set that shows that granite rockfill is non-PAG. The lack of toxicological effects from potential leaching from the dikes of another diamond mine in close proximity to the Jay Project (i.e., Diavik; DDMI 2003, 2005, 2007, 2011), supports this conclusion.

References:

DDMI (Diavik Diamond Mines Inc.). 2003. Year 1 Results, Lakebed Sediment, Water Quality and Benthic Invertebrate Study, A154 Dike, Mine Water Discharge, December 2003.

DDMI. 2005. Lakebed Sediment Water Quality and Benthic Invertebrate Study, A418 Dike Baseline, A154 Dike – Year 2 Results, June 2005.

DDMI. 2007. Lakebed Sediment, Water Quality and Benthic Invertebrate Study, A154 Dike – Year 3 Results, A418 Dike – Year 1 Results, Version #1. May 2003.

DDMI. 2011. Lakebed Sediment, Water Quality and Benthic Invertebrate Study, A154 Dike – Year 4 Results, A418 Dike – Year 2 Results. August 2011.

Fisheries and Oceans Canada. 2014. Fisheries Act Authorization for Works or Undertakings Affecting Fish Habitat, Number SC98001. Letter to Diavik Diamond Mines Inc. January 7, 2014.

Information Request Number: DAR-MVEIRB-IR-70

Source: MVEIRB Information Requests from Chuck Hubert

Subject: Fish and Aquatics

DAR Section(s): 9.3.2.2.1

Preamble (MVEIRB):

One of the mitigation features provided to eliminate the pathway "back-flooding of the dewatered diked area of Lac du Sauvage may generate or release mercury, nutrients or other substances from flooded sediments and vegetation and may cause a change in water quality, affecting fish and aquatic health" is that ? the diked area will not be reconnected until the back-flooded area meets acceptable water quality criteria.

Request (MVEIRB):

Will Dominion commit to a monitoring of mercury in small fish (e.g. slimy sculpin) to confirm lack of mercury uptake prior to reconnecting the diked area ?

Response:

It is not necessary or useful for Dominion Diamond Ekati Corporation to monitor for mercury in small fish prior to reconnecting the diked area to Lac du Sauvage. As described in Section 3.2.1.1 of the Developer's Assessment Report (DAR), the isolated portion of Lac du Sauvage within the diked area will be fished out prior to dewatering. The isolated portion of Lac du Sauvage will then be dewatered to expose the lakebed overlying the Jay kimberlite pipe. Once the lakebed is exposed in the diked area, mining operations will begin and continue for an approximately 10 year operational period and no fish will remain behind the diked area.

At closure, the diked area will be back-flooded with water from Lac du Sauvage. The dike will be breached when water quality in the back-flooded area meets pre-determined acceptability criteria and is suitable for mixing with the lake. Fish will only be able to enter the diked area when the dike has been breached. Fish will be able to move in and out of the area and will not be restricted to the back-flooded habitats. As described in Section 9.4 of the DAR, in post-closure, the physical and chemical environment of the area will allow re-establishment of a healthy functioning aquatic ecosystem.

DOMINION DIAMOND

Information Request Number: DAR-MVEIRB-IR-71

Source: MVEIRB Information Requests from Chuck Hubert

Subject: Socio-Ec

DAR Section(s): 14

Preamble (MVEIRB):

The base case of employment and labour does not appear to include the Sable Pit or A21.

Request (MVEIRB):

How will the development of the Sable Pit and A21 affect the northern employment and labour estimates? If the Jay project is expected to off-set the northern labour reduction at Diavik, will this still hold true?

Response:

At the time of writing of the Developer's Assessment Report (DAR) for the Jay Project (Project), the development of the economic details of the A21 dike and pit at the Diavik Mine, and the development of the Sable pit at the Ekati Mine, were not included in the mine plans for these operations. As a result, assumptions were made regarding the economic details of A21 in the socio-economic assessment (Section 14 of the DAR). The Sable pit was not included. Economic modelling with inputs into the socio-economic assessment has been revised to reflect the more advanced mine plan information for A21. The development of the Sable pit is not advanced enough to include quantitative modelling inputs, but has been considered qualitatively in this Information Request response.

A summary of potential effects on economics and employment, including inputs from A21 and Sable, is provided below.

Addition of A21

On November 27, 2014, Rio Tinto, operator of the Diavik Mine, released a statement indicating the formal approval of the development of the A21 pipe at the Diavik Mine (Rio Tinto 2014). Subsequently, additional economic modelling has been conducted to include mine plan details of A21 into the assessment.

The addition of A21 to the baseline does affect the Northwest Territories (NWT) labour market. For reference, please see the revised Economic Impact Report in Appendix A that has included A21.

The development of A21 will place increased pressure on the labour market, in particular, between the years 2015 and 2018 (Rio Tinto 2014). The total direct and indirect labour demand flowing from the diamond mines will peak during these years, averaging just over 4,100 Full Time Equivalents (FTEs). The NWT Economic Impact Model (NWTEIM) has been used to calculate NWT resident labour participation that will average 1,700 FTEs during that timeframe, with peak participation coming in 2018 at 1,745 FTEs. This will exceed the historic peak in NWT resident labour participation established in 2005 when 1,614 FTE NWT residents worked directly or indirectly with the diamond mines.

Development work at the Ekati and Diavik mines (excluding labour participation during the initial construction phase of these two mines) has not attracted a high percentage of NWT resident labour historically. The typical range of Northern participation has been between 20 percent (%) to 30%. This range was used in the NWTEIM to calculate future participation in development work.

There are several factors that contribute to the estimated level of Northern participation in development work. When comparing the 2018 NWT labour market to that of 2005, the 2018 labour market will benefit from a larger population (44,168 compared to 43,401 in 2005) and more importantly, the source population (those aged 15 and older) will be larger (34,441 compared to 33,045 in 2005), meaning there are more people available to work. Also, in 2005, the unemployment rate fell to 5.0%, the lowest level recorded in the past 25 years (Statistics Canada 2015). The labour force in 2005 was 23,900, and had a participation rate of 76.6%. The increased participation in the mining-related jobs from NWT resident labour in 2018 is achieved with an assumed participation rate of 76.0% and a labour force of 24,660. The result is an unemployment rate of 6.9%. This would be the first time the unemployment rate falls below 7.0% since 2009, but is not unreasonable and remains well above historical records. There is also room for increased participation should more NWT residents enter the labour force during those peak years. Historically, labour force participation has grown as high as 78.2% in 2008 (GNWTBS 2015)

After the development phase of A21, which coincides with the construction of the Project and other developments at the Ekati Mine, the overall labour demand will lessen, alleviating the pressure on the labour force by bringing overall demand below 4,000 FTE positions, and by 2021, that demand will be below 3,500 FTE positions. So, the pressure of the labour market from A21 will be isolated to the period of time it is in development.

Addition of Sable

Dominion Diamond is currently studying the feasibility of adding the Sable Pit to its mine plan. However, as of March 15, 2015, development of the Sable pit (including estimates of engineering inputs and financial outputs) was not advanced enough to create an accurate quantitative assessment (i.e., model) of the effect of the pit's development on Base Case economic conditions. Dominion Diamond conducted additional exploration drilling at the Sable pipe in the winter of 2014/2015 to gather additional geological information on the pipe. This sample, once processed, valued, and analyzed over spring and summer 2015, will help to make a determination on the feasibility of the Sable Project, and may change Dominion Diamond's operational approach to that development. For those reasons, the development and production of the Sable Pit has not been added to the Base Case Scenario.

However, the Sable pipe was considered a reasonably foreseeable development for the cumulative effects assessment of the Project in the Sable Addendum (Dominion Diamond 2014). As described in Section 4.3.1.3.2 of the Sable Addendum, if it were to go ahead, the Sable Pit would represent additional construction and mining activity at the Ekati Mine from 2017 to 2025. Demand for construction labour, however, would primarily met by the existing Ekati workforce and contractors. Because the operation of the Sable Project does not represent an increase in production levels at the Ekati Mine, the development of the Sable Project would not be anticipated to result in additional demand for operational labour. It is expected that labour demand during operations would be met by the existing workforce at the Ekati Mine. The Sable Project would serve to fill some of the potential gap in demand for operational employment between the existing Ekati Mine pits and full production at the Project, relieving the urgency for early operational employment positions at the Project, as described in the DAR.

References:

Dominion Diamond (Dominion Diamond Ekati Corporation). 2014. Jay Project Developer's Assessment Report Sable Addendum. Prepared by Golder Associates Ltd., December 2014. Yellowknife, NWT, Canada.

Rio Tinto. 2014. Media Release. Diavik Diamond Mine – development of the A21 pipe. November 17, 2014.

GNWTBS (Government of the Northwest Territories, Bureau of Statistics. 2015. Labour Market Activity. Table 1a: Labour Force Activity , 2001 to 2014. Available at: http://www.statsnwt.ca/labour-income/labour-force-activity/ Accessed March 15, 2015.

Statistics Canada. 2015. CANSIM Table 282-0002: Labour Force Survey estimates, by sex and detailed age group, annual. Available at: http://www5.statcan.gc.ca/cansim/a26?lang=eng&retrLang=eng&id=2820002&paSer=&pattern=&stByVal=1&p1=1&p2=11&tabMode=dataTable&csid= Accessed March 15, 2015.

DOMINION DIAMOND

Information Request Number: DAR-MVEIRB-IR-72

Source: MVEIRB Information Requests from Chuck Hubert

Subject: Socio-Ec

DAR Section(s): 14

Preamble (MVEIRB):

The income gap within the Local Study Area (LSA) communities has decreased in the past two decades and mine employment helps to increase the incomes of people living in the LSAs.

Request (MVEIRB):

Have IBAs and other programs intended to mitigate social impacts helped in assisting with the reduction in income inequality and if yes, how?

Response:

For the purpose of this information request, income inequality is considered to be a measure of the uneven distribution of income amongst a population (IPS n.d.). Income inequality can be discussed in terms of inequality between communities, and between individuals. In Canada, incomes are not exclusively made up of wages and salaries. Capital gains, interest and dividends associated with investments and savings accounts, and private retirement incomes all comprise an individual's market income. Other income is accessed by some individuals via government transfers, such as, public retirement incomes (e.g., Canada Pension Plan, Old Age Security Plan), child benefits, employment insurance payments, workers compensation, and social assistance payments (Statistics Canada 2011a).

Income Composition and Growth in the Northwest Territories and Impact Benefit Agreement Communities

Detailed average income composition information comparable between census periods is not available for the rural local study area (LSA) communities (Section 14 of the Developer's Assessment Report), as Statistics Canada suppresses sensitive income information on smaller populations in the interest of confidentiality. However, a comparison of income composition in the rural LSA communities can be indirectly inferred by comparing Yellowknife to the Northwest Territories (NWT) total.

In the NWT, wage income accounted for 87.8 percent (%) of all income in 2010 (the most recent census income reporting year), making the NWT the Canadian territorial/provincial jurisdiction with the highest portion of personal income made up of wage income (Table 72-1). Income from government sources (i.e., government transfers) accounted for approximately 7.7% of the personal incomes of the NWT population, while other market incomes made up the remaining 4.5% of personal incomes. Wage incomes in Yellowknife are higher than the territory as a whole at 90.8% of personal incomes, suggesting that wage incomes in smaller rural communities (included in the total for the NWT) are lower than the territorial average. Conversely, government transfers, including income assistance,

are noticeably lower in Yellowknife (4.6%) than in the NWT overall. This suggests that smaller communities receive higher levels of income support from non-market sources.

Table 72-1 Income Composition in the Northwest Territories, 2010

Location	Population	Population Aged 15 +	Labour Force	Market Income		Government Transfers (% of Total)
				Wage Income (% of Total)	Other Market Income (% of Total)	
Yellowknife	18,830	15,025	11,990	90.8	4.6	4.6
NWT	40,800	31,750	23,930	87.8	4.5	7.7
Canada	32,852,325	27,259,525	17,990,080	74.7	12.9	12.4

Source: Statistics Canada (2011a,b).

+ = and over;% = percent; NWT = Northwest Territories.

Table 72-2 provides a breakdown of incomes in Ekati Mine Impact Benefit Agreement (IBA) communities, including income assistance (a legislated program that provides financial aid to help residents meet their basic needs for food, clothing, and shelter) cases and average personal incomes in communities. Income assistance cases have, overall, been on the rise in the NWT since the early 2000s. Income assistance cases in Yellowknife increased during the same period, but at a lower rate than in the territory as a whole. This trend towards increased income assistance has not, however, been the case in the larger rural IBA communities, where income assistance cases have reduced. When considered along with the fact that the rate of increase in income assistance cases in Yellowknife is below the territorial rate, this suggests that income assistance cases in small rural communities without IBAs is increasing at a rate higher than other types of communities (e.g., Yellowknife and rural IBA communities).

Table 72-2 Incomes in Impact Benefit Agreement Communities, 2001 to 2010

Community	Income Assistance[(a)]			Average Personal Income		
	2003	2012	% change	2001	2010	% change
Behchokǫ̀	279	243	**-12.9**	27,431	37,790	**37.8**
Gamètì	32	15	**-53.1**	25,576	36,794	**43.9**
Lutsel K'e	61	29	**-52.5**	25,286	32,875	**30.0**
Whatì	52	57	**9.6**	21,839	31,500	**44.2**
Yellowknife	462	478	**3.5**	45,975	64,350	**40.0**
NWT	2,136	2,240	**4.9**	39,186	53,978	**36.9**

Source: GNWTBS (2011); Statistics Canada (2011b).

a) Average number of income assistance cases per month.

Note: Income information on Dettah, N'Dilo and Wekweètì is supressed by Statistics Canada and the NWT Bureau of Statistics in the interest of confidentiality.

% = percent; NWT = Northwest Territories.

Average personal incomes have increased throughout the NWT in recent years (Table 72-2). The rate of increase has been higher in most rural IBA communities than in the territory, and have been close to, or above the rate in the larger centre of Yellowknife. Average income levels compared between rural IBA communities are relatively similar, but with some gap still between the communities with the highest (i.e., Behchokǫ̀ [$37,790]) and lowest (i.e., Whatì [$31,500]) average incomes. Incomes in rural IBA communities are still, however, noticeably lower than in the urban centre, Yellowknife ($64,350) and the territory as a whole (the value of which is highly skewed by high incomes in Yellowknife).

The variation in average personal income between rural LSA communities and Yellowknife is not unexpected, and is reflective of a typical urban-rural income dichotomy. Most northern commerce and services are based out of Yellowknife, meaning a concentration of high paying positions such as senior government officials, managers in industry, and highly skilled professionals (e.g., medical and legal professionals, scientists, and engineers). The public sector is the largest employer in the NWT, with most positions based out of Yellowknife. This further concentrates economic activity and incomes in the city, as opposed to rural LSA communities.

For further discussion of baseline income equity conditions in LSA communities, in terms of disparity between individuals and families, please refer to the response to Information Request DAR-TłįchǫIR-15.

Community-Level Income Inequality and Impact Benefit Agreements

Impact Benefit Agreements establish employment targets in diamond mining-affected communities[1], bringing employment income into these communities. By establishing IBAs with multiple affected communities, employment income is spread out. Inherently, this reduces some level of income inequality between communities with IBAs, ensuring that all income benefits are not concentrated in one community.

While the community-specific IBA hiring targets are confidential, the breakdown of current employment with Dominion Diamond by community is available (Table 72-3). While the majority of those employed at the Ekati Mine reside in Yellowknife, rather than in the rural LSA communities, it is important to consider the size of the labour force in each community. While the targets outlined in the IBAs are not necessarily based on the size of the labour force in each community, proportionally, it would be expected that communities with larger labour forces would have larger representation in the Ekati Mine workforce, purely as a function of the availability of employment candidates.

Table 72-3 Ekati Mine Employment by Local Study Area Community, 2013

Community	Total Employed at the Ekati Mine		Size of Labour Force	
	#	% of LSA Total	#	% of LSA Total
Yellowknife	282	73.2	12,760	85.9
Behchokǫ̀	57	14.8	680	4.6
Fort Resolution	4	1.0	235	1.6
Gamètì	14	3.6	135	0.9

[1] In this context, “community” refers to physical communities (i.e., settlements, hamlets, towns, and cities), as opposed to cultural communities.

Table 72-3 Ekati Mine Employment by Local Study Area Community, 2013

Community	Total Employed at the Ekati Mine		Size of Labour Force	
	#	% of LSA Total	#	% of LSA Total
Lutsel K'e	2	0.5	135	0.9
Wekweètì	5	1.3	65	0.4
Whatì	13	3.4	230	1.5
Kugluktuk	8	2.1	615	4.1
LSA Community Total	**385**	**100.0**	**14,855**	100.0

Source: Developer's Assessment Report, Sectoin 14; Statistics Canada (2011b).
= number;% = percent; LSA = local study area.

Overall, mining employment is distributed across rural IBA communities proportional to the size of the labour force in each community, suggesting an appropriate distribution of employment opportunities (Table 72-3). This is noticeably lower, yet expected, in Yellowknife, where the concentration of territorial employment activity creates a more diverse labour market. The number of people employed at the Ekati Mine from IBA communities is proportionally lower than the size of the labour force in the communities of Kugluktuk and Lutsel K'e.

Individual Income Inequality

The IBAs signed with communities are designed to distribute economic benefits to the diamond mining-affected communities, and are not focused on the income of individual community members.

While not the exclusive mandate of the IBAs, mining employment and procurement opportunities (direct, indirect, and induced) can result in increased incomes for individuals and businesses. In contexts where economic activity is limited, these opportunities can be an important source of income for some individuals, but do not necessarily benefit every individual in a community, nor translate to a community-level benefit. However, in an environment where a single income-earner may support multiple family members, this issue is, to some extent, alleviated. Overall family income grows, and more individuals are able to benefit from income earned by the employed family member.

Dominion Diamond prioritizes Northern and Northern Aboriginal candidates for positions at the Ekati Mine. Positions in the mining industry are, generally, high paying, including those associated with entry-level duties. For example, the first range of unionized employment at the Ekati mine (typically associated with general labour and maintenance assistance) has a midpoint salary of $60,306, compared to the average employment income in the territory ($56,930 in 2012 [GNWTBS 2012]). Entry level positions are advertised in Northern communities, and no southern applicants are shortlisted. This creates opportunities to earn employment incomes for those who may otherwise not be able to participate in the labour force. Dominion Diamond maintains a regularly updated database of resumes from NWT communities in an effort to extend employment opportunities to Northerners not currently employed.

Most of mining employment is rotational. In the rural LSA communities, women with children do not tend to apply for rotational positions, as they require lengthy periods away from home, and away from the children for which they care. This limits their ability to participate in mining employment, which tends to pay well above the minimum wage. Dominion Diamond evaluates alternative shift options for women on a case-by-case basis.

Closing

While it is difficult for one proponent to address the issue of income inequality in the North, Dominion Diamond is committed to providing income-generating employment opportunities to Northerners through the implementation of IBAs, and programs aimed at increasing the employment of Northern candidates. The Socio-Economic Supplemental Report response to Adequacy Items 11.1 to 11.5 (Dominion Diamond 2015) provides further details as to the barriers to employment of Northerners, and the response of Dominion Diamond in an effort to maximize Northern employment.

References:

Dominion Diamond (Dominion Diamond Ekati Corporation). 2015. Response to: Jay Project Adequacy Review Items 11.1, 11.2, 11.3, 11.4, and 11.5. Submitted to Mackenzie Valley Environmental Impact Review Board. Yellowknife. NWT. Canada. January 2015.

GNWTBS (Government of Northwest Territories – Bureau of Statistics). 2011. Community Profiles. Available at: http://www.statsnwt.ca/community-data/. Accessed March 2015.

GNWTBS. 2012. Income. Available at: http://www.statsnwt.ca/labour-income/income/index.html. Accessed March 2015.

Institute of Policy Studies. n.d. Income Inequality. Available at: http://inequality.org/income-inequality/. Accessed March 2015.

Statistics Canada. 2011a. Income Composition in Canada. Available at: http://www12.statcan.gc.ca/nhs-enm/2011/as-sa/99-014-x/2011001/tbl/tbl01-eng.cfm. Accessed March 2015.

Statistics Canada. 2011b. National Household Survey. Available at: http://www12.statcan.gc.ca/nhs-enm/index-eng.cfm. Accessed March 2015.

DOMINION DIAMOND

Information Request Number:	DAR-MVEIRB-IR-73
Source:	MVEIRB Information Requests from Chuck Hubert
Subject:	Air Quality – Green House Gas (GHG) emissions
DAR Section(s):	7.4.2.1.1

Preamble (MVEIRB):

Section 7.4.2.1.1 of the DAR provides estimates of GHG for the Jay project by project phase. The developer presents GHG estimates for the base case, which includes the existing Ekati mine in 2015, and for the application case which, includes the existing Ekati mine and the Jay project in 2022. For the application case the GHG emissions for the Jay project are 132 kt while the total for the Ekati mine is approximately 400 kt. It is unclear how the developer allocated GHG emissions to the Jay project and the Ekati Mine. It is noted that at some point in time the only operations at the Ekati mine would be associated with the Jay project and therefore 100% of GHG emissions would be associated with the Jay project.

Request (MVEIRB):

Please clearly describe how GHG emissions were allocated between the Jay project and the Ekati mine from construction of the Jay project through to closure of the mine.

Response:

The greenhouse gas (GHG) emissions were estimated based on fuel usage for each equipment type (e.g., generators, boilers/heaters, mine fleet and construction equipment) for each assessment case. A detailed breakdown of the maximum GHG emissions by source type and assessment case is provided in the Developer's Assessment Report (DAR), Appendix 7B, Tables 7B-3.5.2 to 7B-3.5.4. The information is also summarized in Table 73-1 below.

All three assessment cases (Base Case, Construction Case, and Application Case) include emissions from the generators, boilers, and heaters from the existing Ekati Mine. The generator emissions are considered to be identical in all assessment cases based on the assumption that the power demand will remain constant. Boiler and heater emissions will decrease in the Application Case because the underground heaters associated with the Koala underground mine in the Base Case and Construction Case will cease after mining at the Jay Pit begins. The largest change in the GHG emissions between the Base Case and Application Case is in the mine fleet emissions. The mine fleet emissions in the Application Case will increase from those in the Base Case due to more fuel usage associated with longer ore haulage distance between the Jay Pit and the Ekati processing plant. The increase in GHG emissions from open pit mining activities at Jay Pit are mitigated, in part, by the absence of open pit mining activities at other locations at the Ekati Mine (e.g., Koala, Fox, Misery pits etc.) during the operations phase and the absence of air heating for the underground workings at the other pits which are closed by the time the Jay Pit begins operating.

The maximum GHG emissions from all mining and utility activities at the Ekati processing plant and Jay Pit in the Application Case is 397 kilotonnes equivalent carbon dioxide (kt CO_2E) per year. One hundred percent of the 397 kt CO_2E per year is associated with mining and processing of the Jay Pit. The 132 kt CO_2E per year of GHG emissions that was directly attributed to the Jay Project (Project) as cited in Section 7.4.2.1.1 of the DAR represents the net increase of GHG emissions between the approved Ekati Mine estimated in the Base Case and the Ekati processing plant with the Jay Pit in the Application Case (DAR, Section 7.4.2.1.1, Table 7.4-10). A summary of annual GHG emissions through to the closure of the mine is in Table 73-2. Please note that Project-related GHG emissions associated with the transportation of personnel and material by aircraft and winter road, which were not included in the GHG emission tables in the DAR, are included in Tables 73-1 and 73-2. These GHG emissions are addressed as well in the response to DAR-NSMA-IR-06, and so are included here for consistency.

Table 73-1 Maximum Annual Green House Gas Emissions per Case Based on Fuel Usage

Source	Maximum Annual GHG Emissions (kt CO_2E/yr)			
	Base Case	Construction Case	Application Case	Change Due to the Project[a]
Generators	158	158	158	0
Boilers/heaters	29	29	9	-20
Mine Fleet	79	79	231	152
Transportation-Winter Road	2	5	2	0
Transportation- Aircraft	3	3	3	0
Construction Equipment	—	92	—	—
Total	271	366	402	132

a) Changes due to Project represent the differences between Application Case and Base Case emissions.
GHG = Green House Gas; kt CO_2E/yr = kilotonnes carbon dioxide equivalent per year; — = no emissions.

Table 73-2 Annual Green House Gas Emissions Based on Fuel Usage for the Life Cycle of Ekati Mine

	Maximum Annual GHG Emissions (kt CO_2E/yr)																		
	Base Case	Construction Phase			Operation Phase											Closure Phase			
Source	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033
Generators	158	158	158	158	158	158	158	158	158	158	158	158	158	158	158	26	26	26	20
Boilers/heaters	29	29	29	29	9	9	9	9	9	9	9	9	9	9	9	9	9	9	7
Mine Fleet	79	79	79	79	80	229	231	231	231	204	155	127	111	82	48	48	48	48	36
Transportation-Winter Road	2	5	5	5	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Transportation-Aircraft	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
Construction Equipment	—	47	92	21	16	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total	271	320	366	294	269	402	403	403	403	376	327	299	283	255	220	89	89	89	68

GHG = Green House Gas; kt CO2E/yr = kilotonnes carbon dioxide equivalent per year; — = no emission.

DOMINION DIAMOND

Information Request Number:	DAR-MVEIRB-IR-74
Source:	MVEIRB Information Requests from Chuck Hubert
Subject:	Air Quality – Management and Monitoring Plan results and dust mitigation measures
DAR Section(s):	7

Preamble (MVEIRB):

The Jay project will generate additional sources of dust that have the potential to cause adverse environmental effects. The DAR lists mitigations for dust from roads as water spray and/or chemical suppressant and managing vehicle speed (Section 7.3.2.2.1). The existing Ekati mine generates dust which is mitigated and the effectiveness of mitigation is monitored through the Air Quality Management and Monitoring Plan. This existing mitigation and monitoring approach will be applied to the Jay project. In order to provide the Review Board and parties a better understanding of the potential effects of dust and the effectiveness of mitigation and monitoring, results of the Air Quality Management and Monitoring Plan is requested.

Request (MVEIRB):

Please provide an analysis of the effectiveness of existing dust mitigation measures at the Ekati mine site and the effects of dust on the environment to date. Further, please provide the results of the Air Quality Management and Monitoring Plan to date.

Response:

The effectiveness of existing dust mitigation measures is also discussed in the response for DAR-YKDFN-IR-04, item 4.

Dust suppression has been used as a mechanism to mitigate the effects of fugitive dust at the Ekati Mine since the commencement of mining in 1998. Various methods of dust suppression are used at Ekati including DL-10 in areas of high traffic (haul roads), road watering in areas around waterbodies, water crossings and around main camp, and EK-35 on the runway as approved by Boeing for use with planes.

Water was used as a dust suppressant on the Misery Road and around the Ekati Camp and is approved by the Inspector for use as a dust suppression method in areas where DL-10 is not permitted (area around main camp, 30 metres (m) from waterbodies and water crossings). The application of water on the Misery Road as a dust suppression method is used as necessary during the summer season. Approval is granted for the use of water from the Lac de Gras location near the Paul Lake Bridge, from Cell D, and from King Pond. A water truck is deployed periodically from these approved locations to apply water in areas that are prone to generate fugitive dust where DL-10 is not approved. The use of DL-10 is approved for some areas around the main camp and the Fox Haul Road. DL-10 is not used in the front of the main camp as it has been determined that light vehicles travelling at the speed limit (20 kilometres per hour [km/hr]) do not generate significant dust. DL-10 is normally applied in June of each year. In addition

to the application of dust suppressants, the Ekati Mine continues to implement a reduced speed limit around site, which minimizes the impact of vehicle road dust.

DL-10 was applied on the Fox Haul Road in 2012 and 2013, but not in 2014, as mining and traffic had substantially decreased due to the completion of open pit mining in the Fox Pit. DL-10 was applied on the Misery Road in 2012, 2013, and 2014 due to increased traffic related to the additional work at the Misery Pit.

EK-35 is used on the Ekati Mine airstrip in accordance with Boeing guidelines to assist in the control of fugitive dust from incoming and outgoing aircraft and associated vehicle traffic.

Dominion Diamond reviewed the effectiveness of the use of DL-10 on the Misery Road in 2012 and determined that when applied properly, DL-10 was an effective product to mitigate fugitive dust on the haul roads. This was reported to the Wek'èezhìı Land and Water Board (Dominion Diamond 2012). Review of camera data indicated that the DL-10 is still effective 8 weeks post application. During 2014, Dominion Diamond studied whether road watering would be an effective way to mitigate fugitive dust and reduce the use of DL-10 on the haul roads. It was determined that road watering effects disappeared after 2 to 4 hours depending on the conditions of the road and the precipitation, and therefore, was not suitable to be the only method of dust suppression used on the longer haul roads. Road watering was effective in areas that were shorter and closer to the road watering source.

The most effective dust suppression plan for the Ekati Mine and specifically the haul roads at this time is a combination of DL-10 and road watering. Dominion Diamond continues to work on improving the dust suppression program by review and testing appropriate products for use at the Ekati Mine.

Dustfall monitoring at the Ekati Mine has been conducted since 2006 in response to a program wide review conducted by the Ekati Mine, external consultants, and government stakeholders.

The current 3 year Air Quality Monitoring Program Report (2012 to 2014) has been finalized and is being publicly circulated through the Wek'èezhìı Land and Water Board public registry and under the Environmental Agreement concurrently with these responses. Sections 1.3, 2.5 and 3.5 of the 2014 Air Quality Monitoring and Management Program (AQMMP) Report states the following on the dust monitoring and dust suppression programs (ERM 2015):

- In 2012, dustfall was higher near the Fox Haul Road compared to the Misery Haul Road. In 2013, the dustfall near the Misery Haul Road was much higher than in 2012, but still less than at Fox Haul Road. In 2014, the dustfall near the Misery Haul Road was generally higher than in the previous year and dustfall near the Fox Haul Road decreased. These trends reflect the amount of vehicle traffic present on each road.
- In all years, dustfall at 300 m downwind of the road decreased below the BC Pollution Objective goal of 2.9 milligrams per square decimetre per day ($mg/dm^2/d$), except for the August/September 2013 measurement at Fox Haul Road. At 1,000 m downwind of the road, all dustfall concentrations were at background levels.
- Dustfall concentrations measured from the three airport stations and two Long Lake Containment Facility stations showed that average dustfall was higher in 2013 and 2014 compared to 2012. The majority of measurements were below the BC Pollution Objective goal.

- The maximum acid deposition value was calculated to be 836 eq/ha/yr (LLCF-PA station), and the highest annual median value from all non-background sites was 173 equivalents per hectare per year (eq/ha/yr) (based on 3 months of data). This median value is below the established Canadian critical soil load for all provinces as well as the Alberta PAI load standard of 250 eq/ha/yr. The actual annual loading would likely be well below this prediction, due to neutralizing processes that were not accounted for.
- All metal deposition values were below 0.5 mg/dm^2/d. There are no guidelines to compare metal deposition values to; however, all metal deposition values at the two background monitoring stations were below 0.03 mg/dm^2/d.
- The use of DL-10 and water on roads to mitigate dust release was shown to be effective.

References:

ERM (ERM Consultants Ltd). 2015. Ekati Diamond Mine: 2014 Air Quality Monitoring Program. Prepared for Dominion Diamond Ekati Corporation by ERM Consultants Canada Ltd.: Yellowknife, Northwest Territories.

BHP (BHP Billiton Canada Inc.). 2012. Re: Status Report Evaluating the Effectiveness of DL10 as a Dust Suppressant on the Misery Haul Road. Letter Submitted to Wekeezhii Land and Water Board. November 9, 2012. Yellowknife. NWT. Canada.

DOMINION DIAMOND

Information Request Number: DAR-MVEIRB-IR-75

Source: MVEIRB Information Requests from Chuck Hubert

Subject: Alternatives

DAR Section(s): 2

Preamble (MVEIRB):

Section 2.5.3.1 of the DAR provides the developer's position on alternative energy sources for the Jay project. The developer states that natural gas, hydroelectric, and biomass as alternative energy sources were not considered because they are not available at the project site. The only rationale provided to discount these sources is that they are not present at the project site. It is noted that diesel is also not available at the project site however, this is the preferred energy source for the project.

Request (MVEIRB):

Please provide a cost benefit analysis of sourcing the project's power requirements from each of these sources individually or to supplement a part of the total energy needs.

Response:

Dominion Diamond’s approach to the Jay Project alternatives assessment was to evaluate reliable energy sources that could provide the full power requirement needed for the Project. The Jay Project does not significantly change the peak loads of the Ekati Mine, and as such it does not require new investment in power supply in the short term.

A summary of the feasibility of alternative power sources for the Jay Project is provided in Appendix F, Power Supply. Natural gas, hydroelectric, and biomass are not considered to be suitable power sources to provide either the full power requirement or supplemental power for the Project, as discussed in Appendix F.

The Jay Project lengthens the mine life, providing additional time to amortize investments in alternative power supply. Dominion Diamond will continue to evaluate the technical and economic feasibility of alternative power supply options in view of this benefit.

Information Request Number: DAR-MVEIRB-IR-76

Source: MVEIRB Information Requests from Chuck Hubert

Subject: Alternatives

DAR Section(s): 2

Preamble (MVEIRB):

Section 2.5.3.1 of the DAR provides the developer's position on alternative energy sources for the project. This section of the DAR discounted wind power as an alternative energy source for several reasons: wind power could not provide 100% of the power required and therefore standby power is required which doubles the capital cost and, wind turbines do not operate in low temperatures which could potentially prevent the turbines from working for several months of the year. It is noted that Diavik uses wind power to supplement its power needs and that this has proven both economically and technically feasible. Further, the developer states that wind power requires a backup energy source which doubles the capital cost. However, the developer has provided no evidence to support this claim of doubling capital costs.

Request (MVEIRB):

Please provide a cost benefit analysis of wind power as a supplemental power source for a portion of the projects energy needs.

Response:

Dominion Diamond's approach to the Jay Project (Project) alternatives assessment was to evaluate reliable energy sources that could provide the full power requirement needed for the Project. The Jay Project does not significantly change the peak loads of the Ekati Mine, and as such it does not require new investment in power supply in the short term.

A summary of the feasibility of alternative power sources for the Jay project is provided in Appendix F. Natural gas, hydroelectric, biomass, wind, and solar power are evaluated as possible alternative power sources for the Project. Wind turbines were assessed to be a possible supplemental power supply alternative for the Jay Project, but were not considered to be feasible to provide the full power supply for the Project. The other alternative power supplies evaluated were not considered to be suitable for either supplemental power or to provide the full power supply for the Project.

The Jay Project lengthens the mine life, providing additional time to amortize investments in alternative power supply. Dominion Diamond will continue to evaluate the technical and economic feasibility of alternative power supply options in view of this benefit.

DOMINION DIAMOND

Information Request Number: DAR-MVEIRB-IR-78

Source: MVEIRB Information Requests from Chuck Hubert

Subject: Cumulative Effects

DAR Section(s): 12.4.1.4.1, 17.2.3

Preamble (MVEIRB):

Section 12.4.1.2 states that Tier 1 developments include projects anticipated to be in construction by 2016. However, Tier 1 in DAR s. 12.4.1.4.1 does not appear to include potential cumulative effects that could occur in the future from the proposed Jay project in combination with the Diavik A21, which the Diavik Joint Venture (including Dominion) has approved as part of the 2015 programme of works.

Request (MVEIRB):

Please describe how including the A21 pit at Diavik would affect the predicted cumulative effects of the Jay project and revise conclusions accordingly.

Response:

Background

The Terms of Reference (TOR) for the Jay Project (Project) was issued by Mackenzie Valley Environmental Impact Review Board (MVEIRB) on July 17, 2014, and the Developer's Assessment Report (DAR) was submitted to the MVEIRB on November 6, 2014. In accordance with the TOR, the DAR provided an analysis and assessment of cumulative effects from the Project and previous, existing, and reasonably foreseeable developments for all valued biophysical and human environmental components, where applicable.

Section 6.5 of the DAR defines the assessment cases used to analyze effects from the Project, and in combination with previous, existing, and reasonably foreseeable developments. The Reasonably Foreseeable Development (RFD) Case includes the Application Case plus the cumulative effects of future projects. A list of reasonably foreseeable developments were identified and described in the DAR (Section 6.5.2.4).

The Diavik Diamond Mine ore bodies comprise four kimberlite pipes (A154South, A154North, A418, and A21) located in shallow waters adjacent to East Island, Lac de Gras. All four ore bodies were included in the original Diavik mine plan (1999), but in 2004, A21 was removed from the mine plan (reserves reverted to mineral resource). In 2007, the Wek'èezhíi Land and Water Board (WLWB) approved the final water licence submissions related to the A21 development; however, Diavik Diamond Mines Inc. (DDMI) subsequently delayed development of the A21 kimberlite pipe. Additional information was provided to the WLWB in 2012, including updates to water licence submissions, the dike construction environmental management plan, and the dike design report (DDMI 2012). A final dike design report for the A21 Dike was provided to the WLWB in November 2014 (DDMI 2014).

At the time of writing the DAR, the Diavik mine plan did not include any production from the A21 pipe (Dominion Diamond 2014a). The mine plan indicated that the development of the A21 pipe continued to be under review but no decision had been made to develop this pipe at that time since the identification of extensions to the existing pipes had decreased the urgency to bring the pipe into the mine plan in the short term. As a result, mining of the A21 kimberlite was not included as a RFD in the DAR for the Jay Project (Section 6.5.2.4).

However, on November 27, 2014, Rio Tinto, operator of the Diavik Mine, released a statement indicating the formal approval of the development of the A21 pipe at the Diavik Mine (Rio Tinto 2014). A statement was also released from Dominion Diamond on November 26, 2014 (Dominion Diamond 2014b). In the media releases, it was indicated that the Diavik Joint Venture (Rio Tinto 60 percent [%]; Dominion Diamond Corporation 40%) approved the 2015 program of works, with the A21 diamond production planned for late 2018. Diavik's ore reserves will be formally updated in the first quarter of 2015. The current mine plan has production ending in 2023 (Rio Tinto 2014).

The A21 kimberlite pipe is located just south of Diavik's existing mining operations. The A21 development will require rockfill dike construction to encircle the ore body located just offshore of existing mining operations at Lac de Gras. Diavik will use the same design and engineering technologies used to construct the Diavik mine's two other dikes that enabled mining of the three existing pipes.

Information provided with the media release indicates that Diavik will begin construction of the dike to access the A21 kimberlite pipe in 2015. The A21 dike will be 2.2 kilometres (km) in length and constructed in water up to 20 metres (m) deep. From 2015 to 2018, activities will include rock crushing, dike construction, pit dewatering, and pre-stripping. Production is expected to begin in late 2018, with approximately five years of open pit mining (Dominion Diamond 2014b).

Although A21 was not in the Diavik mine plan at the time of writing the DAR, the following provides a summary of the potential cumulative effects for the Jay Project from the mining of the A21 pipe. The additional area related to the footprint of the dike, open pit, and road will create a small increase in the overall area of cumulative surface disturbance. There may also be modifications to existing mining operations at the Diavik Mine that may affect cumulative effects predictions, as well as increases to the workforce at the Diavik Mine. Where information was available, these changes were evaluated by key components to determine whether the conclusions of the DAR would be changed for relevant valued components (VCs). It should be noted that based on the information publically available on the A21 development and the recent public release (November 2014), there are uncertainties associated with the Diavik A21 development; as per Section 6.5.2.2. of the DAR, this uncertainty is similar to other RFD projects.

Aquatics

Addition of the A21 project (pit, dike, and access road) as a RFD would not change the impact classification and determination of significance for cumulative effects to groundwater, surface water hydrology, water quality, or fish and other aquatic life VCs.

Hydrogeology

In the DAR, the hydrogeologic effects of the Project were assessed to be limited to the local scale study area for hydrogeology and all effects pathways from the Project on hydrogeology were assessed as no linkage or secondary. The A21 pipe is located approximately 20 km southwest from the Jay pipe, and it is separated from this pipe by a portion of Lac de Gras and existing Diavik Mine operations at A154N/S and A418 pipes. Because of this large distance and the presence of large lake and existing mine facilities, no cumulative effects for hydrogeology are anticipated from the addition of the A21 project to the RFD Case.

Hydrology

The predicted cumulative effects to surface hydrology from the Jay Project were assessed in Section 8.5.3.3 of the DAR. In this section, cumulative effects from the Project, and the Ekati and Diavik mines, were assessed using the regional hydrology water balance model. The Diavik water transfers used in the assessment in this section were obtained from the Diavik Environmental Assessment (DDMI 1998), and were based on three pits (A154, A418, and A21) being part of the Diavik Mine; therefore, the water transfers associated with the Diavik Mine in Table 8.5-4 of the DAR also account for the A21 pit back-flooding volumes. The DAR Section 8.5.3.3 includes the Diavik A21 pit; however, the dewatering of the A21 pool was not included, as it was previously scheduled prior to Project activities. The timing of the A21 pit back-flooding is not expected to occur during 2017 as indicated in DDMI (1998), but rather at a later date because the current mine plan has production ending in 2023 (Rio Tinto 2014).

Diavik A21 pit water transfers within Lac de Gras, which potentially overlap with Jay Project activities (commencing in 2016), include dewatering (winter months of 2017 to 2018), operation (2018 to 2023) and pit back-flooding (not scheduled) (DDMI 2014; Rio Tinto 2014). Each of these activities and the assessment of cumulative effects to hydrology within Lac de Gras are discussed below.

Cumulative effects to surface hydrology within Lac de Gras and downstream waterbodies in the DAR, due to Diavik operational water transfers (prior to the A21 pool dewatering in winter 2017 to 2018), water transfers from Lac de Gras for the back-flooding of the Ekati Fox Pit, and potential effects to hydrology from Jay construction activities (prior to the Jay diked area dewatering in 2019) were estimated to be within the range of natural variability (DAR Section 8.5.3.3.5). For an average year, effects in Lac de Gras were estimated as a decrease in cumulative annual discharge of less than 1% and a decrease in mean annual water levels of less than 0.01 m. These decreases are primarily associated with water transfers from Lac de Gras for the back-flooding of the Ekati Fox Pit. With the additional water transfers associated with dewatering of the A21 pool, estimated as a total volume of 6.7 million cubic metres (m^3) (of which a proportion will be temporarily stored in on-land facilities for treatment and discharge, but the full volume is used for a conservative estimate), cumulative changes to hydrology in Lac de Gras from baseline are estimated as increases in cumulative annual discharge of 1 percent (%) and increases in mean annual water levels of 0.01 m. These changes are within natural variability, and are negligible. The change to annual surface hydrology within Lac de Gras due to inclusion of the A21 pool dewatering water transfers are changes from a reduction in flows and water levels compared to baseline (as assessed in the DAR) to an increase in flows and water levels of 1% for flows and 0.01 m for water levels compared to baseline (as assessed including the A21 pool dewatering activities in the RFD case).

Operational water transfers associated with the Diavik Mine were based on volumes provided in the Diavik Environmental Assessment (DDMI 1998). These water transfers (net withdrawals) are used as an estimate for future Diavik operational water transfers and include the A21 pit. There is uncertainty in the volumes of water transferred. However, the operational water transfers (ending in 2023) are not expected to overlap with Jay Project back-flooding. The cumulative effects to Lac de Gras hydrology are within a 1% decrease in cumulative annual flows and a 0.01 m decrease in mean annual water levels (DAR Section 8.5.3.3.5). There are no changes to the DAR assessment of cumulative effects to hydrology because the DAR included operational water transfers that included the A21 pit.

Closure water transfers associated with back-flooding of the Diavik A21 pit are included in the regional hydrology water balance model during 2017 and the cumulative effects are shown in Section 8.5.3.3.5. It is understood that the A21 pit back-flooding is not expected to occur in 2017, and the uncertainty in timing was discussed in the DAR Section 8.5.3.3.5. The estimated magnitude of cumulative effects to hydrology within Lac de Gras during the A21 pit back-flooding included in the DAR is expected to be valid, as the back-flooding of Diavik pits are not expected to overlap with the back-flooding of the Jay Pit (scheduled for 2030-2033). These cumulative effects to Lac de Gras (during the A21 pit back-flooding) are expected to be a decrease in annual cumulative discharge of approximately 2% and a decrease in mean annual water levels of approximately 0.02 m. Changes to the DAR assessment include the timing of effects due to back-flooding, which will be determined in future planning, but are not expected to overlap with the Jay pit back-flooding.

Water Quality

There is a potential for cumulative effects to Lac de Gras between the Project and the development of the A21 pit, from activities such as dike construction, the generation of air emissions, and the management of minewater (including the discharge of effluent from the Diavik Mine), as these activities link to potential effects to water quality. Due to the location of the A21 development, it is not expected that cumulative effects on water quality in Lac du Sauvage would occur between the Jay Project and the A21 project (if included as an RFD development).

Diavik construction of the A21 project begins in 2015, with dike construction activities occurring in Lac de Gras in 2015-2017. This has the potential to overlap in terms of schedule with dike construction activities associated with the Jay Project. Effects on water quality from the sediment associated with the construction of the Jay Dike in Lac du Sauvage were assessed in the secondary pathway of *Release of sediment during construction of the horseshoe-shaped dike in Lac du Sauvage may cause changes in sediment yield, water quality, and sediment quality in Lac du Sauvage* (Section 8.4.2.4.2 of the DAR). The dike construction pathway was determined to have minor effects on water quality and sediment quality, which will be localized through use of turbidity curtains and limited to the period of construction.

Mitigation associated with Jay dike construction will be implemented including:

- a detailed dike construction plan will be developed and implemented, and will include information relevant to mitigation, inspection, and monitoring;
- erosion and sediment control measures will be implemented in Lac du Sauvage during dike construction where appropriate;

- the majority of dike construction activities (central trench excavation, removal of lakebed sediment, and backfilling activities) will occur during the open-water season with placement of silt curtains;
- turbidity (silt) curtains will be installed upstream of the dike (within Lac du Sauvage) and downstream of the dike (within the isolated portion of Lac du Sauvage) during the open-water seasons;
- rockfill will be placed during the winter months at a slower rate that, in the absence of wind effects on open-water, reduces sedimentation; and,
- turbidity and total suspended solids (TSS) will be monitored at designated locations throughout open-water and under-ice conditions, within and outside of the zone of the turbidity curtains; if concentrations approach monitoring thresholds during construction activities, a review of local conditions and activities will be conducted.

As a result, construction of the dike in Lac du Sauvage is expected to result in a minor, localized change to the water quality in Lac du Sauvage (Section 8.4.2.4.2). The area of change will be in close proximity to the dike construction area and the type of change will be an increase in turbidity and TSS from the disturbance of the lakebed and placement of mine rock material in construction of the dike. The use of turbidity curtains, consistent with those successfully used at the Diavik and Meadowbank Gold mines, will restrict the transport of TSS into Lac du Sauvage (outside of the localized area), and will create areas of still water to allow settling of particles. Regular monitoring during construction will allow for an early warning indication and additional mitigation (e.g., temporary cessation of construction, installation of supplemental, or different types of, silt curtains or barriers) to be employed, if required. Outside of the silt curtains, changes to water quality and sediment quality are not anticipated.

Due to the mitigation associated with the dike construction activities, it not expected that there would be cumulative effects in Lac de Gras associated with the Diavik Mine dike A21 construction in combination with the Jay Dike construction upstream in Lac du Sauvage. As described in DDMI (2014), Diavik also plans to use silt curtains during A21 dike construction to limit the transport of sediments outside the work areas within Lac de Gras. The silt curtains will be designed and installed to minimize effects on Lac de Gras. Diavik will regularly inspect the turbidity barrier, and monitoring of TSS and turbidity will be used to assess the effectiveness of the turbidity barrier and to determine requirement for any adjustments and/or additions (DDMI 2014). Therefore, the activity of dike construction at the Jay Project, in combination with the dike construction of A21 would not be expected to interact cumulatively, due to the implementation of mitigation at both sites, and as such, would not be expected to affect the ability of the Jay Dike and the A21 Dike to be built within the same time period.

In the DAR, effects of aerial deposition of acids, metals, and dust on the surface water chemistry of lakes was completed (Section 8.5.4.1.1 and 8.5.4.2.1) with deposition inputs to water quality provided by the air quality assessment. As described in the Air Quality section below, because of the distance between the A21 Pit and Jay Project, it is expected that any change to ground-level concentrations at the Jay Project site from emissions due to the addition of the A21 Pit will be very low. The Diavik Mine emissions with the addition of the A21 Pit should remain relatively similar to those assessed in the DAR, with marginal increases in mine fleet exhaust and road dust emissions. Changes to the predicted ground-level concentrations as a result of the inclusion of the A21 Pit will likely be confined to areas immediately outside of the Diavik Mine disturbance boundary. As a result, emissions associated with the A21 Pit are

accounted for within the conservatism applied in the air effects modelling under the Application Case. Thus, the addition of the A21 Pit to the RFD Case would not be anticipated to change the water quality predictions due to the potential for acidifying air emissions and deposition of dust and metals.

In Section 8.5.4.2.2 of the DAR, effects to water quality in Lac de Gras during operations to post-closure were assessed; detailed water quality modelling (described in Section 8.5.4.1.2 and associated appendices) was conducted to predict changes to surface water quality in Lac de Gras resulting from Project discharges, as well as the effluent discharge from the Diavik Mine. For example, the hydrodynamic water quality model developed for Lac de Gras (Appendix 8F; Golder [2015a]) incorporates changes to Lac de Gras as a consequence of the Project, and incorporates projected changes as a result of the operation and closure inputs from the Diavik Mine (effluent discharge and runoff from the reclaimed surfaces) and existing Ekati Mine operations.

One of the source-term inputs to Lac de Gras under existing conditions and early operations of the Jay Project (2013 to 2023) is treated effluent discharge from the Diavik mine. Based on current information, the inclusion of the A21 Pit into the RFD Case would not extend the mine life of the Diavik Mine, as the current mine plan has production ending in 2023 (Rio Tinto 2014). An update to the Lac de Gras water quality model was completed to include A21 (Appendix B, Compendium of Supplemental Water Quality Modelling). As described in Appendix B, the remodelled projections for some constituents change slightly from, but are similar to, those presented in the DAR, however, the revised projections do not result in exceedances of the constituent screening guidelines and objectives used in the DAR. Therefore, the inclusion of A21 into the RFD Case does not change the conclusions of the DAR, which are that the Jay Project will not result in significant adverse effects to surface water quality, aquatic health, and the use of water for drinking.

The inclusion of the Diavik A21 project to the assessment of cumulative effects from the Project and other developments is not predicted to alter the Project's influence on the maintenance or suitability of surface water quality for healthy and sustainable aquatic ecosystems in the effects study area. Primary pathways influencing measurement indicators for the suitability of surface water quality to support healthy and sustainable ecosystems were reconsidered based on the inclusion of the A21 project footprint and activities, with the conclusion that residual effects would remain of low magnitude and local to regional in geographic extent (Section 8.7.2 in the DAR). The incremental and cumulative effects from the Project and previous, existing, and future developments, with the inclusion of the A21 project to the RFD Case, are expected to remain the same, that is, not result in a significant adverse effect on water quality.

Fish and Fish Habitat

In Section 9.4.3.1 of the DAR, the effects from the footprint of the dike and dewatering of the diked area in Lac du Sauvage were assessed, relating to the following primary pathways:

- The construction of the horseshoe dike and Jay Pit within Lac du Sauvage will result in the direct loss or alteration of habitat, affecting fish and other aquatic life within Lac du Sauvage and Lac de Gras.
- The dewatering of the diked area will result in the direct loss or alteration of habitat in Lac du Sauvage, affecting fish and other aquatic life within Lac du Sauvage and Lac de Gras.

The existing developments in Lac de Gras (A154 and A418 pits and dikes, and water management area at the Diavik Mine) were considered in the DAR, where the baseline footprint is approximately 196 hectares (ha) (or 0.3% of lake habitat in the effects study area (ESA) for the 2014 Base Case). The reported footprint area in Lac de Gras was derived in a GIS (Geographic Information System) and using lake shorelines described by CanVec Data (digitized 1:50,000 National Topographic Service data).

The total in-lake footprint of the Project in Lac du Sauvage during operations is estimated to be 54.3 ha from the dike and 335.7 ha from the dewatering of the diked area, resulting in a total loss of 390 ha, or 4.5% of the aquatic habitat in Lac du Sauvage, and 0.6% within Lac du Sauvage and Lac de Gras combined (i.e., the ESA). The total cumulative change in lake habitat for the Application Case will be 586 ha or 0.9% of lake habitat in the ESA, representing the existing A154 and A418 footprint, and water management area in the North Arm in Lac de Gras (196 ha) plus the operational footprint of the Project (390 ha).

If considering the A21 dike at the Diavik Mine as a RFD, the expected loss of lake habitat area from the A21 dike in Lac de Gras is approximately 55.6 ha (derived in GIS from digitized maps in DDMI [2014]). Thus, the cumulative loss of existing and proposed developments, including RFDs is approximately 642 ha, or 1% of lake habitat in the Effects Study Area (Lac de Gras and Lac du Sauvage combined). This small increase (i.e., 0.1%) in in-lake footprint from the A21 dike would not change the outcome of the DAR (Section 9.6.2). The amount of incremental and cumulative change (e.g., existing, proposed, and reasonably foreseeable footprints) to fish habitat during operations is expected to result in no measurable effects to population abundance for fish VCs, such as Lake Trout and Lake Whitefish. Effects, if any, will be limited to a minor change in the distribution of fish with no effects on the on-going productivity of fisheries.

Furthermore, as described in Section 9.4.3.1, the Jay Dike will be breached at multiple locations at closure and the dike and pits in Lac de Gras for the Diavik mine will also be reclaimed (DDMI 2014). Thus, the amount of permanent change to habitat (e.g., dike footprints) in the ESA for the Application Case is expected to result in less than a 1% loss in habitat area at post-closure and no measurable effects to population abundance and distribution for Arctic Grayling, Lake Trout, and Lake Whitefish.

The construction of the A21 dike at the Diavik Mine is not expected to affect stream habitat for fish.

In Section 9.4.3.1.2, the effects from the direct mortality of fish from the fish-out were assessed, relating to the following primary pathway:

- Dewatering Lac du Sauvage within the diked area will require removal of fish from the area.

As per Section 3.2.1 of the DAR, the fish-out for the Jay Project is planned for 2017 and 2018. Diavik plans to conduct a fish salvage as part of the A21 project as a requirement of DDMI's Fisheries Authorization (DDMI 2012). The timing of the salvage will be dependent on the dike construction schedule (potentially in 2017). Fish salvages were conducted by DDMI for the A154 and A418 dikes. The fish salvage from the A154 Dike in 2002 (McEachern et al. 2003) showed a survival rate of approximately 50% of 5,049 fish captured during the salvage and fish-out operation. It is expected that fish mortality associated with the fish salvage at the A21 dike in Lac de Gras will not change the outcome of the DAR.

The area of the A21 dike is small (55.6 ha) relative to the size of the ESA, and therefore, the number of fish to be removed from this area would also be proportionately small.

For the Project, the amount of direct mortality from the fish-out in the ESA for the Application Case, and the RFD Case including the A21 development, is expected to result in minor measurable effects to population abundance and distribution for Arctic Grayling, Lake Trout, and Lake Whitefish. However, the recovery or reversibility of mortality effects from removal of fish during the fish-out on fish populations in Lac du Sauvage and Lac de Gras is expected to begin during the operations phase of the Project.

Incremental and cumulative changes to fish and fish habitat from the Jay project in combination with other developments, including the A21 project, are predicted to not have significant adverse effects on fish VCs.

Air Quality

The following primary pathways identified in the DAR were assessed for cumulative effects, and would be included with effects from the A21 project:

- emissions of sulphur dioxide (SO_2), oxides of nitrogen (NO_X), carbon monoxide (CO), and particulate matter (both fine particulate matter [$PM_{2.5}$], total suspended particulates [TSP]) from construction equipment, mining equipment, site utility equipment, ore processing equipment, and vehicle fleet; and,
- fugitive dust emissions from mining activities, material movement and storage, exposed lakebed, and haul roads.

The A21 project is assumed to consist of a dike-isolated open pit approximately 3 km to the southwest of pits A154 and A418. Construction and pre-stripping would occur from 2015 to 2018, and production planned to begin in late 2018 and running to 2023.

Emissions from the A21 project would come from the following sources:

- stack emissions from existing power generators and diesel heaters;
- mine fleet exhaust emissions from the mobile and portable diesel combustion equipment;
- fugitive particulate emissions from all mining (e.g., drilling, blasting and etc.) and material handling activities;
- road dust emissions caused by mine vehicle traffic along haul roads;
- fugitive particulate emissions due to wind erosion from the storage of waste rock, kimberlite, and processed kimberlite;
- fugitive particulate emissions from potentially exposed lakebed; and,
- vehicle exhaust emissions related to vehicle travel on the Tibbitt to Contwoyto Winter Road (TCWR).

Diavik Mine as an underground mining configuration was included in all assessment cases of the air quality assessment of the DAR (Section 7.4), as well as the subsequent Jay Project Air Quality Assessment Update (Golder 2015b). The A21 project will change the emission profile of the Diavik Mine after 2018 when the primary mining activities at the Diavik Mine return to open pit mining. The types of air contaminants expected to be emitted from the A21 project will be similar to those emitted from the Diavik Mine in underground mining configuration and the Jay Pit. The A21 project is not expected to increase the production level of the Diavik Mine but rather maintain the existing Diavik Mine production levels. Therefore, all emissions associated Diavik Mine's utility equipment (e.g., power generation) and ore processing will remain identical to those assessed in the DAR.

It is expected that the net changes of emissions from inclusion of the A21 project into the Diavik Mine operations would primarily consist of increased vehicle exhaust and fugitive dust from mine fleet operations associated with the A21 project, and potentially increased fugitive dust from the exposed lake bed within the A21 dike. Emissions associated with the Diavik Mine's utility equipment (e.g., power generation) and ore processing will remain identical to those assessed in the DAR. Mine heater exhaust emissions may decrease as heating for underground mining operations will no longer be needed during operation of the A21 pit.

The dispersion modelling results presented in Section 7.4 of the DAR indicated that maximum ground-level concentrations in the Application Case were predicted to occur at or near to the edge of the disturbance boundaries of either the Jay Pit facilities and Ekati Mine infrastructure, or the Diavik Mine facilities and infrastructure. The dispersion modelling results also indicated that ground-level concentrations of emitted compounds diminish rapidly with increasing distance from the disturbance boundaries. The A21 pit would be approximately 17 km southwest from the Jay Pit, and approximately 3 km southwest from the A154 and A418 pits, and any emissions located near the A21 pit should not result in substantial changes within several kilometers from the pit.

Annual vehicle traffic volumes on the TCWR during operation of the A21 project are likely to be similar to the traffic volumes during the Application Case. Vehicle traffic on the TCWR will likely increase moderately during the construction phase of the A21 project; however, the increased traffic will only proceed as far as Diavik, and should not affect air quality predictions near the Jay Project.

Construction and operation of the A21 project may moderately increase the total mine fleet exhaust and road dust emissions from the Diavik Mine. It is expected that the bulk of any increase would occur on the southern portion of the Diavik Mine near the A21 pit. If mine fleet is diverted from operations on the north side of the Diavik Mine (i.e., A154 and A418) to A21 pit operations, then there should be a commensurate decrease in fleet exhaust emissions on the northern portion of the Diavik Mine. Any changes to air quality at the Project from mine fleet exhaust at the Diavik Mine due to changes in operations involving the A21 pit would not be expected to be substantial, as the total vehicle exhaust emissions would only be expected to increase marginally, would occur at a distance of approximately 17 km from the Project, and from a location (A21 pit) that is 3 km further away from the Project than that modelled in the DAR.

In summary, because of the distance between the A21 pit and Jay Project, it is expected that any change to ground-level concentrations at the Jay Project site from emissions due to the addition of the A21 project will be very low. The Diavik Mine emissions with the addition of the A21 project should remain relatively similar to those assessed in the DAR, with marginal increases in mine fleet exhaust and road

dust emissions. Changes to the predicted ground-level concentrations as a result of the inclusion of the A21 project will likely be confined to areas immediately outside of the Diavik Mine disturbance boundary. The inclusion of the A21 project in the cumulative effects assessment will result in no change in residual impact classification and predicted significance of cumulative effects on air quality.

Terrestrial

Addition of the A21 project (pit, dike, and access road) as a reasonably foreseeable development would not change the impact classification and determination of significance for cumulative effects to vegetation, caribou and other wildlife VCs.

Effects to the Abundance and Distribution of Plant Populations and Communities

Much of the area to be disturbed by the A21 project consists of deep water, which is not suitable for vegetation communities, and listed and traditional use plant species (Section 11.2.2 of the DAR). The A21 project is not expected to alter esker, riparian tall shrub and birch seep/riparian shoreline habitats (Table 78-1). These habitats represent moderate to high potential for listed and traditional use plants. The A21 project will remove a total of 11.9 ha of heath tundra and heath tundra 30% to 80% boulders (Table 78-1). These Ecological Landscape Classification (ELC) units represent high potential habitat for traditional use plants, but are also two of the most common land cover types in the region. The combined decrease of upland, wetland and shallow water ELC units from the A21 project represents less than 0.01% of the vegetation effects study area.

Table 78-1 Additional Area of Ecological Landscape Classification Map Units Disturbed by the A21 Project Relative to the Existing Diavik Mine

Ecological Landscape Classification (ELC) Map Units	Existing Habitat Disturbed (ha)	Additional Habitat Disturbed by A21 (ha)
Upland ELC Map Units		
Esker Complex	23.0	0.0
Bedrock Complex (>80% rock)	8.9	0.0
Boulder Complex (>80% rock)	1.7	0.3
Heath Tundra 30% to 80% Bedrock	45.5	1.2
Heath Tundra 30% to 80% Boulder	131.3	5.7
Heath Tundra	395.6	6.2
Wetland ELC Map Units		
Riparian Tall Shrub	0.5	0.0
Birch Seep and Riparian Shoreline Shrub	2.4	0.0
Tussock/Hummock	117.5	0.7
Sedge Wetland	34.6	1.1

Table 78-1 Additional Area of Ecological Landscape Classification Map Units Disturbed by the A21 Project Relative to the Existing Diavik Mine

Ecological Landscape Classification (ELC) Map Units	Existing Habitat Disturbed (ha)	Additional Habitat Disturbed by A21 (ha)
Non-Vegetated ELC Map Units		
Shallow Water	35.5	4.2
Deep Water	213.1	54.0
Unclassified ELC Map Unit		
Unclassified	0.3	0.0

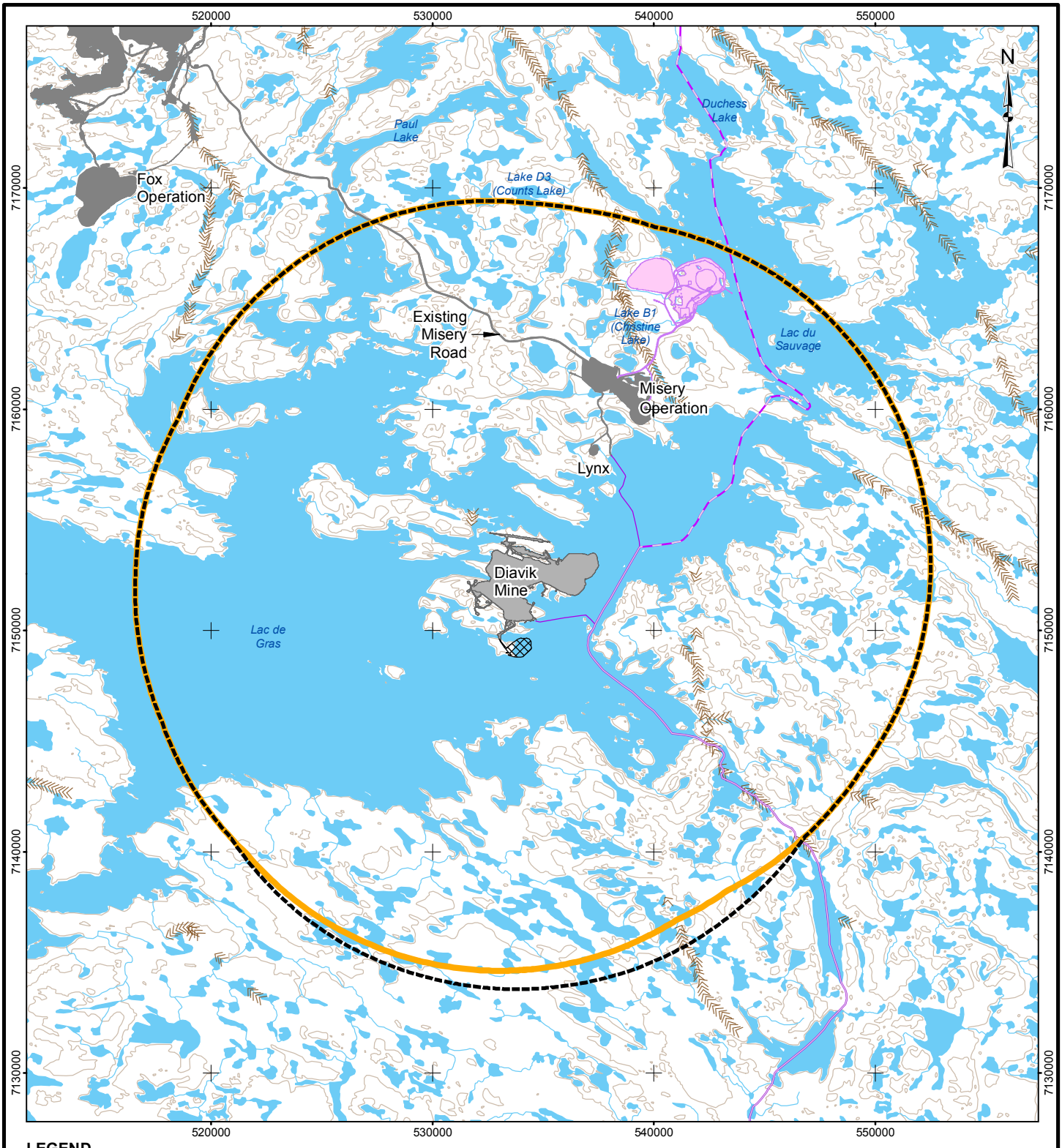
ha = hectare;% = percent; >= greater than; ELC = Ecological Landscape Classification.

Effects to the Abundance and Distribution of Wolf and Upland Breeding Birds

For wolf and upland breeding birds, no primary pathways were identified from the Jay Project (Section 13.3.2.2; Table 13.3-1). The A21 project would not change the assessment of no linkage and secondary pathways, including pathways related to habitat loss and fragmentation, and habitat quality (Section 13.3.2.2.2). Much of the area expected to be directly disturbed by the physical footprint of the A21 project is shallow and deep water (Table 78-1), which is of low value to wolf and upland breeding birds. The A21 project is also immediately adjacent to existing disturbance of the Diavik Mine, which limits effects to these VCs. Wolves are seldom recorded on the East Island, and the 300 m buffer from the existing Diavik Mine footprint used to estimate indirect habitat loss on upland breeding birds (Section 13.3.2.2.2) would have included much of the change in habitat quality associated with the future A21 project. Incremental and cumulative changes to habitat quantity and quality from the A21 project and other developments are predicted to not have significant adverse effects on wolf and upland breeding bird VCs.

Effects to the Abundance and Distribution of Caribou, Grizzly Bear and Wolverine

The addition of the A21 project to the RFD Case and subsequent increase in direct and indirect habitat loss on caribou, grizzly bear and wolverine populations is predicted to be ecologically not measurable. The sum of all upland and wetland ELC map units disturbed by the A21 project is 15.2 ha (Table 78-1) or 0.152 square kilometres (km^2), which is less than 0.001% of the seasonal ranges of caribou, grizzly bear, and wolverine. Similarly, the increase in the zone of influence from the A21 project is approximately 2,050 ha (20.5 km^2), which is 0.02% of the current Bathurst post-calving and autumn ranges (0.01% of winter and spring ranges), and 0.01% of grizzly bear and wolverine seasonal ranges (Map 78-1). The increase in the zone of influence from the A21 project is predicted to have little influence on encounter rates, energetics and migratory movements of the Bathurst herd.



LEGEND

- EKATI MINE FOOTPRINT
- DIAVIK MINE FOOTPRINT
- PROPOSED DIAVIK A21 PIT
- PROPOSED JAY FOOTPRINT
- WINTER ROAD
- TIBBITT TO CONTWOYTO WINTER ROAD
- NORTHERN PORTION OF TIBBITT TO CONTWOYTO WINTER ROAD
- ELEVATION CONTOUR (20 m INTERVAL)
- ESKER
- WATERCOURSE
- WATERBODY
- ZONE OF INFLUENCE EXCLUDING A21 PIT
- ZONE OF INFLUENCE INCLUDING A21 PIT

5 0 5

SCALE 1:250,000 KILOMETRES

REFERENCE

NATIONAL TOPOGRAPHIC BASE DATA (NTDB) 1:250,000
CANVEC © NATURAL RESOURCES CANADA, 2012
NATURAL RESOURCES CANADA, CENTRE FOR TOPOGRAPHIC INFORMATION, 2012
DATUM: NAD83 PROJECTION: UTM ZONE 12N

DOCUMENT

DAR-MVEIRB-IR-78

PROJECT
DOMINION DIAMOND

JAY PROJECT
NORTHWEST TERRITORIES, CANADA

TITLE
ZONE OF INFLUENCE ASSOCIATED WITH THE DIAVIK MINE INCLUDING AND EXCLUDING THE A21 PIT

Golder Associates

PROJECT		1419751	FILE No. POSTDAR_IR_Wild_009_GIS	
DESIGN	JV	19/02/15	SCALE AS SHOWN	REV. 0
GIS	LMS	02/04/15	MAP 78-1	
CHECK	JV	02/04/15		
REVIEW	JV	02/04/15		

G:\CLIENTS\DOMINION\DDEC Jay and Lynx Projects\Figures\13-1328-0041 Jay & Lynx EA\Wildlife\POST-DAR IRs\POSTDAR_IR_Wild_009_GIS.mxd

Effects to the Abundance and Distribution of Waterbirds

The addition of the A21 project to the RFD Case is predicted to decrease the amount of available high and good quality waterbird staging habitats in the effects study area by 0.2% (Table 78-2). The A21 project is predicted to remove less than 0.1% of both high and good quality breeding habitats, relative to the RFD Case without the A21 project (Table 78-2).

Table 78-2 Additional Area of Waterbird Staging and Breeding Habitat Disturbed by the A21 Project Relative to the Existing Diavik Mine

Habitat Type	Habitat under RFD Case without A21 Project (ha) Compared to Reference Case	Habitat Disturbed by A21 (ha)	% Change from RFD Case without A21 Project to RFD Case with A21 Project
Staging Habitat (Entire Waterbody Plus Upland Habitat Within 100 m of Waterbodies)			
High	-9,539	-312	0.2
Good	-4,301	0	<-0.1
Low	10,707	246	0.7
Poor	3,134	67	<0.1
Breeding Habitat (Shallow and Deep Water Within 100 m of the Shore Plus Upland Habitat Within 100 m of Waterbodies)			
High	-5,444	-9	<-0.1
Good	-4,301	0	<-0.1
Low	7,509	-15	0.0
Poor	2,238	24	<0.1

Note: Values <-0.1 approach zero.

ha = hectare;% = percent; m = metre; RFD = reasonably foreseeable development; <= less than.

Effects to the Abundance and Distribution of Raptors

The A21 project is predicted to directly remove less than 0.1% of high quality raptor habitat relative to the RFD Case without the A21 project (Table 78-3).

Table 78-3 Additional Area of Raptor Habitat Directly Disturbed by the A21 Project Relative to the Existing Diavik Mine

Habitat Type	Habitat under RFD Case without A21 Project (ha) Compared to Reference Case	Habitat Disturbed by A21 (ha)	% Change from RFD Case without A21 Project to RFD Case with A21 Project
High	-94	0.1	<-0.1
Good	-235	0.1	<0.1
Low	-2,982	-0.3	<0.1
Poor	3,311	0.6	<0.1

Note: Values <-0.1 approach zero.

ha = hectare;% = percent; m = metre; RFD = reasonably foreseeable development.

Indirect effects from the A21 project are predicted to remove less than 0.1% of high quality raptor habitat relative to the RFD Case without the A21 project (Table 78-4).

Table 78-4 Additional Area of Raptor Habitat Indirectly Disturbed by the A21 Project Relative to the Existing Diavik Mine

Habitat Type	Habitat under RFD Case without A21 Project (ha) Compared to Reference Case	Habitat Disturbed by A21 (ha)	% Change from RFD Case without A21 Project to RFD Case with A21 Project
High	-478	-0.3	<-0.1
Good	-754	0.1	<0.1
Low	-12,687	0.4	<0.1
Poor	13,919	0.3	<0.1

Note: Values <-0.1 approach zero.

ha = hectare;% = percent; m = metre; RFD = reasonably foreseeable development.

Socio-Economics

As described in the response to DAR-MVEIRB-IR-71, economic modelling with inputs into the socio-economic assessment has been revised to reflect the more advanced mine plan information for the A21 project. The addition of the A21 project to the baseline does affect the Northwest Territories (NWT) labour market during the pit's development and operation. For reference, please see Appendix A, Economic Impact Report (Revised) that has included A21.

The development of the A21 project will place increased pressure on the labour market, in particular, between the years 2015 and 2018 (Rio Tinto 2014). The total direct and indirect labour demand flowing from the diamond mines will peak during these years, averaging just over 4,100 Full Time Equivalents (FTEs). The Northwest Territories (NWT) Economic Impact Model (NWTEIM) has been used to calculate NWT resident labour participation that will average 1,700 FTEs during that timeframe, with peak participation coming in 2018 at 1,745 FTEs. This will exceed the historic peak in NWT resident labour participation established in 2005 when 1,614 FTE NWT residents worked directly or indirectly with the diamond mines.

Development work at the Ekati and Diavik mines (excluding labour participation during the initial construction phase of these two mines) has not attracted a high percentage of NWT resident labour historically. The typical range of Northern participation has been between 20% to 30%. This range was used in the NWTEIM to calculate future participation in development work.

There are several factors that contribute to the estimated level of Northern participation in development work. When comparing the 2018 NWT labour market to that of 2005, the 2018 labour market will benefit from a larger population (44,168 compared to 43,401 in 2005) and more importantly, the source population (those aged 15 and older) will be larger (34,441 compared to 33,045 in 2005), meaning there are more people available to work. Also, in 2005, the unemployment rate fell to 5.0%, the lowest level recorded in the past 25 years (Statistics Canada 2015). The labour force in 2005 was 23,900, and had a participation rate of 76.6%. The increased participation in the mining-related jobs from NWT resident labour in 2018 is achieved with an assumed participation rate of 76.0% and a labour force of 24,660. The result is an unemployment rate of 6.9%. This would be the first time the unemployment rate falls

below 7.0% since 2009, but is not unreasonable and remains well above historical records. There is also room for increased participation should more NWT residents enter the labour force during those peak years. Historically, labour force participation has grown as high as 78.2% in 2008 (NWT Bureau of Statistics. 2015).

After the development phase of A21, which coincides with the construction of the Project and other developments at the Ekati Mine, the overall labour demand will lessen, alleviating the pressure on the labour force by bringing overall demand below 4,000 FTE positions, and by 2021, that demand will be below 3,500 FTE positions. So, the pressure of the labour market from A21 will be isolated to the period of time it is in development.

While the additional of A21 to the Diavik mine plan is expected to affect mining employment and incomes during the development and operation of the pit, between 2015 and 2018, the life of the Diavik Mine will not be extended (i.e., the mine is expected to close in the same timeframe as that discussed in the DAR). Therefore, there are no predicted changes to the residual impact classification and determination of significance provided in the DAR for cumulative effects to socio-economic VCs as a result of the addition of the A21 pit to the Diavik mine plan.

Conclusions

In brief, the incremental and cumulative effects from the Project and previous, existing and reasonably foreseeable developments (including the Diavik Mine A21 project) are predicted to have a positive influence on the economic environment. Project-specific and cumulative changes in measurement indicators from all developments are predicted to have no significant adverse impacts on valued components of the aquatic and terrestrial environments (i.e., water quality, fish and other aquatic life, air quality, vegetation, caribou, and other wildlife). These predictions remain unchanged from the conclusions in the DAR.

References:

DDMI (Diavik Diamond Mines Inc.). 1998. Diavik Diamonds Project Environmental Assessment – Environmental Effects Report on Fish and Water Quality. Diavik CD-ROM series, second edition. Yellowknife, NWT, Canada.

DDMI. 2012. A21 Dike: Construction Environmental Management Plan: 2012 update. Prepared for Diavik Diamond Mines Inc., Yellowknife, NWT, by amec Environmental and Infrastructure, Burnaby, BC. http://www.mvlwb.ca/Boards/WLWB/Registry/2007/W2007L2-0003/W2007L2-0003%20-%20Diavik%20-%20A21%20Submissions%20-%20Jul%2031_12.pdf

DDMI. 2014. A21 Dike. 2014 Design Report Update. FINAL. Prepared for Diavik Diamond Mines Inc., Yellowknife, NWT, by BCG Engineering Inc. http://www.mvlwb.ca/Boards/WLWB/Registry/2007/W2007L2-0003/Reports/W2007L2-0003%20-%20Diavik%20-%20A21%20Dike%20Design%20Report%20-%20Jan%205_15.pdf

Dominion Diamond (Dominion Diamond Corporation). 2014a. Dominion Diamond Corporation Issues Updated Mine Plans for the Ekati and Diavik Diamond Mines, Toronto, Canada. February 3, 2014. http://www.ddcorp.ca/investors/news-single?id=1896393.

Dominion Diamond. 2014b. Dominion Diamond Corporation Reports approval for the A-21 Pipe at Diavik. November 26,2014. http://www.ddcorp.ca/investors/news-single?id=1993309

Golder. (Golder Associates Ltd.). 2015a. Jay Project – Lac de Gras Hydrodynamic Model Updates. Technical Memorandum to Rick Bargery, Dominion Diamond Ekati Corporation, from Michael Herrell, Jerry Vandenberg, and John Faithful. January 19, 2015

Golder (Golder Associates Ltd.). 2015b. Jay Project Air Quality Assessment Update – Technical Memorandum. Submitted to Dominion Diamond Ekati Corporation, Yellowknife, NWT Canada, January 19, 2015.

McEachern, LJ, Matthew GK, Madsen, E. 2003. Fish Salvage Activities Related to Diamond Mine Construction in the NWT. Produced for Diavik Diamond Mines Inc (DDMI). 11 pp.

NWT Bureau of Statistics. 2015. Labour Market Activity. Table 1a: Labour Force Activity , 2001 to 2014. Available at: http://www.statsnwt.ca/labour-income/labour-force-activity/ Accessed March 15, 2015.

Rio Tinto. 2014. Diavik Diamond Mine – development of the A21 pipe. November 27, 2014. http://www.riotinto.com/media/media-releases-237_13678.aspx.

Statistics Canada. 2015. CANSIM Table 282-0002: Labour Force Survey estimates, by sex and detailed age group, annual. Available at: http://www5.statcan.gc.ca/cansim/a26?lang=eng&retrLang=eng&id=2820002&paSer=&pattern=&stByVal=1&p1=1&p2=11&tabMode=dataTable&csid= Accessed March 15, 2015.

DOMINION DIAMOND

Information Request Number: DAR-MVEIRB-IR-79

Source: MVEIRB Information Requests from Chuck Hubert

Subject: Barren-ground Caribou

DAR Section(s): 12, 17

Preamble (MVEIRB):

The lower section of the Jay kimberlite and the Cardinal pipe were in the original project description but are no longer part of the project. These have been excluded from project-specific parts of this EA accordingly. With respect to cumulative effects, section 12.4.1.2 states that the reasonably foreseeable developments include projects that "may be induced" by the Jay Project. The Jay project would involve the construction of mining infrastructure near these known diamondiferous kimberlites. This is likely to improve the economics and probability of underground mining of the Jay pipe, and of the mining of the Cardinal pipe, as separate projects in the future. However, Tier 3 in DAR s. 12.4.1.4.1 does not include potential cumulative effects that could occur in the future from the proposed (open pit) Jay project in combination with these reasonably foreseeable future activities. These are also not considered in the cumulative effects summary (s.17).

Request (MVEIRB):

Please describe how including possible future underground mining of the Jay pipe and mining of the Cardinal pipe would affect the predicted cumulative effects of the proposed (open pit) project and revise conclusions accordingly for each Key Line of Inquiry (except Alternatives).

Response:

The Cardinal kimberlite pipe is a much smaller pipe than the Jay kimberlite pipe and is smaller than most of the other kimberlite pipes that have been developed at the Ekati Mine. As described in Section 2 of the Developer's Assessment Report (DAR), it is not economical to develop the Cardinal pipe as its own project due to the high costs for a stand-alone dike around the Cardinal pipe. As the project is not economically feasible to develop, the development of the Cardinal pipe would not qualify as a reasonably foreseeable development (RFD).

The potential for underground mining of the Jay pipe is described in Section 3.5.4.3 of the DAR. Currently, the available geological information is limited in terms of diamond grade, pipe size and shape, and rock strength below the proposed pit bottom for the Jay pipe. Additional information would be collected throughout operations of the Jay open pit mine, which would enable an economic evaluation of the potential for mining deeper in the Jay kimberlite through an underground development. If the geology and economics prove favourable for underground mining, a detailed design of the underground mining facilities would be developed, along with the details on mining methods, mine access, construction practices, and operations of the underground. A detailed water management plan for the underground mine would also be developed, which would be based on the actual volumes of water managed through open pit mining and water quality measured in monitoring programs.

The approach for the RFD Case is described in Section 6.5.2.2 of the DAR. As described above, there is considerable uncertainty regarding the potential for mining deeper into the Jay kimberlite, to the degree that underground mining was removed from the proposed Project. For instance, whether the economics are favourable and the project proceeds or not, and if it were to proceed, the timing, duration of the project, mining methods, mine access, construction practices, mine plan, water management plan are currently not known. Due to the uncertainty in the potential Jay underground mining project, the project cannot be included in an RFD Case with any reasonable level of confidence; even as a Tier 3 project.

.

The assessment of cumulative effects for the RFD Case necessarily needs to be based on projects that have a reasonable degree of certainty of being developed with a level of information useful for generating confident impact predictions. As described in Section 6.5.2.2 (page 6-21) and Section 12.6.2 (page 12-135), extending the assessment into the RFD decreases confidence in the effects predictions, which is largely due to the uncertainty in timing, location, and construction and operational details of possible future projects. This level of certainty and design information is often available through regulatory applications or approvals. Underground mining of the Jay kimberlite, however, is not defined to a reasonable degree of certainty that is appropriate for RFD projects, even at Tier 3. Therefore, underground mining of the Jay kimberlite cannot reasonably be included in the RFD Case. If in the future the geology and economics prove favourable for mining deeper in the Jay kimberlite, that project would be subject to its own regulatory review process.

DOMINION DIAMOND

Information Request Number:	DAR-MVEIRB-IR-80
Source:	MVEIRB Information Requests from Chuck Hubert
Subject:	Barren-Ground Caribou – Reasonable Foreseeable Developments and Cumulative Effects
DAR Section(s):	12.4.1.4.1 and 17.2.3

Preamble (MVEIRB):

Kennady Diamonds has recovered 2.59 carats per tonne in its mini-bulk sample near the Gahcho Kue Diamond Mine, with an estimated high-grade diamond potential between 9 and 12 million tonnes. This has not been considered as a reasonably foreseeable future development case, even though other such projects (such as the Seabridge project at Courageous Lake) were included in Tier 2.

Request (MVEIRB):

Please describe how including the future development of the Kennady Diamonds resource would affect the predicted cumulative effects of the Jay project and revise conclusions accordingly.

Response:

The approach for the Reasonably Foreseeable Development (RFD) Case is described in Section 6.5.2.2 of the Developer's Assessment Report. As described in this section, a scenario analysis was used to identify future projects and assess potential cumulative effects on Valued Components. To allow for the assessment to be completed, the determination of projects to include in the assessment cases was completed approximately six months prior to the filing date (i.e., approximately April/May 2014), before the results of mini-bulk samples from the Kennady Diamonds Kelvin kimberlite were published. The most recent published information on this exploration project results have now been reviewed in the context of RFD's for the Jay Project assessment, as described below.

The RFDs are defined as projects that:

- are currently under regulatory review or have entered a regulatory application process;
- have a reasonable likelihood of being initiated during the life of the Project;
- or may be induced by the Project; and,
- have the potential to change the Project or the effects predictions.

Throughout 2014, the Kennady Diamonds Inc. (Kennady Diamonds) Kennady North diamond project was in the exploration stage, and continues in 2015 with further exploration to define the resource. According to information on the company's website (Kennady Diamonds 2015), the proposed Kennady North diamond project (including the Kelvin kimberlite) is located 280 kilometres east-northeast of Yellowknife and consists of 13 leases and claims located to the west and north of the four leases controlled by the De Beers Canada Inc. and Mountain Province Diamonds Gahcho Kué Joint Venture.

Exploration drilling has been conducted by Kennady Diamonds to identify a resource along the Kelvin – Faraday kimberlite corridor and also to identify new kimberlites outside of the corridor. The Kelvin – Faraday kimberlite corridor is a target for further exploration and the tonnage estimate of between 9 and 12 million tonnes is based on the drilling completed to date. The potential quantity is conceptual in nature as there has been insufficient drilling to define a mineral resource and it is uncertain if further exploration will result in the target being delineated as a mineral resource (Kennady Diamonds 2015).

In 2014, Kennady Diamonds continued its exploration drilling program, and conducted a mini-bulk sample program in summer/fall 2014. In early 2015, preparations are underway to recover a 500 to 700-tonne bulk sample from the Kelvin kimberlite by large diameter drilling while continuing delineation drilling at the Kelvin and Faraday kimberlites. Diamonds recovered from the bulk sample will be used for revenue modelling of the Kelvin kimberlite. Exploration drilling will be commenced at the diamond-bearing MZ and Doyle kimberlites as well as a number of new exploration targets (Kennady Diamonds 2015).

The Kennady North project is currently only in the exploration drilling stage. No development applications have been filed and no conceptual development plans have been published. Subsequently the Kennady North project does not qualify as a Tier 2 or Tier 3 project, and was not included in the RFD Case.
As described in Indian and Northern Affairs Canada (INAC; 2010), few mineral exploration projects result in producing mines. Between 1971 and 2009, approximately 2,350 exploration projects were monitored by INAC (2010), with about 20 (less than 1%) of these projects being advanced to production. In the Northwest Territories, the probability of creating a mine from an attractive deposit is considered to be less due to higher costs from the lack of infrastructure, such as roads and expensive power, as well as the challenging climate (INAC 2010).

References:

INAC (Indian and Northern Affairs Canada). 2010. Citizen’s Guide to Mining in the NWT. Minister of Public Works and Government Services Canada. Ottawa, Ontario, Canada. Available online: http://publications.gc.ca/collections/collection_2011/ainc-inac/R2-321-2010-eng.pdf

Kennady Diamonds. 2015. Available at http://www.kennadydiamonds.com. Accessed February 9, 2015.

DOMINION DIAMOND

Information Request Number:	DAR-MVEIRB-IR-81
Source:	MVEIRB Information Requests from Chuck Hubert
Subject:	Barren-ground Caribou – Reasonably foreseeable developments and cumulative effects
DAR Section(s):	12.4.1.4.1, 17.2.3

Preamble (MVEIRB):

The DAR has not described how it would affect the cumulative effects assessment of the Jay project if the operating life of another existing diamond mine was extended with the addition of a new pipe, as has happened at Ekati twice.

Request (MVEIRB):

Please describe how extending the operating life of an existing diamond mine would affect the predicted cumulative effects of the Jay project and revise conclusions accordingly.

Response:

As described in the Developer's Assessment Report (DAR) Section 6.5.2.2 and Section 12.4.1.2, the Reasonably Foreseeable Development (RFD) Case includes the Application Case plus the cumulative effects of future projects. The RFDs are defined as projects that:

- are currently under regulatory review or have entered a regulatory application process;
- have a reasonable likelihood of being initiated during the life of the Jay Project (Project);
- or may be induced by the Project; and,
- have the potential to change the Project or the effects predictions.

An extension to an operating mine does not fit the definition of a RFD unless it is has been publically disclosed, or is in a current mine plan. It is not possible to include an additional pit at an existing mine unless some level of information is available regarding potential timing, location, and construction and operational details. In terms of existing diamond mines, the operations of the Snap Lake, Ekati and Diavik mines were included in the Base Case, as well as the proposed Gahcho Kué, NICO, and Nechalacho projects. Mine plans for these operations were reviewed as part of the screening process for the selection of RFDs.

The current Ekati Mine plan assumes production from Misery, Pigeon, and Lynx open pits, and the Koala and Koala North underground operations. Under this mine plan, Ekati will cease mining operations in 2020 (i.e., without the Project). The Lynx Pit was permitted in early 2014 and was included in the Base Case. Although mining of the Sable kimberlite pipe was permitted in 2002 as part of the Sable, Pigeon, and Beartooth Expansion Project, the Sable pipe is not scheduled in the current Ekati Mine plan.

However, as Dominion Diamond is conducting new exploration work (bulk sample) at the Sable pipe in winter 2015 to gather additional geological information, the Sable Project was considered an RFD for the Project in the Sable Addendum (Dominion Diamond 2014).

The Diavik Mine ore bodies comprise four kimberlite pipes (A154 South, A154 North, A418, and A21) located in shallow water adjacent to East Island, Lac de Gras. The current reserve base supports mining operations at Diavik up to 2023. In 2004, A21 was removed from the Diavik Mine plan (i.e., reserves reverted to mineral resource). See response to DAR-MVEIRB-IR-78 for further information on A21.

The mine plan for the Gahcho Kué Project includes open pit mining of three kimberlite pipes (5034, Hearne, and Tuzo) located under Kennady Lake. Approvals and permits for the De Beers Canada Inc. and Mountain Province Diamonds Gahcho Kué Project were received in late 2014 and construction has recently been initiated. The Gahcho Kué Project is scheduled to begin production in 2016, with closure in 2028.

The assessment of cumulative effects for the RFD Case necessarily needs to be based on projects that have a reasonable degree of certainty of being developed with a level of information useful for generating confident impact predictions. As explained in Section 6.5.2.2 (page 6-21) and Section 12.6.2 (page 12-135), extending the assessment into the RFD Case decreases confidence in the effects predictions, which is largely due to the uncertainty in the timing, location, and construction and operational details of possible future projects (also mentioned above). As additional kimberlite pipes beyond what is described above are not identified in current mine plans for these operations (at the time of assessment writing, as well as the current time), they cannot be included as RFDs. It is not possible to predict cumulative effects with the Project (i.e., potential interactions in time and space) without some level of information on timing, location, and construction and operational details of possible future projects. Any extension projects of these existing operations, if they were identified through additional exploration, would be formally proposed and subject to their own regulatory review process.

References:

Dominion Diamond (Dominion Diamond Ekati Corporation). 2014. Jay Project Developer’s Assessment Report Sable Addendum. Prepared by Golder Associates Ltd., December 2014. Yellowknife, NWT, Canada.

DOMINION DIAMOND

Information Request Number: DAR-MVEIRB-IR-82

Source: MVEIRB Information Requests from Chuck Hubert

Subject: Barren-Ground Caribou – Determination of Significance

DAR Section(s): 12.6.1.2

Preamble (MVEIRB):

The DAR (p12-129) states that "a significant effect may also result from habitat loss and fragmentation that reduces migratory or seasonal range movements to the point that it disrupts (breaks) population connectivity". However, fragmentation may greatly reduce population connectivity without reaching the extreme of "breaking" it. For example, only a small fraction of caribou may move through an area in response to a disturbance, even without completely eliminating connectivity.

Request (MVEIRB):

Please clarify why the developer's definition of significance appears to exclude fragmentation that reduces population connectivity, even if that fragmentation does not fully eliminate connectivity.

Response:

To clarify, the definition of significance relative to habitat fragmentation and population connectivity relates to effects other than direct changes to survival and reproduction (i.e., vital rates that affect population growth). Adverse changes to vital rates are specifically mentioned in the definition of significance; the full definition of significance, including the sentence cited in the Preamble is as follows:

> ***"Significant** – impacts are measurable at the population level, and are likely to decrease resilience and increase the risk to the maintenance of a self-sustaining and ecologically effective caribou population. Loss of habitat that causes permanent adverse changes to survival or reproduction at the population level would likely be significant. A significant effect may also result from habitat loss and fragmentation that reduces migratory or seasonal range movements to the point that it disrupts (breaks) population connectivity."*

The full definition includes permanent adverse changes to population vital rates through the second sentence of the definition, which covers conditions related to population decline as a consequence of habitat loss and fragmentation. The assessment in Section 12.4.2.3 in the Developer's Assessment Report (DAR) addresses the energetic and vital rate consequences from developments and their zones of influence, should they act as obstacles to migrating caribou. Together, the effects of development on vital rates and population growth rates are directly considered.

The final sentence of the definition, with the reference to a break in population connectivity is about habitat loss and fragmentation that produces divisions within the population that would preclude gene flow or that would exclude portions of the population from portions of the range, beyond those accounted for through the assessment of habitat loss. Connectivity within the entire range of the Bathurst herd is essential to allow seasonal movements among habitats, provide access to the different resources

required for caribou to satisfy their life history requirements, and decrease the risk of predation through predator swamping behaviour. Connectivity also allows for gene flow within the Bathurst herd, necessary to maintain genetic diversity and remain resilient to environmental stressors (e.g., changing range conditions, disease, predation, and severe weather).

To summarize, the definition of significance is based on range (regional) scale and population level effects to barren-ground caribou. Barrier effects from developments are also assessed in the DAR, such as, the local changes in caribou movement and behaviour from habitat loss and fragmentation due roads and other mine infrastructure. The DAR assesses a very protective (conservative) case wherein there is no movement of caribou across the mine roads, which is not expected to occur based on road monitoring that shows there is movement across the mine roads. However, even under this conservative assumption, the DAR predicts that the local and regional scale changes in habitat loss and fragmentation on the seasonal ranges would not divide the caribou herd (disrupt population connectivity) and result in significant population effects. In this sense, a portion of a population that moves through an area and back again, or that moves through an area and reunites with the remainder of the population, with which it may interbreed, maintains connectivity with both the range and the population gene pool.

DOMINION DIAMOND

Information Request Number:	DAR-MVEIRB-IR-83
Source:	MVEIRB Information Requests from Chuck Hubert
Subject:	Barren-ground Caribou movement barriers
DAR Section(s):	3, 12

Preamble (MVEIRB):

The DAR describes the Jay Road crossing the esker which is currently used as a main movement corridor for caribou, and considers effects of barriers to caribou movements. Communities have expressed concerns about the road and overhead powerlines as barriers to caribou movements (e.g., p4-28). Dominion proposes to build an overhead power line adjacent to the road. Dominion also proposes to run multiple pipelines adjacent to the road, to a maximum three feet in height.

Request (MVEIRB):

Is Dominion able to bury the pipelines and powerline underground for the portion of the Jay Road that crosses the esker? If yes, is Dominion willing to do so?

Response:

The portion of the road that crosses (cuts through) the esker will be designed as a caribou crossing, and as such, the pipelines will be buried, with the exception of any valve or joint. Design will be advanced to minimize the need for joints or valves through the esker crossing.

Other portions of the Jay Road will also be constructed as caribou crossings except where road height requires side berms, where surface conditions preclude caribou use, or where maintenance access is essential for pipe valves. Caribou crossings will be designed so that the side slopes of the road are flatter and have finer crushed rock particles (200 millimetres or less). In the caribou crossing areas, the pipelines will also be covered with finer crushed rock particles; however, valves and pipeline joints will not be covered. Once the road is constructed, monitoring, including by Aboriginal community members, will be implemented to assess the effectiveness and extent of the constructed caribou crossings and modifications can be incorporated.

The potential for overhead power lines to act as a barrier to caribou movement was identified as a primary pathway by which the Jay Project might affect caribou, and an analysis was completed on the following pathway (Developer's Assessment Report [DAR] Section 12.3.1):

- Increased traffic on the Misery Road and Jay Road and the above-ground power line along these roads may create barriers to caribou movement, change migration routes, and reduce population connectivity.

The results of the assessment of this pathway appear in Section 12.4.2.2.2 of the DAR. Research suggests that effects from power lines are minor when compared to active roads (Berger et al. 2000; Reimers et al. 2000, 2007; Vistnes et al. 2008). Qualitative analysis predicted that the presence of the power lines should result in negligible changes to caribou movements and distribution relative to increased traffic on the Misery and Jay roads; rather it is the potential adverse effects of increased traffic on Misery and Jay Roads that are recognized as the focus of concern. Burying the power line through the esker cut would require substantive extra work to bring the (high-voltage) cables to the ground, encase them in a protective conduit, and elevate them again. The loss of ability for safety inspection on that portion of the high-voltage cables would introduce unnecessary operational and safety risks, for no apparent environmental benefit.

References:

Berger R, Martinez I, Wisener M. 2000. Analysis of GPS Relocation Data (1995-1999) for the Owl Lake Woodland Caribou – Report to Manitoba Hydro, Manitoba Conservation, Pine Falls Paper Company, Manitoba Model Forest and Time to Respect Earth's Ecosystems. 88 pp + appendices.

Reimers E, Dahle B, Eftestøl S, Colman JE, Gaare E. 2007. Effects of a power line on migration and range use of wild reindeer. Biol Conserv 134: 484-494.

Reimers E, Flydal K, Stenseth R. 2000. High Voltage Power Lines and Their Effect on Reindeer: A Research Programme in Progress. Polar Res:75-82.

Vistnes I, Nellemann C. 2008. The matter of spatial and temporal scales: a review of reindeer and caribou response to human activity. Polar Biol 31:399-407.

DOMINION DIAMOND

Information Request Number:	DAR-MVEIRB-IR-84
Source:	MVEIRB Information Requests from Chuck Hubert
Subject:	Barren-ground Caribou – powerline design measures
DAR Section(s):	4.5, 12.3

Preamble (MVEIRB):

The DAR states, with respect to powerlines as a barrier to caribou movement, that community concerns remain and have been addressed in the DAR through environmental design and mitigation measures. Table 12.3.1 provides little information on how this has been addressed in project design.

Request (MVEIRB):

Please provide detailed information on how design measures have been applied to reduce the effect of powerlines as barriers to caribou movement.

Response:

As noted in the preamble to this request, in Table 12.3-1 of the Developer's Assessment Report (DAR), there was a primary effects pathways identified that included potential effects of the Jay Project power distribution lines on caribou:

- increased traffic on the Misery Road and Jay Road and the above-ground power line along these roads may create barriers to caribou movement, change migration routes, and reduce population connectivity.

A qualitative analysis of the potential effects of the power distribution line was presented in the Developer's Assessment Report (DAR) Section 12.4.2.2.2 (pages 12-97 and 12-98). The analysis identified a range of magnitude of observed effects from power lines, roads, traffic, and human activity levels on caribou (Berger et al. 2000; Reimers et al. 2000; Vistnes and Nellemann 2001; Reimers et al. 2007; Vistnes et al. 2008). Potential effects from corona noise were also discussed and evaluated (Flydal et al. 2003, 2009; Harper 2014). Overall, the limited information suggests that above-ground power lines have smaller effects on caribou movement and distribution than roads and traffic. Experience with existing power lines at the Ekati Mine indicate that caribou will pass underneath them (Photo 84-1). The project design to include the power line within the Jay and Misery road right-of-way is a mitigation that avoids additional direct habitat loss and minimizes indirect effects to caribou habitat. The incremental effect of the power line on caribou movement is considered to be minor in the context of the potential effects of the road and traffic. Therefore, the focus of mitigation and monitoring for the power distribution lines, Jay and Misery roads is directed at Jay Road design, caribou crossings, modification of traffic patterns, and road closures. Effective mitigation of the effects of roads and traffic to caribou movement will reduce the overall effects.

In addition to the primary pathway noted in the preamble, there was a secondary pathway identified in the DAR that included the concern that the power line will add physical hazards leading to increased risk of

injury or mortality to individual caribou. The detailed design of the power line for the Jay Project has not yet been completed. Based on the profile for the Ekati to Misery power line: the minimum vertical clearance of the power line above ground will be 6.1 metres (m); and pole spacing can range from less than 40 m on curves to more than 100 m over rough terrain. Additionally, as reported in DAR Section 12.3.2.2.2 (page 12-56), the use of guy wires for power poles will be minimized as much as feasible, and those guy wires that are required will be made more visible with coloured plastic sleeves to reduce risk of injury to caribou.

Photo 84-1 Caribou Passing Underneath Power Line on Long Lake Road at Ekati Mine, 2001



References:

Berger R, Martinez I, Wisener M. 2000. Analysis of GPS Relocation Data (1995-1999) for the Owl Lake Woodland Caribou – Report to Manitoba Hydro, Manitoba Conservation, Pine Falls Paper Company, Manitoba Model Forest and Time to Respect Earth's Ecosystems. 88 pp + appendices.

Flydal K, Rogstad I, Per E, Reimers E. 2003. Reindeer (Rangifer tarandus tarandus) Perception of noise from powerlines. Rangifer 23:21-24.

Flydal K, Korslund L, Reimers E, Johansen F, Colman JE. 2009. Effects of power lines on area use and behaviour of semi-domestic reindeer in enclosures. Int J Ecol: 2009.

Harper M. 2014. Lines Designer, McGregor Construction 2000 Ltd. Calgary, AB, Canada. E-mail. July 8, 2014.

Reimers E, Flydal K, Stenseth R. 2000. High Voltage Power Lines and Their Effect on Reindeer: A Research Programme in Progress. Polar Res:75-82.

Reimers E, Dahle B, Eftestøl S, Colman JE, Gaare E. 2007. Effects of a power line on migration and range use of wild reindeer. Biol Conserv 134: 484-494.

Vistnes I, Nellemann C. 2001. Avoidance of cabins, roads, and power lines by reindeer during calving. J Wildl Manage 65: 915–925.

Vistnes I, Nellemann C, Jordhøy P, Støen, O-G. 2008. Summer distribution of wild reindeer in relation to human activity and insect stress. Polar Biology 31:1307-1317.

DOMINION DIAMOND

Information Request Number: DAR-MVEIRB-IR-85

Source: MVEIRB Information Requests: Chuck Hubert

Subject: Barren-ground Caribou - Waste rock storage area

DAR Section(s): 3, 12

Preamble (MVEIRB):

The Jay waste rock storage area will contain over 110 million tonnes of rock, and is located over a route currently used by caribou. It will remain after the project is completed, at a height of approximately 80 meters above the surrounding landscape. Some natural landforms offer features such as insect relief and are beneficial to caribou. If the waste rock storage area can be landformed into a design that is good for caribou after the mine closes, it might present an opportunity to partially offset other potential adverse impacts with a beneficial impact (assuming is could be used without exposing caribou to contaminants).

Request (MVEIRB):

Please consider and discuss any ways, in addition to the proposed caribou ramps, that the Jay waste rock storage area can be designed as a landform that is beneficial to caribou for the post-closure period.

Response:

Dominion Diamond estimates that 102 million cubic metres (m^3) of waste rock will be produced from the mining of the Jay Pit, with the majority being placed in the Jay waste rock storage area (WRSA). The height of the pile will vary, but the maximum height is estimated to be about 80 metres (m) above the existing land. The WRSA is designed and constructed to be a physically stable structure that will remain in place following the completion of mining.

While caribou are not anticipated to regularly use the rock pile, caribou may occasionally be present at the WRSA. Dominion Diamond has designed the WRSA to be a neutral feature on the land by providing for the construction of several caribou egress ramps as the rock pile progresses. The ramps will provide multiple areas for caribou or other wildlife to safely egress from the pile. In selecting the location of the ramps, Dominion Diamond will consider input from community engagement and rely upon observations during the operations period.

The planned location for the Jay waste rock storage area is at least 200 m away from the natural esker and 100 m away from Lac du Sauvage. A single waste rock pile was selected to reduce the overall area of ground disturbance and fragmentation of land. Dominion Diamond recognizes there is a trade-off between the height and side slopes of the pile and the amount of land covered. If the side slopes of the pile are made flatter and the pile a lower height, then more of the land becomes covered by the boulders and rock. As a result, a decision was made to slightly increase the height of the pile over other waste piles at the Ekati Mine to minimize the amount of land covered.

Dominion Diamond was pleased to support the Tłı̨chǫ Government What'aa – Eskers Research Project conducted by the Tłı̨chǫ researcher and with the participation of Tłı̨chǫ Elders. This project is relevant to the construction of waste rock storage areas generally and may provide direction on approaches to constructing rock piles in a manner that further mitigates risk or, perhaps, provides benefit for wildlife and people. We recognize and appreciate the assistance provided by staff members of the Departments of Lands and Culture Protection and the Kwe Beh Working Group to prepare the report. Dominion Diamond is grateful to the Elders who participated in the research project and shared their knowledge, information and opinions contained in the report, to aid in mine site development and for purposes of closure planning. Dominion Diamond acknowledges that the interviews and report findings are the property of the Tłı̨chǫ Government.

Dominion Diamond is open to considering potential modifications to the WRSA that would result in a beneficial landform for caribou, including review of the newly released Tłı̨chǫ report on the What'aa Project. However, Dominion Diamond is not aware of any such measures that could be incorporated into the design at this time.

DOMINION DIAMOND

Information Request Number: DAR-MVEIRB-IR-86

Source: MVEIRB Information Requests from Chuck Hubert

Subject: Barren-ground Caribou

DAR Section(s): 3, 12

Preamble (MVEIRB):

The Jay road crossing of the esker presents a potential barrier to caribou movements. In Banff National Park, a wildlife overpass is used by ungulates over the twinned Trans-Canada Highway. At Ekati, the Pigeon Creek culvert on the Sable road appears to be functioning as a caribou underpass.

Request (MVEIRB):

Please describe the feasibility of constructing a wildlife overpass over the Jay road where it crosses the esker, and discuss the likelihood that such an overpass would be used by caribou.

Response:

There are 28 wildlife crossing structures, including two overpasses (Photograph 86-1), that cross a 45 kilometre portion of the Trans-Canada Highway in Banff National Park (Ford and Clevenger 2010). The 4-lane highway has an average of 17,970 vehicles per day in the Park (Sawaya et al. 2013). The wildlife crossing structures are coupled with continuous exclusion fencing on both sides of the highway (Sawaya et al. 2013). Hence, to be effective, the construction of a wildlife overpass on the Jay Road would need to be accompanied by a continuous fence on either side of the road that would exclude caribou from crossing anywhere else. At the esker crossing, the maximum elevation difference between the road surface and top of the esker will be approximately 5 metres (m). The height of some of the largest pieces of equipment that operate in the open pit are well in excess of this (e.g., shovels are approximately 15 m in height, loaders 8 m), and therefore, the configuration of any overpass that would allow large mining equipment to pass underneath, and provide adequate clearance, would not conform to the natural topography of the esker.

During community engagement meetings, wildlife crossing options were discussed. In general it was felt that wildlife, and in particular caribou, should be allowed to cross the road where they choose and not have access restricted.

While the results suggest that the wildlife crossings in Banff National Park provide population connectivity for black and grizzly bears, Sawaya et al. (2013: 728) note that "*Wildlife crossings are no guaranteed solution for landscape and species conservation and the potential merits of building each crossing should be weighed against the costs and potential direct and indirect effects of road mitigation*."

The primary mitigation for caribou movement at the esker crossing is to construct that section of the road as a continuous caribou crossing, except where pressure relief valves or other item need to be accessible for safe operations of the pipelines. This approach, in combination with the Ekati Mine traffic management practices, will allow caribou to cross the road at this location if they choose. Other areas of the Jay road will be constructed in a manner to allow caribou to cross.

Photograph 86-1 Wildlife Overpass in Banff National Park



References:

Ford AT, Clevenger AP. 2010. Validity of the prey-trap hypothesis for carnivore-ungulate interactions at wildlife-crossing structures. Conserv Biol 24:1679-1685.

Sawaya MA, Clevenger AP, Kalinowski ST. 2013. Demographic connectivity for ursid populations at wildlife crossing structures in Banff National Park. Conserv Biol 27:721-730.

DOMINION DIAMOND

Information Request Number: DAR-MVEIRB-IR-87

Source: MVEIRB Information Requests from Chuck Hubert

Subject: Barren-ground Caribou – Roads alternative assessment

DAR Section(s): 2.5.1.2.1

Preamble (MVEIRB):

In selecting the Jay road alternative, the number of caribou crossings for each route was assumed to be relative to the length of the road (p.2-43). This suggests that Dominion expects the number of road crossings to be uniform for any equal stretch of road.

Request (MVEIRB):

Are there any parts of the road that caribou are more likely to cross the road than others, considering, for example, currently known caribou movement routes? If so, has this been considered in the selection of the Jay road alternative, and if not, why?

Response:

There are areas on each Jay Road alternative that are more likely to be crossed by caribou and they were considered in the initial selection process, and will continue to be considered in the prefeasibility engineering design work. The sources of information on historical and existing caribou movements through the area that were and will be used in the Jay road alternatives analysis include:

- Traditional knowledge information about characteristics of roads relative to caribou travel. Łutselk'e Dene First Nation Elders identified potential barriers and hazards to caribou movement, including high ridges and sharp rocks along the edges of the roads (DAR Section 12.2.3.2). Inuit participants in the Wildlife Effects Monitoring Plan suggested that caribou crossings at the roads should be larger to facilitate caribou movement, especially if in the presence of predators (DAR Section 12.2.3.7).
- Available radio-collar location data for Bathurst herd caribou.
- Studies of caribou relative to existing roads at the Ekati Mine, including the Misery Road (DAR Sections 12.2.1.1.3, 12.2.1.1.4, and 12.2.1.1.6).
- An aerial survey to identify historical caribou trails in the Lac de Gras region completed as part of the 2013 Baseline Study for the Jay Project (DAR Section 12.2.1.5). Results appear in DAR Map 12.2-5.
- Ground-based surveys and high resolution orthophotos to identify high, medium and low occurrence of trails in the area of the Jay Project as part of 2014 baseline studies (Dominion Diamond 2014: Sable Addendum; Appendix I; Section I2.3, Map I-5).

Traditional Knowledge has provided important information for the assessment of road alternatives and for siting caribou crossings. The following information appears in the DAR:

From 2.2.2.1

> *"Based on Traditional Knowledge, the outlet of Lac du Sauvage into Lac de Gras and along the esker on the west side of Lac du Sauvage are known to be important caribou movement sites."*

From 2.5.1.2.3

> *"The main caribou migration route in the Project area runs northwest from the Narrows. The three road alternatives must run in an approximately east-west direction to connect the Jay Pit to the Misery Haul Road, and as such, will cross the main caribou migration path and are predicted to have similar effects on caribou movement. Areas requiring wildlife crossings will be identified and designed as part of the prefeasibility engineering design work. A combination of sources will be used to identify the wildlife crossings, including: collared caribou Global Positioning System tracking data, visible evidence of historical caribou tracks, vegetation and landform information, observations, and site experience of Ekati environmental staff, biologists, Traditional Knowledge (where available), and advice obtained from Elders and IBA community members. Each road alignment must cross the esker; however, the approach to crossing the esker differs and is considered in the evaluation."*

2.5.1.2.4 Social and Economic Considerations

> *"The esker has been identified as an important location for caribou hunting, trapping, and as a travel route in both the past and present. As such, it holds particular importance to the local Aboriginal communities and to the archaeological record. The three road alternatives must run in an approximately east-west direction to connect the Jay Pit to the Misery Haul road and will cross the esker, as such the potential to affect the esker does not differentiate between the alternatives. Input for the esker crossing design was obtained during community consultations (Section 2.5.1.2.3)."*

The needs and opportunities to create caribou crossings will respect knowledge of historical and existing crossing areas, and crossing characteristics along each alternative. The collection of knowledge to inform these decisions is ongoing and will continue through detailed design. The history of, and commitment to, this process is described in Section 4.4.4 of the DAR. For example, workshops were held with communities in March and June 2014, which included discussions on caribou migration and roads, and road design/caribou crossings. Site visits with community members were also held in summer 2014.

Environmental considerations for road alternative selection also appear in Table 2.5.1 of the DAR:

Environmental Considerations	*• Alternative 1 is longest and will require the most extensive mitigation to create caribou crossings.* *• The length of the esker crossing is shorter than Alternative 2, but longer than Alternative 3.* *• Alternatives 1 and 2 require large fills to cross the esker, which could result in an additional barrier to caribou.*	*• Alternative 2 requires more mitigation to create caribou crossings than Alternative 3 and less than Alternative 1.* *• Alternative 2 has the longest esker crossing.* *• Alternatives 1 and 2 require large fills to cross the esker, which could result in an additional barrier to caribou.*	*• Alternative 3 is the shortest and requires the least mitigation to create caribou crossings.* *• Alternative 3 has the shortest esker crossing.* *• Alternative 3 has a cut through the esker, which would result in less of a barrier to caribou movement near the esker than the large fills required to cross the esker for Alternatives 1 and 2.*

In regard to the preamble of this request, the three road alternatives have the following lengths:

- Jay Road Alternative 1 11.7 kilometres (km)
- Jay Road Alternative 2 10.6 km
- Jay Road Alternative 3 9.9 km

Consequently the difference between the longest alternative and the shortest alternative was 1.8 km or 18 percent. For technical feasibility purposes in the Alternatives Assessment, the number of crossings was assumed to increase proportionally to road length. As per Section 2.5.1.3, Jay Road Alternative 3, which is the most southern alignment, was considered the most viable option for the Project. Input regarding the design of the Jay Road esker crossing was obtained during community engagement and was used to conduct a more detailed assessment of the esker crossing for the Jay Road Alternative 3. Furthermore, as described above, the number and placement of crossings for the selected road alignment will be determined in prefeasibility engineering design work and will take into account input from community engagement.

References:

Dominion Diamond (Dominion Diamond Ekati Corporation). 2014. Jay Project Developer's Assessment Report Sable Addendum. Prepared by Golder Associates Ltd., December 2014. Yellowknife, NWT, Canada.

Information Request Number: DAR-MVEIRB-IR-88

Source: MVEIRB Information Requests from Chuck Hubert

Subject: Risk Assessment

DAR Section(s): Appendix 3C

Preamble (MVEIRB):

On Table 7: Risk matrix, the Likelihood Table is set out in terms of events per year Indices of >1 to 1/1000. Normally, failure modes are assigned annual probabilities based on the experience of the panel team. In this case significant experience has been gained from the Meadowbank and Diavik Dikes. For instance, excessive seepage through the East Dike occurred in the deepest channel during dewatering. It is not apparent that this and other experience at Meadowbank and Diavik is properly accounted for in the likelihood assignments.

Request (MVEIRB):

Summarize the experience at the Meadowbank and Diavik dikes with respect to each failure mode and adjust likelihoods of occurrence as appropriate.

Response:

The likelihood category in Table 7 of the Risk Assessment for Accidents and Malfunctions for the Jay Project (Golder [2015]) was revised to reflect the annual probability of an event occurring over the life of the Project. The updated Risk Assessment for Accidents and Malfunctions was submitted to the Mackenzie Valley Environmental Impact Review Board (MVEIRB) as part of the response to the Adequacy Review Item 10.2 (DAR-MVEIRB-25) on January 19, 2015. The likelihood category in the risk matrix has been modified as shown below in Table 88-1.

Table 88-1 Modified Likelihood Category in the Risk Matrix

Likelihood	Annual probability of exceedance during the life of the Project
Almost certain	> 99%
Likely to occur at least once over the life of the Project	50% to 99%
Unlikely to occur over the life of the Project	10% to 50%
Very unlikely to occur over the life of the Project	1% to 10%
Extremely unlikely to occur during the life of the Project	< 1%

% = percent; > = greater than; < = less than.

Probabilities are determined based on the following equation:

$$Probability = 1 - \left(1 - \frac{1}{T}\right)^{n}$$

Where:
T = Return period (defined as events per year)
n = Project life

Lessons learned and experience gained from dike construction and operation at the Meadowbank Mine (Esford et al. 2013; Bonin et al. 2013; Esford and Julien 2013) and Diavik Mine (Schwank and Bauer 2003) in addition to other projects and engineering experience, were utilized in the development of the conceptual design for the Jay Dike, and in the various field investigation programs being carried out to collect site specific characterization information. In short, the design of the Jay dike incorporates and mitigates those lessons-learned, and this is reflected in the Jay Dike risk-assessment.

As part of the mitigation of potential failure modes, the design has incorporated key geological and geotechnical findings, construction methodologies, including quality assurance and quality control measures, instrumentation, and monitoring in order to reduce the probability of occurrence. The risk assessment ratings provided for the Jay Dike are based on the pre-feasibility design for this dike, and are in accordance with the current understanding of the Jay Project.

References:

Bonin GR, Rombough VT, Julien MR. 2013. Part 2: Grouting Techniques Employed for Dike Construction, Meadowbank Gold Mine, Nunavut. Canadian Dam Association 2013 Annual Conference, Montreal, QC, Canada. October 5 – 10, 2013.

Esford F, Bonin GR, Julien MR. 2013. Part 1: Construction of the Dewatering Dikes, Meadowbank Gold Mine, Nunavut. Canadian Dam Association 2013 Annual Conference, Montreal, QC, Canada. October 5 – 10, 2013.

Esford F, Julien MR. 2013. Part 3: Performance Monitoring of Dikes – Dewatering and Operation, Meadowbank Gold Mine, Nunavut. Canadian Dam Association 2013 Annual Conference, Montreal, QC, Canada. October 5 – 10, 2013.

Golder (Golder Associates Ltd.) 2014. Jay Project Pre-feasibility Dike Design. 1313280041-E14069-R-Rev0-2020. December 8, 2014.

Golder. 2015. Dominion Diamond Jay Project - Risk Assessment for Accidents and malfunctions of the Jay Project. 1313280041-E14066-TM-Rev1-4060. January 16, 2015.

Schwank SK, Bauer Maschinen GmbH. Cutoff Walls for Diamond Mining in the Arctic. Deep Foundations Institute Conference Proceedings – 2003.

DOMINION DIAMOND

Information Request Number: DAR-MVEIRB-IR-89

Source: MVEIRB Information Requests from Chuck Hubert

Subject: Barren-ground Caribou - Primary and Secondary Pathways

DAR Section(s): 12.3 (Table 12.3-1)

Preamble (MVEIRB):

In table 12.3-1, three pathways for caribou are rated as primary (and two of them were also rated as primary for Gahcho Kué mine). Dust on forage altering caribou distribution is listed as a secondary pathway for Jay but was a primary pathway for the Gahcho Kué mine assessment.

Request (MVEIRB):

Please revise dust on forage from a secondary to a primary pathway or provide reasons why the dust on forage for Gahcho Kué levels (primary effect) is not applicable to Jay and Misery road for the Jay Project.

Response:

A summary and comparison of the pathway analyses related to dust deposition and effects on barren-ground caribou for the Gahcho Kué Project and the Jay Project is provided below.

Gahcho Kué pathway analyses

In the pathway analysis for the Gahcho Kué Project (De Beers 2010, Table 7.4-1, page 7-52), the effects of dust deposition on barren-ground caribou were assessed through four separate pathways. The assessment results from the effects pathways analyses for the Gahcho Kué project were as follows:

No linkage pathway:

- Ingestion of soil, vegetation, and water, or inhalation of air that has been chemically altered by air emissions (including nitrogen oxides and potential acid input deposition) or dust deposition, may affect caribou survival and reproduction.

Secondary pathways:

- dust deposition may cover vegetation and decrease abundance of forage for caribou (i.e., habitat quantity); and,
- dust deposition and air emissions may change the amount of different quality habitats (through chemical changes in soil and vegetation), and alter caribou movement and behaviour.

Primary pathway:

- Dust deposition may cover vegetation and change the amount of different quality habitats, and alter caribou movement and behaviour.

Jay Project pathway analyses

In the pathway analysis for the Jay Project Developer's Assessment Report (DAR Table 12.3-1, pp. 12-49), the effects of dust deposition on barren-ground caribou were assessed through three separate pathways. The assessment results from the effects pathway analyses for the Jay Project were as follows:

No linkage pathway:

- Ingestion of water, soil, and vegetation, or inhalation of air that has been chemically altered by air emissions or dust deposition may affect wildlife health.

Secondary pathway:

- Air and dust emissions and subsequent deposition can change the quantity or quality of plant forage and alter caribou distribution and behaviour.

Primary pathway:

- Sensory disturbance (lights, smells, noise, dust, viewscape) and barriers to movement causes changes to caribou movement and behaviour, and changes to energetics and reproduction.

Comparison

Although the wording is different, the effect of dust is considered as a primary effect pathway for barren-ground caribou in the assessment of effects for both the Gahcho Kué and Jay projects. In the effects assessments of both projects, the effect of dust is considered through its ability to change habitat quality for caribou. The analyses for both projects employed zones of influence and disturbance coefficients to estimate changes in the amounts of different quality habitats and to reflect potential changes in the behaviour and occurrence of caribou (De Beers 2010, Section 7.5.3; DAR, Section 12.4.2.2). The effects of dust on caribou habitat quality have been appropriately assessed as a primary pathway in the DAR for the Jay Project.

References:

De Beers (De Beers Canada Inc.). 2010. Environmental Impact Statement for the Gahcho Kué Project. Volumes 1, 2, 3a, 3b, 4, 5, 6a, 6b, 7 and Annexes A through N. Submitted to Mackenzie Valley Environmental Impact Review Board. December 2010.

DOMINION DIAMOND

Information Request Number: DAR-MVEIRB-IR-90

Source: MVEIRB Information Requests from Chuck Hubert

Subject: Barren-Ground Caribou

DAR Section(s): 12

Preamble (MVEIRB):

The Jay Project DAR does not provide sufficient detail about the effectiveness of mitigation in reducing predicted incremental and cumulative effects on caribou. Further actions may be necessary to avoid, reduce and offset current and any potential further effects on caribou. Table 12.3- and Section 12.3.2.1 provide no detailed description and classification of all mitigation actions despite their importance. Effectiveness is not consistently described or quantified. There is no mention of on- or off-site offset mitigation. The DAR glossary defines mitigation as "elimination, reduction or control of the adverse environmental effects of a project, including restitution for any damage to the environment caused by such effects through replacement, restoration, compensation, or any other means". Mitigation needs to be classified as to the objectives, whether it is one time (how the structures are designed) or whether they are on-going and can be reduced or intensified adaptively. The listed mitigation lacks criteria for when and how each mitigation action will be implemented, and their effectiveness and their direct relationship to monitoring is unexplained.

Request (MVEIRB):

Please construct a detailed mitigation table with a hierarchical classification of mitigation including offsets. Please discuss how mitigation can be intensified or reduced.

Response:

The request by the Mackenzie Valley Environmental Impact Review Board has been addressed by consolidating mitigation identified for caribou and wildlife in the Developer's Assessment Report (DAR) (Tables 12.3-1 and 13.3-1) into Table 90-1. The table is structured by identifying effects pathways to wildlife and caribou associated with different Jay Project (Project) components or activities and then describing the mitigation applied to each effect pathway. The table includes a column that classifies mitigation according to the standard mitigation hierarchy (IFC 2012; BBOP 2015).

- **Avoid**: measures taken to completely avoid creating impacts from the outset, such as careful spatial or temporal placement of elements of infrastructure and engineered designs of facilities (e.g., waste rock storage areas).
- **Minimize**: measures taken to reduce the duration, intensity and / or extent of impacts that cannot be avoided.
- **Reclaim**: measures taken to rehabilitate degraded ecosystems or restore ecological function following exposure to impacts that cannot be completely avoided and/ or minimized.

- **Offset**: measures taken to compensate for any residual significant, adverse impacts that cannot be avoided, minimized and / or rehabilitated or restored. Offsets are achieved once compensation is sufficient that the outcome is no net loss or a net gain for the feature (e.g., valued component) for which compensation was developed. Offsets can take the form of positive management interventions, such as restoration of degraded habitat, arrested degradation or averted risk, and protecting areas where there is imminent or projected loss.

Adverse effects from a project should be mitigated as much as possible using avoidance, followed by minimization, reclamation, and finally, offsetting (BBOP 2015). This is because effects that are avoided entirely or minimized mean that the effects from a Project prior to implementing reclamation or offsetting are reduced. Table 90-1 shows that the Project will use mitigation that avoids, minimizes, and reclaims adverse effects associated with effects pathways identified for the Project. The results of the DAR indicate that there are no significant adverse effects from the Project, and no offset mitigation has been proposed. Further, there is no regulatory requirement or guidelines for offsetting residual adverse effects to caribou and other wildlife.

Table 90-1 also has a column explaining how mitigation will be applied and how it can be intensified or reduced within an adaptive management framework. The ability to manage the intensity of mitigation will depend on the type of environmental design feature and mitigation. For example, designing the development footprint to cover the smallest practicable spatial extent is applied at its maximum level and is therefore constant. Other mitigation, such as the use of wildlife deterrents, occur intermittently and are applied as required. The intensity of application of this kind of mitigation can be managed through monitoring and adaptive management. For example, the frequency with which wildlife deterrents are applied could increase or decrease, depending on results of monitoring. Similarly, if monitoring demonstrated that wildlife-vehicle collisions were high or increasing, then the scope or frequency or driver training, speed limits, or other mitigation can be managed adaptively in a way that is intended to reduce the effect. Adaptive management could also include increasing monitoring, consideration of alternate mitigation, or implementing a special study to further understand an effect.

As described in the response DAR-MVEIRB-12 (Adequacy Review Item 8.5), adaptive management is a structured process of decision making to deal with uncertainty. The objective of adaptive management is to reduce uncertainty through on-going monitoring of the effectiveness of mitigation resulting in the evolution of those mitigation measures based on the monitoring, or ‘learning by doing’ (WLWB 2010). In the case of wildlife monitoring, the ‘doing’ is the environmental monitoring and implementation of on-going or intermittent mitigation measures, and the ‘learning’ is continual improvements to environmental management and the monitoring programs. This requires the monitoring program to be adaptive and flexible The monitoring program must be flexible enough to incorporate comments, suggestions, and information based both on science and local and Traditional Knowledge. There are no regulator established guidelines for wildlife critical values, threshold conditions, or action levels. If changes to the receiving environment are determined to be greater than the predictions in the DAR to the point of representing a risk of harm to the environment, then the most suitable course of action will be determined by Dominion Diamond, in discussion with communities and regulatory agencies. This type of process has been used successfully in the past (e.g., Marshall 2009; Handley 2010).

Monitoring programs in the Wildlife Effects Monitoring Program have and will continue to be adaptively managed. If adaptive management responses are required, the actions available to Dominion Diamond include the following:

- increase monitoring effort;
- implement special studies to further understand the effects; and/or,
- implement additional mitigation to reduce the effects.

Dominion Diamond has and will continue to actively seek input from regulatory authorities and communities through Dominion Diamond's engagement activities and through other regional programs led by the Government of the Northwest Territories such as the Zone of Influence Task Group. Annual reports and meetings are ways that Dominion Diamond will present the findings of the monitoring program, and the basis for communities and regulatory agencies to provide feedback and direction.

An important means of mitigating risk to caribou movement is caribou crossings on roads. Dominion has increased caribou mitigation measures based on community feedback. For example, in the DAR, Dominion Diamond proposed to construct caribou crossings at appropriate discreet locations along the Jay Road. After receiving input from Aboriginal communities during our engagement process and during site visits, Dominion Diamond has changed its approach to caribou crossings along the Jay Road to reflect that feedback, as described below.

Because of the importance of the esker for caribou movement as identified through community engagement, the portion of the Jay Road that cuts through the esker will be constructed as a caribou crossing. The pipelines will be covered over with crushed rock along this section of road, except where there are valves or joints that require visual inspection for safe operation. Dominion Diamond will strategically construct the pipelines to reduce the number of joints or valves through the esker crossing.

Dominion Diamond's community engagement program has indicated that the area to be crossed by the Jay Road is important for caribou movement. In response to the feedback received through community engagement, Dominion Diamond proposes to construct an increased number of caribou crossings along the main section of the Jay Road (i.e., roughly between King Pond Dam and the approach to the active operations area at Lac du Sauvage). This main section of the Jay Road will be constructed with frequent and wide caribou crossings that will respect the communities' identification of the importance of this area for caribou movement. Caribou crossings will not be built in areas where raised safety berms are required by the Mines Inspector, or at locations where there are necessary joints and valves in the pipelines that require visual inspection for safe operation. The pipelines will be strategically designed to reduce the number of locations that cannot be constructed as caribou crossings due to joints and valves. This approach also makes beneficial use of 'lessons-learned' from the original Misery Road, where caribou crossings were only installed after construction of the road.

Caribou crossings will be constructed using crushed rock (6 inches / 200 millimetres or less in size) so that the side slopes of the road are flatter and easier walking for caribou than the large roadfill rock. In the caribou crossing areas, the pipelines will also be covered with crushed rock. Once the road is constructed, monitoring, including by Aboriginal community members, will be implemented to assess the effectiveness of the constructed caribou crossings.

References:

BBOP (Business and Biodiversity Offset Programme). 2015. Mitigation Hierarchy. Available at: http://bbop.forest-trends.org/pages/mitigation_hierarchy. Accessed February 4, 2015.

Handley J. 2010. Diamond Mine Wildlife Monitoring Workshop Report. Prepared for Environment and Natural Resources. Yellowknife, NWT, Canada.

IFC (International Finance Corporation). 2012. Performance Standard 6: Biodiversity Conservation and Sustainable Management of Living Natural Resources. January 12, 2012.

Marshall R. 2009. Diamond Mine Wildlife Monitoring Workshop Report. Prepared by Rob Marshall for Diavik Diamond Mines Inc.

WLWB (Wek'èezhìi Land and Water Board). 2010. Guidelines for Adaptive Management - A Response Framework for Aquatic Effects Monitoring. Yellowknife, NWT Canada, Wek'èezhìi Land and Water Board.

Table 90-1 Mitigation applied to the Jay Project for Caribou and Wildlife

Project Component / Activity	Effects Pathway	Mitigation	Hierarchical Classification	How Mitigation Can be Managed	Pathway Assessment
Project Infrastructure and Footprint • access roads • power lines • surface infrastructure and support facilities • open pit • waste rock storage areas • accommodations • dikes	Direct loss and fragmentation of habitat from the Project footprint causes changes in caribou and wildlife abundance and distribution	• The Project maximizes the use of the existing infrastructure to reduce the environmental footprint to the extent practical.	Avoid	Applied at maximum level	Primary for caribou and wildlife
		• The new access roads will be as narrow as feasible, while maintaining safe construction and operation practices.	Avoid	Applied at maximum level	
		• Only one access road crosses the Lac du Sauvage esker.	Avoid	Applied at maximum level	
		• The Jay WRSA is set back 200 m from the Lac du Sauvage esker.	Avoid	Applied at maximum level	
		• Kimberlite stockpile areas have been designed in strategic locations that facilitate continued mine operations through various types of road closures.	Avoid	Applied at maximum level	Primary for caribou
		• Footprints of the WRSAs and other structures will be optimized to limit surface disturbance to the extent practical.	Avoid	Applied at maximum level	Primary for caribou
		• The Jay power line will parallel the haul road to avoid additional fragmentation and reduce the environmental footprint as much as possible.	Avoid	Applied at maximum level	Primary for caribou Secondary for wildlife
		• A pipe bench will be constructed to accommodate the pipelines, which will follow existing and proposed road alignments to the extent practical, to minimize the Project footprint.	Avoid	Applied at maximum level	Primary for caribou Secondary for wildlife
		• Soil disturbance will be limited to only those areas required for construction and operation of the Project.	Avoid	Used as required	Primary for caribou Secondary for wildlife
		• Siting and construction of the Project will be planned to avoid environmentally sensitive areas (e.g., critical wildlife habitat, listed plants and wildlife species, and wetlands) to the extent practical. For example, Jay Road alternative 3 intersects the fewest number of grid cells with historical caribou trails.	Avoid	Applied at maximum level	Primary for caribou Secondary for wildlife
		• Design of the Jay Project minimizes the construction of new buildings, roads, pads, or excavations, which will reduce the area directly disturbed for infrastructure.	Minimize	Applied at maximum level	Primary for caribou Secondary for wildlife
		• The existing Misery and Lynx pits will be used for dewatering and minewater management, limiting the requirement for additional areas to be altered for minewater management.	Avoid	Applied at maximum level	Primary for caribou Secondary for wildlife
		• Management practices already in place at the Ekati Mine will be implemented to control erosion and sediment.	Minimize	Management practices will be reviewed and altered through Adaptive Management	Primary for caribou Secondary for wildlife
		• The existing Ekati Mine Interim Closure and Reclamation Plan identifies how and where land will be reclaimed and will be amended to include the Project.	Reclaim	Applied at maximum level	Primary for caribou Secondary for wildlife
	Physical hazards (open pit, blasting, buildings, WRSAs) may result in increased risk of injury or mortality to individual animals	• Site environmental technicians will investigate all wildlife incidents and mortalities, report to government, and recommend follow-up actions to reduce future incidents or mortalities.	Minimize	Can be intensified or reduced through monitoring and Adaptive Management	
		• Wildlife are deterred (e.g., skirting, fencing) or removed (e.g., herding, noise making devices) from areas of risk.	Avoid/Minimize	Used as required	
		• Mitigation is currently in place to minimize human-wildlife interactions, including awareness training.	Minimize	Can be intensified or reduced through monitoring and Adaptive Management	
		• Pit wall monitoring procedures for raptor nests implemented at the Ekati Mine will include the Jay Project. Nesting will be prevented, when possible, in active mining areas by interrupting nest-building activities. Blasting operations may be modified where necessary to protect active nests with eggs/chicks.	Minimize	Can be intensified or reduced through monitoring and Adaptive Management	
		• Birds showing nesting activity in areas of critical risk will be actively deterred by removing or covering inactive nests with nets.	Minimize	Used as required	
		• Animals will be deterred from entering the diked area where most fly rock will occur (until pit is too deep for escape of fly rock) and animals will be removed from active blast zones, when necessary, using herding and noise making devices or other deterrents to safely remove animals.	Avoid	Used as required	
Project Infrastructure and Footprint • access roads • power lines • surface infrastructure and support facilities • open pit • waste rock storage areas • accommodations • dikes • exposed lakebed sediments	Physical hazards leading to increased risk of injury or mortality to individual caribou and wildlife	• The current, effective practices and mitigations for safety of wildlife on roads, airstrip, and other areas of the mine will be continued and expanded as necessary to include the Jay Project. These practices include reporting of wildlife sightings by all employees, removing wildlife from or preventing their access to hazardous areas, and control of encounters by Environment staff.	Minimize	Monitoring can be intensified or reduced through Adaptive Management	Secondary
	The Misery and Jay power lines may cause increased risk of injury or mortality to birds	• The power line will incorporate perching deterrents on poles including cone-shaped pole caps and cross arm perch preventers to prevent large birds from perching and nesting on poles or on dangerous areas around phase conductors.	Minimize	Applied at maximum level	Secondary
		• Bird deterrents (e.g., spinning reflectors) will be installed on the power line in areas of concern (e.g., near waterbodies known to represent staging areas) and identified through monitoring of bird activity along the power line.	Minimize	Applied at maximum level	

Table 90-1 Mitigation applied to the Jay Project for Caribou and Wildlife

Project Component / Activity	Effects Pathway	Mitigation	Hierarchical Classification	How Mitigation Can be Managed	Pathway Assessment
	Site preparation and construction may result in the destruction of nests, eggs, and individuals of migratory birds (incidental take)	• If vegetation clearing is required, activities will be managed to avoid mortalities and comply with the Species at Risk Act and the Migratory Birds Convention Act.	Avoid	Used as required	Secondary
	Changes in surface flows (e.g., isolation and diversion, altered drainage patterns) and water levels from the construction of diked area of Lac du Sauvage alters riparian habitat and caribou distribution	• During construction of dike, silt curtains, and other sediment and turbidity mitigation will be used as appropriate.	Minimize	Applied at maximum level	
General Construction and Operation Activities • mining of the kimberlite pipes • operation of surface infrastructure and support facilities • vehicle traffic along the access road	Air and dust emissions and subsequent deposition can change the quantity or quality of plant forage and alter caribou and wildlife distribution and behaviour	• Regular maintenance of equipment will continue at the Ekati Mine.	Minimize	Managed in accordance with manufacturer guidelines	Secondary
		• Dust suppression will be applied, consistent with current practices, to haul roads, the airstrip, and other high traffic areas.	Minimize	Can be intensified or reduced through monitoring and Adaptive Management	
		• Speed limits will continue to be applied to limit fugitive dust.	Minimize	Can be intensified or reduced through monitoring and Adaptive Management	
		• Salvaged soil material stockpiles or exposed soils will be seeded or protected by berms, to reduce wind erosion.	Minimize	Used as required	
	Ingestion of water, soil, and vegetation, or inhalation of air that has been chemically altered by air emissions or dust deposition may affect caribou and wildlife health	• Wildlife are deterred (e.g., skirting, fencing) or removed (e.g., herding, noise making devices) from areas of risk.	Avoid/Minimize		No Linkage
		• The small, intermittent water ponds at the contaminated snow containment facility and landfarm are covered with flagging to prevent bird landings.	Minimize	Used as required	
	Sensory disturbance (lights, smells, noise, dust, viewscape) and barriers to movement causes changes to caribou movement and behaviour, and changes to energetics and reproduction. Will also cause changes in wildlife habitat quality, movement and behaviour	• Use of existing surface facilities will avoid disturbing some areas and limit the quantity of new sensory disturbances.	Avoid/Minimize	Applied at maximum level	Primary
		• Only one access road crosses the Lac du Sauvage esker.	Minimize	Applied at maximum level	
		• The Jay WRSA is set back 200 m from the Lac du Sauvage esker.	Minimize	Applied at maximum level	
		• Kimberlite stockpile areas have been designed in strategic locations that facilitate continued mine operations through various types of road closures.	Avoid	Applied at maximum level	
		• The current, effective practices and mitigations (e.g., wildlife right-of-way, signage, low speed limits) for safety of wildlife on roads, the airstrip, and other areas of the mine will be continued and expanded as necessary to include the Jay Project. These practices include reporting of wildlife sightings by all employees, and control of encounters by Environment staff.	Minimize	Applied at maximum level	Primary for caribou Secondary for wildlife
		• A minimum flying altitude of 600 m above ground level (except during takeoff and landing, and during field work) will be maintained for cargo, passenger aircraft, and helicopters outside of the Project site.	Minimize	Applied at maximum level	Primary for caribou Secondary for wildlife
		• Environmental training will be provided for personnel.	Minimize	Applied at maximum level	Primary for caribou Secondary for wildlife
		• The WEMP implemented at the Ekati Mine will include the Jay Project.	Minimize	Applied at maximum level	Primary for caribou Secondary for wildlife
		• Wildlife always have the right-of-way.	Minimize	Applied at maximum level	Primary for caribou Secondary for wildlife
		• Vehicles encountering wildlife on roads will communicate the presence of wildlife on the roads to the Environment Department and others in the area.	Minimize	Applied at maximum level	Primary for caribou Secondary for wildlife
		• Modified traffic patterns and road closures will be used as necessary to protect caribou and people.	Avoid/Minimize	Can be intensified or reduced through monitoring and Adaptive Management	Primary for caribou Secondary for wildlife
General Construction and Operation Activities • mining of the kimberlite pipe • operation of surface infrastructure and support facilities • vehicle traffic along the access road	Increased traffic on the Misery Road and Jay Road and the above-ground power line along these roads, may create barriers to caribou movement, change migration routes, and reduce population connectivity	• Only one access road crosses the Lac du Sauvage esker.	Minimize	Applied at maximum level	Primary
		• Animal crossing locations will be built along roads to reduce barrier effects. The number of location of crossings will consider historical caribou trails and recommendations of communities.	Minimizes	Can be intensified or reduced through monitoring and Adaptive Management	
		• Spatially and temporally staged monitoring of the Bathurst caribou herd will be used to track migratory movements via (i) satellite radio collars and (ii) road surveys (i.e., advanced information on approaching caribou).Results will be used to manage traffic patterns when caribou are in close proximity of roads including closure.	Avoid/Minimize	Can be intensified or reduced through monitoring and Adaptive Management	
		• Kimberlite stockpile areas have been designed in strategic locations that facilitate continued mine operations through various types of road closures.	Avoid/Minimize	Applied at maximum level	

Table 90-1 Mitigation applied to the Jay Project for Caribou and Wildlife

Project Component / Activity	Effects Pathway	Mitigation	Hierarchical Classification	How Mitigation Can be Managed	Pathway Assessment
		• The current, effective practices and mitigations (e.g., wildlife right-of-way, signage, low speed limits) for safety of wildlife on roads, the airstrip, and other areas of the mine will be continued and expanded as necessary to include the Jay Project. These practices include reporting of wildlife sightings by all employees, and control of encounters by Environment staff.	Minimize	Used as required	
		• Modified traffic patterns and road closures will be used as necessary to protect caribou and people.	Avoid/Minimize	Can be intensified or reduced through monitoring and Adaptive Management	
	Collisions between caribou or wildlife and vehicles or aircraft causes injury or mortality of animals	• Current mitigation includes deterring and removing wildlife from the airstrip.	Minimize	Used as required	Secondary
		• Speed limits are in place.	Minimize	Can be intensified or reduced through monitoring and Adaptive Management	
		• Wildlife always have the right-of-way.	Minimize	Applied at maximum level	
		• Drivers have standard safety training and are provided with awareness training.	Minimize	Can be intensified or reduced through monitoring and Adaptive Management	
		• Appropriate signage is in place to identify areas of high wildlife use.	Minimize	Can be intensified or reduced through monitoring and Adaptive Management	
		• Vehicles encountering wildlife on roads are required to stop and communicate the presence of wildlife on the roads to the Environment Department and others in the area.	Minimize	Used as required	
		• Vehicles are restricted to designated roads and prepared work areas (recreational use of off-road vehicles is prohibited).	Minimize	Applied at maximum level	
		• The current, effective practices and mitigations (e.g., wildlife right-of-way, signage, low speed limits) for safety of wildlife on roads, the airstrip, and other areas of the mine will be continued and expanded as necessary to include the Jay Project. These practices include reporting of wildlife sightings by all employees, and control of encounters by Environment staff. There have been no incidents of caribou mortality caused by vehicle collisions at the Ekati Mine.	Minimize	Monitoring can be intensified or reduced through Adaptive Management	
		• Modified traffic patterns and road closures will be used as necessary to protect caribou and people.	Minimize	Can be intensified or reduced through monitoring and Adaptive Management	
General Construction and Operation Activities • mining of the kimberlite pipes • operation of surface infrastructure and support facilities • storage of industrial, domestic, hazardous, and contaminated waste • vehicle traffic along the access road	Attractants at site (food, shelter) leading to problem wildlife or disruption to predator-prey relationships, or increases in predator densities and predation on caribou	• Apply the Waste Management Plan, Landfill Management Plan, and Incinerator Management Plan to manage waste and prevent or reduced wildlife access to attractants (e.g., food waste).	Minimize	Monitoring can be intensified or reduced through Adaptive Management	Secondary
		• The WEMP is implemented at the Ekati Mine and will be amended to incorporate the Jay Project; wildlife activity will be monitored at waste management areas.	Minimize	Monitoring can be intensified or reduced through Adaptive Management	
		• The efficiency of the waste management program will be reviewed regularly and improved through adaptive management where practical.	Minimize	Monitoring can be intensified or reduced through Adaptive Management	
		• Separate bins will be located throughout the accommodations complex, shops, and other facilities on-site for immediate sorting of domestic wastes.	Minimize	Can be intensified or reduced through monitoring and Adaptive Management	
		• Food wastes will be collected in specific bins before transport directly to the incinerator storage area for incineration.	Minimize	Can be intensified or reduced through monitoring and Adaptive Management	
		• Littering and the feeding of wildlife is prohibited.	Avoid	Applied at maximum level	
		• Raised, heated buildings will be skirted to prevent wildlife access to shelter.	Avoid	Applied at maximum level	
		• Education and reinforcement about proper waste management practices and issues surrounding wildlife habituation is provided to all workers and visitors to the site.	Minimize	Can be intensified or reduced through monitoring and Adaptive Management	
		• Incinerator is enclosed and camp waste will be burned regularly.	Minimize	Applied at maximum level	
		• Landfill sites and waste storage areas will be inspected.	Minimize	Monitoring can be intensified or reduced through Adaptive Management	
		• A chain-link fence is maintained around Misery Camp to prevent wildlife from entering.	Avoid	Can be intensified or reduced through monitoring and Adaptive Management	
		• Wildlife are prevented (e.g., skirting, fencing) or removed (e.g., herding, noise making devices) from areas of risk.	Avoid/Minimize	Used as required	
General Construction and Operation Activities • operation of surface infrastructure and support facilities • vehicle traffic along the access road	Increased traffic on the Misery Road and Jay Road, and the above-ground power line along these roads, may create barriers to carnivore and caribou movement, which may affect carnivore population connectivity, abundance, and distribution	• Only one access road crosses the Lac du Sauvage esker.	Minimize	Applied at maximum level	Primary
		• Crossing locations will be built along roads to reduce barrier effects. The number of location of crossings will consider historical caribou trails and recommendations of communities.	Minimizes	Can be intensified or reduced through monitoring and Adaptive Management	
		• Spatially and temporally staged monitoring of Bathurst caribou herd to track migratory movements via (i) satellite radio collars, and (ii) road surveys (i.e., advanced information on approaching caribou).	Minimize	Can be intensified or reduced through monitoring and Adaptive Management	
		• Kimberlite stockpile areas have been designed in strategic locations that facilitate continued mine operations through various types of road closures.	Minimize	Applied at maximum level	Secondary

Table 90-1 Mitigation applied to the Jay Project for Caribou and Wildlife

Project Component / Activity	Effects Pathway	Mitigation	Hierarchical Classification	How Mitigation Can be Managed	Pathway Assessment
		• The current, effective practices and mitigations for safety of wildlife on roads, airstrip and other areas of the mine will be continued and expanded as necessary to include the Jay Project. These practices include reporting of wildlife sightings by all employees, and control of encounters by Environment staff.	Minimize	Applied at maximum level	
		• Modified traffic patterns and road closures will be used as necessary to protect caribou and people.	Avoid/Minimize	Can be intensified or reduced through monitoring and Adaptive Management	
Site Water Management • dewatering of diked area of Lac du Sauvage • diversions	Changes in surface flows (e.g., isolation and diversion, altered drainage patterns) and water levels from the dewatering of diked area of Lac du Sauvage leading to change in riparian habitat and caribou and wildlife distribution	• Where practical, natural drainage patterns will be unaltered to reduce the use of ditches or diversion berms.	Minimize	Applied at maximum level	No Linkage
		• The Sub-Basin B Diversion Channel design will include caribou crossing locations.	Minimize	Applied at maximum level	
		• Culverts will be installed along site access roads, as necessary, to maintain drainage.	Avoid	Applied at maximum level	
		• The road route alignment will minimize stream crossings and limit disturbance to sensitive habitat as feasible.	Minimize	Applied at maximum level	
		• The Sub-Basin B Diversion Channel will be designed to manage flows and minimize potential for erosion and bank instability.	Minimize	Applied at maximum level	
	Changes in surface flows (e.g., isolation and diversion, altered drainage patterns) and water levels may alter water quality (e.g., suspended sediments, metals, and nutrients) and affect the quality of riparian habitat	• The Sub-Basin B Diversion Channel will be designed to manage flows and minimize potential for erosion and bank instability.	Minimize	Applied at maximum level	No Linkage
		• Dewatering and operational discharges will be monitored for downstream erosion and actions will be taken to prevent erosion in downstream lakes and channels	Avoid	Applied at maximum level	
		• Standard erosion and sediment control measures (e.g., silt curtains, runoff management) will also be used during construction around areas to be disturbed, where appropriate.	Minimize	Applied at maximum level	
	Nets set for the fish-out of the diked area of Lac du Sauvage before dewatering may increase risk of injury or mortality to loons and other diving bird species	• Lessons learned from previous fish-outs will be taken to reduce risk of mortalities of loons from nets based on experience at the Ekati Mine and other recent northern fish-out projects.	Minimize	Applied at maximum level	Secondary
	Injury or mortality to animals from being trapped in exposed lakebed sediments	• By design, the dewatered portion of Lac du Sauvage will be contained within the Jay Dike, which restrict access to animals.	Avoid	Applied at maximum level	No Linkage
Waste Rock Management	Ingestion of seepage and surface runoff from WRSAs and kimberlite stockpiles, or ingestion of water, soil, and vegetation that has been chemically altered by seepage and surface runoff may affect caribou and wildlife health	• Metasediment rock mined from the Jay open pit will be encapsulated within a thermally protective cover layer of granite such that metasediment is frozen into permafrost; this method continues the approach that was successfully established at the Ekati Mine for the Misery WRSA.	Minimize	Applied at maximum level	No Linkage
		• Mine rock used to construct the dikes will be non-potentially acid generating (non-PAG).	Avoid	Applied at maximum level	
	Surface runoff and seepage from the WRSAs and kimberlite stockpiles may change habitat quality	• The WRSA will include a basal layer of non-potentially acid generating (non-PAG) granite that enhances permafrost aggradation and physically separates potentially reactive materials from direct contact with the naturally low pH of natural tundra runoff.	Avoid	Applied at maximum level	No Linkage
General Closure and Decommissioning Activities • back-flooding of Jay Pit • seepage	Changes in surface flows (e.g., isolation and diversion, altered drainage patterns) and water levels from the back-flooding of diked area of Lac du Sauvage alters riparian habitat and caribou distribution	• The existing Ekati Interim Closure and Reclamation Plan will be expanded to include the Jay Project.	Reclaim	Used as required	No Linkage
		• Dike breaching and re-flooding of the dewatered area will be done in a controlled manner so water levels will be equalized on both sides of the dike, and back-flooding will be managed to avoid adverse effects in source waterbodies and downstream.	Avoid	Applied at maximum level	
		• The Sub-Basin B Diversion Channel will be reclaimed at closure so that water flows through the natural drainage pattern to Lac du Sauvage.	Reclaim	Used as required	
		• The road route alignment will minimize stream crossings and limit disturbance to sensitive habitat as feasible.	Minimize	Applied at maximum level	
		• During excavation of dike breaches, silt curtains, and other sediment and turbidity mitigation will be used as appropriate.	Minimize	Applied at maximum level	
		• Reclamation of shoreline and shallow areas within the diked area will include localized repair of erosion and revegetation with aquatic and riparian plants, as necessary.	Reclaim	Used as required	

Table 90-1 Mitigation applied to the Jay Project for Caribou and Wildlife

Project Component / Activity	Effects Pathway	Mitigation	Hierarchical Classification	How Mitigation Can be Managed	Pathway Assessment
	Ingestion of seepage and surface runoff from WRSAs after closure, or ingestion of water, soil, and vegetation that has been chemically altered by long-term seepage and surface runoff may affect caribou health	• Following established Ekati Mine WRSA practices, PAG metasediment rock will be encapsulated within a thermally protective cover layer of granite to facilitate and maintain permafrost development.	Avoid	Applied at maximum level	No Linkage
Accidents and Malfunctions	Ingestion of soil, vegetation, or water that has been altered by chemical spills (i.e., fuels, petroleum products, reagents, pipelines) on site affecting caribou and wildlife health	• The existing Spill Contingency Plan in place for the Ekati Mine and will be expanded to include the Jay Project.	Minimize	Applied at maximum level	No Linkage
		• Regular equipment maintenance (e.g., regular checks for leaks) will continue.	Minimize	Can be intensified or reduced through monitoring and Adaptive Management	
		• Drip trays and/or absorbent pads are used during servicing and refuelling.	Avoid	Applied at maximum level	
		• All hazardous substances are stored and handled on site in accordance with applicable regulations.	Minimize	Applied at maximum level	
		• Fuel is stored at a central bulk fuel farm at the Ekati Mine main camp, and at satellite fuel farms located at Misery, Fox, and Koala North. Fuel tanks are contained within berms.	Minimize	Applied at maximum level	
		• The Project will follow existing standard policies in the event of a spill; spill response training is provided and updated.	Minimize	Can be intensified or reduced through monitoring and Adaptive Management	
		• Soil and snow affected by hydrocarbon spills will continue to be handled in accordance with the existing Hydrocarbon-Impacted Materials Management Plan, and will be remediated in the landfarm or shipped off-site.	Reclaim	Used as required	
		• Mine water management in the WPKMP will include the pipelines used for ongoing water management of the Jay Pit.	Minimize	Applied at maximum level	
		• Mine water and fine processed kimberlite slurry pipelines will be monitored and inspected throughout construction, operations, and closure to identify areas requiring maintenance and prevent leaks.	Minimize	Applied at maximum level	
		• Any leaks or spills identified along the pipelines will be addressed immediately, and clean-up, if required, will be implemented following the existing Spill Contingency Plan.	Minimize	Applied at maximum level	

WRSA = Waste Rock Storage Area; ICRP = Interim Closure and Reclamation Plan; WPKMP = Wastewater and Processed Kimberlite Management Plan; WROMP = Waste Rock and Ore Storage Management Plan; PAG = potentially acid generating; non-PAG = non-potentially acid generating; km/h = kilometres per hour; m = metre.

DOMINION DIAMOND

Information Request Number: DAR-MVEIRB-IR-91

Source: MVEIRB Information Requests from Chuck Hubert

Subject: Barren-ground Caribou

DAR Section(s): 12

Preamble (MVEIRB):

The annual Wildlife Effects Monitoring Program's (WEMPs) report incidental caribou sightings at Ekati since 2006, but this is not included in the DAR. Sightings have stayed relatively consistent which indicates an increasingly large proportion of the herd moves through the Ekati site. The 1996-98 baseline surveys for Diavik showed large numbers of caribou funneling into the Ekati area in the fall. Likewise the 2003-2013 WEMPs report groups of 1000s caribou in September and October on the Lac de Gras north shore peninsula and in the vicinity of the Misery Road. Rescan (2012) reports for example, "During the southern migration, 19,063 caribou were sighted (97% of all caribou counted) between September 1 and September 30, 2009. Overall, the number of caribou observed between 2009 and 2011 indicates that caribou are continuing to use the area around EKATI." As well as incidental sightings, since 2011, caribou are recorded by the remote cameras (6,399 individual caribou in 2012 with the highest rate of sightings in August and October). The cameras are an additional dataset to build a composite picture of caribou abundance and distribution at Ekati (allowing for repeated sightings). Rescan (ERM Rescan Environmental Services Ltd.). 2012. Ekati Diamond mine 2012 Environmental Impact Report, prepared for BHP Billiton Canada Inc., Yellowknife, Northwest Territories
http://reviewboard.ca/upload/project_document/EA1314-01_Ekati_Diamond_Mine_2012_Environmental_Impact_Report.PDF

Request (MVEIRB):

a) Please summarize as tables or maps the annual and monthly incidental caribou sightings (2006-2014) and camera sightings at Ekati main site and Misery/Jay vicinity.

b) Please table or graph the annual incidental & camera sightings relative to trends in herd size as a percentage measure of the Bathurst herd's exposure to Ekati.

Response:

Table 91-1 summarizes the annual incidental caribou observations reported by staff and the total number of caribou recorded by cameras at the Ekati Mine from 2006 to 2014. Monthly estimates are not available for caribou incidental observations. However, the annual values reflect the three months of each year when Bathurst caribou encounter the Ekati Mine during their northern or southern migrations.

Table 91-1 Annual Incidental Caribou Observations at the Ekati Mine, 2006 to 2014

Year	Total Caribou Incidentally Observed	Bathurst Herd Size[(a)]	Percent Incidental Observations	Total Individuals Observed by Camera	Total Camera Days	Average Number of Individuals/Camera/Day
2006	20,403	128,000	15.9	-	-	-
2007	20,092	96,000	20.9	-	-	-
2008	876	64,000	1.4	-	-	-
2009	19,633	32,000	61.4	-	-	-
2010	11,571	33,000	35.1	-	-	-
2011	14,766	34,000	43.4	336	4,495	0.08
2012	4,674	35,000	13.4	1,389	8,542	0.16
2013	2,652	-	-	654	9,059	0.07
2014	1,508	-	-	-	-	-

a) Herd size of 2006, 2009, and 2012 from photo census of Bathurst calving grounds. All other years were predicted from linear relationship between photo-census estimates.

Table 91-2 summarizes the average encounter rates of caribou recorded by cameras at the Ekati Mine and as reported in ERM Rescan (2014). Camera monitoring at the Ekati Mine has produced over 1 million photos annually since the program began in 2011 as was discussed at the Wildlife Monitoring Workshop in March, 2015. Providing a summary by restricting camera locations other than has been reported by the Ekati Mine (ERM Rescan 2014) would require substantial processing time.

Table 91-2 Average Encounter Rates (Total Counts of Individuals In Groups per Camera Day), by Area of the Ekati Mine, 2011 to 2013

Area	2011				2012				2013			
	Jul	**Aug**	**Sep**	**Oct**	**Jul**	**Aug**	**Sep**	**Oct**	**Jul**	**Aug**	**Sep**	**Oct**
Fox Pit	-	-	-	-	-	-	-	0	-	-	-	-
LLCF	0.00 (0.00)	3.56 (3.68)	1.00 (0.00)	0.00 (0.00)	-	-	0.00 (0.00)	0.00 (0.00)	3.33 (4.04)	4.00 (4.24)	0.00 (0.00)	0.00 (0.00)
WRSF	-	-	-	-	0.00 (0.00)	2.31 (1.18)	0.00 (0.00)	378.50 (299.11)	-	-	-	-
Misery Road	0.00 (0.00)	1.00 (0.00)	3.25 (4.73)	0.00 (0.00)	1.00 (0.00)	1.50 (1.17)	1.00 (0.00)	1.00 (0.00)	1.27 (0.59)	1.15 (0.38)	0.00 (0.00)	1.00 (0.00)
Sable, Pigeon and Access Roads	1.00 (0.00)	4.23 (3.30)	3.00 (2.00)	0.00 (0.00)	0.00 (0.00)	5.41 (8.58)	0.00 (0.00)	19.88 (34.14)	1.81 (1.76)	9.23 (15.4)	6.00 (1.41)	0.00 (0.00)
Reference Sites	1.00 (0.00)	2.90 (2.77)	2.83 (1.17)	0.00 (0.00)	-	-	-	-	-	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)

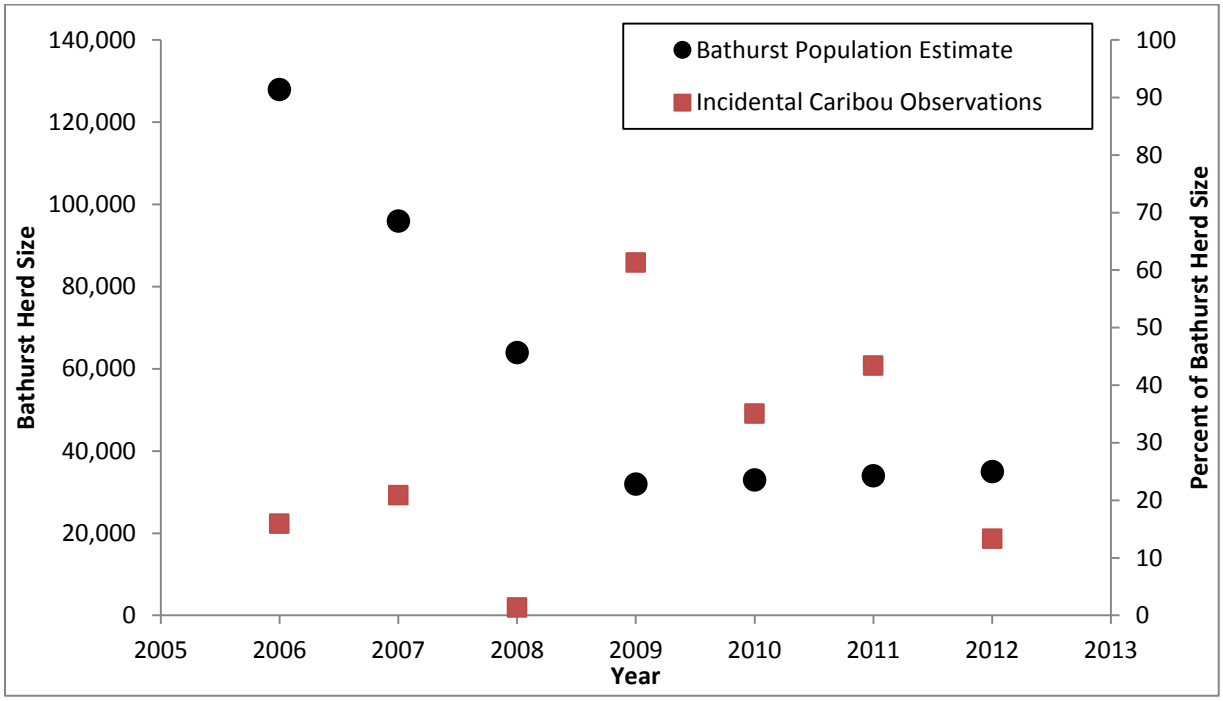
Source: ERM Rescan (2014).

Note: Values reflect the average number of individuals observed in photos per day. Values in parenthesis indicate the standard deviation.

LLCF = Long Lake Containment Facility; WRSF = Waste Rock Storage Facility; - = no photos recorded.

The Government of the Northwest Territories (GNWT) completes photo-census surveys of the Bathurst calving grounds to generate population estimates, which were completed in 2006, 2009, and 2012 and overlap caribou incidental observations in Table 91-1. To provide annual percentage values for all years other than photo census years, predictions of herd size of Bathurst caribou were derived by assuming a linear relationship between photo census population estimates reported by the GNWT (Figure 91-1). It is important to note that incidental observations represent a biased index of abundance because the same individual(s) could be reported by more than one person at the Ekati Mine on the same or more than one occasion. For example, if 10 caribou are present near the Misery Road for 5 days and observed by 2 different haul truck drivers, the count of caribou could sum to 100 even though there were only 10 caribou present. Incidental observations are also biased because staff only observe caribou when they are conspicuous (e.g., near site, standing, or moving).

Figure 91-1 Actual and Predicted Bathurst Caribou Population Estimates and Percentage of Population Estimates for Caribou Incidentally Observed at the Ekati Mine, 2006 to 2012



Note: Bathurst caribou herd size for 2006, 2009, and 2012 from photo census of Bathurst calving grounds. All other years were predicted from linear relationship between photo-census estimates.

References:

ERM Rescan (ERM Rescan Environmental Services Ltd.). 2014. Ekati Diamond Mine: 2013 WEMP Addendum — Wildlife Camera Monitoring Summary Report. Prepared for Dominion Diamond Ekati Corporation by ERM Rescan: Yellowknife, NWT, Canada.

DOMINION DIAMOND

Information Request Number:	DAR-MVEIRB-IR-92
Source:	MVEIRB Information Requests from Chuck Hubert
Subject:	Barren-ground Caribou - Integrating information on local movements
DAR Section(s):	12.2.2.1 (Map 12.2-3)

Preamble (MVEIRB):

Mitigation requires detailed understanding of caribou movements as there are caribou distribution and behavior differences within the Ekati site (Rescan 2012). The North shore of Lac de Gras and neighbouring lakes funnel post-calving, summer and fall caribou movements. Dominion mapped trails (Map 12.2-3; Map 12.2-5) but the survey area was truncated at Jay Pit. Compilation of the historic trails and the collar trajectories such as the GPS collars within the Zone of Influence would be useful to increase the efficiency of mitigation and monitoring.

Request (MVEIRB):

a) Please integrate recent trail mapping to build a composite map of historic trails, traditional knowledge trails and trails relative to the collar trajectories within the Zone of Influence.

b) Please describe the methodology for trail mapping and commit to mapping the trails south-west of the proposed Jay Pit.

Response:

a) The map requested is provided as Map 92-1. It includes the historical caribou trail information from Developer's Assessment Report (DAR) Map 12.2-5 and traditional knowledge based caribou paths from DAR Map 12.4-3. Radio-collared caribou point-to-point movements from 1996 to 2013 data are also shown on Map 92-1. Though not mapped in the DAR, these were the data used to delineate seasonal ranges for the Bathurst herd.

There was additional work on caribou trails conducted as part of the 2014 Wildlife Baseline Study. This additional information on the density of caribou trails was included in Appendix I of the Sable Addendum (Dominion Diamond 2014); Attachment 1 (Dominion Diamond Map I-4) shows locations of caribou trails observed during 2014 field work and Attachment 2 (Dominion Diamond Map I-5) shows densities of trails in the vicinity of the Jay Project (Project). These data are additional to the information shown in Map 92-1.



LEGEND

- EKATI MINE FOOTPRINT
- DIAVIK MINE FOOTPRINT
- PROPOSED JAY FOOTPRINT
- ESKER
- WATERCOURSE
- WATERBODY
- HISTORICAL CARIBOU TRAIL
- RADIO-COLLARED CARIBOU MOVEMENTS (1996 TO 2013 DATA)
- TRADITIONAL KNOWLEDGE BASED CARIBOU PATH
- REASONABLY FORESEEABLE DEVELOPMENT 15 KM ZONE OF INFLUENCE

NOTES

1. CARIBOU PATHS DERIVED FROM COLLAR DATA, JUNE 15 TO OCTOBER 31 FOR EACH YEAR SHOWN

REFERENCE

NATIONAL TOPOGRAPHIC BASE DATA (NTDB) 1:250,000
CANVEC © NATURAL RESOURCES CANADA, 2012
NATURAL RESOURCES CANADA, CENTRE FOR TOPOGRAPHIC INFORMATION, 2012
DATUM: NAD83 PROJECTION: UTM ZONE 12N

DOCUMENT

MVEIRB-IR-92

5 0 5
SCALE 1:300,000 KM

PROJECT
DOMINION DIAMOND™
JAY PROJECT
NORTHWEST TERRITORIES, CANADA

TITLE
HISTORICAL CARIBOU TRAILS, TRADITIONAL KNOWLEDGE BASED PATHS, AND RADIO-COLLARED CARIBOU MOVEMENTS

Golder Associates

PROJECT		1419751	FILE No. POSTDAR_IR_Wild_019_GIS	
DESIGN	JR	03/03/15	SCALE AS SHOWN	REV 0
GIS	LS/AK	18/03/15	MAP 92-1	
CHECK	JR	18/03/15		
REVIEW	JV	18/03/15		

G:\CLIENTS\DOMINION\DDEC Jay and Lynx Projects\Figures\13-1328-0041 Jay & Lynx EA\Wildlife\POST-DAR IRs\POSTDAR_IR_Wild_019_GIS.mxd

b) Map 92-1 shows historical trails already mapped in the area southwest of the Jay Project. Attachments 1 and 2 show locations and densities of caribou trails in the same area.

An aerial reconnaissance survey was conducted in 2013 as part of the baseline study for the Jay Project. Historical caribou trails observed during the survey were plotted (Map 92-1). In July 2014, the Wildlife Baseline Study included ground-based field studies and the use of orthophotos to map caribou trail densities in the area southwest of the Jay Project. The methodology for this work (Sable Addendum, Appendix I, page I-4) was to ground-truth caribou trails that were visible on high resolution orthophotos of the area. Trails identified on orthophotos were then verified by field crews on the ground. The orthophoto and field observations (Attachment 1) were used to assist in digitizing trails at a resolution of 1 hectare to classifying areas of low, medium, and high occurrence of trails around the Project. Low, medium, and high use trail occurrences were assigned classification values 1, 2, and 3, respectively. A low use trail area was an area that had five or fewer caribou trails, or trails that covered less than 25 percent (%) of the cell area. A medium trail area was classified as containing more than five trails but fewer than 15 trails, or trails that covered less than 50% of the cell area. A high use area had greater than 15 trails, or had trails that covered greater than 50% of the cell area. The results from this classification appear in Attachment 2.

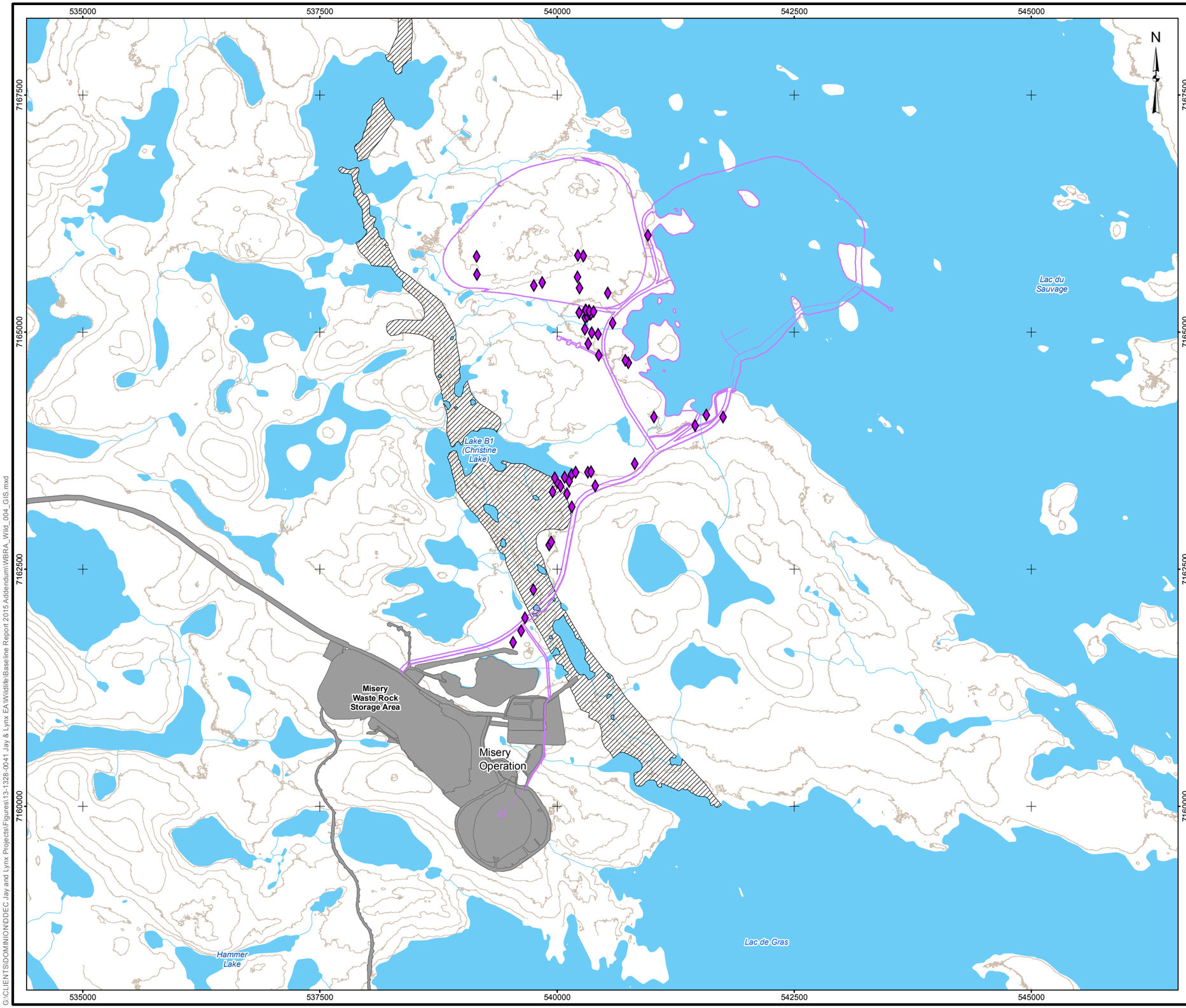
The 2015 field program workplan for the Jay Project includes expanding the 2014 area of orthophoto mapped historic caribou trails. As noted, the density and locations of trails in the area southwest of the proposed Jay Pit have been mapped and no further studies specific to this area are planned at this time.

References:

Dominion Diamond (Dominion Diamond Ekati Corporation). 2014. Jay Project Developer’s Assessment Report Sable Addendum. Prepared by Golder Associates Ltd., December 2014. Yellowknife, NWT, Canada.

Attachment 1

Caribou Trails Observed, 2014



LEGEND

- EKATI MINE FOOTPRINT (MISERY OPERATION)
- PROPOSED JAY PROJECT DEVELOPMENT AREA
- ELEVATION CONTOUR (10 m INTERVAL)
- WATERCOURSE
- WATERBODY
- ESKER
- CARIBOU TRAIL

NOTES

ROAD, PIPELINES, AND POWER LINE ARRANGEMENT TO BE DETAILED AS PART OF FURTHER PRE-FEASIBILITY DESIGN. APPROXIMATE CORRIDOR WIDTHS ARE SHOWN.

REFERENCE

JAY PROJECT CONCEPTUAL ENGINEERING REPORT, EKATI MINE, DOC#: 1313280041-E14037-R-REV0-4060, DATED: MAY 13, 2014
JAY PROJECT DESIGN BASIS MEMORANDUM FOR PRE-FEASIBILITY DESIGN OF PROJECT ROADS AND PIPELINE BENCHES, DOC#: 1313280041-E14031-TM-REVD-2020, DATED: AUGUST 1, 2014
LIDAR AND BATHYMETRIC DATA OBTAINED FROM AURORA, 2013
WATER OBTAINED FROM CANVEC © NATURAL RESOURCES CANADA, 2012
DATUM: NAD83 PROJECTION: UTM ZONE 12N

DOCUMENT

WILDLIFE BASELINE REPORT: 2015 ADDENDUM

1 0 1
SCALE 1:40,000 KILOMETRES

PROJECT
DOMINION DIAMOND
JAY PROJECT
NORTHWEST TERRITORIES, CANADA

TITLE

CARIBOU TRAILS OBSERVED, 2014

Golder Associates

PROJECT		13-1328-0041	FILE No. WBRA_Wild_004_GIS	
DESIGN	EN	02/09/14	SCALE AS SHOWN	REV 0
GIS	UW	26/11/14		
CHECK	JV	26/11/14		
REVIEW	JV	26/11/14		

MAP I-4

G:\CLIENTS\DOMINION\DEC Jay and Lynx Projects\Figures\13-1328-0041 Jay & Lynx EA\Wildlife\Baseline Report 2015 Addendum\WBRA_Wild_004_GIS.mxd

Attachment 2

Historic High, Medium, and Low Use Caribou Trail Cells Around the Proposed Jay Development Area

535000
537500
540000
542500
545000
7167500
7165000
7162500
7160000
N
Misery Operation

LEGEND

- EKATI MINE FOOTPRINT (MISERY OPERATION)
- PROPOSED JAY PROJECT DEVELOPMENT AREA
- ELEVATION CONTOUR (10 m INTERVAL)
- WATERCOURSE
- WATERBODY

CARIBOU TRAIL CLASSIFICATION

- NONE
- LOW
- MEDIUM
- HIGH

REFERENCE

JAY PROJECT CONCEPTUAL ENGINEERING REPORT, EKATI MINE, DOC#: 1313280041-E14037-R-REV0-4060, DATED: MAY 13, 2014
LIDAR AND BATHYMETRIC DATA OBTAINED FROM AURORA, 2013
WATER OBTAINED FROM CANVEC © NATURAL RESOURCES CANADA, 2012
DATUM: NAD83 PROJECTION: UTM ZONE 12N

NOTES

ROAD, PIPELINES, AND POWER LINE ARRANGEMENT TO BE DETAILED AS PART OF PRE-FEASIBILITY DESIGN. APPROXIMATE CORRIDOR WIDTHS ARE SHOWN.

1 0 1
SCALE 1:40,000 KILOMETRES

PROJECT
DOMINION DIAMOND
JAY PROJECT
NORTHWEST TERRITORIES, CANADA

TITLE
HISTORIC HIGH, MEDIUM, AND LOW USE CARIBOU TRAIL CELLS AROUND THE PROPOSED JAY DEVELOPMENT AREA

Golder Associates

PROJECT		13-1328-0041	FILE No. WBRA_Wild_006_GIS
DESIGN	DP EN	01/08/14	SCALE AS SHOWN REV 0
GIS	UW	25/11/14	
CHECK	JV	25/11/14	MAP I-5
REVIEW	JV	25/11/14	

G:\CLIENTS\DOMINION\DDEC Jay and Lynx Projects\Figures\13-1328-0041 Jay & Lynx EA\Wildlife\Baseline Report 2015 Addendum\WBRA_Wild_006_GIS.mxd

DOMINION DIAMOND

Information Request Number:	DAR-MVEIRB-IR-93
Source:	MVEIRB Information Requests from Chuck Hubert
Subject:	Dust
DAR Section(s):	3

Preamble (MVEIRB):

Dust is partly related to traffic levels. The DAR projects that ore trucks will average 12 minutes between trips, and unspecified levels of other traffic once the Jay pit is constructed and operational. Dustfall was measured on other roads to other pits at Ekati. Understanding corresponding traffic levels would help in predicting dustfall on the Jay Road.

Request (MVEIRB):

Please table or graph traffic frequency by season and year for the Misery Road, Fox and Sable Haul roads. If truck frequency is unavailable, please estimate from rock handled tonnage and truck capacity.

Response:

Detailed information of traffic volumes for all vehicle types is provided in Appendix C (Traffic Associated with the Jay Project).

DOMINION DIAMOND

Information Request Number: DAR-MVEIRB-IR-94

Source: MVEIRB Information Requests from Chuck Hubert

Subject: Barren-ground Caribou

DAR Section(s): 12, Annex VII

Preamble (MVEIRB):

There is a total of 87 km of roads at Ekati, and while caribou behavior was monitored 2001-2010, gaps remain which reduce certainty in mitigation and predicting effects. Table 1.2-1 refers to construction of caribou crossings along the Misery Road in areas of high usage but without a map or describing how high usage was measured. It is uncertain whether the low rate of caribou crossings as documented by cameras (2011-2013) reflects effectiveness of the crossings; or cameras vs snow tracking (2002-2010), or traffic frequency or a change in caribou behavior. Remote cameras on the Misery Haul Road revealed caribou were deterred from crossing the road for 2-8% of the observations (ERM Rescan 2013 , 2014), and crossings did not vary with changes in traffic volumes but traffic frequency was not reported. In contrast, based on snow-tracks, caribou were deflected at Misery Road at a higher rate (57% of the observed events; 2002 - 2010 p.12-21). This suggests Misery Road was a partial barrier to caribou movement depending on height of snow banks at the edge of the road, group size, and year. The DAR notes that road deflections by caribou were more common in the Sable and Pigeon roads than the Misery Haul Road (no information on caribou numbers or traffic frequency). Rescan. 2013. Ekati Diamond Mine: 2012 WEMP Addendum Wildlife Camera Monitoring Summary Report. Prepared for Dominion Diamond Ekati Corporation by Rescan Environmental Services Ltd.: Yellowknife, Northwest Territories. http://www.reviewboard.ca/upload/project_document/EA1314-01_Ekati_2012_WEMP_Wildlife_Camera_Monitoring_Report.PDF

Request (MVEIRB):

a) Please table or map how known crossing areas were identified on the Misery road (snow and snow free season) and if subsequent monitoring confirmed use of the crossings (mitigation effectiveness);

b) Describe how mitigation could be adapted if crossing success is seasonal for the Misery Road, mitigation could be adapted;

c) Relate the Misery Road mitigation (construction of crossings) to the proposed Jay Pit access road and compare the cross-section profile of the two roads, considering that the Jay access road includes a pipeline bench. Please describe the additional mitigation required based on the width of the of road and the space between road and pipeline bench, considering the existing experience of pipelines and roads.

Response:

a) Locations where caribou were expected to intersect the Misery Road were determined by engagement with community members to identify the presence of historic trails during the snow free season and by regular surveys during the Bathurst caribou northern migration to locate snow trails

(Rescan 2006, 2010). Map 94-1 shows the location of caribou crossings constructed by the Ekati Mine, which were determined from the presence of historic trails and based on recommendations of the Elders Advisory Group (Rescan 2006). Community engagement has also identified areas along the Misery Road where caribou crossings would not be necessary (due to the presence of natural boulder fields, for example). Recent analysis of camera monitoring indicates that caribou do use the crossing locations constructed along the Misery Road (ERM Rescan 2014). Snow berms are maintained at low height during routine road clearing activities for operational safety reasons (visibility, prevention of snow drifting), which also mitigates risks to caribou during the spring migration.

b) Mitigation included in the Developer's Assessment Report (DAR) to avoid and limit barrier effects associated with traffic from the Jay Project, which can be used regardless of season, includes the combination of staged kimberlite stockpiles and traffic management so that traffic volume can be reduced or suspended when necessary to protect caribou movement and safety. If monitoring indicates additional mitigation is necessary, then additional crossing locations may be constructed.

c) Figure 94-1 illustrates the typical profiles of the Misery and Jay roads. Additional caribou mitigation measures are planned for the Jay Road (as compared to the Misery road) that are based on community feedback and that will accommodate the presence of the pipeline bench.

In the DAR, Dominion Diamond proposed to construct caribou crossings at appropriate discrete locations along the Jay Road. After receiving input from Aboriginal communities during our engagement process and during site visits, Dominion Diamond has changed its approach to caribou crossings along the Jay Road to reflect that feedback, as described below.

Because of the importance of the esker for caribou movement as identified through community engagement, the portion of the Jay Road that cuts through the esker will be constructed as a caribou crossing. The pipelines will be covered over with crushed rock along this section of road, except where there are valves or joints that require visual inspection for safe operation. Dominion Diamond will strategically construct the pipelines to reduce the number of joints or valves through the esker crossing.

Dominion Diamond's community engagement program has indicated that the area to be crossed by the Jay Road is important for caribou movement. In response to the feedback received through community engagement, Dominion Diamond proposes to construct an increased number of caribou crossings along the main section of the Jay Road (i.e., roughly between King Pond Dam and the approach to the active operations area at Lac du Sauvage). This main section of the Jay Road will be constructed with frequent and wide caribou crossings that will respect the communities' identification of the importance of this area for caribou movement. Caribou crossings will not be built in areas where raised safety berms are required by the Mines Inspector, or at locations where there are necessary joints and valves in the pipelines that require visual inspection for safe operation. The pipelines will be strategically designed to reduce the number of locations that cannot be constructed as caribou crossings due to joints and valves. This approach also makes beneficial use of 'lessons-learned' from the original Misery Road, where caribou crossings were only installed after construction of the road.

Caribou crossings will be constructed using crushed rock (200 millimetres or less in size) so that the side slopes of the road are flatter and easier walking for caribou than the large roadfill rock. In the caribou crossing areas, the pipelines will also be covered with crushed rock. Once the road is constructed, monitoring, including by Aboriginal community members, will be implemented to assess the effectiveness of the constructed caribou crossings.



LEGEND

- EKATI MINE FOOTPRINT
- PROPOSED JAY FOOTPRINT
- ELEVATION CONTOUR (10 m INTERVAL)
- ESKER
- WATERCOURSE
- WATERBODY
- CARIBOU CROSSING

REFERENCE

CARIBOU CROSSINGS PROVIDED BY DOMINION, MARCH 16, 2015
CANVEC © NATURAL RESOURCES CANADA, 2012
NATURAL RESOURCES CANADA, CENTRE FOR TOPOGRAPHIC INFORMATION, 2012
DATUM: NAD83 PROJECTION: UTM ZONE 12N

DOCUMENT

DAR-MVEIRB-IR-94

2 0 2
SCALE 1:100,000 KILOMETRES

PROJECT
DOMINION DIAMOND™
JAY PROJECT
NORTHWEST TERRITORIES, CANADA

TITLE
LOCATION OF CARIBOU CROSSINGS ALONG MISERY ROAD

Golder Associates

PROJECT	1419751		FILE No. POSTDAR_IR_Wild_027_GIS	
DESIGN	DC	17/03/15	SCALE AS SHOWN	REV 0
GIS	ANK	02/04/15		
CHECK	DC	02/04/15	MAP 94-1	
REVIEW	JV	02/04/15		

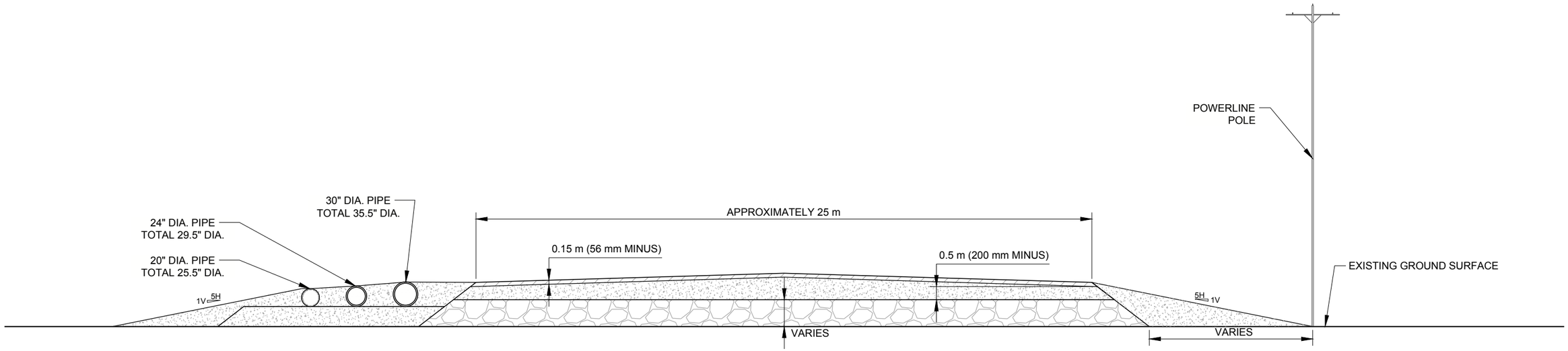
G:\CLIENTS\DOMINION\DDEC Jay and Lynx Projects\Figures\13-1328-0041 Jay & Lynx EA Wildlife\POST-DAR IRs\POSTDAR_IR_Wild_027_GIS.mxd

References:

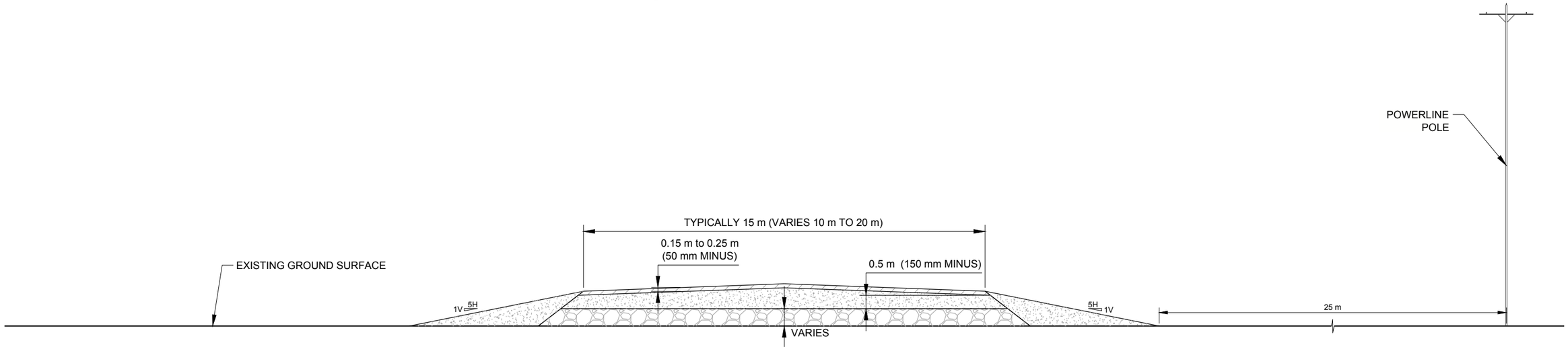
ERM Rescan (ERM Rescan Environmental Services Ltd.). 2014. Ekati Diamond Mine: 2013 WEMP Addendum — Wildlife Camera Monitoring Summary Report. Prepared for Dominion Diamond Ekati Corporation by ERM Rescan: Yellowknife, NWT.

Rescan (Rescan Environmental Services Ltd.). 2006. Ekati Diamond Mine: Caribou and roads, implementing Traditional Knowledge in Wildlife Monitoring at the Ekati Diamond Mine 2005 Annual Report. Prepared for BHP Billiton.

Rescan. 2010. Ekati Diamond Mine 2009 Wildlife Effects Monitoring Program. Yellowknife, NWT.



A **JAY ROAD CARIBOU CROSSING**



LEGEND

- ROAD BASE
- ROAD SURFACING
- ROCKFILL

B **TYPICAL MISERY ROAD CARIBOU CROSSING**

NOTES

1. ALL UNITS IN METRES UNLESS OTHERWISE NOTED.
2. ELEVATION IN METRES ABOVE SEA LEVEL.
3. TOTAL DIAMETER INCLUDES 2.75" OF INSULATION AND HEAT TRACING. DIA. = OUTSIDE DIAMETER DIMENSION.
4. BERM TO BE CONSTRUCTED WHERE ROAD FILL THICKNESS EXCEEDS 3 m. MINIMUM OPERATION WIDTH TO BE MAINTAINED.
5. GEOMETRY OF ROAD AND PIPELINE BENCH VARIES BASED ON TERRAIN.

0 2.5 5
SCALE METRES

REV	DATE	DESCRIPTION	DRW	DES	CHK	RVW
0	2015-04-02	ISSUED FOR FINAL	RW	CM	FE	FD
B	2015-03-26	DRAFT-ISSUED FOR REVIEW	RW	CM	-	-

SEAL / PERMIT

CLIENT: DOMINION DIAMOND

CONSULTANT: Golder Associates

PROJECT: 1419751.3200.35
JAY PROJECT
NORTHWEST TERRITORIES, CANADA

TITLE: TYPICAL SECTIONS
CARIBOU CROSSINGS

DRAWING No. 94-1

SHEET No. 1 OF 1

SHEET SIZE ANSI D 25 mm 0

Drawing File: N:\Cnet\Dominion Diamond\Jay-Cardinal Project\99_PROJECTS\13-1328-0041\02_PRODUCTION\2020\03\Road Design Basis Memo\131328004 1--2020--20_03.dwg Layout:TYPICAL SECTIONS CARIBOU CROSSING Monday, March 30, 2015 2:04:22 PM By: JKowalski

DOMINION DIAMOND

Information Request Number:	DAR-MVEIRB-IR-95
Source:	MVEIRB Information Requests from Chuck Hubert
Subject:	Barren-ground Caribou
DAR Section(s):	Sable Addendum

Preamble (MVEIRB):

The maps showing the caribou trails relative to the locations of the proposed Jay Road and waste rock storage area are valuable in predicting impacts from these project components on caribou.

Request (MVEIRB):

a) Please provide alternative Jay access road route options and changes to the shape of the rock pile that would reduce the likely encounter rate of caribou based on the mapped trails.

b) Provide the design. including profile (such as road bed height), for the alternative road.

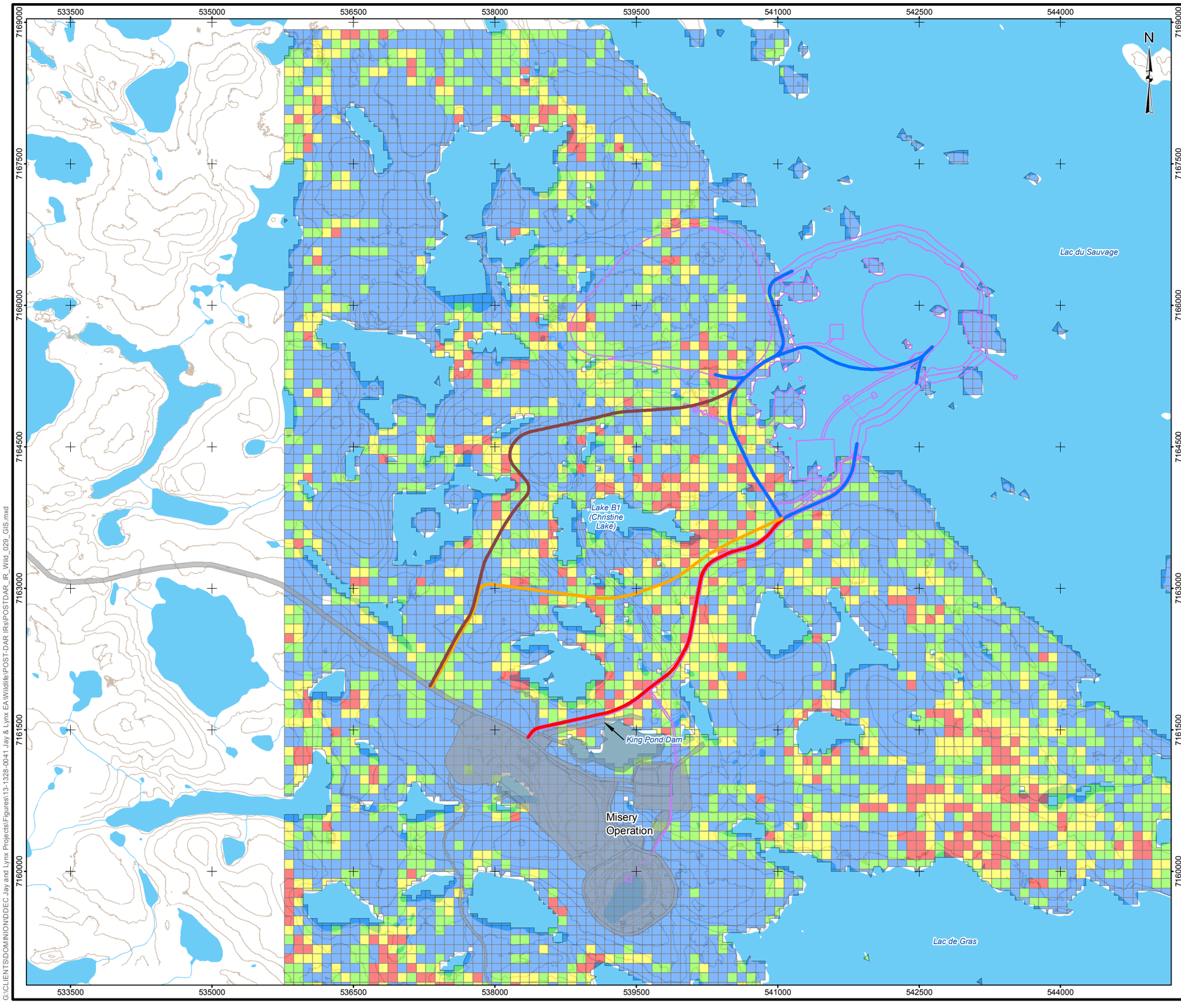
c) Describe placement of mitigation options relative to the identified high and medium caribou track locations.

Response:

a) As part of the alternatives assessment, three alignments for the Jay Road were evaluated. It was recognized that each alignment would also provide the corridor for the power line, and three pipelines, associated with water management for the Jay Project. Therefore, a single, optimal alignment for the road, pipelines, and power line was sought.

The main caribou migration route in the Project area runs northwest from the Narrows. The three road alternatives must run in an approximately east-west direction to connect the Misery Road to the Jay Pit, and as such, will cross the main caribou migration path and are predicted to have similar effects on caribou movement, due to the amount of traffic that will operate on the road.

The assessment was conducted prior to the caribou distribution mapping information being available and prior to the 2014 field work (included in the Sable Addendum [Dominion Diamond 2014]). Map 95-1 presents the three alternative road alignments evaluated with the caribou trail distribution mapping. Table 95-1 presents the approximate distribution of grid cells crossed by each of the road alignments, in terms of high (red squares), medium (yellow squares), and low (green squares) caribou trails. For the road Alternative 3, the number in brackets represents the entire number of grid cells crossed in each category. The number outside of the bracket represents the number of grid cells crossed by Alternative 3 alignment, excluding those cells also touched by the King Pond Dam.



LEGEND

- EKATI MINE FOOTPRINT (MISERY OPERATION)
- PROPOSED JAY FOOTPRINT
- ELEVATION CONTOUR (10 m INTERVAL)
- WATERCOURSE
- WATERBODY

CARIBOU TRAIL CLASSIFICATION

- NONE
- LOW
- MEDIUM
- HIGH

JAY ROAD ALTERNATIVES

- ROAD COMMON TO ALL ALTERNATIVES
- ALTERNATIVE 1
- ALTERNATIVE 2
- ALTERNATIVE 3

NOTES

ROAD, PIPELINES, AND POWER LINE ARRANGEMENT TO BE DETAILED AS PART OF FEASIBILITY DESIGN. APPROXIMATE CORRIDOR WIDTHS ARE SHOWN.
POTENTIAL QUARRY MAY BE REQUIRED WITHIN THE FOOTPRINT OF THE PROPOSED JAY WASTE ROCK STORAGE AREA

REFERENCE

JAY PROJECT CONCEPTUAL ENGINEERING REPORT, EKATI MINE, DOC#: 1313280041-E14037-R-REV0-4060, DATED: MAY 13, 2014
JAY PROJECT DESIGN BASIS MEMORANDUM FOR PRE-FEASIBILITY DESIGN OF PROJECT ROADS AND PIPELINE BENCHES, DOC#: 1313280041-E14031-TM-REVD-2020, DATED: AUGUST 1, 2014
LIDAR DATA OBTAINED FROM AURORA, 2013
WATER OBTAINED FROM CANVEC © NATURAL RESOURCES CANADA, 2012
DATUM: NAD83 PROJECTION: UTM ZONE 12N

DOCUMENT

DAR-MVEIRB-IR-95

1 0 1
SCALE 1:40,000 KILOMETRES

PROJECT
DOMINION DIAMOND™
JAY PROJECT
NORTHWEST TERRITORIES, CANADA

TITLE
HISTORIC CARIBOU TRAIL USE AND JAY ROAD ALTERNATIVES

Golder Associates

PROJECT		1419751	FILE No. POSTDAR_IR_Wild_029_GIS	
DESIGN	FE	01/03/15	SCALE AS SHOWN	REV 0
GIS	EN/AK	02/04/15	MAP 95-1	
CHECK	FE	02/04/15		
REVIEW	KM	02/04/15		

G:\CLIENTS\DOMINION\DDEC Jay and Lynx Projects\Figures\13-1328-0041 Jay & Lynx EA\Wildlife\POST-DAR IRs\POSTDAR_IR_Wild_029_GIS.mxd

Table 95-1 Estimated Frequency of Caribou Distribution Cells Crossed by Alignments

Ranking (Map 95-1)	Estimated Frequency		
	Alternative 1	Alternative 2	Alternative 3 [(a)]
Red	4	8	5 (9)
Yellow	15	11	16 (20)
Green	28	33	24 (27)
Total	47	52	45 (56)

a) Values outside the brackets represent grid squares crossed by Alternative 3 alignment, excluding those also contacted by King Pond Dam. Values inside the brackets represent grid squares crossed by the entire alignment.

It is important to recognize that caribou trails identified from the aerial photographs and used for the distribution mapping are not able to distinguish between historic caribou trails and trails that are actively in use. For example, just north of the King Pond there are visible caribou trails; however, the quality and frequency of use of these trails has likely decreased since the construction of the Misery operations, and in particular, the King Pond Dam.

As per the request, the alternatives assessment for the combined route selection (road, pipelines, and power line) has been updated with results summarized in Table 95-2. The following types of information have been considered in the evaluation:

- Length of road (shorter road length is positive in terms of economic and environmental factors);
- Length of pipeline (shorter length is positive in terms of economic factors);
- Length and height of esker crossing;
- Area of esker disturbed;
- Road grades (flatter route is positive in terms of economic and environmental factors, and results in fewer areas that require berms be constructed along the roadway, and therefore, less of a potential physical barrier to wildlife movement; where berms are required, caribou crossings will not constructed);
- Footprint of the mine and proximity to disturbed areas;
- Fragmentation of disturbed areas;
- Location of water bodies, stream, and drainage crossings and potential to affect fish and/or fish habitat;
- Proximity to archaeological sites;
- Visual impact to the esker;
- Ability to reclaim the esker during closure;
- Input from Impact Benefit Agreement (IBA) community members during engagement meetings and site visits to the esker conducted during the summer of 2014;

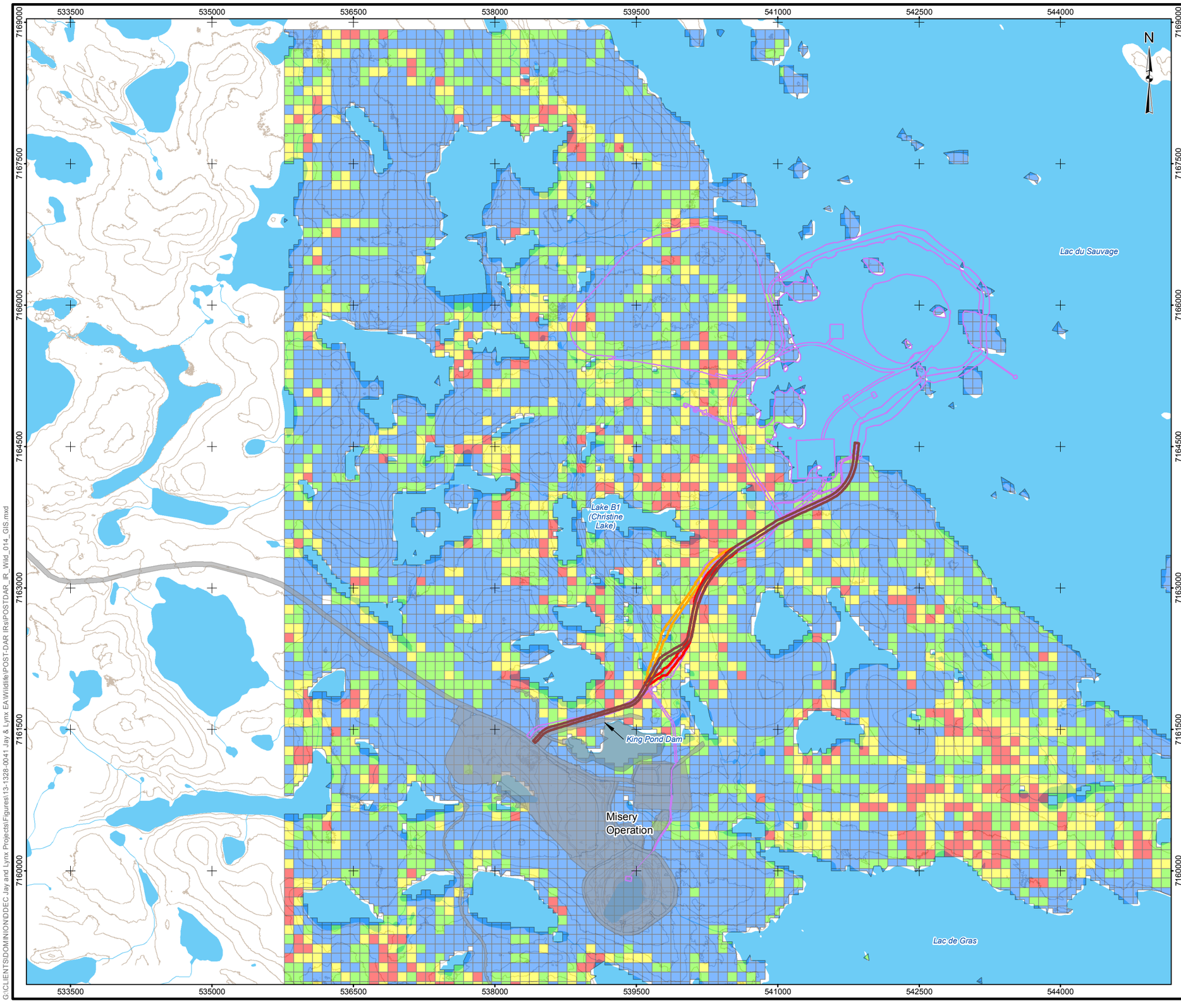
- Amount of fill material required for construction;
- Caribou migration routes (information gathered from Traditional Knowledge, mapped caribou trails in 2013 (Map 12.2-5 of the DAR; and Map 4.2-4 of the Dominion Diamond [2014]);
- Relation to high, medium, and low caribou trail distribution trail mapping (Map 95-1 and values shown in Table 95-1);
- Closure and reclamation; and,
- Diesel fuel usage and associated greenhouse gas (GHG) emissions.

Alternate 3 remains as the overall preferred alignment for the road, pipeline, and power line (Table 95-2).

Once Alternative 3 was selected, small variations in the alignment and whether making a cut through the esker or constructing a road over the esker were also assessed. These alignments are shown on Map 95-2. Crossing 2 with the esker cut was assessed to be the preferred route.

Table 95-2 Jay Road, Pipeline, and Power Line Corridor Alternatives Assessment for Route Selection - Updated Results

Account	Alternative 1	Alternative 2	Alternative 3
Technical Feasibility	• The grade for Alternative 1 is between the other alternatives. • Requires additional fill/cut for crossing the esker • Requires the most fill for construction	• Alternative 2 has the steepest maximum grade. • Requires the most fill/cut for crossing the esker. • Requires the second most fill for construction	• Alternative 3 has the shallowest maximum grade. • Requires the least fill/cut for crossing the esker • Requires the least fill for construction
Relative Scores	**2**	**1**	**3**
Economic Viability	• Alternative 1 requires the longest section of new road, pipeline, power line, and most fill. • Alternatives 1 and Alternative 3 have similar haul distances, which are longer than Alternative 2. • Alternative 1 has the longest pipeline alignment. • Alternative 1 grade is between Alternative 2 and Alternative 3.	• Alternative 2 requires less road length and fill than Alternative 1, but more than Alternative 3. • Alternative 2 has the shortest haul distance. • The length of the pipeline for Alternative 2 is between Alternatives 1 and Alternative 3. • Alternative 2 grade is steepest.	• Alternative 3 requires the shortest section of new road and the least amount of fill. • Alternatives 1 and Alternative 3 have similar haul distances, which are longer than Alternative 2. • Alternative 3 has the shortest pipeline. • Alternative 3 grade is shallower.
Relative Scores	**1**	**2**	**3**
Environmental Considerations	• Alternative 1 is the furthest from the Misery Camp and existing disturbed land, greatest extension of area of environmental impact, and largest fragmentation of land by development (largest footprint). • All Alternatives cross two of the significant caribou trails identified during the 2013 aerial survey (DAR Map 12.2-5) north of Christine Lake. • Alternative 1 crosses one of the Traditional Knowledge caribou paths (Map 4.2-4 Sable Addendum). • Alternative 1 and Alternative 2 have marginally fewer high and medium density caribou trails (Map 95-1). • Alternative 1 crosses approximately 150 m of esker, with an elevation of 10 m (longest crossing, intermediate elevation). • Alternative 1 and Alternative 2 disturb more of the esker. • Alternative 1 has the medium grade between alternatives, would have the medium amount of road length requiring berms (areas without caribou crossings) • Alternative 1 requires three watercourse crossings. • Alternative 1 is estimated to have the highest diesel fuel usage and GHG emissions (combination of road length and grades) • Alternative 1 and Alternative 2 have similar work for reclamation of the esker	• Alternative 2 is mid-way between Alternative 1 and Alternative 3, in terms of existing disturbed land, fragmentation of land by development, and footprint. • All Alternatives cross two of the significant caribou trails identified during the 2013 aerial survey (DAR Map 12.2-5) east of Christine Lake. • Alternative 1 and Alternative 2 have marginally fewer high and medium density caribou trails (Map 95-1) • Alternative 2 crosses approximately 130 m of esker, with an elevation of 15 m (intermediate length of esker, highest elevation). • Alternative 1 and Alternative 2 disturb more of the esker • Alternative 2 has the highest grade, so would require the most berms (areas without caribou crossings) • Alternative 2 requires two watercourse crossings. • Alternative 2 and Alternative 3 are estimated to have lower diesel fuel usage and GHG emissions (combination of road length and grades). • Alternative 1 and Alternative 2 have similar work for reclamation of the esker.	• Alternative 3 is most proximal to Misery Camp and existing disturbed land, least extension of area of environmental impact and fragmentation of land by development (smaller footprint). • All Alternatives cross two of the significant caribou trails identified during the 2013 aerial survey (Map 12.2-5) east of Christine Lake. • Alternative 3 has marginally more high and medium density caribou trails (Map 95-1). • Alternative 3 crosses approximately 80 m of esker, with an elevation of 6 m (shortest and lowest). • Alternative 3 least disturbance to the esker. • Alternative 3 has the lowest grade, so would require the least amount of berms (areas without caribou crossings). • Alternative 3 requires two watercourse crossing. • Alternative 2 and Alternative 3 are estimated to have lower diesel fuel usage and GHG emissions (combination of road length and grades) • Alternative 3 requires the least amount of work to reclaim the esker.
Relative Scores	**2**	**2**	**3**
Social and Economic Considerations	• One unmitigated archaeological site of low significance is located within 150 m of Alternative 1.	• No archaeological sites have been identified within 150 m of Alternative 2.	• No archaeological sites have been identified within 150 m of Alternative 3.
Relative Scores	**2**	**3**	**3**
Total Scores	**7**	**8**	**12**



LEGEND

- EKATI MINE FOOTPRINT (MISERY OPERATION)
- PROPOSED JAY FOOTPRINT
- ELEVATION CONTOUR (10 m INTERVAL)
- WATERCOURSE
- WATERBODY

CARIBOU TRAIL CLASSIFICATION

- NONE
- LOW
- MEDIUM
- HIGH

ESKER CROSSING OPTIONS

- OPTION 1
- OPTION 2
- OPTION 3

NOTES

ROAD, PIPELINES, AND POWER LINE ARRANGEMENT TO BE DETAILED AS PART OF FEASIBILITY DESIGN. APPROXIMATE CORRIDOR WIDTHS ARE SHOWN.
POTENTIAL QUARRY MAY BE REQUIRED WITHIN THE FOOTPRINT OF THE PROPOSED JAY WASTE ROCK STORAGE AREA

REFERENCE

JAY PROJECT CONCEPTUAL ENGINEERING REPORT, EKATI MINE, DOC#: 1313280041-E14037-R-REV0-4060, DATED: MAY 13, 2014
JAY PROJECT DESIGN BASIS MEMORANDUM FOR PRE-FEASIBILITY DESIGN OF PROJECT ROADS AND PIPELINE BENCHES, DOC#: 1313280041-E14031-TM-REVD-2020, DATED: AUGUST 1, 2014
LIDAR DATA OBTAINED FROM AURORA, 2013
WATER OBTAINED FROM CANVEC © NATURAL RESOURCES CANADA, 2012
DATUM: NAD83 PROJECTION: UTM ZONE 12N

DOCUMENT

DAR-MVEIRB-IR-95

1 0 1
SCALE 1:40,000 KILOMETRES

PROJECT
DOMINION DIAMOND™
JAY PROJECT
NORTHWEST TERRITORIES, CANADA

TITLE
HISTORIC CARIBOU TRAIL USE AND ESKER CROSSING OPTIONS

Golder Associates

PROJECT		1419751	FILE No. POSTDAR_IR_Wild_014_GIS	
DESIGN	FE	01/03/15	SCALE AS SHOWN	REV 0
GIS	EN/AK	02/04/15	MAP 95-2	
CHECK	FE	02/04/15		
REVIEW	KM	02/04/15		

G:\CLIENTS\DOMINION\DEC Jay and Lynx Projects\Figures\13-1328-0041 Jay & Lynx EA\Wildlife\POST-DAR IRs\POSTDAR_IR_Wild_014_GIS.mxd

As part of the alternatives assessment for the Jay waste rock storage area (WRSA), various on land areas were evaluated. As was the case for the assessment of the roads, this was conducted prior to the caribou distribution mapping information being available and prior to the 2014 field work. The alternative assessment reviewed:

- A single WRSA located towards the northwest side of the Jay Pit (Map 95-3);
- A single WRSA located towards the southwest side of the Jay Pit (Map 95-3); and,
- Two WRSAs, with a portion of the material to be placed on the northwest side of the Jay Pit and a portion of the material to be placed on the southwest side of the Jay Pit (Map 95-4).

Map 95-3 and Map 95-4 present the assessed WRSA pile locations with the caribou trail distribution mapping data. Table 95-1 presents the approximate distribution of grid cells crossed and occupied by each of the WRSA pile configurations, in terms of high (red squares), medium (yellow squares), and low (green squares) caribou trails.

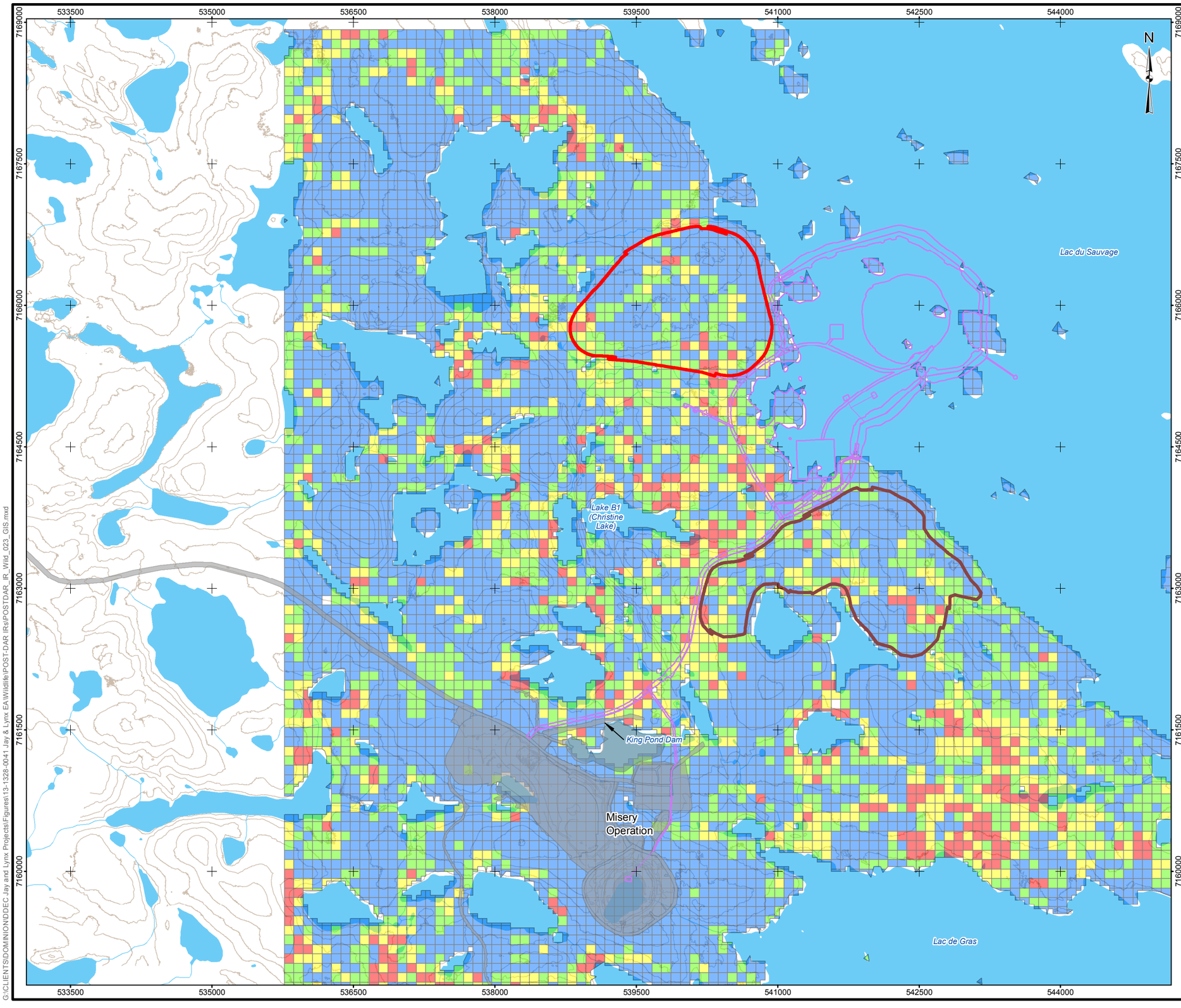
Table 95-3 Estimated Frequency of Caribou Distribution Cells Crossed or within WRSA Footprints

Ranking	Estimated Frequency		
	Alternative 1 (Map 95-3)	Alternative 2 (Map 95-3)	Alternative 3 (Map 95-4) North and South = Total
Red	16	16	13 and 8 = 21
Yellow	33	44	27 and 20 = 47
Green	68	76	50 and 48 = 98
Total	117	136	166

Based on the previous assessment, Alternative 1 was selected as the best location for the WRSA. With the caribou trail distribution mapping data, Alternative 1 remains the best option.

A single WRSA was assessed as being less of a detriment to caribou in comparison to having two separate piles: to minimize fragmentation, and disturbance of the land. Alternative 3 has a larger footprint by spreading the placement out over two areas and the southern location (Alternative 2) would adversely affect higher quality caribou habitat than the northern location. At the local scale, the presence of two WRSAs would result in increased habitat fragmentation and decreased connectivity relative to one larger WRSA for caribou and other wildlife.

Elongating the WRSA along Lac du Sauvage to increase setback from the esker, could potentially increase the barrier the WRSA poses to caribou during spring migration. Modifying the layout of the WRSA (elongating) towards the north would require a permanent water diversion channel to divert flow from Lake C1 and Lake C17 around the WRSA to Lac du Sauvage, and to support connectivity for fish between Lake C1 and Lac du Sauvage. Lake C1 is a relatively deep lake (maximum depth of 23.5 m), with populations of Round Whitefish, Lake Trout, Arctic Grayling, and Slimy Sculpin.



LEGEND

- EKATI MINE FOOTPRINT (MISERY OPERATION)
- PROPOSED JAY FOOTPRINT
- ELEVATION CONTOUR (10 m INTERVAL)
- WATERCOURSE
- WATERBODY

CARIBOU TRAIL CLASSIFICATION

- NONE
- LOW
- MEDIUM
- HIGH

JAY PROJECT WASTE ROCK STORAGE AREA (WRSA) ALTERNATIVES

- ALTERNATIVE 1
- ALTERNATIVE 2

NOTES

ROAD, PIPELINES, AND POWER LINE ARRANGEMENT TO BE DETAILED AS PART OF FEASIBILITY DESIGN. APPROXIMATE CORRIDOR WIDTHS ARE SHOWN.
POTENTIAL QUARRY MAY BE REQUIRED WITHIN THE FOOTPRINT OF THE PROPOSED JAY WASTE ROCK STORAGE AREA

REFERENCE

JAY PROJECT CONCEPTUAL ENGINEERING REPORT, EKATI MINE, DOC#: 1313280041-E14037-R-REV0-4060, DATED: MAY 13, 2014
JAY PROJECT DESIGN BASIS MEMORANDUM FOR PRE-FEASIBILITY DESIGN OF PROJECT ROADS AND PIPELINE BENCHES, DOC#: 1313280041-E14031-TM-REVD-2020, DATED: AUGUST 1, 2014
LIDAR DATA OBTAINED FROM AURORA, 2013
WATER OBTAINED FROM CANVEC © NATURAL RESOURCES CANADA, 2012
DATUM: NAD83 PROJECTION: UTM ZONE 12N

DOCUMENT

DAR-MVEIRB-IR-95

1 0 1
SCALE 1:40,000 KILOMETRES

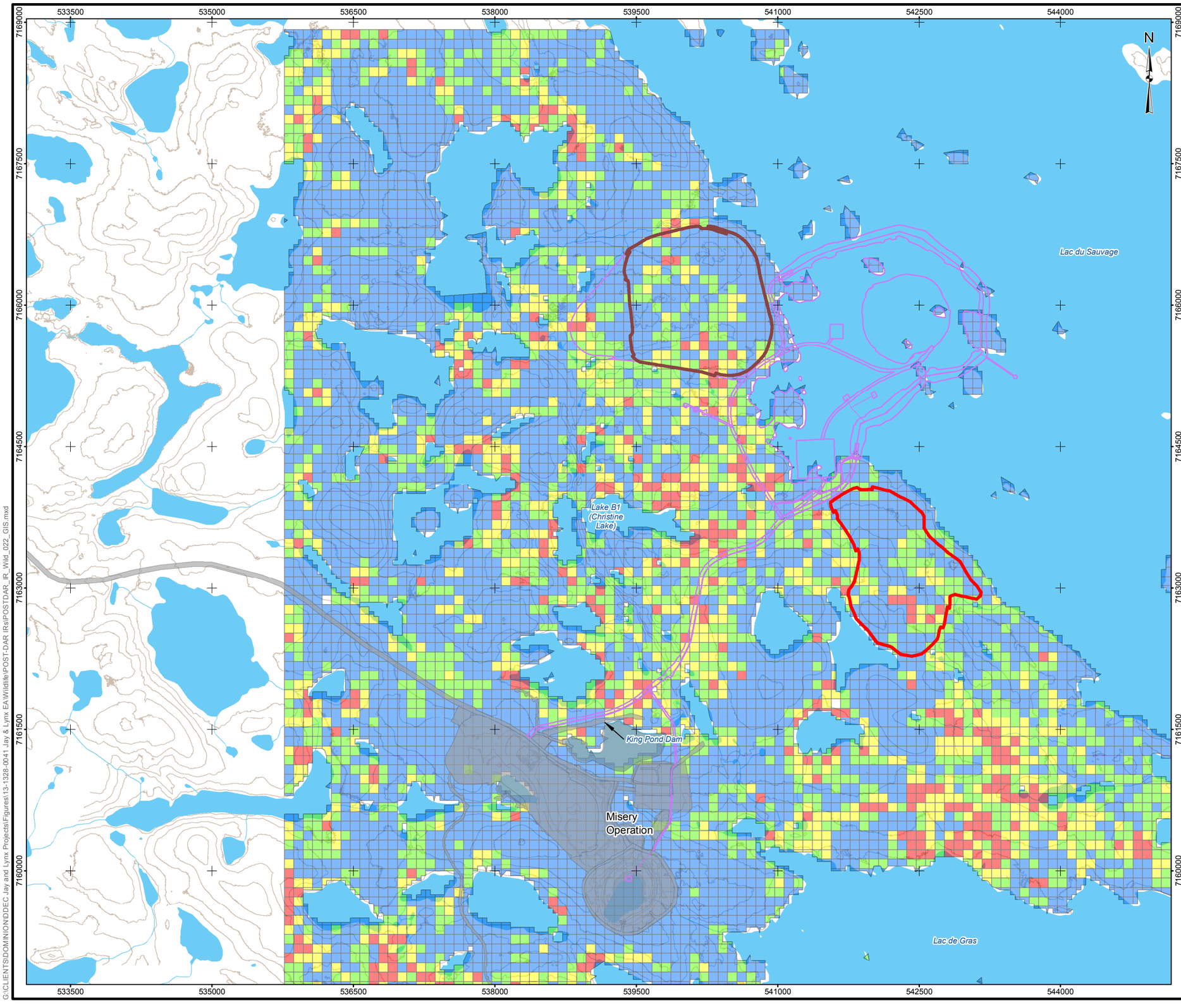
PROJECT
DOMINION DIAMOND™
JAY PROJECT
NORTHWEST TERRITORIES, CANADA

TITLE
HISTORIC CARIBOU TRAIL USE AND WRSA FOOTPRINTS

Golder Associates

PROJECT		1419751	FILE No. POSTDAR_IR_Wild_023_GIS	
DESIGN	FE	01/03/15	SCALE AS SHOWN	REV 0
GIS	EN/AK	02/04/15	MAP 95-3	
CHECK	FE	02/04/15		
REVIEW	KM	02/04/15		

G:\CLIENTS\DOMINION\DDEC Jay and Lynx Projects\Figures\13-1328-0041 Jay & Lynx EA\Wildlife\POST-DAR IRs\POSTDAR_IR_Wild_023_GIS.mxd



LEGEND

- EKATI MINE FOOTPRINT (MISERY OPERATION)
- PROPOSED JAY FOOTPRINT
- ELEVATION CONTOUR (10 m INTERVAL)
- WATERCOURSE
- WATERBODY

CARIBOU TRAIL CLASSIFICATION

- NONE
- LOW
- MEDIUM
- HIGH

JAY PROJECT WASTE ROCK STORAGE AREA (WRSA) ALTERNATIVES

- ALTERNATIVE 3 NORTH PORTION OF PILE
- ALTERNATIVE 3 SOUTH PORTION OF PILE

NOTES

ROAD, PIPELINES, AND POWER LINE ARRANGEMENT TO BE DETAILED AS PART OF FEASIBILITY DESIGN. APPROXIMATE CORRIDOR WIDTHS ARE SHOWN.
POTENTIAL QUARRY MAY BE REQUIRED WITHIN THE FOOTPRINT OF THE PROPOSED JAY WASTE ROCK STORAGE AREA

REFERENCE

JAY PROJECT CONCEPTUAL ENGINEERING REPORT, EKATI MINE, DOC#: 1313280041-E14037-R-REV0-4060, DATED: MAY 13, 2014
JAY PROJECT DESIGN BASIS MEMORANDUM FOR PRE-FEASIBILITY DESIGN OF PROJECT ROADS AND PIPELINE BENCHES, DOC#: 1313280041-E14031-TM-REVD-2020, DATED: AUGUST 1, 2014
LIDAR DATA OBTAINED FROM AURORA, 2013
WATER OBTAINED FROM CANVEC © NATURAL RESOURCES CANADA, 2012
DATUM: NAD83 PROJECTION: UTM ZONE 12N

DOCUMENT

DAR-MVEIRB-IR-95

1 0 1
SCALE 1:40,000 KILOMETRES

PROJECT
DOMINION DIAMOND™
JAY PROJECT
NORTHWEST TERRITORIES, CANADA

TITLE
HISTORIC CARIBOU TRAIL USE AND WRSA FOOTPRINTS

Golder Associates

PROJECT		1419751	FILE No. POSTDAR_IR_Wild_022_GIS	
DESIGN	FE	01/03/15	SCALE AS SHOWN	REV 0
GIS	EN/AK	01/03/15	MAP 95-4	
CHECK	FE	02/04/15		
REVIEW	KM	02/04/15		

G:\CLIENTS\DOMINION\DDEC Jay and Lynx Projects\Figures\13-1328-0041 Jay & Lynx EA\Wildlife\POST-DAR IRs\POSTDAR_IR_Wild_022_GIS.mxd

b) Irrespective of the road alignment selected the general design of the road, pipeline and power line will be equivalent and will have the following dimensions and geometry:

- Operating road width = 25 m;
- Pipe bench width (for the three pipelines) = 7.5 m;
- Caribou crossing locations, pipelines would be covered with gravel and edges of the road would be constructed with flatter side slopes (5 horizontal : 1 vertical) and also covered with gravel;
- Power line parallel to the road, opposite side of the road as the pipelines;
- Amount of fill (height of the road) varies based on the terrain;
- Where fill thickness, at the edge of the road exceeds 3 m, safety berms will be constructed. Note that where safety berms are required, caribou crossings will not be constructed (WCB NWT and NU 1995).

In accordance with Worker's Compensation Board of the NWT and Nunavut (WCB NWT and NU) Mine Health and Safety Regulations (1995), for two-way haul traffic, the minimum operating road width is required to be three times the width of the widest truck that will operate on the road. The maximum operating width of the haul traffic that will operate on the Jay Road is 8.3 m, which corresponds to an operating width of 25 m for two-way traffic.

As the road grades for Alternative 1 and Alternative 2 alignments are steeper than Alternative 3, it is likely that more safety berms will be required.

Figure 95-1 shows the typical cross-section of the Jay Road, constructed as a caribou crossing.

c) Dominion Diamond respects the feedback from Aboriginal communities and has changed or designed important aspects of the Project to reflect that feedback.

Because of the importance of the esker for caribou movement as identified through community engagement, the portion of the Jay Road that cuts through the esker will be constructed as a caribou crossing. The pipelines will be covered over with gravel along this section of road, except where there are valves or joints that require visual inspection for safe operation. Dominion Diamond will strategically construct the pipelines to reduce the number of joints or valves through the esker crossing.

Dominion Diamond's community engagement program has consistently indicated that the area to be crossed by the Jay Road is of special importance for caribou movement. In response to the feedback received through community engagement, Dominion Diamond proposes to construct an increased number of caribou crossings along the main section of the Jay Road (i.e., roughly between King Pond Dam and the approach to the active operations area at Lac du Sauvage). This main section of the Jay Road will be constructed with frequent and wide caribou crossings that will respect the communities' identification of the importance of this area for caribou movement. Dominion Diamond cannot build caribou crossings in areas where raised safety berms are required by the Mines Inspector, or at locations where there are necessary joints and valves in the pipelines that require visual inspection for safe operation. The pipelines will be strategically designed to reduce the number of locations that

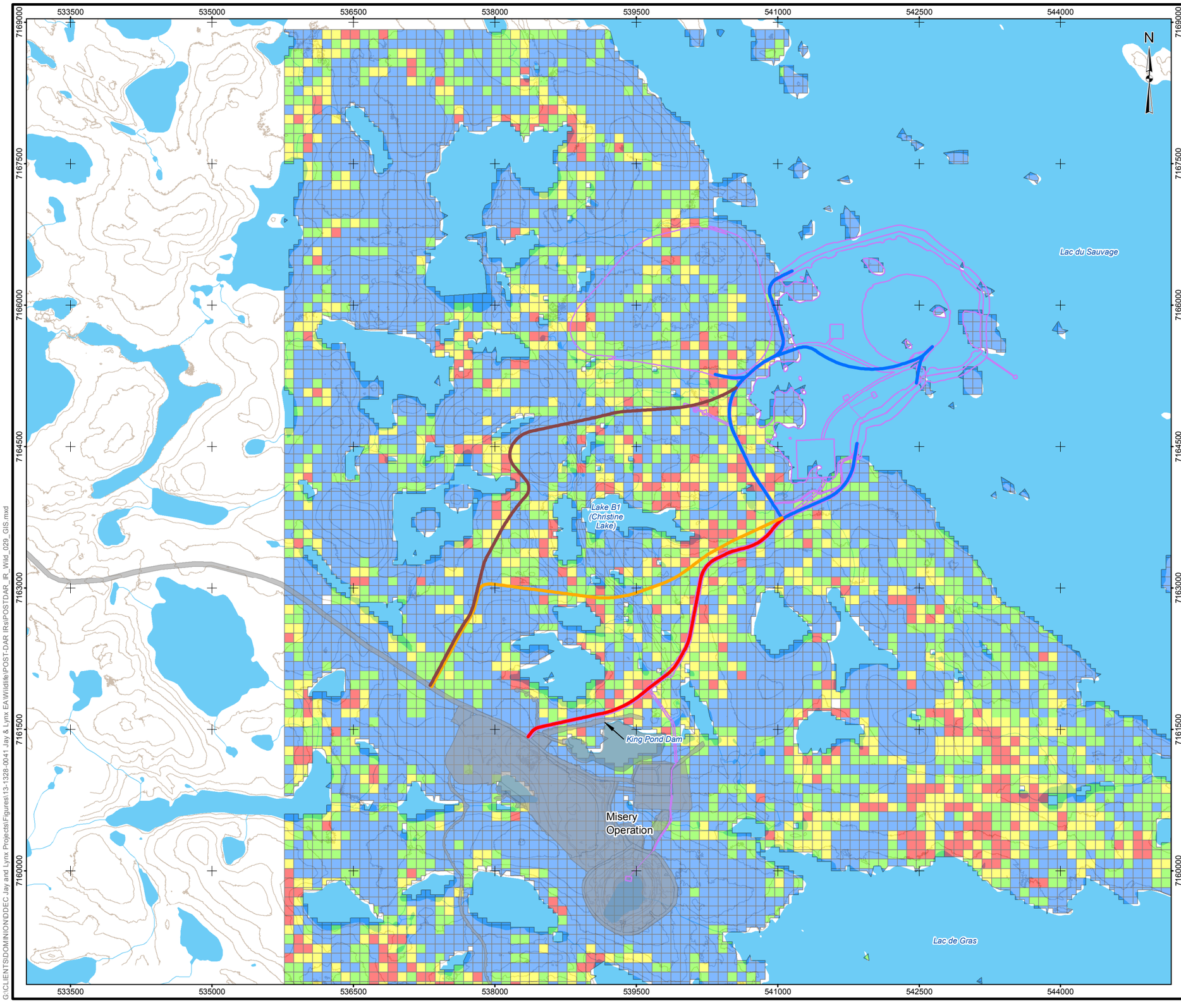
cannot be constructed as caribou crossings due to joints and valves. This approach also makes beneficial use of 'lessons-learned' from the original Misery Road, where caribou crossings were only installed after construction of the road.

Caribou crossings will be constructed using crushed rock (200 millimetres or less in size) so that the side slopes of the road are flatter and easier walking for caribou than the large roadfill rock. In the caribou crossing areas, the pipelines will also be covered with crushed rock. Once the road is constructed, monitoring, including by Aboriginal community members, will be implemented to assess the effectiveness of the constructed caribou crossings.

References:

Dominion Diamond (Dominion Diamond Ekati Corporation). 2014. Jay Project Developer's Assessment Report Sable Addendum. Prepared by Golder Associates Ltd., December 2014. Yellowknife, NWT, Canada.

WCB NWT and NU (Worker's Compensation Board of the NWT and Nunavut). 1995. Consolidation of Mine Health and Safety Regulations R-125, 1995. Available at: http//www.wscc.nt.ca/YourWSCC/Resources/Documents/Mines%20Health%20and%20Safety/Regus/NUMineRegulations.pdf.



LEGEND

- EKATI MINE FOOTPRINT (MISERY OPERATION)
- PROPOSED JAY FOOTPRINT
- ELEVATION CONTOUR (10 m INTERVAL)
- WATERCOURSE
- WATERBODY

CARIBOU TRAIL CLASSIFICATION

- NONE
- LOW
- MEDIUM
- HIGH

JAY ROAD ALTERNATIVES

- ROAD COMMON TO ALL ALTERNATIVES
- ALTERNATIVE 1
- ALTERNATIVE 2
- ALTERNATIVE 3

NOTES

ROAD, PIPELINES, AND POWER LINE ARRANGEMENT TO BE DETAILED AS PART OF FEASIBILITY DESIGN. APPROXIMATE CORRIDOR WIDTHS ARE SHOWN.
POTENTIAL QUARRY MAY BE REQUIRED WITHIN THE FOOTPRINT OF THE PROPOSED JAY WASTE ROCK STORAGE AREA

REFERENCE

JAY PROJECT CONCEPTUAL ENGINEERING REPORT, EKATI MINE, DOC#: 1313280041-E14037-R-REV0-4060, DATED: MAY 13, 2014
JAY PROJECT DESIGN BASIS MEMORANDUM FOR PRE-FEASIBILITY DESIGN OF PROJECT ROADS AND PIPELINE BENCHES, DOC#: 1313280041-E14031-TM-REVD-2020, DATED: AUGUST 1, 2014
LIDAR DATA OBTAINED FROM AURORA, 2013
WATER OBTAINED FROM CANVEC © NATURAL RESOURCES CANADA, 2012
DATUM: NAD83 PROJECTION: UTM ZONE 12N

DOCUMENT

DAR-MVEIRB-IR-95

1 0 1
SCALE 1:40,000 KILOMETRES

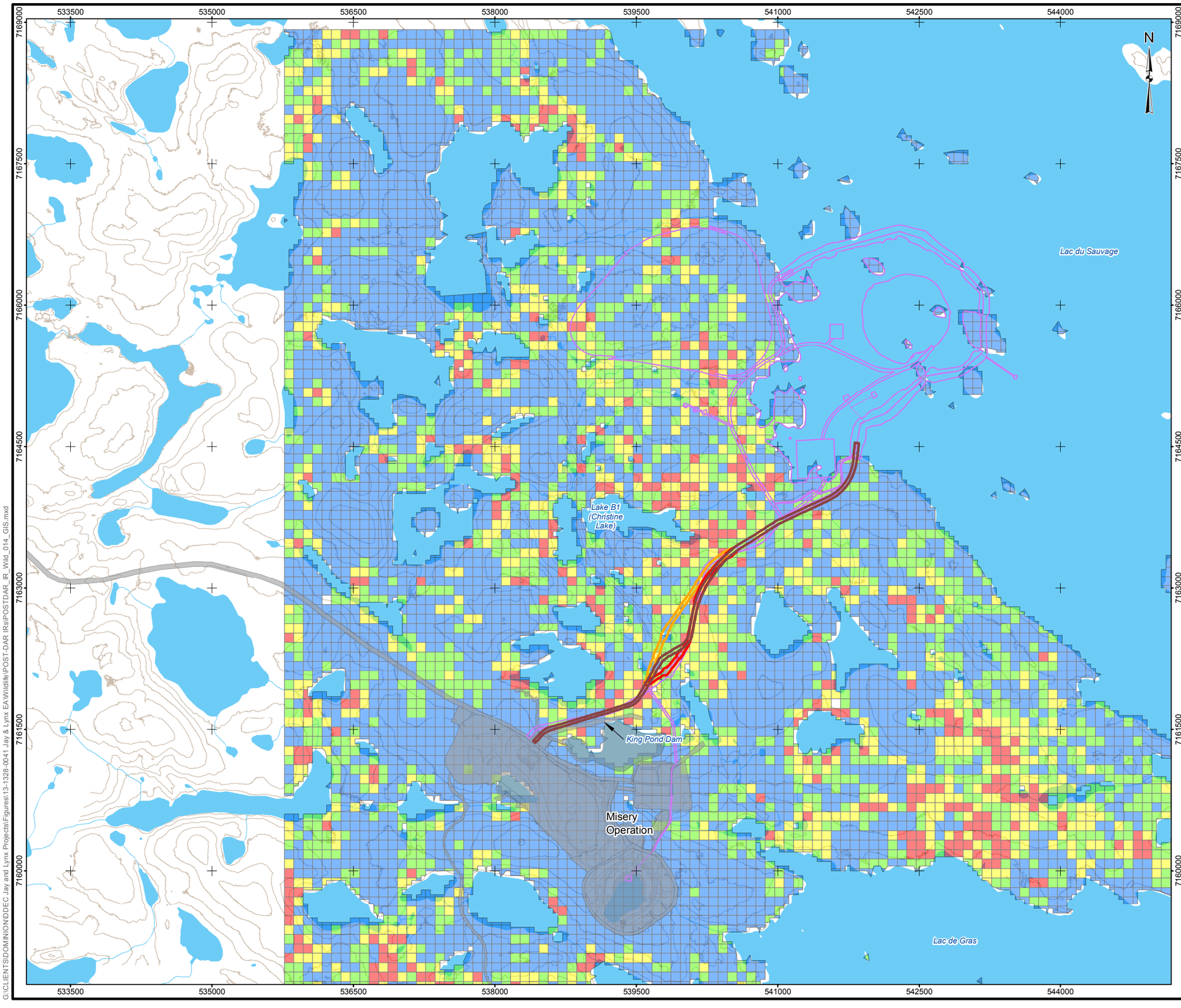
PROJECT
DOMINION DIAMOND™
JAY PROJECT
NORTHWEST TERRITORIES, CANADA

TITLE
HISTORIC CARIBOU TRAIL USE AND JAY ROAD ALTERNATIVES

Golder Associates

PROJECT		1419751	FILE No. POSTDAR_IR_Wild_029_GIS	
DESIGN	FE	01/03/15	SCALE AS SHOWN	REV 0
GIS	EN/AK	02/04/15	MAP 95-1	
CHECK	FE	02/04/15		
REVIEW	KM	02/04/15		

G:\CLIENTS\DOMINION\DDEC Jay and Lynx Projects\Figures\13-1328-0041 Jay & Lynx EA\Wildlife\POST-DAR IRs\POSTDAR_IR_Wild_029_GIS.mxd



LEGEND

- EKATI MINE FOOTPRINT (MISERY OPERATION)
- PROPOSED JAY FOOTPRINT
- ELEVATION CONTOUR (10 m INTERVAL)
- WATERCOURSE
- WATERBODY

CARIBOU TRAIL CLASSIFICATION

- NONE
- LOW
- MEDIUM
- HIGH

ESKER CROSSING OPTIONS

- OPTION 1
- OPTION 2
- OPTION 3

NOTES

ROAD, PIPELINES, AND POWER LINE ARRANGEMENT TO BE DETAILED AS PART OF FEASIBILITY DESIGN. APPROXIMATE CORRIDOR WIDTHS ARE SHOWN.
POTENTIAL QUARRY MAY BE REQUIRED WITHIN THE FOOTPRINT OF THE PROPOSED JAY WASTE ROCK STORAGE AREA

REFERENCE

JAY PROJECT CONCEPTUAL ENGINEERING REPORT, EKATI MINE, DOC#: 1313280041-E14037-R-REV0-4060, DATED: MAY 13, 2014
JAY PROJECT DESIGN BASIS MEMORANDUM FOR PRE-FEASIBILITY DESIGN OF PROJECT ROADS AND PIPELINE BENCHES, DOC#: 1313280041-E14031-TM-REVD-2020, DATED: AUGUST 1, 2014
LIDAR DATA OBTAINED FROM AURORA, 2013
WATER OBTAINED FROM CANVEC © NATURAL RESOURCES CANADA, 2012
DATUM: NAD83 PROJECTION: UTM ZONE 12N

DOCUMENT

DAR-MVEIRB-IR-95

1 0 1
SCALE 1:40,000 KILOMETRES

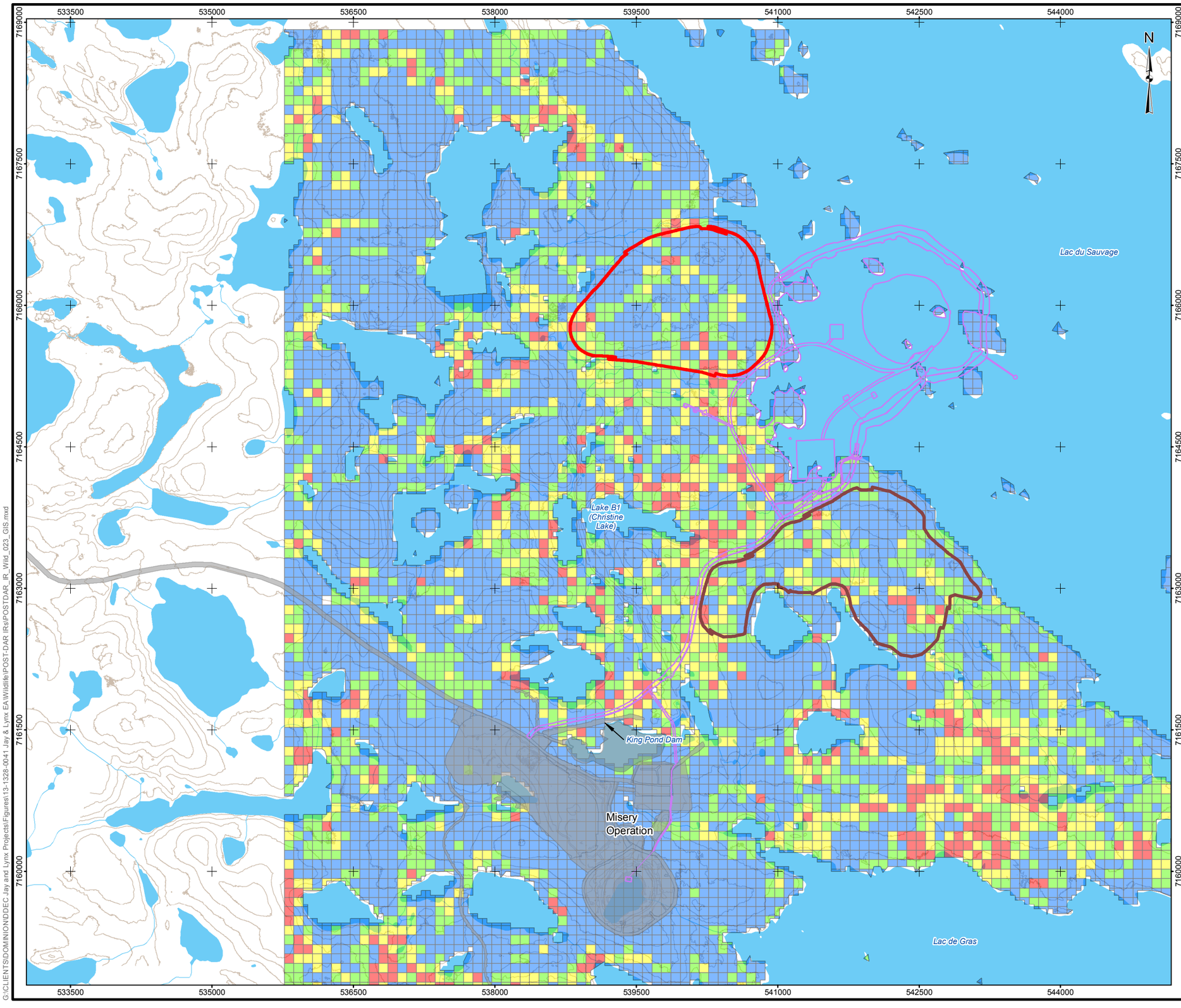
PROJECT
DOMINION DIAMOND™
JAY PROJECT
NORTHWEST TERRITORIES, CANADA

TITLE
HISTORIC CARIBOU TRAIL USE AND ESKER CROSSING OPTIONS

Golder Associates

PROJECT		1419751	FILE No. POSTDAR_IR_Wild_014_GIS	
DESIGN	FE	01/03/15	SCALE AS SHOWN	REV 0
GIS	EN/AK	02/04/15	MAP 95-2	
CHECK	FE	02/04/15		
REVIEW	KM	02/04/15		

G:\CLIENTS\DOMINION\DEC Jay and Lynx Projects\Figures\13-1328-0041 Jay & Lynx EA\Wildlife\POST-DAR IRs\POSTDAR_IR_Wild_014_GIS.mxd



LEGEND

- EKATI MINE FOOTPRINT (MISERY OPERATION)
- PROPOSED JAY FOOTPRINT
- ELEVATION CONTOUR (10 m INTERVAL)
- WATERCOURSE
- WATERBODY

CARIBOU TRAIL CLASSIFICATION

- NONE
- LOW
- MEDIUM
- HIGH

JAY PROJECT WASTE ROCK STORAGE AREA (WRSA) ALTERNATIVES

- ALTERNATIVE 1
- ALTERNATIVE 2

NOTES

ROAD, PIPELINES, AND POWER LINE ARRANGEMENT TO BE DETAILED AS PART OF FEASIBILITY DESIGN. APPROXIMATE CORRIDOR WIDTHS ARE SHOWN.
POTENTIAL QUARRY MAY BE REQUIRED WITHIN THE FOOTPRINT OF THE PROPOSED JAY WASTE ROCK STORAGE AREA

REFERENCE

JAY PROJECT CONCEPTUAL ENGINEERING REPORT, EKATI MINE, DOC#: 1313280041-E14037-R-REV0-4060, DATED: MAY 13, 2014
JAY PROJECT DESIGN BASIS MEMORANDUM FOR PRE-FEASIBILITY DESIGN OF PROJECT ROADS AND PIPELINE BENCHES, DOC#: 1313280041-E14031-TM-REVD-2020, DATED: AUGUST 1, 2014
LIDAR DATA OBTAINED FROM AURORA, 2013
WATER OBTAINED FROM CANVEC © NATURAL RESOURCES CANADA, 2012
DATUM: NAD83 PROJECTION: UTM ZONE 12N

DOCUMENT

DAR-MVEIRB-IR-95

1 0 1
SCALE 1:40,000 KILOMETRES

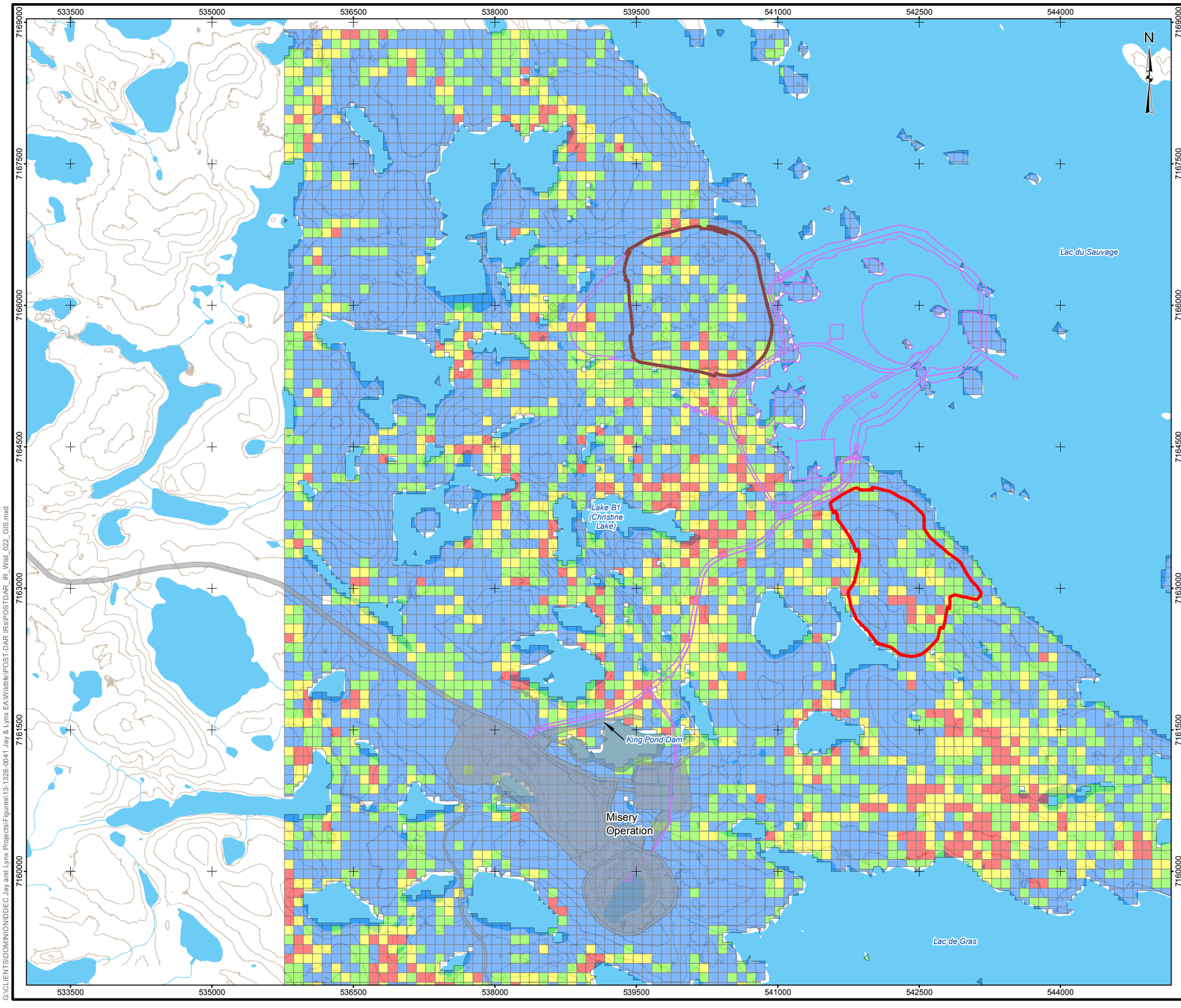
PROJECT
DOMINION DIAMOND™
JAY PROJECT
NORTHWEST TERRITORIES, CANADA

TITLE
HISTORIC CARIBOU TRAIL USE AND WRSA FOOTPRINTS

Golder Associates

PROJECT		1419751	FILE No. POSTDAR_IR_Wild_023_GIS	
DESIGN	FE	01/03/15	SCALE AS SHOWN	REV 0
GIS	EN/AK	02/04/15	MAP 95-3	
CHECK	FE	02/04/15		
REVIEW	KM	02/04/15		

G:\CLIENTS\DOMINION\DDEC Jay and Lynx Projects\Figures\13-1328-0041 Jay & Lynx EA\Wildlife\POST-DAR IRs\POSTDAR_IR_Wild_023_GIS.mxd



LEGEND

- EKATI MINE FOOTPRINT (MISERY OPERATION)
- PROPOSED JAY FOOTPRINT
- ELEVATION CONTOUR (10 m INTERVAL)
- WATERCOURSE
- WATERBODY

CARIBOU TRAIL CLASSIFICATION

- NONE
- LOW
- MEDIUM
- HIGH

JAY PROJECT WASTE ROCK STORAGE AREA (WRSA) ALTERNATIVES

- ALTERNATIVE 3 NORTH PORTION OF PILE
- ALTERNATIVE 3 SOUTH PORTION OF PILE

NOTES

ROAD, PIPELINES, AND POWER LINE ARRANGEMENT TO BE DETAILED AS PART OF FEASIBILITY DESIGN. APPROXIMATE CORRIDOR WIDTHS ARE SHOWN.
POTENTIAL QUARRY MAY BE REQUIRED WITHIN THE FOOTPRINT OF THE PROPOSED JAY WASTE ROCK STORAGE AREA

REFERENCE

JAY PROJECT CONCEPTUAL ENGINEERING REPORT, EKATI MINE, DOC#: 1313280041-E14037-R-REV0-4060, DATED: MAY 13, 2014
JAY PROJECT DESIGN BASIS MEMORANDUM FOR PRE-FEASIBILITY DESIGN OF PROJECT ROADS AND PIPELINE BENCHES, DOC#: 1313280041-E14031-TM-REVD-2020, DATED: AUGUST 1, 2014
LIDAR DATA OBTAINED FROM AURORA, 2013
WATER OBTAINED FROM CANVEC © NATURAL RESOURCES CANADA, 2012
DATUM: NAD83 PROJECTION: UTM ZONE 12N

DOCUMENT

DAR-MVEIRB-IR-95

1 0 1
SCALE 1:40,000 KILOMETRES

PROJECT
DOMINION DIAMOND™
JAY PROJECT
NORTHWEST TERRITORIES, CANADA

TITLE
HISTORIC CARIBOU TRAIL USE AND WRSA FOOTPRINTS

Golder Associates

PROJECT		1419751	FILE No. POSTDAR_IR_Wild_022_GIS	
DESIGN	FE	01/03/15	SCALE AS SHOWN	REV 0
GIS	EN/AK	01/03/15	MAP 95-4	
CHECK	FE	02/04/15		
REVIEW	KM	02/04/15		

G:\CLIENTS\DOMINION\DDEC Jay and Lynx Projects\Figures\13-1328-0041 Jay & Lynx EA\Wildlife\POST-DAR IRs\POSTDAR_IR_Wild_022_GIS.mxd

DOMINION DIAMOND

Information Request Number: DAR-MVEIRB-IR-96

Source: MVEIRB Information Requests from Chuck Hubert

Subject: Adaptive management, fencing, pit

DAR Section(s): 12

Preamble (MVEIRB):

The DAR (Table 1.2-1) notes that observations of caribou crossing Misery Haul Road were used to shape the design of berms around Misery and Beartooth pits but does not include details. Fencing has been adapted as a mitigation action and the Beartooth pit 'snow' fence was considered effective (p. 12-47). However, the remote cameras have revealed shortcomings for the Beartooth pit fence which suggests modified mitigation is required to protect caribou at the pits. Section 7.3.1.2 of the Terms of Reference includes the requirement to describe how raising water levels and changes in flow rates may impact caribou movement relative to shoreline changes. Map 3.2-4 indicates a buffer zone will be left along the shoreline at the base of the Jay waste rock pile which could lead caribou to the Jay Road and the dykes that modify the shoreline.

Request (MVEIRB):

a) Please list the specific monitoring, and subsequent changes in fencing design, to mitigate risks to caribou at pits including Misery and Jay Pits relative to Maps 1.4 and 1.5 (Sable Addendum)

b) Describe mitigation when the Misery pit is being used to manage water from Jay Pit in order to prevent caribou getting into and out of the pit.

c) Describe mitigation to manage movements around the Jay waste rock and shoreline.

Response:

a) Injury and mortality to caribou from open pits and changes to distribution resulting from altered water levels were effects pathways assessed in the Developer's Assessment Report (Section 12.3.2.2). The residual effect of injury or mortality to caribou from open pits was assessed as a secondary pathway (Section 12.3.2.2.2). Although individual caribou have been observed to cross fencing at the Ekati Mine, direct observation indicates that the fencing is having a positive effect at deflecting caribou from areas of heightened risk (Section 12.3.2.1.4). The Beartooth snow fence was suggested by Kugluktuk Elders as a temporary means of deflecting caribou around the Beartooth area, to be removed once mining and adjacent traffic had ceased (BHP Billiton 2007). Based on the observed benefits of this approach, this style of fencing was subsequently installed in other areas, such as the airstrip (to replace previous electrical wire fencing) and at the previous Pigeon test pit. However, It is also likely that the high level of activity in the vicinity of the Jay Pit and the restricted approach to enter into the diked area will effectively prevent caribou from being in close proximity. Unlike other pits at the Ekati Mine, such as Beartooth, there is only one land approach to the Jay Pit, which is readily monitored.

When assessing the risk to caribou, it is important to note that there have been no reports of caribou injury or mortalities related to open pits in the Northwest Territories (including the Misery Pit, which was first opened in 2000), which suggests that caribou recognize open pits as hazards, and actively avoid them.

Changes to the distribution of caribou resulting from altered water levels was assessed as a no linkage pathway (Section 12.3.2.2.1). Minor and local changes to riparian vegetation communities are predicted to occur in response to changes in soil moisture conditions (Section 11.3.2.2) but these changes are predicted to result in no measurable change to the abundance and distribution of caribou.

b) and c)

The current and effective mitigation practices and procedures for safety of caribou and other wildlife on roads, airstrip, and other areas (including open pits) of the Ekati Mine will be continued and expanded to include the Jay Project. These practices include reporting of wildlife sightings by all employees and deterring or removing wildlife from hazardous areas, and control of encounters by environment staff. Examples of mitigation that can be used to protect caribou from hazardous areas including open pits and the Jay waste rock storage area (WRSA) include the use of noise making deterrents and active movement techniques, which are common procedures implemented at the Ekati (Rescan 2009, 2010) and Diavik mines.

Caribou would be prevented from entering the Jay Pit using deterrents such as noise makers and movement techniques.

Construction of the Jay WRSA will build caribou egress ramps on a progressive basis, rather than waiting until final reclamation as per past practice. This approach will provide safe egress should caribou be present on the WRSA. Additionally, the WRSA is set back 300 metres from the esker as a means of providing space for caribou movement without the need for caribou to necessarily go onto the WRSA.

References:

Rescan (Rescan Environmental Services Ltd.). 2010. EKATI Diamond Mine: 2009 Wildlife Effects Monitoring Program. Prepared for BHP Billiton Canada Inc. by Rescan Environmental Services Ltd. Yellowknife, NWT, Canada.

Rescan. 2011. EKATI Diamond Mine: 2010 Wildlife Effects Monitoring Program. Prepared for BHP Billiton Canada Inc. by Rescan Environmental Services Ltd. Yellowknife, NWT, Canada.

BHP Billiton (BHP Billiton Canada Inc.). 2007. Caribou and Roads: Implementing Traditional Knowledge in Wildlife Monitoring at the Ekati Diamond Mine. 2006 Annual Report. Prepared for BHP Billiton Canada Inc. by Rescan Environmental Services Ltd. Yellowknife, NWT, Canada.

DOMINION DIAMOND

Information Request Number: DAR-MVEIRB-IR-97

Source: MVEIRB Information Requests from Chuck Hubert

Subject: Barren-ground Caribou

DAR Section(s): 7

Preamble (MVEIRB):

a) The DAR's CALPUFF model isopleths (Map 7.4-14 annual deposition PM2.5; application case) covers a smaller area than the kg/ha/yr isopleths in the Ekati 2006 CALPUFF model (Fig. 2.3-3). The 2006 model showed that dustfall predictions extend outside the claim block and include the south shore of Lac de Gras. The baseline case states it includes Diavik but not whether the Construction and Application case include Diavik's return to open pit mining (more dustfall) with the development of A21.

b) The DAR includes relatively little use of existing reports of dustfall and lichen sampling for Ekati which suggest that levels of mining activity (open pit or underground) and ore-hauling distance determine levels of dustfall more than mitigation. Correlation between dustfall and mine activity could be used for adaptive management (to determine if and when mitigation needs to intensify or be reduced). Dustfall levels as indexed by concentration of metals in lichens were higher in 2005 than in 2008. This was a time when ore was mined from Beartooth and Fox and mining was underground mining at Koala and Panda. Although mining at the Misery Pit stopped in 2005, ore was trucked along the Misery Road until fall 2007. Rescan (2011) reports that "Misery haul road was a major contributor to ambient PM2.5 concentrations within the EKATI claim boundary. In 2009-2011, total dustfall was significantly higher near the Fox haul road compared to the Misery haul road although dust suppression mechanisms for 2009 to 2011 did not differ from previously . Rescan. 2012. EKATI Diamond Mine: 2011 Air Quality Monitoring Program. Prepared for BHP Billiton Canada Inc. by Rescan Environmental Services Ltd.: Yellowknife, Northwest Territories. Rescan Environmental Services Ltd. 2006.Assessment of Acid and Fugitive Dust Deposition Using CALPUFF Air Dispersion Model" and "EKATI Diamond Mine CALPUFF Air Dispersion Modelling Assessment," prepared for BHP Billiton Diamonds Inc. by Rescan Environmental Services Ltd.: Yellowknife, Northwest Territories. http://www.mvlwb.ca/Boards/WLWB/Registry/2009/W2009L2-0001/W2009L2-0001%20-%20BHP%20-%20Air%20Quality%20Monitoring%20Program%20-%202011%20Version%20-%20Aug%203_11.pdf Rescan. 2011. EKATI Diamond Mine: 2008 Air Quality Monitoring Program. Prepared for BHP Billiton Canada Inc. by Rescan Environmental Services Ltd.: Yellowknife, Northwest Territories.

Request (MVEIRB):

a) Please compare the CALPUFF 2006 and 2012 model predictions; provide a map of annual or seasonal TSP and PM2.5 levels relative to the snow and lichen sampling stations (Rescan 2008 Fig 3 2-1). Confirm whether the Construction or Application case includes Diavik's A21open pit.

b) Please describe how mitigation to reduce dustfall changed in 2005-2012 relative to changes in mining activity and table (or graph) an indicator of mine activity (such as amount of waste rock trucked; amount of diesel; truck mileage) to determine correlations with dustfall. Please describe whether a correlation could be used to help guide adaptive management, to decide if and when mitigation should be intensified or reduced.

Response:

a) The Information Request (IR) preamble discusses the isopleths for Map 7.4-14 (Application Case Annual $PM_{2.5}$ Concentrations) of the DAR and the seasonal TSP deposition isopleths from Figure 3.2-3 (incorrectly referred as Figure 2.3-3, as there is no such figure in the 2006 Rescan report) of the Rescan dispersion modelling for the Ekati Mine (Rescan 2006).

Map 7.4-14 of the DAR presents the Application Case maximum annual $PM_{2.5}$ (particulate matter of mean aerodynamic diameter of 2.5 microns [µm] or less) concentration predictions. This is different from TSP (total suspended particulate) which can include larger particulates up to 100 µm in mean aerodynamic diameter. Figure 3.2-3 of the Rescan (2006) report also presents TSP deposition rate, which is the rate of TSP mass deposited on an area over time, rather than ground-level air concentration, which is the mass suspended in the air within a volume of air. As the isopleths in these two maps present different information (different particle size and different physical properties), they are not comparable.

The closest comparison to the dustfall predictions between the 2006 study and the Jay Project Air Quality Assessment Update (Golder 2015[1]) is the TSP deposition predictions provided in both studies. The TSP deposition predictions were presented in the 2006 study as separate summer and winter TSP deposition rates. However, the TSP deposition predictions presented as a part of the Jay Project Air Quality Assessment Update (please see the response to DAR-LKDFN-IR-10 for details) were annual TSP deposition rates. The seasonal TSP deposition rates from the 2006 study were compared to the Base Case annual TSP deposition rates for the Project in Maps 97-1 to 97-4. Map 97-1 shows the summer predictions from the 2006 study, and Map 97-2 shows the Base Case annual predictions at the corresponding contour levels with Map 97-1. Map 97-3 shows the winter predictions from the 2006 study, and Map 97-4 shows the Base Case annual predictions at the corresponding contour levels with Map 97-3.

[1] The Jay Project Air Quality Assessment Update (Golder 2015) was submitted as part of the adequacy review information.

gis no. 648-7-24 | Job No. 648-7 | May 10, 2006

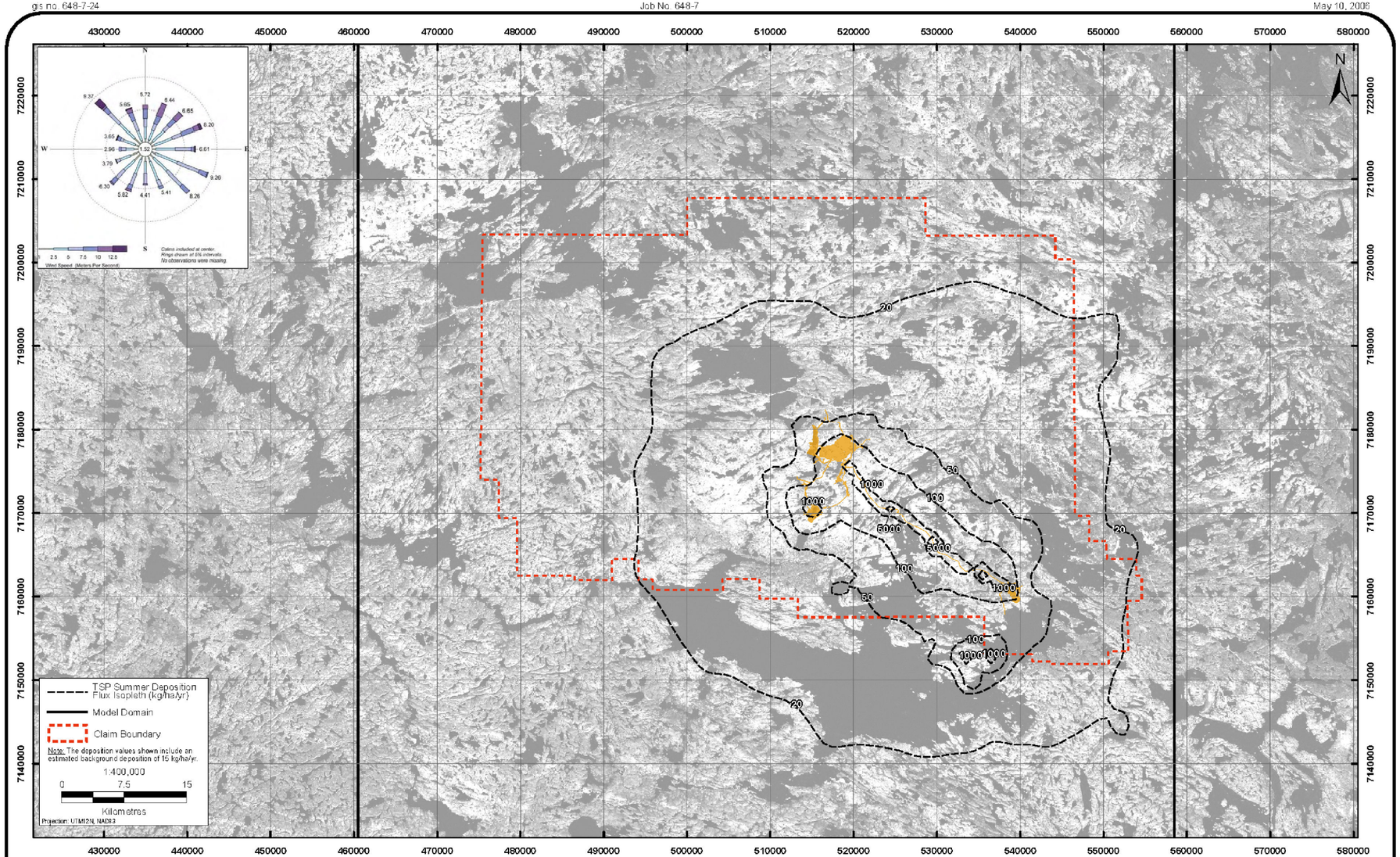


FIGURE 3.2-4

Average Runtime TSP Deposition Flux (kg/ha/yr) - Summer (June 2 to September 30)

bhpbilliton

Rescan™

DOCUMENT
DAR-MVEIRB-IR-97

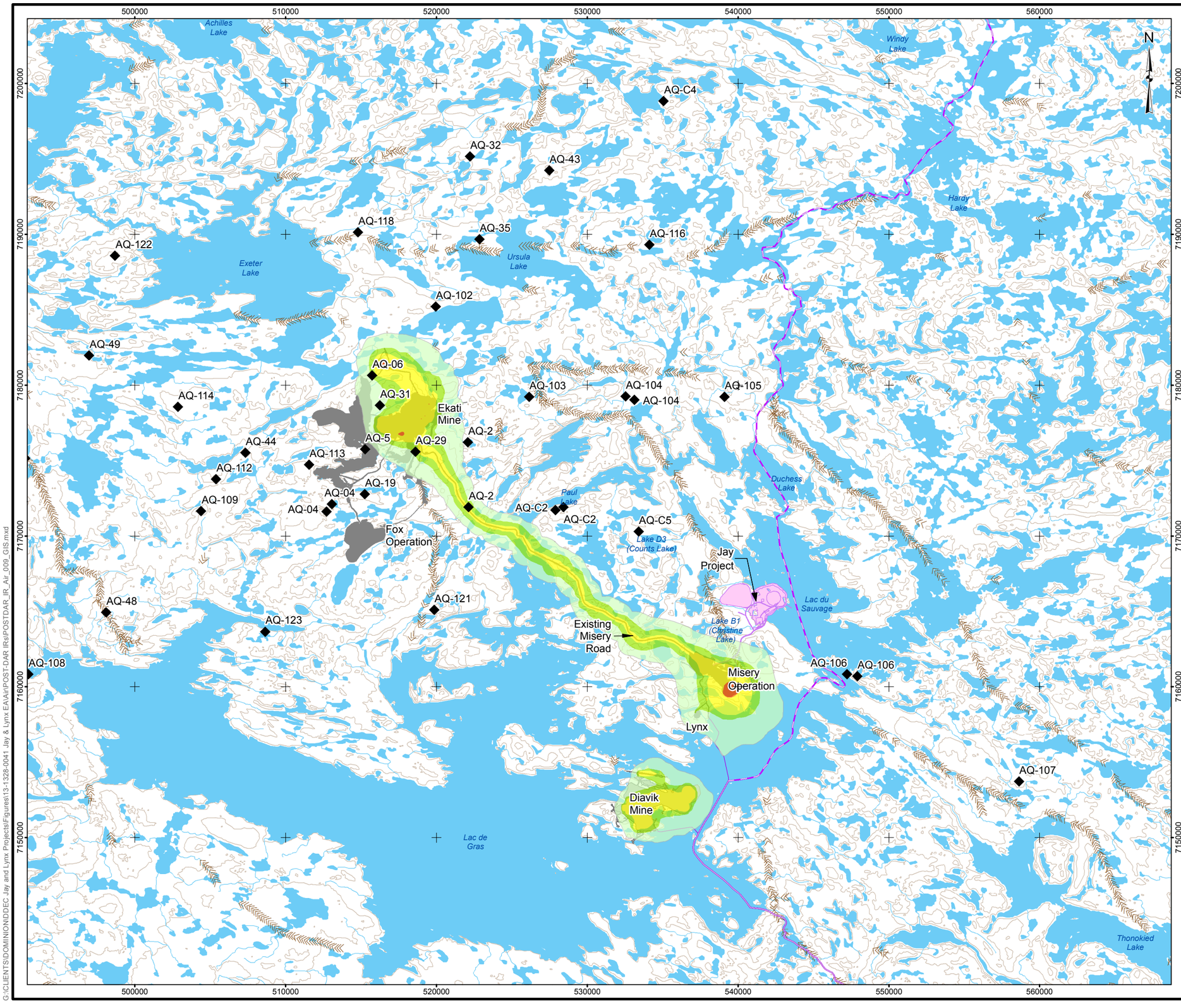
PROJECT
DOMINION DIAMOND™
JAY PROJECT
NORTHWEST TERRITORIES, CANADA

TITLE
2006 TSP DEPOSITION RATE - SUMMER

Golder Associates

PROJECT		1419751	FILE No. POSTDAR_IR_Air_007_GIS	
DESIGN	AP	02/04/15	SCALE AS SHOWN	REV 0
GIS	LMS	02/04/15		
CHECK	DC	02/04/15	**MAP 97-1**	
REVIEW	CM	02/04/15		

G:\CLIENTS\DOMINIONDDEC_Jay and Lynx Projects\Figures\13-1328-0041_Jay & Lynx EA\Air\POST-DAR IRs\POSTDAR_IR_Air_007_GIS.mxd



LEGEND

- EKATI MINE FOOTPRINT
- DIAVIK MINE FOOTPRINT
- PROPOSED JAY FOOTPRINT
- WINTER ROAD
- TIBBITT TO CONTWOYTO WINTER ROAD
- NORTHERN PORTION OF TIBBITT TO CONTWOYTO WINTER ROAD
- ELEVATION CONTOUR (20 m INTERVAL)
- ESKER
- WATERCOURSE
- WATERBODY
- LICHEN/SNOW/DUSTFALL STATION

DEPOSITION (kg/ha/yr)

- 0 to <20 (BLANK)
- 20 to <50
- 50 to <100
- 100 to <1,000
- 1,000 to <5,000
- 5,000 and Above

REFERENCE

NATIONAL TOPOGRAPHIC BASE DATA (NTDB) 1:250,000
CANVEC © NATURAL RESOURCES CANADA, 2012
NATURAL RESOURCES CANADA, CENTRE FOR TOPOGRAPHIC INFORMATION, 2012
DATUM: NAD83 PROJECTION: UTM ZONE 12N

DOCUMENT

DAR-MVEIRB-IR-97

5 0 5
SCALE 1:250,000 KILOMETRES

PROJECT
DOMINION DIAMOND™

JAY PROJECT
NORTHWEST TERRITORIES, CANADA

TITLE

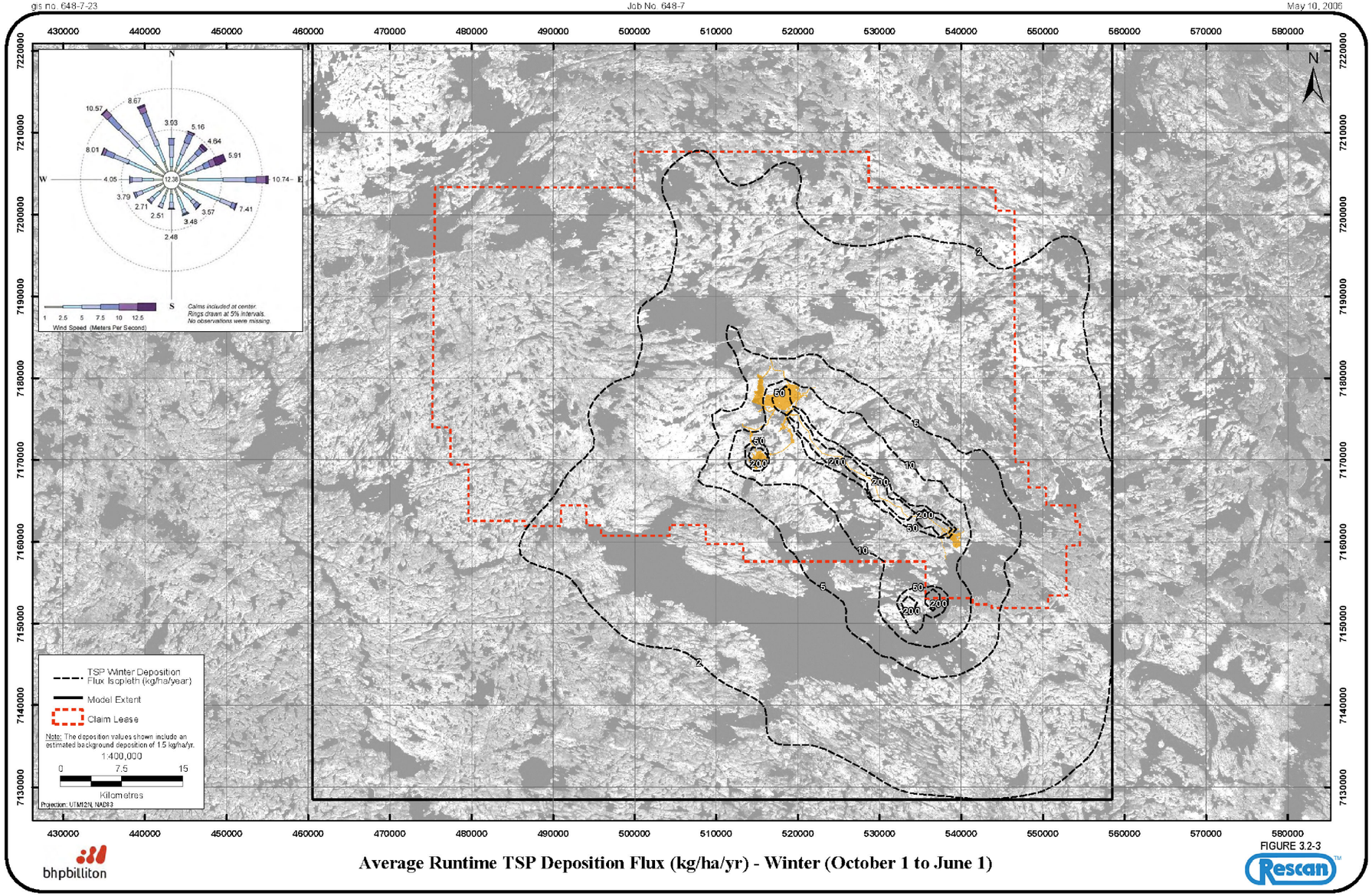
BASE CASE TSP DEPOSITION RATE - ANNUAL

Golder Associates

PROJECT	1419751		FILE No. POSTDAR_IR_Air_009_GIS	
DESIGN	AP	02/04/15	SCALE AS SHOWN	REV 1
GIS	ANK	02/04/15		
CHECK	DC	02/04/15	MAP 97-2	
REVIEW	CM	02/04/15		

G:\CLIENTS\DOMINION\DDEC Jay and Lynx Projects\Figures\13-1328-0041 Jay & Lynx EAA\ir\POST-DAR IRs\POSTDAR_IR_Air_009_GIS.mxd

gis no. 648-7-23 | Job No. 648-7 | May 10, 2006



bhpbilliton

Average Runtime TSP Deposition Flux (kg/ha/yr) - Winter (October 1 to June 1)

FIGURE 3.2-3

Rescan™

DOCUMENT
DAR-MVEIRB-IR-97

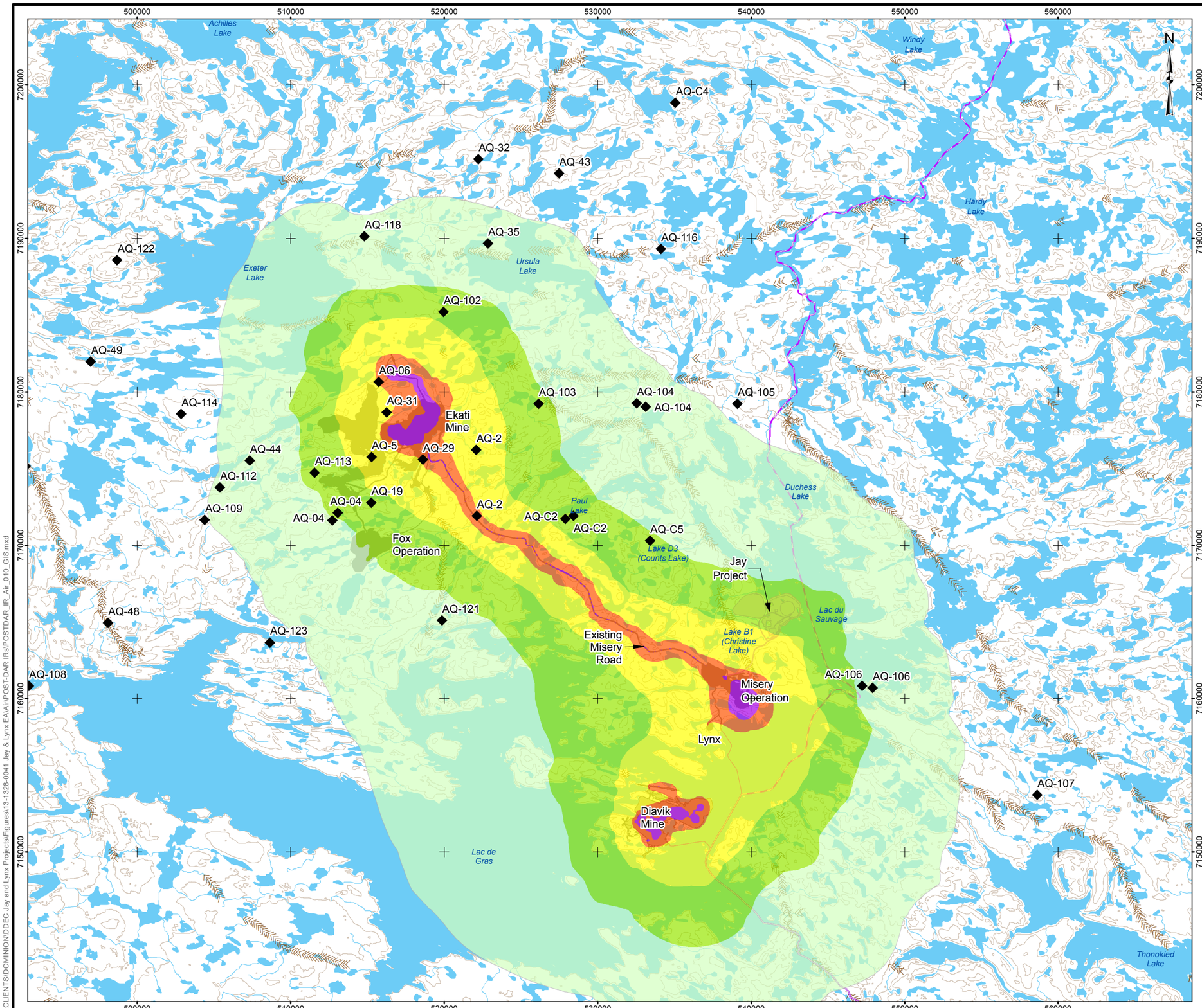
PROJECT
DOMINION DIAMOND™
JAY PROJECT
NORTHWEST TERRITORIES, CANADA

TITLE
2006 TSP DEPOSITION RATE - WINTER

Golder Associates

PROJECT		1419751	FILE No. POSTDAR_IR_Air_008_GIS	
DESIGN	AP	02/04/15	SCALE AS SHOWN	REV 0
GIS	LMS	02/04/15		
CHECK	DC	02/04/15	**MAP 97-3**	
REVIEW	CM	02/04/15		

G:\CLIENTS\DOMINION\DDEC Jay and Lynx Projects\Figures\13-1328-0041 Jay & Lynx EA\Air\POST-DAR IRs\POSTDAR_IR_Air_008_GIS.mxd



LEGEND

- EKATI MINE FOOTPRINT
- DIAVIK MINE FOOTPRINT
- PROPOSED JAY FOOTPRINT
- WINTER ROAD
- TIBBITT TO CONTWOYTO WINTER ROAD
- NORTHERN PORTION OF TIBBITT TO CONTWOYTO WINTER ROAD
- ELEVATION CONTOUR (20 m INTERVAL)
- ESKER
- WATERCOURSE
- WATERBODY
- LICHEN/SNOW/DUSTFALL STATION

DEPOSITION (kg/ha/yr)

- 0 to <2 (BLANK)
- 2 to <5
- 5 to <10
- 10 to <50
- 50 to <250
- 250 and Above

REFERENCE

NATIONAL TOPOGRAPHIC BASE DATA (NTDB) 1:250,000
CANVEC © NATURAL RESOURCES CANADA, 2012
NATURAL RESOURCES CANADA, CENTRE FOR TOPOGRAPHIC INFORMATION, 2012
DATUM: NAD83 PROJECTION: UTM ZONE 12N

DOCUMENT

DAR-MVEIRB-IR-97

5 0 5
SCALE 1:250,000 KILOMETRES

PROJECT
DOMINION DIAMOND™
JAY PROJECT
NORTHWEST TERRITORIES, CANADA

TITLE

BASE CASE TSP DEPOSITION RATE - ANNUAL

Golder Associates

PROJECT	1419751		FILE No. POSTDAR_IR_Air_010_GIS	
DESIGN	AP	02/04/15	SCALE AS SHOWN	REV 1
GIS	ANK	02/04/15		
CHECK	DC	02/04/15	MAP 97-4	
REVIEW	CM	02/04/15		

G:\CLIENTS\DOMINION\DDEC Jay and Lynx Projects\Figures\13-1328-0041 Jay & Lynx EAA\ir\POST-DAR IRs\POSTDAR_IR_Air_010_GIS.mxd

Summer TSP deposition predictions are expected to be higher than the winter TSP deposition predictions due to the drier conditions that can promote fugitive dust emissions. The annual TSP deposition predictions are bounded by the (higher) summer and (lower) winter predictions. Overall, the Base Case isopleths are smaller compared to the 2006 study. However, it should be noted that there are several differences in the between the two studies when comparing their TSP deposition predictions.

The 2006 study is based on the Ekati Mine's air emissions data from 2003, while the Developer's Assessment Report (DAR) Base Case is based on the Ekati Mine's projected 2015 emission inventory. Although the total Ekati Mine emissions between the two emission inventory years are in the same order of magnitude, the emissions from the individual sources may vary due to the activities at the mine in these two different years.

The potential differences in the dispersion model parameters between the two studies may also explain differences in the deposition predictions. It appears that different dry deposition parameters for particles in the model were used between two studies. Although the CALPUFF model does provide default dry deposition parameters for $PM_{2.5}$ and PM_{10}, it does not for TSP. The default parameters from the CALPUFF model species library for $PM_{2.5}$ and PM_{10} are for particulate matter (PM) resulting from combustion process rather than mechanical process, such as fugitive PM (e.g., road dust, blasting, and wind erosion). Therefore, the dry deposition parameter values chosen by modellers for fugitive PM are typically based on the nature of the PM and the modeller's professional experience and opinion. The different dry deposition parameter values used between the two studies may contribute to some of the differences noted in the predictions.

Neither the Base Case, Application Case, nor the Construction Case in the DAR included Diavik's A21 Pit. It is expected that any change to air quality predictions near the Project from emissions due to the addition of the A21 Pit would be very low, and that emissions from the Diavik Mine with the addition of the A21 open pit mine should remain relatively similar to those assessed in the DAR, with marginal increases in dust emissions. The bulk of any changes to predictions as a result of the inclusion of A21 will likely be confined to areas near the Diavik Mine disturbance areas. Please refer to the response for DAR-MVEIRB-IR-78 which addresses the expected air quality effects of the inclusion of A21 open pit mining in more detail.

b) The Ekati Mine Air Quality Management and Monitoring Plan (AQMMP) undergoes periodic review and update based on current monitoring information and changes to mine operating activities. The 2009 AQMMP is currently undergoing review based on the results of the most recent 3-year monitoring cycle that was conducted in 2014.

An Air Quality Management Plan was first described in Volume III of the Environmental Impact Statement (BHP 1995). That plan described emissions control equipment and procedures to manage and monitor that equipment, and air quality monitoring activities. The Air Quality Monitoring Program (AQMP) was initiated in 1998, which in part assesses the effectiveness of the AQMMP. The AQMMP has since updated those procedures and activities.

Additional snow sampling was undertaken in 2000 as part of the baseline data collection for the Misery site (BHP Billiton 2006).

An air dispersion modelling assessment was performed as part of the 2005 Air Quality Monitoring Program (Rescan 2006).

Dustfall monitoring was initiated in 2006 in response to a review conducted by BHP Billiton, external consultants, and government stakeholders (BHP Billiton 2010).

In 2008, in consultation with the Independent Environmental Monitoring Agency (IEMA), the Government of the Northwest Territories Environment and Natural Resources (GNWT-ENR) and Environment Canada, several changes were made to the AQMMP (BHP Billiton 2009). They included:

- The Continuous Air Monitoring Station (CAMS) was relocated from the Grizzly Lake location to the current Polar Explosives location to better monitor effects from the main complex.
- The methods and locations for sampling snow and lichen were updated to provide more representative samples and better coverage.
- The locations for dustfall monitors were updated to provide better coverage.

The DAR provides Dominion Diamond's intention to amend the AQMMP to address monitoring and mitigation of air quality for the Jay Project. This will build on the current Ekati Mine AQMMP. Detailed changes to the AQMMP will be developed as part of the regulatory permitting based on the outcome of the Environmental Assessment. The Government of the Northwest Territories, Environment Canada, aboriginal communities, and other organizations will be engaged during the amendment of the AQMMP.

References:

BHP (Broken Hill Proprietary Company). 1995. NWT Diamond Project Environmental Impact Statement, Volume IV, Impacts and Mitigation – Part 2.

BHP Billiton. 2006. Ekati Diamond Mine: 2005 Air Quality Management and Monitoring Plan, October 2006.

BHP Billiton. 2009. Ekati 2009 Air Quality Management and Monitoring Plan, March 2009.

BHP Billiton. 2010. Ekati 2008 Air Quality Monitoring Program, January 2010.

Golder (Golder Associates Ltd.). 2015. Technical Memorandum. Jay Project Air Quality Assessment Update. Prepared for Dominion Diamond Ekati Corporation. Yellowknife, NWT, Canada. January 19, 2015. Submitted to the Mackenzie Valley Environmental Impact Review Board on January 19, 2015.

Rescan (Rescan Environmental Services Ltd.). 2006. Ekati Diamond Mine CALPUFF Air Dispersion Modelling Assessment, October 2006.

DOMINION DIAMOND

Information Request Number: DAR-MVEIRB-IR-98

Source: MVEIRB Information Requests from Chuck Hubert

Subject: Barren-ground Caribou - Low frequency noise

DAR Section(s): 13.4.2

Preamble (MVEIRB):

The sound frequency levels used in the disturbance coefficient for caribou 40-55 decibels) did not include Low Frequency sound (<20 decibels). Section 3.1.2 (Low Frequency Noise Results) concluded that low frequency noise was not present. There is no reference to measurements during blasting. Caribou have highly enervated hooves and aboriginal knowledge is that their feet are 'sensitive'.

Request (MVEIRB):

Please describe low frequency sound transmission potential during blasting and detection distances. Please describe how the modeled decibel ranges compare with the lower limit of caribou hearing with regard to sensory disturbance from the project.

Response:

In the Developer's Assessment Report (DAR) for the Jay Project (Project), steady-state noise associated with construction and operation activities was assessed separately from short-duration, highly-impulsive noise and vibration associated with blasting. The character of steady-state noise and blasting noise/vibration are sufficiently different that it was not possible to identify a single assessment approach or set of assessment criteria appropriate for both phenomena.

Because the Northwest Territories does not provide a legal framework or regulatory guidance for the assessment of noise and vibration, the DAR for the Project relied on widely-accepted noise and vibration assessment guidelines from other jurisdictions. In particular, the DAR:

- assessed steady-state noise associated with Project construction using guidance provided by Health Canada (Health Canada 2010);
- assessed steady-state noise associated with Project operation using guidance provided by the Alberta Energy Regulator (EUB 2007); and,
- assessed short-duration, highly-impulsive noise and vibration associated with blasting using guidance provided by the Ontario Ministry of Environment (OMOE 1978).

Steady-State Noise

In accordance with the Health Canada and Alberta Energy Regulator noise guidelines, the DAR modelled steady-state construction and operation noise using the widely-accepted International Organization for Standardization (ISO) propagation standard ISO 9613-2 (ISO 1996). As implemented in the DAR, the ISO 9613-2 standard breaks the spectra of noise sources down into nine octave-bands centred on

frequencies of 31.5 hertz (Hz), 63 Hz, 125 Hz, 250 Hz, 500 Hz, 1 kilohertz (kHz), 2 kHz, 4 kHz, and 8 kHz. The specific octave-band frequencies identified by the ISO 9613-2 standard reflect the range of human frequency sensitivity.

Research into the range of caribou frequency sensitivity has found that caribou are less sensitive to low frequency noise than humans (Flydal et al. 2001). For example, the caribou hearing threshold at 63 Hz is approximately 30 decibels (dB) higher than the human hearing threshold at 63 Hz. Put another way, a human could be expected to detect a low frequency noise approximately 30 dB quieter than could be detected by a caribou.

Because human hearing is more sensitive to low frequencies than caribou hearing, using the human-centric ISO 9613-2 standard and human-centric Health Canada and Alberta Energy Regulator guidelines to assess steady-state low frequency noise effects from the Project on caribou can be considered conservative – i.e., tending to overestimate the magnitude of the effect. Based on the Alberta Energy Regulator guideline, Section 13B1.6.2.2 of the DAR concluded that there was no potential for steady-state low frequency noise issues at three relevant receptors (Rsouth, Rwest, and Rsouthwest), and only a small potential for low frequency noise issues at the fourth relevant receptor (Rnorth). Furthermore, the potential low frequency noise issue at Rnorth was very likely the result of conservatism in the modelling. These conclusions were based on a human-centric assessment of Project noise; however, because caribou are less sensitive to low frequency noise than humans, these conclusions about steady-state low frequency noise also apply to caribou.

As regards to detection distances and caribou hearing thresholds, it is important to note that the caribou hearing threshold established in a laboratory environment is not the same as the minimum noise level that a caribou could be expected to detect in the outdoor environment. For example, laboratory research suggests that caribou hearing is sensitive to noise levels lower than 10 dB in the frequency band between 1 kHz and 16 kHz (Flydal et al. 2001) but the presence of masking noises (e.g., wind, birds, insects) means that caribou are unlikely to detect noise levels as low as 10 dB in the outdoor environment.

Detectability of a given noise in the outdoor environment depends on physical characteristics of the noise itself and the background noise (i.e., noise level and spectral/temporal structure) and on physiological or psychological factors (i.e., the acuity of a given listener's hearing/auditory system and the amount of attention that a given listener is paying to the noise). As such, audibility is nearly impossible to predict or assess. Instead, regulations such as those provided by Health Canada and the Alberta Energy Regulator establish noise thresholds below which noise levels are considered to be acceptable. Based on these regulatory thresholds, the DAR concluded steady-state noise levels from the Project, including low frequency noise levels, are acceptable.

Section 12 of the DAR presents a caribou-specific assessment of sensory disturbance effects from the Project. The sensory disturbance assessment used results from the noise assessment (presented in Section 13B of the DAR) to establish Zones of Influence (ZOIs) around the Project. The established ZOIs were large enough to capture the extent of steady-state Project noise levels greater than 40 to 45 A-weighted decibels (dBA) for operation and 50 to 55 dBA for construction. As discussed above, because caribou hearing is less sensitive to low frequency noise than human hearing, using human-centric A-weighted noise level predictions to establish caribou ZOIs can be considered a conservative approach.

Blasting Noise and Vibration

In accordance with OMOE guidelines for the assessment of blasting, the DAR modelled blasting activities using a widely-accepted handbook published by the International Society of Explosives Engineers (ISEE 1998). In particular, blasting activities were characterized using two parameters:

- Peak Particle Velocity (PPV) expressed in millimetres per second (mm/s); and,
- Peak Pressure Level (PPL) expressed in linear decibels (dBL).

PPV is a measure of blasting-induced ground vibration and PPL is a measure of blasting-induced pressure changes in the atmosphere.

Much of the energy associated with blasting is very low frequency (i.e., distributed below 50 Hz). The ISEE approach used to estimate PPV and PPL associated with Project blasting accounts for all energy associated with blasting, including the very low frequency energy. Furthermore, the ISEE approach to estimating PPV and PPL treats the energy associated with blasting as a purely physical phenomena and does not apply any type of correction or weighting to reflect human perception. In particular, the PPV and PPL thresholds used in the DAR were established by the OMOE so as to prevent physical damage to buildings and other structures. As such, the results of the Project blasting assessment presented in Section 13B of the DAR are as applicable to caribou as they are to humans (or any other type of animal).

The Project blasting assessment concluded that PPV and PPL associated with Project blasting would drop below the relevant OMOE thresholds within 800 metres (m) of the blasting site. This does not mean that humans or caribou will not be able to detect blasting noise or ground vibration at distances beyond 800 m; it just means blasting effects will not physically damage buildings or other structures.

Research suggests that caribou hearing is less sensitive at low frequencies than human hearing (Flydal et al. 2001); therefore, it is likely that humans will be able to detect airborne PPL associated with blasting at larger distances than will caribou. In contrast, Aboriginal knowledge indicates that caribou feet are sensitive; therefore, it is likely that caribou will be able to detect ground-borne PPV associated with blasting at larger distances than humans. In the absence of research identifying specific vibration detection thresholds for caribou feet, it is not possible to estimate specific distances over which caribou will be able to detect ground vibration from Project blasting, although Reimers and Coleman (2001) noted that aerial bombing in military exercises did not typically elicit a visible behavioural response from reindeer at distances between 1.8 and 3.0 kilometres (km). That being said, Table 13B1.5-13 from the DAR indicates that PPV from Project blasting is predicted to drop to effectively 0 mm/s for distances of 5.2 km from the blasting site. As such, it seems reasonable to conclude that PPV associated with blasting would not be detectible by even the most sensitive caribou feet at distances beyond 5.2 km from the blasting site.

The preamble to DAR-MVEIRB-IR-98 correctly indicates that blasting was not measured as part of the baseline noise monitoring program. The purpose of the baseline noise monitoring program was to establish existing steady-state noise levels in the Project area to serve as inputs to the assessment of steady-state Project noise levels via the Health Canada Guidance. As such, short-duration/highly-impulsive noise and vibration levels associated with blasting were not measured. Instead, as indicated

above, PPV and PPL associated with Project blasting were predicted using a widely-accepted handbook from the ISEE.

References:

EUB (Alberta Energy and Utilities Board). 2007. Directive 038: Noise Control. Approved February 16, 2007.

Flydal K, Hermansen A, Enger PS, Riemers E. 2001. Hearing in reindeer (*Rangifer tarandus*). J. Comp. Physiol. A. 187: 265 – 269.

Health Canada. 2010. Useful Information for Environmental Assessments. H128-1/10-599E.

ISEE (International Society of Explosives Engineers). 1998. Blaster's Handbook of International Society of Explosives Engineers.

ISO (International Organization for Standardization). 1996. ISO 9613-2 Acoustics – attenuation of sound during propagation outdoors – Part 2: General method of calculation.

OMOE (Ontario Ministry of Environment). 1978. Model Municipal Noise Control By-Law – Final Report. Noise Pollution Control Publication 119. Issued August 1978.

Reimers E, Colman JE. 2001. Reindeer and caribou (*Rangifer tarandus*) response towards human activity. Rangifer 26:55-71.

DOMINION DIAMOND

Information Request Number: DAR-MVEIRB-IR-99

Source: MVEIRB Information Requests from Chuck Hubert

Subject: Barren-ground Caribou - Energetics model assumptions and errors

DAR Section(s): 12.4.2.3

Preamble (MVEIRB):

Dominion analyzed Jay Project's effects on energy and protein balance of caribou during different seasons in Section 12.4.2.3. The approach estimated energy expended on behavioral costs added to costs of insect harassment and reduced body condition followed by lowered pregnancy rates. a) The energetic cost of a single disturbance event within the Zone of Influence around Ekati was extrapolated from the energetic cost of simulated seismic exploration on boreal caribou during late winter in a forest (Bradshaw et al. 1997). Disturbance intensity was high, and sample size was low with high annual variation in snow depth. The simulated disturbance was a 1 sec blast/1-2 min of a propane cannon for a 1- hour. In estimating energetic costs for Ekati, the assumption was a single disturbance event/day. b) The energetic cost of insect harassment (to add to the cost of responses to mine activities) was derived from reindeer calves (Weladji et al. 2003) and applied to Bathurst cows. There are two shortcomings with this approach. Firstly, caribou cows are buffered from some energetic stress from insect harassment as they reduce milk production. This was not included in the modeling. Secondly, the model has the following mistake in calculating the cost to the cow. Dominion multiplied the cost per insect day (37 g) for a 20 kg calf to a 100 kg cow by multiplying by 5 (185 g). However, the extrapolated cost for the cow was based on carcass weight of calves. Assuming carcass weight is about 50% of live weight, the cost of insect harassment/day is 92 g for a 100 kg cow, not 185 g, which appears to be a high over-estimate. The estimated body weight is extrapolated to pregnancy rate but based on a relationship derived for cows from the Central Arctic herd which may over-estimate pregnancy rates.

Request (MVEIRB):

a) Please list the assumptions and relevance to Ekati of basing the energy costs on a simulated disturbance response of boreal caribou. Re-examine the assumption of a single disturbance event/day within the Zone of Influence using the activity patterns measured at Ekati 2001-2009 and re-consider the conservatism of the assumptions.

b) Please re-calculate the cost of insect harassment for cows and pregnancy rates based on body mass for Bathurst cows to reduce the over-estimated effect of insect harassment on pregnancy rate.

Response:

As noted in Section 12.4.2.3.1 (page 12-102), the energetic model used in the Developer's Assessment Report (DAR) was based primarily on the energy costs determined by Boertje (1985) for female caribou in the Denali herd in Alaska, which is a barren-ground caribou herd. The fasting metabolic rate assumed in the DAR energetic model was also based on barren-ground caribou (McEwan 1970; Fancy 1986 [referenced in Bradshaw et al. 1998]). The only effect from boreal caribou used in the DAR was the movement distance of 2.11 kilometres (km) and was based on the experimental work by Bradshaw (1994

[referenced in Bradshaw et al. 1998]) and represents the best available information about how far caribou move following a disturbance event. In addition to this distance, the DAR also used longer distances related to absolute deflection around the Misery, Sable, and Jay Project roads, which monitoring has shown not to be the case. The deflection distances were derived from migration routes identified through Traditional Knowledge. The relationship between fall body mass loss and fecundity was based on the results of Cameron and Ver Hoeff (1994), which is also empirically derived from observations of barren-ground caribou from the Central Arctic herd.

The conservative assumptions for the energetic model are provided in Sections 12.4.2.3.1 and 12.5 of the DAR, including Table 12.5-1. The assumptions associated with the results of the energetic model used in the DAR and the associated implications to effects are summarized in Table 99-1.

Conservative assumptions were applied to maximize predicted effects and manage uncertainty. Relaxing these assumptions to produce less conservative and smaller estimates of cumulative effects will not change the impact classification and determination of significance. The relative difference between the effects from insects and development will be smaller, but the overall cumulative effect to calf recruitment will also decrease.

Table 99-1 Conservative Assumptions Implemented to Reduce Uncertainty and Improve Prediction Confidence for Barren-Ground Caribou

Effects Pathway	Conservative Assumption	Implication to Effect
Behaviour, Energy Balance, and Calf Production	A 15 km zone of influence applied to all active mineral developments	Overestimates the zone of influence recently determined by Boulanger et al. (2012) including for Snap Lake Mine. Increases the likelihood of encounter by increasing the cumulative range area indirectly disturbed.
	Exploration developments active for the entire permit period	Overestimates the temporal indirect disturbance as exploration activities typically occur for a few months in winter. This increases the likelihood of encounter by increasing the cumulative range area indirectly disturbed.
	Caribou do not habituate to disturbance effects	Overestimates the energetic costs of disturbance by maximizing the number of events that result in energy cost.
	Application of a linear relationship between number of disturbance encounters and subsequent body mass loss and decline in parturition	Overestimates the energetic costs of small numbers of encounters.
	Higher energetic cost associated with walking in snow	Overestimates the cost associated with walking in summer range.
	20% (20 kg) threshold of no parturition for energetics model	Smaller than usual margin of body mass loss for no parturition.
	Flight response to disturbance event plus 12-hour agitation period	Severe response overestimates energetic cost of a disturbance event. Estimated zones of influence have been shown to have a gradient effect; the assessment used binary approach (i.e., effect was equal regardless of how far caribou were from development).
	Caribou can tolerate lower levels of harassment	Under emphasizes the influence of insect harassment on body mass loss and parturition rates (i.e., mass loss from insect harassment begins at higher levels of harassment).
	Caribou cows as sensitive to insect harassment as demonstrated in caribou calves	Overestimates the amount of body mass loss in cows and associated decrease in fecundity from insect harassment.

Table 99-1 Conservative Assumptions Implemented to Reduce Uncertainty and Improve Prediction Confidence for Barren-Ground Caribou

Effects Pathway	Conservative Assumption	Implication to Effect
Behaviour, Energy Balance, and Calf Production	Caribou would not cross Misery or Jay roads	Severe response overestimates energetic cost of deflection movements.
	Equal effect on caribou body mass from encounters with zones of influence regardless of distance from development, even though estimated zones of influence have been shown to have a gradient effect on caribou distribution	Overestimates energetic cost of a disturbance event.
	Maximum mean annual disturbance events used to calculate energetic cost	Estimates energetic cost with a higher than average encounter rate
	No compensatory foraging outside of ZOIs	Mass loss from an encounter cannot be offset by supplemental foraging.

ZOI = zone of influence; km = kilometre.

References:

Boertje RD. 1985. An Energy Model for Adult Female Caribou of the Denali Herd, Alaska. J Range Manage 38: 468-173.

Boulanger J, Poole KG, Gunn A, Wierzchowski J. 2012. Estimating the Zone of Influence of Industrial Developments on Wildlife: a Migratory Caribou *Rangifer tarandus groenlandicus* and diamond mine case study. Wildlife Biol 18: 164-179.

Bradshaw CJA. 1994. An assessment of the effects from petroleum exploration on woodland caribou (*Rangifer tarandus caribou*) in northeastern Alberta. M.Sc. thesis, University of Alberta, Edmonton, AB, Canada.

Bradshaw CJA, Boutin S, Hebert DM. 1998. Energetic implications of disturbance caused by petroleum exploration to woodland caribou. Can J Zool 76:1319-1324.

Cameron RD, Ver Hoef JM. 1994. Predicting parturition rate of caribou from autumn body mass. J Wildlife Manage 58:674-679.

Fancy SG. 1986. Daily energy budgets of caribou: a simulation approach. Ph.D. thesis, University of Alaska, Fairbanks, AK, USA.

McEwan EH. 1970. Energy metabolism of barren ground caribou. Can J Zool 48:391-392.

DOMINION DIAMOND

Information Request Number:	DAR-NSMA-IR-02
Source:	North Slave Metis Alliance: Shin Shiga
Subject:	Project Alternatives
DAR Section(s):	2

Preamble (NSMA):

Contribution of Jay Project infrastructure investment towards Cardinal.

Request (NSMA):

Please summarize the infrastructure and other investments that will have been made for the Jay Project that could make the development of Cardinal pipe more viable. Please include in this summary relevant economic analyses.

Response:

Please see the response to Information Request NSMA-IR-01 regarding the Cardinal kimberlite pipe.

Infrastructure developed for the Jay Project would not be sufficient to support the economic viability of the Cardinal pipe.

DOMINION DIAMOND

Information Request Number: DAR-NSMA-IR-05

Source: North Slave Metis Alliance: Shin Shiga

Subject: Community Engagement

DAR Section(s): 4

Preamble (NSMA):

Previous to the DAR community and technical staff sessions in December 2014, it was communicated to DDEC that NSMA members often find it difficult to attend these meetings because they are held during week days, between 9am and 5pm. This happened again in February 2015, when DDEC organized another session to consult NSMA members regarding the Project.

Request (NSMA):

Please explain why DDEC consistently organizes community engagement sessions in these times when many working and full-time student members of the affected communities are unable to attend? Please plan and consult ahead of time when these meetings should be held to maximize attendance.

Response:

Dominion Diamond Ekati Corporation (Dominion Diamond) works with communities on the time and date of meetings to maximize attendance. In the past, Dominion Diamond has organized meetings with the North Slave Métis Alliance (NSMA) on weekends so more members can attend and at lunch times with the NSMA Board so that Board Members who work or go to school could attend.

However, in some instances where there are requirements for workshops that involve many communities and require sufficient time to allow for the presentation of materials and a full discussion, it is not practical to do so on weekends or in the evenings. For example, the December Information Sessions involved over 60 people over a four-day period. The February meeting with the NSMA was organized through the office of the President of the NSMA.

In the future, Dominion Diamond would be happy to work with NSMA if there are better times and ways to engage with their members on specific issues.

DOMINION DIAMOND

Information Request Number: DAR-NSMA-IR-06

Source: North Slave Metis Alliance: Shin Shiga

Subject: Greenhouse Gas Emissions

DAR Section(s): 7

Preamble (NSMA):

DDEC based its emission estimation on diesel generators and vehicle operations. Appendix 7B presents detailed calculations.

Request (NSMA):

Does "Mine Fleet" (Appendix 7B3.5-3) include vehicles and aircrafts traffic into and out of the Ekati Mine site?

Response:

Table 7B3.5-2 to 7B3.5-4 in Appendix 7B of the Developer's Assessment Report (DAR) summarized the greenhouse gas (GHG) emissions associated with the existing Ekati Mine and the proposed Jay Project (Project) in the Baseline Case, Construction Case, and Application Case, respectively. The "Mine Fleet" category emissions detailed in Table 7B3.5-2 to 7B3.5-4 include haul trucks, service trucks, and other on-site heavy equipment associated with the Ekati Mine and the Project. Worker and material transport via the winter road and aircraft into and out of the Ekati Mine site was not included as part of the DAR.

The expected Project-related GHG emissions from transportation activities along the winter road presented in this Information Request response are estimated based on the most recent year of data collected at Ekati Mine (2013) and can be considered a typical representation of winter road activity in the Base Case. A total of 2,063 trips for the delivery of dry goods, materials, and fuel to the Ekati Mine site were considered in the Base Case. Each trip was considered as the equivalent distance from Yellowknife to the Ekati Mine site and back (a 1,080 kilometre [km] round trip). All transportation was conservatively assumed to occur by heavy-duty diesel vehicles (tractor-trailer units).

Use of the winter road is expected to increase during the construction phase beyond levels associated with the existing Ekati Mine operation, up to a maximum of 4,000 trips per year. A more realistic projection is that an additional 200 trips will occur during the construction phase. As a conservative assumption, a projection of 4,000 trips per year on the winter road was used for the Construction Case GHG emissions estimations. However, upon completion of the construction phase, use of the winter road is expected to return to activity levels similar to the Base Case.

As described in the Project Description, Section 3.4.1.8.2 of the DAR, the Project is not anticipated to result in air transport activity levels outside that typically experienced at the existing Ekati Mine, because workforce demand is not predicted to increase, as periods of heavy construction activity have been experienced throughout the life of the mine. As such, there is no change in expected aircraft activity or aircraft GHG emissions between the Baseline, Construction, and Application Cases.

The expected GHG emissions from aircraft transportation were estimated based the most recent year (2013) of flight data from the Ekati Mine airport. Various types of aircraft were used to transport freight and passengers from numerous locations in Alberta, the Northwest Territories, and Nunavut to the Ekati Mine site. In 2013, the Ekati Mine airport experienced 2,255 flights.

GHG emissions from aircraft occur in two phases over the length of the flight. The first phase of GHG emissions occurs during the landing and takeoff (LTO) cycle of the aircraft. The LTO cycle includes GHG emissions from aircraft taxiing and auxiliary power unit usage while on the ground and established emission factors for various engine types during the aircraft takeoff and landing sequence. Information on aircraft type used for each flight to and from the Ekati Mine site was provided by Dominion Diamond. The Airport Carbon and Emissions Reporting Tool (ACERT v1.0) (ACI 2012) was used to quantify the total GHG emissions during the LTO cycles of all aircraft arriving and departing from the Ekati Mine airport. The GHG emissions associated with LTO cycles at the destination or origin airports for each flight segment were also considered. The second phase of GHG emissions occurs as the aircraft is in-flight. A total in-flight distance travelled for all aircraft was calculated based on a review of flight itineraries for 2013 (average flight times per trip for each flight segment and aircraft type) and assuming an average aircraft cruising speed of 521 kilometres per hour (km/hr) for turboprop aircraft, 540 km/hr for freight aircraft, and 850 km/hr for large passenger turbofan aircraft. Environment Canada (Environment Canada 2014) recommends the use of emission factors and methods developed by the Intergovernmental Panel on Climate Change (IPCC) to calculate GHG emissions. Therefore, the most recent emission factors from the IPCC's *Fifth Assessment Report* (IPCC 2013) were used to estimate in-flight GHG emissions.

Estimates of maximum annual GHG emissions are expressed as kilotonnes of CO_2 equivalent (kt CO_2E), which were calculated based on the global warming potential for each greenhouse gas relative to the global warming potential of CO_2. Values for global warming potentials were obtained from the IPCC *Fourth Assessment Report* (IPCC 2007) which are consistent with Environment Canada's GHG reporting requirements (Environment Canada 2014).

A breakdown of GHG by source for the Base Case, Construction Case, and Application Case considering the contributions from the winter road and air transport is provided in Tables 6-1 to 6-3. By including the GHG emissions from winter road and aircraft traffic, the estimated annual GHG emissions the Ekati Mine in the Base Case and the Project in the Application Case and Construction Case increased by 1 to 2% from the estimates presented in the DAR. Therefore, the revised GHG emission estimates do not change the conclusions in the DAR.

Table 6-1 Base Case Annual Greenhouse Gas Emissions for Ekati Mine

Source	Annual Greenhouse Gas Emissions (kt CO_2E) for Base Case			
	CO_2	**CH_4**	**N_2O**	**Total**
Generators	150.659	0.188	6.744	**157.591**
Boilers/heaters	27.586	0.034	1.235	**28.855**
Mine Fleet	70.028	0.099	8.620	**78.746**
Transportation - Winter Road	2.344	0.002	0.040	**2.386**
Transportation – Aircraft[(a)]	3.336	0.000	0.000	**3.387**

Table 6-1 Base Case Annual Greenhouse Gas Emissions for Ekati Mine

Source	Annual Greenhouse Gas Emissions (kt CO_2E) for Base Case			
	CO_2	CH_4	N_2O	Total
Total	**253.953**	**0.323**	**16.639**	**270.965**

(a) In-flight aircraft emissions are only included in the CO_2 grouping as CO_2E.

kt CO_2E = kilotonne carbon dioxide equivalent; CO_2 = carbon dioxide; CH_4 = methane; N_2O = nitrous oxide.

Table 6-2 Construction Case Annual Greenhouse Gas Emissions for Ekati Mine and Jay Project

Source	Annual Greenhouse Gas Emissions (kt CO_2E) for Construction Case			
	CO_2	CH_4	N_2O	Total
Generators	150.659	0.188	6.744	**157.591**
Boilers/heaters	27.586	0.034	1.235	**28.855**
Mine Fleet	70.028	0.099	8.620	**78.746**
Construction Equipment	82.122	0.116	10.109	**92.347**
Transportation - Winter Road	4.544	0.005	0.077	**4.626**
Transportation – Aircraft[(a)]	3.336	0.000	0.000	**3.387**
Total	**338.275**	**0.442**	**26.785**	**365.552**

(a) In-flight aircraft emissions are only included in the CO_2 grouping as CO_2E.

kt CO_2E = kilotonne carbon dioxide equivalent; CO_2 = carbon dioxide; CH_4 = methane; N_2O = nitrous oxide.

Table 6-3 Application Case Annual Greenhouse Gas Emissions for the Jay Project

Source	Annual Greenhouse Gas Emissions (kt CO_2E) for Application Case			
	CO_2	CH_4	N_2O	Total
Generators	150.659	0.188	6.744	**157.591**
Boilers/heaters	8.485	0.011	0.380	**8.875**
Mine Fleet	205.052	0.289	25.241	**230.581**
Transportation - Winter Road	2.344	0.002	0.040	**2.386**
Transportation – Aircraft[(a)]	3.336	0.000	0.000	**3.387**
Total	**369.876**	**0.490**	**32.405**	**402.820**

(a) In-flight aircraft emissions are only included in the CO_2 grouping as CO_2E.

kt CO_2E = kilotonne carbon dioxide equivalent; CO_2 = carbon dioxide; CH_4 = methane; N_2O = nitrous oxide.

References:

ACI (Airports Council International). 2012. Airport Greenhouse Gas Inventory Tool (ACERT v1.0). Available at: http://www.aci.aero/About-ACI/Priorities/Environment/ACERT

Environment Canada. 2014. Technical Guidance on Reporting Greenhouse Gas Emissions. Environment Canada, Gatineau, Quebec. ISSN: 1719-0487. Available at: http://www.ec.gc.ca/ges-ghg/default.asp?lang=En&n=47B640C5-1

IPCC. 2007. Climate Change 2007: The Physical Science Basis. Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change [Solomon, S., D. Qin, M. Manning, Z. Chen, M. Marquis, K.B. Averyt, M. Tignor and H.L. Miller (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA, 996 pp.

IPCC. 2013. Climate Change 2013: The Physical Science Basis. Contribution of Working Group I to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change [Stocker, T.F., D. Qin, G.-K. Plattner, M. Tignor, S.K. Allen, J. Boschung, A. Nauels, Y. Xia, V. Bex and P.M. Midgley (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA, 1535 pp.

DOMINION DIAMOND

Information Request Number: DAR-NSMA-IR-07

Source: North Slave Metis Alliance: Shin Shiga

Subject: Greenhouse Gas Emissions

DAR Section(s): 7

Preamble (NSMA):

DDEC based its emission estimation on diesel generators and vehicle operations. Appendix 7B presents detailed calculations.

Request (NSMA):

If above is negative, please provide GHG and other emissions estimations and models that include the vehicle and aircraft traffic into and out of the Ekati Mine site. Please also provide the assumptions used to calculate the emissions (e.g., distance travelled by those vehicles and aircrafts).

Response:

Please see response to DAR-NSMA-IR-06. Worker and material transport with the winter road and aircraft into and out of the Ekati Mine site was not included as part of the Developer's Assessment Report. The response to DAR-NSMA-IR-06 presents the expected greenhouse gas emissions from transportation activities along the winter road and from aircraft transportation to and from the Ekati Mine, and provides the assumptions used to calculate the emissions.

DOMINION DIAMOND

Information Request Number: DAR-NSMA-IR-08

Source: North Slave Metis Alliance: Shin Shiga

Subject: Greenhouse Gas Emissions

DAR Section(s): Appendix 7B

Preamble (NSMA):

DDEC considers GHG emissions as a contributing factor to climate change. It is known that land use change is also a driver of human-induce climate change.

Request (NSMA):

In additions to GHG emissions data provided above, please provide in DDEC's revised climate change assessment the effects of land use change. Please include in this assessment: the reference case, base case, the Project, and the updated RFD case that includes Sable, A21, underground mining of Jay, and Kennady Diamond Project.

Response:

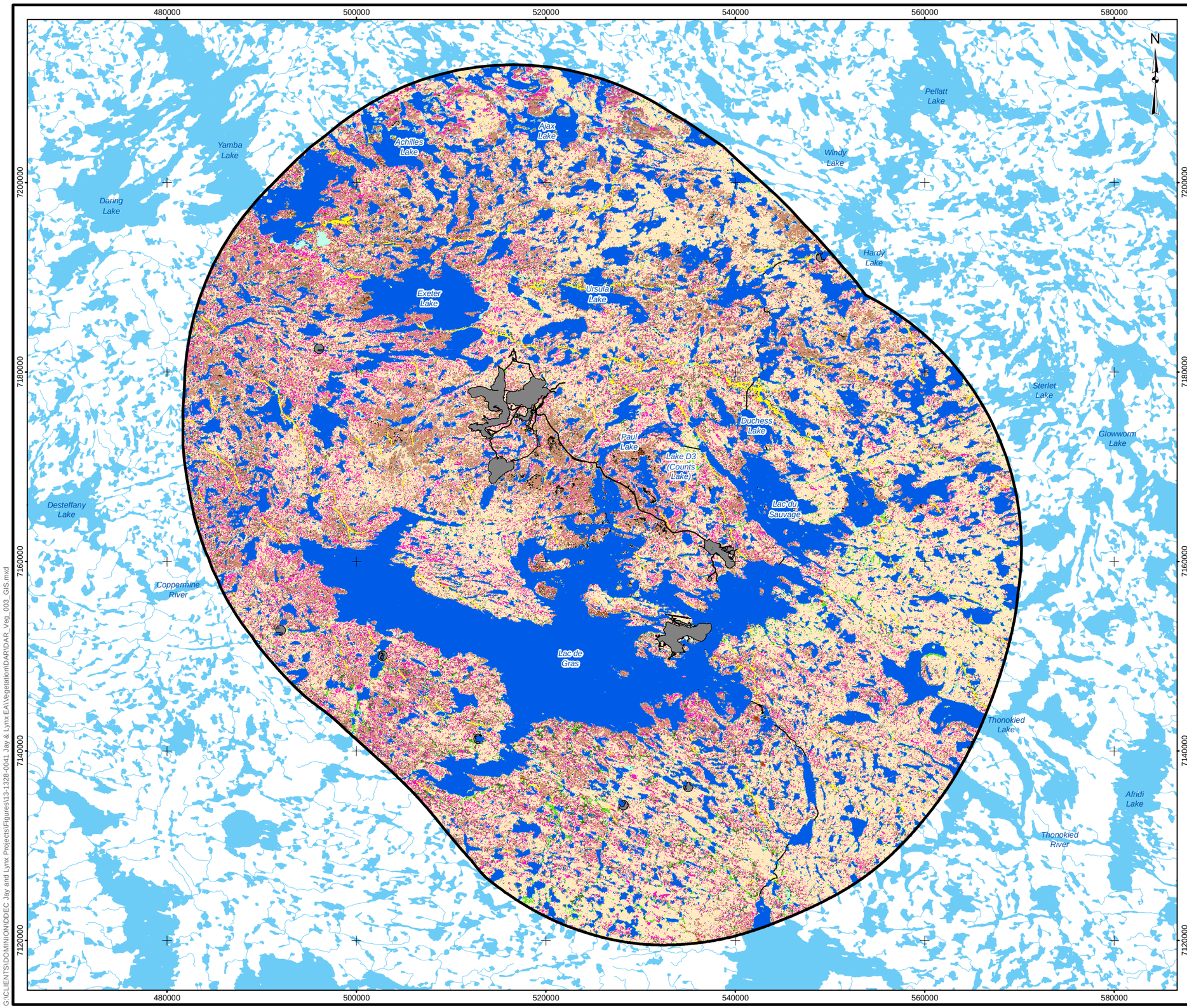
Introduction and Background

The most important types of land use change that can result in greenhouse gas emissions are as follows:

1) changes in forest and other woody biomass stocks (including commercial management, harvest of industrial roundwood and fuelwood, production and use of wood commodities, and establishment and operations of forest plantations, as well as planting trees in urban, village, and other on-forest locations);
2) forest and grassland conversion (conversion of forests and grasslands to pasture, cropland, or other managed uses can significantly change carbon stored in vegetation and soil);
3) abandonment of croplands, pastures, plantation forests, or other managed lands that regrow into their prior natural grassland of forest conditions; and,
4) changes in soil carbon.

The Project is located in the Tundra Shield Low Arctic Level III Ecoregion and is dominated by Heath tundra and Heath tundra with 30-80% boulders (Figure 8-1). In these areas, dwarf-shrub tundra and low-shrub tundra are the dominant vegetation types on upland areas; sedge fens predominant in wet areas. Consequently, the dominant type of land use change from the Project that could lead to changes in greenhouse gas (GHG) is “changes to soil carbon”; changes to vegetation represent a smaller secondary change to GHG emissions.

Quantifying Project-related changes to GHG emissions due to land use change is complicated by a lack of specifically relevant data, and uncertainty surrounding changing rates of natural emissions in the context of climate change.



LEGEND

- WATERCOURSE
- WATERBODY
- EFFECTS STUDY AREA

ECOLOGICAL LANDSCAPE CLASSIFICATION MAP UNITS

- ESKER COMPLEX
- BEDROCK COMPLEX (>80% ROCK)
- BOULDER COMPLEX (>80% ROCK)
- HEATH TUNDRA 30% TO 80% BEDROCK
- HEATH TUNDRA 30% TO 80% BOULDERS
- HEATH TUNDRA
- RIPARIAN TALL SHRUB
- BIRCH SEEP AND RIPARIAN SHORELINE SHRUB
- TUSSOCK/HUMMOCK
- SEDGE WETLAND
- SHALLOW WATER
- DEEP WATER
- EXISTING DISTURBANCE
- UNCLASSIFIED

REFERENCE

VEGETATION CLASSIFICATION DATA: DIAVIK LANDSAT CLASSIFICATION 1997; WEST KITIKMEOT CLASSIFICATION 2001; MODIFIED BY GOLDER ASSOCIATES 2014
NATIONAL TOPOGRAPHIC BASE DATA (NTDB) 1:250,000
NATURAL RESOURCES CANADA, CENTRE FOR TOPOGRAPHIC INFORMATION, 2012
DATUM: NAD83 PROJECTION: UTM ZONE 12N

DOCUMENT

DEVELOPER'S ASSESSMENT REPORT

10 0 10
SCALE 1:400,000 KILOMETRES

PROJECT
DOMINION DIAMOND™
JAY PROJECT
NORTHWEST TERRITORIES, CANADA

TITLE
ECOLOGICAL LANDSCAPE CLASSIFICATION IN THE EFFECTS STUDY AREA

Golder Associates

PROJECT		13-1328-0041	FILE No. DAR_Veg_003_GIS	
DESIGN	JF	24/02/14	SCALE AS SHOWN	REV 0
GIS	LMR	07/10/14	MAP 8-1	
CHECK	JF	07/10/14		
REVIEW	CD	07/10/14		

G:\CLIENTS\DOMINIONDDEC Jay and Lynx Projects\Figures\13-1328-0041 Jay & Lynx EA\Vegetation\DAR\DAR_Veg_003_GIS.mxd

Many observation-based field studies of GHG emissions from tundra ecosystems have been carried out in Alaska and Siberia (Torn and Chapin 1993; Nakano et al. 2000), locations with deep soils that are rich in soil carbon. Since the tundra ecosystems in the Project area are characterized by shallow soils underlain by bedrock and with bedrock outcrops, the applicability of these studies is limited.

Observational studies also typically occur during the growing season only (Chang et al. 2014), but even these studies show there can be large seasonal and interannual variability in GHG emissions (Schuur et al. 2009). Consequently, there is considerable uncertainty regarding the long-term mean annual exchanges of GHGs between the land and atmosphere in the Arctic.

Modelling-based studies (Sitch et al. 2007; Zhuang et al. 2007) are often focused on accurately simulating observed rates of carbon exchange at specific locations (e.g., Alaska), extrapolating these results regionally or to the circumpolar region, and then running model simulations forward to predict the changes to the regional or global carbon budgets in the context of climate change. These regional or global extrapolations are of limited applicability to the Project assessment cases.

GHG Emissions from Tundra

Natural emissions of GHG in tundra ecosystems are primarily controlled by the presence/absence of soil carbon (e.g., mineral versus organic soils), soil temperature, and local depth to the water table. When considering GHG emissions, an assessment needs to separately analyze processes that control emissions/uptake of carbon dioxide (CO_2) (i.e., photosynthesis versus respiration) from those that control the emissions/uptake of methane (CH_4) (i.e., methanogenesis versus methane oxidation).

A recent synthesis (McGuire et al. 2012) of flux observations and inversion models indicate that Arctic tundra may serve as a sink or source of atmospheric CO_2 and that interannual variability results in a long-term (decadal) mean that is not significantly different than a neutral balance (i.e., neither a large net source or sink). The same study notes that modelling studies indicate that Arctic tundra may be a weak CO_2 sink, but that "it is clearly important to reduce uncertainties". Similarly Schuur et al. (2009) evaluated carbon loss/uptake from minimally thawed, moderately thawed, and extensively thawed permafrost in a tundra ecosystem over a 3-year period. They found that the minimally and extensively thawed permafrost were net sources to the atmosphere (17 +/- 11 and 32 +/-22 grams of carbon per square metre per year [g-C/m^2/yr]), but that the moderately thawed location was a net sink (25 +/- 29 g-C/m^2/yr).

Methane emissions differ between saturated and unsaturated areas of permafrost tundra. Methanogens found in saturated tundra soils produce methane with rates of 2 to 10 grams per square metre per year (g/m^2/yr) (Zhuang et al. 2007; Chang et al. 2014). Emissions rates are controlled by soil temperature and local depth to the water table but are predicted to increase in the future due to climate change. Methane emissions from unsaturated tundra are lower (0.1 – 1.5 g/m^2/yr) because soil microbes consume methane through oxidation as it moves from the saturated zone through the unsaturated zone to the land surface. In unsaturated, moist tundra, the presence of shrubs enhances methane emissions as their roots provide a channel along which methane can escape directly to the atmosphere (effectively short-circuiting past soil microbes found in the unsaturated zone).

Project-Related GHG Emissions from Land Use Change

The Project may excavate and stockpile the organic veneer in the area of the WRSA and will excavate and stockpile esker material in the area of the Jay Road crossing. In these areas, the residual exposures of till or rock will be quickly covered by the ensuing construction activities.

Methane emissions from formerly saturated soils will likely decrease because they will be unsaturated in the stockpile/waste rock storage area. This is expected to lead to methane oxidation, and therefore, an increase in CO_2 emissions. Since the global warming potential of methane is 35 times that of CO_2, CO_2 emissions would need to increase by a factor of 35 before GHG emissions from stockpiled, formally saturated soils, would exceed the observed natural rates of CH_4 emissions of undisturbed soils.

CO_2 uptake by vegetation on unsaturated soils will end when soils are removed and stockpiled; microbial respiration will continue to produce CO_2. This is expected to result in a net increase in CO_2 emissions from these soils to the atmosphere during the short cool summer, but is not expected to result in enhanced CO_2 emissions when soils are frozen.

Tundra ecosystems are currently a small net source of GHGs, emissions which are expected to increase as the Arctic tundra warms due to climate change. Project-related changes to GHGs may result in small net reduction or a small net increase in GHG emissions from stockpiled soil. These considerably uncertain changes to GHG emissions due to Project-related land-use change are likely small compared to direct Project-related GHG emissions from fossil fuel use for heating and electricity.

References:

Chang RYW, Miller CE, Dinardo SJ, Karion A, Sweeney C, Daube BC, Henderson JM, Mountain ME, Eluszkiewicz J, Miller JB, Bruhwiler LMP, Wofsy SC. 2014. Methane emissions from Alaska in 2012 from CARVE airborne observations, Proceedings of the National Academy of Sciences, 11(47).

McGuire AD, et al., 2012. An assessment of the carbon balance of Arctic tundra: Comparisons among observations, process models, and atmospheric inversions. Biogeosciences, 9(8):3185–3204

Nakano T, Kuniyoshi S, Fukuda M. 2000. Temporal variation in methane emission from tundra wetlands in a permafrost area, northeastern Siberia, Atmos Environ, 34(8), 1205-1213.

Schuur EAG, Vogel JG, Crummer KG, Lee H, Sickman JO, Osterkamp TE. 2009. The effect of permafrost thaw on old carbon release and net carbon exchange from tundra. Nature 459, 556-559

Sitch S, McGuire AD, Kimball J, Gedney N, Gamon J, Engstrom R, Wolf A, Zhuang Q, Clein J, McDonald KC. 2007. Assessing the carbon balance of circumpolar arctic tundra using remote sensing and process modelling, Ecol Appl, 17(1), pp. 213-234.

Torn MS, Chapin III, FS. 1993. Environmental and biotic controls over methane flux from Arctic tundra, Chemosphere, 26(1-4), 357-368.

Zhuang Q, Melillo JM, McGuire AD, Kicklighter DW, Prinn RG, Steudler PA, Felzer BS, Hu S. 2007. Net emissions of CH4 and CO2 in Alaska: Implications for the Region's Greenhouse Gas Budget. Ecol Appl 17:203–212.

DOMINION DIAMOND

Information Request Number: DAR-NSMA-IR-09

Source: North Slave Metis Alliance: Shin Shiga

Subject: Greenhouse Gas Emissions

DAR Section(s): 7

Preamble (NSMA):

The reviewer failed to find DDEC's approach to mitigate GHG emissions in the DAR or any subsequent documents.

Request (NSMA):

Please provide the reference for that information.

Response:

The mitigation measures provided in Section 7.3.2.2 of the Developer's Assessment Report (DAR) for reducing air emissions also apply to greenhouse gases. The dominant sources of greenhouse gas emissions from the Ekati Mine and the Project are the exhaust from the diesel-fired power generators and the use of diesel vehicles and equipment. In keeping with its focus on responsible and sustainable development, Dominion Diamond Ekati Corporation (Dominion Diamond) has identified a series of good practices to minimize air quality impacts that it will employ. Dominion Diamond will follow general management approaches for air emissions from the Project:

- Project mine equipment and haul vehicles will be regularly maintained to reduce emissions and maximize fuel efficiency.
- Low sulphur (15 parts per million by weight) diesel will be used in fleet vehicles.
- Site road topping surfaces will be regularly maintained for operational efficiencies and to minimize fuel consumption.
- Energy conservation initiatives such as maintaining site road topping surfaces for energy efficiency will be undertaken.

Continuous improvement and emission reduction are key management approaches that support the principle of keeping clean areas clean and encompass the Dominion Diamond goal of using best available technology economically achievable. Some examples of past initiatives that resulted in reduction of fuel consumption and emissions at the Ekati Mine (BHP Billiton 2009) are:

- fuel coolers were changed from a water cooled system to an air cooled system;
- optimization studies were conducted on the power generators to increase output efficiency. Results of the studies led to an increase of the generators' load from 73 percent (%) to 93%. The need to continuously run a stand-by generator was eliminated;

- power generator maintenance procedures were reviewed, resulting in an ongoing maintenance program where vapour phase modules are cleaned regularly to reduce fuel consumption; and,
- a piping system was commissioned in 2009 to utilize waste heat from the power generators to preheat the air underground. This resulted in a reduction of the amount of diesel fuel required for heating.

Dominion Diamond plans to follow the principle of continuous improvement and identify opportunities to reduce the fuel consumption and greenhouse gas emissions at the Project.

References:

(BHP Billiton) BHP Billiton Diamonds Inc. 2009. Ekati Diamond Mine – Air Quality Management and Monitoring Program. March 2009.

DOMINION DIAMOND

Information Request Number:	DAR-NSMA-IR-10
Source:	North Slave Metis Alliance: Shin Shiga
Subject:	Greenhouse Gas Emissions
DAR Section(s):	7

Preamble (NSMA):

The reviewer failed to find DDEC's approach to mitigate GHG emissions in the DAR or any subsequent documents.

Request (NSMA):

If such mention is not made in the DAR or its subsequent documents, please explain why, and provide DDEC's mitigation measures for GHG emissions.

Response:

Please refer to the response to DAR-NSMA-IR-09 for the information requested.

DOMINION DIAMOND

Information Request Number:	DAR-NSMA-IR-11
Source:	North Slave Metis Alliance: Shin Shiga
Subject:	Greenhouse Gas Emissions
DAR Section(s):	7

Preamble (NSMA):

The reviewer failed to find DDEC's approach to mitigate GHG emissions in the DAR or any subsequent documents.

Request (NSMA):

Please list of climate change mitigation measures that DDEC has taken, is going to take, or can potentially take. Please provide their effectiveness and cost-benefit analyses. Please also include in this table, at minimum, wind turbine, hydro-electric, biomass, and market-based carbon offset programs.

Response:

Section 7B3.5 of Appendix 7B of the Developer's Assessment Report (DAR) presents a summary of estimated greenhouse gas emissions associated with the Project. The estimated projections indicate that greenhouse gas emissions due to power generation are not expected to increase with the transition to the Jay Project. Emissions due to the mine fleet associated with the Project are anticipated to increase and surpass power generation greenhouse gas emissions.

Section 7.3.2.2.1 of the DAR presents good practices to mitigate and reduce emissions that Dominion Diamond intends to implement for the Project as follows:

- Project mine equipment and haul vehicles will be regularly maintained to reduce emissions and maximize fuel efficiency.
- Low sulphur (15 parts per million by weight [ppmw]) diesel will be used in fleet vehicles.
- Site road topping surfaces will be regularly maintained for operational efficiencies and to minimize fuel consumption.
- Energy conservation initiatives such as maintaining site road topping surfaces for energy efficiency will be undertaken.

Appendix F, Power Supply, presents a discussion of alternative energy sources for the Project, including wind, hydroelectric, biomass, as well as others. As discussed in this appendix, none of these alternative energy sources is suitable as a stand-alone power supply for the Project. Wind energy could possibly be a supplemental energy source, but will require further studies and evaluation.

DOMINION DIAMOND

Information Request Number:	DAR-NSMA-IR-12
Source:	North Slave Metis Alliance: Shin Shiga
Subject:	Climate Change
DAR Section(s):	10

Preamble (NSMA):

DDEC used the “moderate greenhouse gas emissions” scenario in CSA Technical Guide – Infrastructure in permafrost (2010).

Request (NSMA):

Please provide the details of the scenario in the referenced document.

Response:

Table 5.2 of Canadian Standards Association (CSA; 2010) (included below) presents the predictions of mean temperature changes for the “moderate (A1B) greenhouse gas emissions” scenario of the Intergovernmental Panel on Climate Change (IPCC; 2007) AR4 models, relative to the 1971 to 2000 baseline temperature data.

For Arctic sector C1, the predicted mean annual air temperature increase is 3.7 degrees over 100 years for year 2071 to 2100 for the “moderate (A1B) greenhouse gas emissions” scenario.

Table 5.2
Seasonal mean temperature change from 1971 to 2000 baseline, under moderate (A1B) green-house gas scenario (Ensemble of best four model outputs — AR4 GCM models regridded to common 2.5 × 2.5 degree NCEP grid) (CCCSN, 2009)

	WESTERN ARCTIC: Latitude (deg N) — Ensemble results														
	60–65 (Arctic Sector W1)					65–70 (Arctic Sector W2)					70–75 (Arctic Sector W3)				
Year	Winter	Spring	Summer	Autumn	Annual	Winter	Spring	Summer	Autumn	Annual	Winter	Spring	Summer	Autumn	Annual
2011–2040	0.9	0.9	0.6	0.6	0.8	1.4	1.0	0.5	1.4	1.1	1.4	1.3	0.4	2.2	1.3
2041–2070	2.3	2.0	1.6	2.2	2.0	3.8	2.5	1.6	4.0	3.0	4.4	3.1	1.3	6.4	3.8
2071–2100	4.3	2.8	2.5	2.9	3.1	6.6	3.7	2.7	5.3	4.6	7.8	4.4	2.1	8.8	5.8
Note: *The value displayed in each cell represents the average change in mean seasonal or annual temperature for the specified 30-year period when compared to the average mean seasonal temperature from 1971 to 2000.*															
	CENTRAL ARCTIC: Latitude (deg N) — Ensemble results														
	60–65 (Arctic Sector C1)					65–70 (Arctic Sector C2)					70–75 (Arctic Sector C3)				
Year	Winter	Spring	Summer	Autumn	Annual	Winter	Spring	Summer	Autumn	Annual	Winter	Spring	Summer	Autumn	Annual
2011–2040	1.9	1	0.8	1.3	1.3	1.8	1.4	0.6	1.8	1.4	1.9	1.7	0.4	2.2	1.6
2041–2070	4.2	2.1	1.8	2.7	2.7	4.5	2.7	1.5	4	3.2	5	3.3	0.9	5.4	3.7
2071–2100	6.2	2.8	2.4	3.4	3.7	6.5	3.6	2.2	5.2	4.4	7.2	4.5	1.5	7.4	5.2
Note: *The value displayed in each cell represents the average change in mean seasonal or annual temperature for the specified 30-year period when compared to the average mean seasonal temperature from 1971 to 2000.*															
	EASTERN ARCTIC: Latitude (deg N) — Ensemble results														
	60–65 (Arctic Sector E1)					65–70 (Arctic Sector E2)					70–75 (Arctic Sector E3)				
Year	Winter	Spring	Summer	Autumn	Annual	Winter	Spring	Summer	Autumn	Annual	Winter	Spring	Summer	Autumn	Annual
2011–2040	1.9	1.0	0.6	0.9	1.1	1.5	1.2	0.7	1.5	1.2	1.7	1.3	0.7	2.0	1.4
2041–2070	5.5	2.3	1.4	2.0	2.8	4.2	2.5	1.4	3.6	2.9	4.3	2.8	1.3	4.7	3.3
2071–2100	8.7	3.5	2.0	2.7	4.2	7.3	3.8	2.1	4.7	4.5	6.9	4.0	2.0	6.5	4.9
Note: *The value displayed in each cell represents the average change in mean seasonal or annual temperature for the specified 30-year period when compared to the average mean seasonal temperature from 1971 to 2000.*															

References:

CSA (Canadian Standards Association). 2010. TECHNICAL GUIDE Infrastructure in permafrost: A guideline for climate change adaptation. Canadian Standards Association (CSA) Special Publication, Chapter 5 (PLUS 4011-10). P. 41-53.

IPCC (Intergovernmental Panel on Climate Change). 2007. Climate Change 2007: Working Group I: The Physical Science Basis. Intergovernmental Panel on Climate Change (IPCC). Fourth Assessment Report.

DOMINION DIAMOND

Information Request Number: DAR-NSMA-IR-13

Source: North Slave Metis Alliance: Shin Shiga

Subject: Climate Change

DAR Section(s): 10

Preamble (NSMA):

DDEC used the “moderate greenhouse gas emissions” scenario in CSA Technical Guide – Infrastructure in permafrost (2010).

Request (NSMA):

Please present the referenced scenario alongside the most recent comparable scenario analyses in the IPCC report. Please include in this the most severe climate change scenario that the IPCC report includes.

Response:

Table 5.3 of Canadian Standards Association (CSA 2010) (included below) presents the predictions of mean temperature changes for the “high (A2) greenhouse gas emissions” scenario of the Intergovernmental Panel on Climate Change (IPCC) 2007 AR4 models, relative to the 1971 to 2000 baseline temperature data (IPCC 2007).

For Arctic sector C1, the predicted mean annual air temperature increase is 5.0 degrees Celsius (°C) over 100 years for year 2071 to 2100.

DOMINION DIAMOND

Table 5.3
Seasonal mean temperature change from 1971 to 2000 baseline, under "high" (A2) green-house gas scenario (Ensemble of best four model outputs — AR4 GCM models regridded to common 2.5 × 2.5 degree NCEP grid) (CCCSN, 2009)

	WESTERN ARCTIC: Latitude (deg N) — Ensemble results														
	60–65 (Arctic Sector W1)					65–70 (Arctic Sector W2)					70–75 (Arctic Sector W3)				
Year	Winter	Spring	Summer	Autumn	Annual	Winter	Spring	Summer	Autumn	Annual	Winter	Spring	Summer	Autumn	Annual
2011–2040	1.2	1.0	0.9	1.3	1.1	1.8	1.2	0.9	2.1	1.5	1.8	1.4	0.6	2.9	1.7
2041–2070	2.7	1.9	1.7	2.1	2.1	4.2	2.5	1.7	4.1	3.1	4.6	2.9	1.3	6.5	3.8
2071–2100	4.6	3.4	3.0	3.5	3.6	7.8	4.7	3.1	6.3	5.5	9.6	5.5	2.5	10.1	6.9
Note: *The value displayed in each cell represents the average change in mean seasonal or annual temperature for the specified 30-year period when compared to the average mean seasonal temperature from 1971 to 2000.*															
	CENTRAL ARCTIC: Latitude (deg N) — Ensemble results														
	60–65 (Arctic Sector C1)					65–70 (Arctic Sector C2)					70–75 (Arctic Sector C3)				
Year	Winter	Spring	Summer	Autumn	Annual	Winter	Spring	Summer	Autumn	Annual	Winter	Spring	Summer	Autumn	Annual
2011–2040	2.2	1.0	0.9	1.4	1.4	2.2	1.4	0.9	2.1	1.7	2.4	1.7	0.6	2.8	1.9
2041–2070	4.9	2.0	1.8	2.8	2.9	5.2	2.4	1.5	4.4	3.4	5.7	3.1	1.1	6.5	4.1
2071–2100	8.9	3.5	3.0	4.7	5.0	9.9	4.5	2.6	7.0	6.0	11.2	6.0	2.1	10.5	7.5
Note: *The value displayed in each cell represents the average change in mean seasonal or annual temperature for the specified 30-year period when compared to the average mean seasonal temperature from 1971 to 2000.*															
	EASTERN ARCTIC: Latitude (deg N) — Ensemble results														
	60–65 (Arctic Sector E1)					65–70 (Arctic Sector E2)					70–75 (Arctic Sector E3)				
Year	Winter	Spring	Summer	Autumn	Annual	Winter	Spring	Summer	Autumn	Annual	Winter	Spring	Summer	Autumn	Annual
2011–2040	2.1	0.9	0.6	1.1	1.2	1.4	1.1	0.8	2.0	1.3	1.7	1.3	0.7	2.5	1.6
2041–2070	5.6	2.2	1.3	2.0	2.8	4.6	2.4	1.4	3.7	3.0	4.3	2.6	1.3	5.0	3.3
2071–2100	10.9	4.3	2.5	3.3	5.3	9.5	4.5	2.6	5.7	5.6	8.7	4.8	2.3	8.0	6.0
Note: *The value displayed in each cell represents the average change in mean seasonal or annual temperature for the specified 30-year period when compared to the average mean seasonal temperature from 1971 to 2000.*															

This is comparable with the highest increase of 4.8°C of global mean surface temperature by 2081 to 2100 predicted by IPCC (2013), as shown in Table 1 from IPCC (2013), provided below.

Table 1 Predicted Changes in Global Mean Surface Air Temperature (IPCC 2013)

	2046–2065			2081–2100		
		Likely Range			Likely Range	
Scenarios	Mean (°C)	From (°C)	To (°C)	Mean (°C)	From (°C)	To (°C)
RCP2.6	1	0.4	1.6	1	0.3	1.7
RCP4.5	1.4	0.9	2	1.8	1.1	2.6
RCP6.0	1.3	0.8	1.8	2.2	1.4	3.1
RCP8.5	2	1.4	2.6	3.7	2.6	4.8

Source: IPCC (2013)
Notes: 1) Based on the CMIP5 ensemble
2) Calculated with respect to the period of 1986–2005.
3) Abbreviation/Unit Definitions: Representative Concentration Pathways (RCP); and degrees Celsius (°C)

An average increase in air temperature of 0.056°C per year was predicted by Pham et al. (2012) based on available climate data between 1970 to 2007 from the Diavik mine site and Environment Canada Lupin A and Ekati Weather Stations, and based on projections under the IPCC (2007) climate change A2 scenario. A projected long-term air temperature increase for the Ekati Mine of 5.6°C over 100 years in thermal analysis modelling was recommended by Annex IV (Permafrost Baseline Report of the Developer's Assessment Report [DAR]).

References:

CSA (Canadian Standards Association). 2010. Technical Guide Infrastructure in permafrost: A guideline for climate change adaptation. Canadian Standards Association (CSA) Special Publication, Chapter 5 (PLUS 4011-10). P. 41-53.

IPCC (Intergovernmental Panel on Climate Change), 2007. Climate Change 2007: Working Group I: The Physical Science Basis. Intergovernmental Panel on Climate Change (IPCC). Fourth Assessment Report.

IPCC. 2013. Climate Change 2013, The Physical Science Basis, Working Group I Contribution to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change.

Pham N, Sego DC, Blowes DW, Smith L, Amos RT. 2012. Heat Transport and the Effects of Climate Change in a Large-scale Waste Rock Pile Located in a Continuous Permafrost Region at Diavik Diamond Mine. Proceedings of the 9th International Conference on Acid Rock Drainage (ICRAD), Ottawa, Canada, May 2012.

DOMINION DIAMOND

Information Request Number:	DAR-NSMA-IR-14 and DAR-NSMA-IR-15
Source:	North Slave Metis Alliance: Shin Shiga
Subject:	Barren-Ground Caribou
DAR Section(s):	12

Preamble (NSMA):

Significant gap of knowledge remains in the area of understanding of the population resilience at different levels of population health. At present, the Bathurst herd is going under a rapid decline, which likely has reduced its resilience to disturbance. Without this data, it is unclear how DDEC concludes what magnitude (significance) of impact the Project may have on the Bathurst herd population health and resilience.

Request (NSMA):

DAR-NSMA-IR-14: Please explain how DDEC evaluated the current resilience of the Bathurst caribou?

DAR-NSMA-IR-15: How does DDEC incorporate the ongoing rapid decline of Bathurst caribou population into the analyses in the DAR and its subsequent addendums?

Response:

The current (and future predicted) resilience of the Bathurst herd was examined through analysis of the magnitude of changes in environmental (habitat) and demographic (survival and reproduction) measurement indictors that have occurred during the decline of the Bathurst herd from the Base Case to the Reasonably Foreseeable Development (RFD) Case. Lines of evidence (analyses of primary pathways) indicate that the Project and other developments do not significantly contribute to adverse cumulative effects on the abundance and distribution of the Bathurst herd. The primary pathways are analyzed in detail in the Developer's Assessment Report (DAR; Section 12.4.2). Subsequent to the DAR, population modelling was completed in response to Mackenzie Valley Environmental Review Board (MVEIRB) Jay Project Adequacy Review Item 8.8. The response was presented in a submission to the Board on February 2, 2015 as DAR-MVEIRB-15.

The population modelling examined both the decline phase of the Bathurst caribou herd (based on the most recent comprehensive estimates for vital rates) and for an increasing population phase of the Bathurst herd. The vital rates provided following the 2012 calving ground photographic survey (Boulanger et al. 2011, 2014) are the most recent vital rates that have been calculated for the Bathurst herd that reconcile all available sources of information (Adamczewski 2015). These vital rates were used in the population modelling. From the modelling:

- Based on the current estimates of vital rates for reference conditions (Boulanger et al. 2014), the results of the population modelling show the negative trend in population growth is predicted to be similar with and without the development-related cumulative changes in habitat quantity and quality, and caribou behaviour and energetics;

- The information required for the determination of vital rates (Boulanger et al. 2014) requires information not gathered in the 2014 reconnaissance survey. However, a discussion of the 2014 reconnaissance survey results and the relationship with population decline is provided in the adequacy response to DAR-MVEIRB-15: any set of vital rates consistent with the 2014 reconnaissance survey results will show rapid decline in the population for all assessment cases; and,
- The final set of scenarios presented in DAR-MVEIRB-15 examined RFD cases built on a population stage matrix of vital rates that may be closer to those expected during an increasing population phase. The results of those models showed the potential for population growth with high levels of insect harassment, maximum levels of disturbance in the RFD Case, on continued harvest of the population.

From the different scenarios examined, the additional energetic costs from changes in movement and behaviour associated with the Project and other developments are not expected to decrease population resilience and increase the risk to the viability of the Bathurst herd at any phase of the population cycle.

References:

Adamczewski, J., 2015. Personal communication. Wildlife Biologist, Ungulates – Environment & Natural Resources, Wildlife Division, Government of the Northwest Territories. Phone call with J. Rettie, Golder Associates. March 2, 2015.

Boulanger J, Gunn A, Adamczewski J, Croft B. 2011. A Data-Driven Demographic Model to Explore the Decline of the Bathurst Caribou Herd. J Wildlife Manage 75: 883-896.

Boulanger J, Croft B, Adamczewski J. 2014. An Estimate of Breeding Females and Analyses of Demographics For The Bathurst Herd of Barren-ground Caribou: 2012 Calving Ground Photographic Survey. Integrated Ecological Research Unpublished File Report No. 142 for Environment and Natural Resources, GNWT. 81 pp.

DOMINION DIAMOND

Information Request Number:	DAR-NSMA-IR-16 and DAR-NSMA-IR-17
Source:	North Slave Metis Alliance: Shin Shiga
Subject:	Barren-Ground Caribou
DAR Section(s):	12

Preamble (NSMA):

It seems that DDEC applied the same ZOI and other habitat degradation matrix to the four seasonal ranges (spring, post-calving, autumn, and winter). It has been expressed by many Traditional Knowledge holders that calving and post-calving periods are especially important to the population health of caribou.

Request (NSMA):

DAR-NSMA-IR-16: Please explain why DDEC did not employ a different set of criteria to incorporate this important piece of TK.

DAR-NSMA-IR-17: Please develop a new evaluation matrix that takes into account the significance of calving and post-calving periods. Please use this matrix to re-evaluate DDEC's caribou assessment.

Response:

The Traditional Knowledge indicating the importance of calving and post-calving periods is recognized as an important factor in considering the effects of the project on barren-ground caribou. To consider the maximum effects on each of the seasonal ranges, the maximum zones of influence (ZOIs) around development were calculated to account for the maximum spatial extent of direct and indirect habitat disturbance. Similarly, the maximum disturbance coefficients (DCs) applied to habitat within those zones of influence were selected to represent the maximum degree (size or magnitude) of habitat degradation. These ZOIs and DCs were then applied to each seasonal range to maximize the effect on caribou abundance and distribution at each point in the year. The spring range covers the period from April 15 to June 14 and includes the time and the geographic range used during the northern migration and during the calving period.

The Effects Study Area (ESA) presented in the Developer's Assessment Report (DAR) was determined as the outermost perimeter of the set of individual seasonal ranges. The entire ESA was approximately 306,000 square kilometres (km^2). Had the analyses been conducted on the entire ESA rather than each individual seasonal range, the effects of development would have been diluted by the larger study area. For example, the Ekati Mine (including the Jay and Sable Projects) and Diavik Mine (including A21) have a combined footprint of approximately 70 km^2 and a 15 kilometre (km) buffer ZOI containing approximately 1,800 km^2 of terrestrial habitat. The entire 15 km buffer ZOI around Ekati and Diavik mines is contained within both the spring and the post-calving seasonal ranges. The spring range is 200,000 km^2 and the post-calving seasonal range is 89,000 km^2. The 1,800 km^2 within the ZOI (the affected habitat) represents:

1,800 km^2 ÷ 89,000 km^2 = 2.0 percent (%) of the post-calving range;

1,800 km^2 ÷ 200,000 km^2 = 0.9% of spring range; and

1,800 km^2 ÷ 306,000 km^2 = 0.6% of the annual range.

From the example provided, it can be seen that the approach maximizes the percentage of each seasonal range that is affected. This maximizes the effects on caribou abundance and distribution at the seasonal level, which provides ecologically relevant and confident impact predictions.

This approach resulted in the following:

- Habitat loss and degradation were analyzed separately for each seasonal range;
- In each seasonal range, the same maximum ZOI was applied and the same maximum DC was applied; and,
- Because seasonal ranges are smaller than the annual range, the maximum percentage of each seasonal range was affected in each analysis.

By analyzing the effects on habitat separately for each season and maximizing the area disturbed and the degree of disturbance, the estimated effects of the Project provided ecologically relevant and confident impact predictions. Any season-specific sensitivities to the effects of development are accounted for by the approach and methods used in the DAR. These include the effects during the sensitive calving, post-calving, and rutting periods.

DOMINION DIAMOND

Information Request Number:	DAR-NSMA-IR-18
Source:	North Slave Metis Alliance: Shin Shiga
Subject:	Barren-Ground Caribou
DAR Section(s):	12.4.2.3.1 (Figure 12.4-2)

Preamble (NSMA):

The graph includes meteorological data from Diavik Diamond Mine and Snap Lake Mine, duration of 1993-2013.

Request (NSMA):

Please explain why data from 2014 is not included.

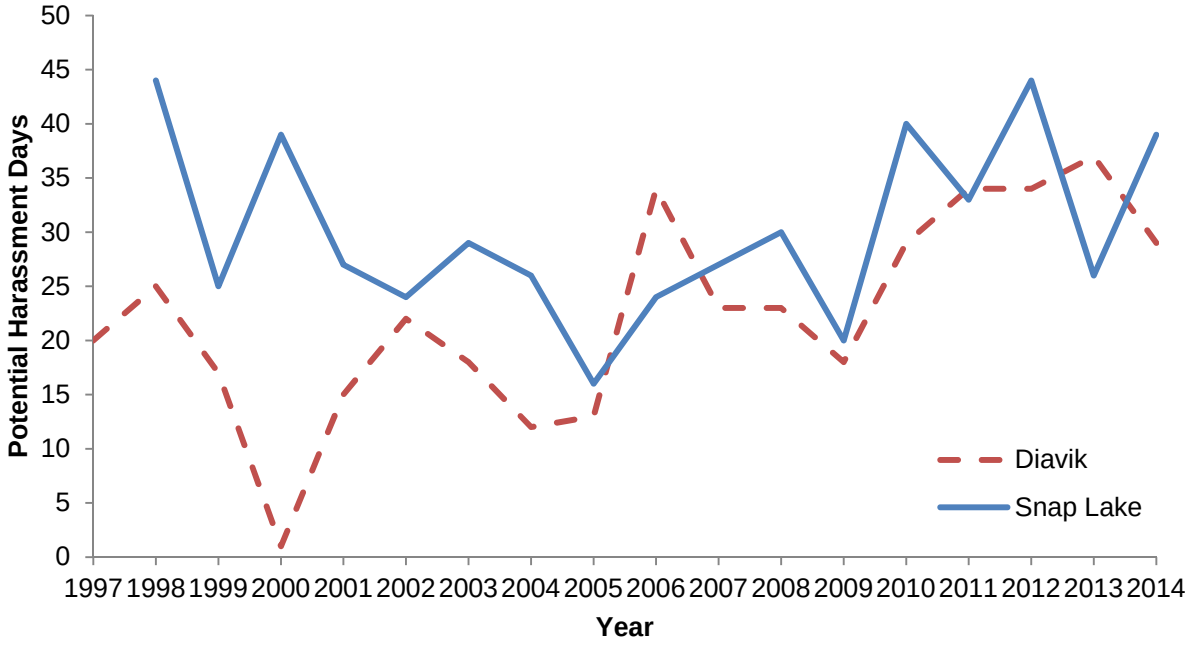
Response:

Figure 12.4-2 shows the insect harassment indices defined as Potential Harassment Days (PHDs) by year, based on meteorological data from the Diavik Mine and Snap Lake Mine from 1997 to 2013.

At the time that the modelling was completed for the Developer's Assessment Report (DAR) (i.e., through spring/summer 2014), weather results representing the entire post-calving to autumn/rut period (June 15 to October 31) from the Diavik and Snap Lake mines were not available and could not be used to calculate the total number of Insect PHDs for 2014.

Weather patterns during post-calving to autumn/rut period in 2014 at the Diavik and Snap Lake mines resulted in PHD values of 29 and 39, respectively (Figure 18-1), which are within the range of historical values reported in Table 12.4-26 of the DAR and do not change those used in the assessment of effects to caribou. The addition of results from 2014 weather data from the Diavik and Snap Lake mines does not change the residual impact classification and determination of significance provided in the DAR for cumulative effects to caribou.

Figure 18-1 Insect Harassment Indices Defined as Potential Harassment Days



Note: Calculated with meteorological data from the Diavik Diamond Mine (dashed red line) and Snap Lake Mine (solid blue line).

DOMINION DIAMOND

Information Request Number: DAR-NSMA-IR-19

Source: North Slave Metis Alliance: Shin Shiga

Subject: Barren-Ground Caribou

DAR Section(s): 12

Preamble (NSMA):

The graph [Figure 12.4-3] includes meteorological data from Diavik Diamond Mine and Snap Lake Mine, duration of 1993-2013.

Request (NSMA):

Please include data from 2014.

Response:

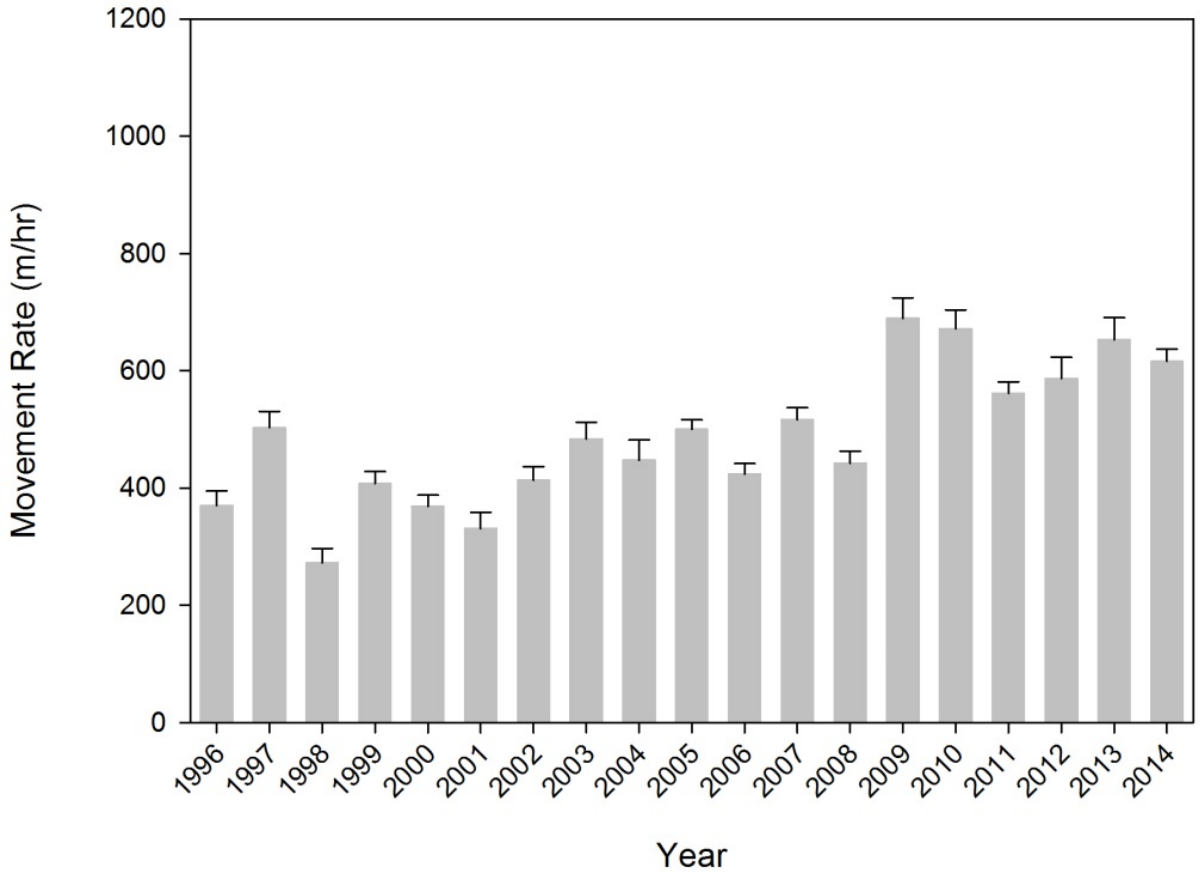
Figure 12.4-2 of the Developer's Assessment Report (DAR) shows annual patterns in insect harassment indices (based on meteorological data) from the Diavik and Snap Lake mines, and is updated with 2014 data in the response to DAR-NSMA-IR-18. Figure 12.4-3 in the DAR shows annual movement rates of caribou based on locations of satellite and global positioning system (GPS) collared Bathurst caribou cows. This response covers the requested information related to Information Requests DAR-NSMA-IR-19, -20, and -21.

The temporal scope of collared caribou cow data used in the energetic model included the post-calving to autumn/rut period (June 15 to October 31). As described in the DAR, this period represents the time when lactating caribou cows are under nutritional stress due to the presence of calves, and thus, most sensitive to additional effects from development disturbance. It also represents the time when caribou are most likely to encounter a zone of influence around active developments based on the distribution of developments within their annual range (excluding potential encounters with the Tibbitt to Contwoyto Winter Road). Because the period starts at post-calving, it represents the beginning point where body mass loss from cumulative effects would be associated with the likelihood of producing a calf the following June. The period used in the DAR predicted maximum levels or disturbance and was ecologically appropriate for assessing cumulative effects to caribou.

The DAR was submitted on November 6, 2014, and at the time that the modelling was completed (i.e., through spring/summer 2014), the locations of Bathurst collared caribou cows for the post-calving to autumn/rut period were not available. Collar location data are typically not available from the Government of the Northwest Territories (GNWT) until several months after acquisition from satellites.

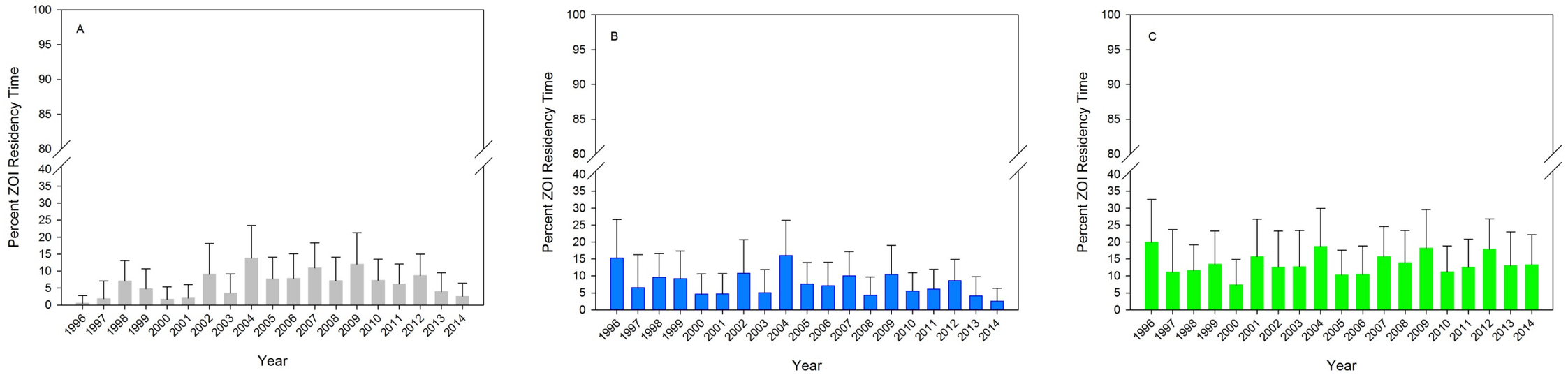
The figures referenced in the Information Requests have been updated with 2014 caribou collar data acquired from the GNWT and are provided below. These include annual mean movement rates (Figure 19-1), mean percent time in zones of influence (Figure 19-2), and mean encounter rates with zones of influence (Figure 19-3). The results including the 2014 locations of collared cows do not change the effects assessment or determination of significance of the DAR.

Figure 19-1 Annual Trends in Mean Movement Rate (± 1SE) for Female Caribou in the Bathurst Herd from June 15 to October 31



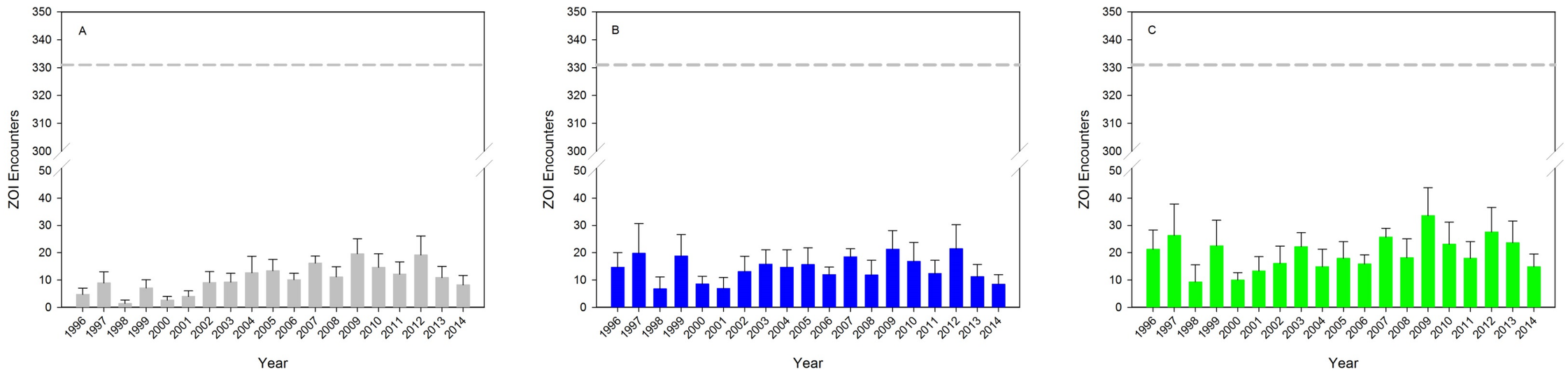
m/hr = metres per hour.

Figure 19-2 Temporal Trend in Mean Percent Time (± 1SE) in Zones of Influence for Female Caribou in the Bathurst Herd from 1996 to 2014 for the Base Case (A), Application Case (B), and Reasonably Foreseeable Development Case (C)



ZOI = zone of influence.

Figure 19-3 Temporal Trend in Mean Encounter Rates (± 95% Upper Interval) with Zones of Influence for Female Caribou in the Bathurst Herd from 1996 to 2014 for the Base Case (A), Application Case (B), and the Reasonably Foreseeable Development Case (C). Also shown is the reference threshold of 385 encounters (dashed line) estimated to result in no parturition during a severe insect year



ZOI = zone of influence.

DOMINION DIAMOND

Information Request Number:	DAR-NSMA-IR-20
Source:	North Slave Metis Alliance: Shin Shiga
Subject:	Barren-Ground Caribou
DAR Section(s):	12

Preamble (NSMA):

The graph [Figure 12.4-4] includes meteorological data from Diavik Diamond Mine and Snap Lake Mine, duration of 1993-2013.

Request (NSMA):

Please increase spatial scale of this data so that it covers at least the calving/post-calving areas.

Response:

Please see the response to DAR-NSMA-IR-19.

DOMINION DIAMOND

Information Request Number:	DAR-NSMA-IR-21
Source:	North Slave Metis Alliance: Shin Shiga
Subject:	Barren-Ground Caribou
DAR Section(s):	12

Preamble (NSMA):

The graph [Figure 12.4-5] includes meteorological data from Diavik Diamond Mine and Snap Lake Mine, duration of 1993-2013.

Request (NSMA):

Please increase the temporal scope of this data if possible.

Response:

Please see the response to DAR-NSMA-IR-19.

DOMINION DIAMOND

Information Request Number:	DAR-NSMA-IR-22
Source:	North Slave Metis Alliance: Shin Shiga
Subject:	Barren-Ground Caribou
DAR Section(s):	12.4.2.3.1 (Figure 12.4-6)

Preamble (NSMA):

The graph [Figure 12.4-6] includes meteorological data from Diavik Diamond Mine and Snap Lake Mine, duration of 1993-2013.

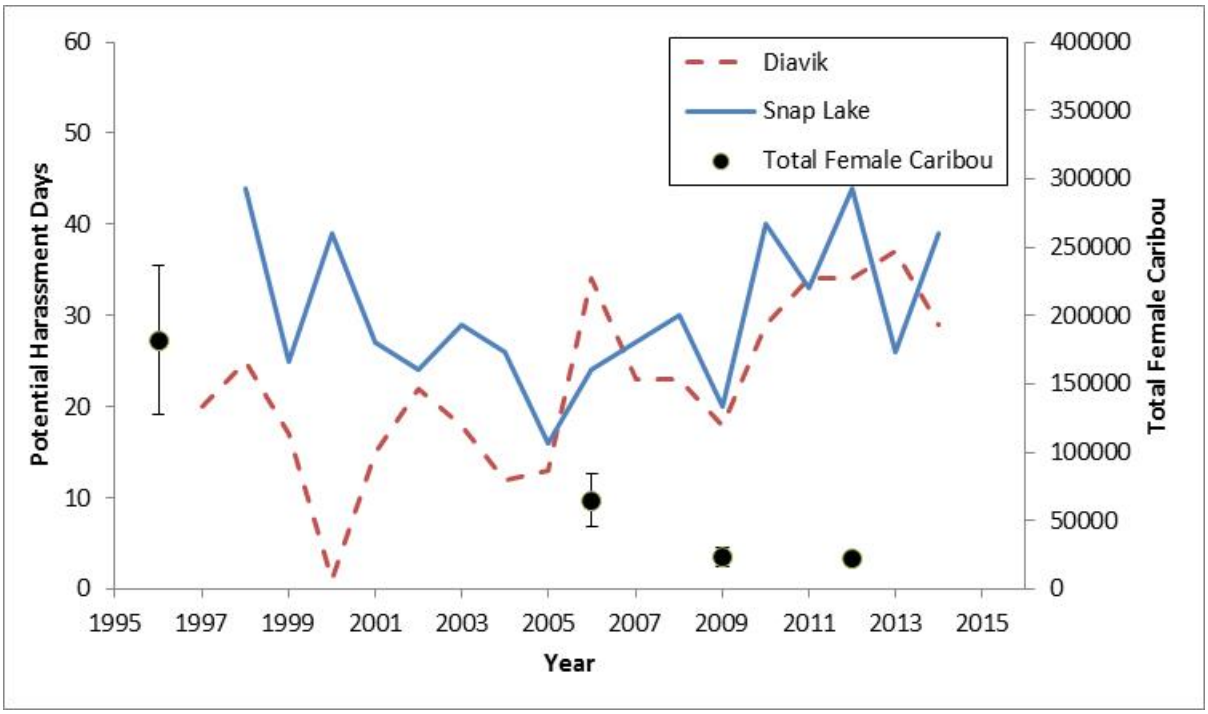
Request (NSMA):

Please superimpose on this data the Bathurst caribou population data for ease of comparison.

Response:

Section 12 of the DAR does not contain a Figure 12.4-6. The North Slave Métis Alliance clarified that the intended figure for this request was Figure 12.4-2 of the DAR. To meet this request, a secondary vertical axis was added in order to display the Bathurst population data on the total number of female caribou results shown in Figure 12.2-1 of the DAR (Figure 22-1). Bathurst population data on total female caribou were reported in the DAR, and therefore readily available to meet this request. The trend in total female caribou is consistent with the trend reported for the entire Bathurst herd (Adamczewski et al. 2009).

Figure 22-1 Insect Harassment Indices Defined as Potential Harassment Days and Estimates (± SD) of Total Female Bathurst Caribou



SD = standard deviation.

References:

Adamczewski JZ, Boulanger J, Croft B, Cluff D, Elkin B, Nishi J, Kelly A, D'Hont A, Nicholson C. 2009. Decline of the Bathurst Caribou Herd 2006-2009: A technical evaluation of field data and modeling. Draft technical report December 2009. GNWT.

DOMINION DIAMOND

Information Request Number:	DAR-NSMA-IR-23
Source:	NSMA
Subject:	Employment
DAR Section(s):	14, Response to Jay Project Adequacy Review Items 11.1, 11.2, 11.3, 11.4, 11.5

Preamble (NSMA):

See recommendation

Request (NSMA):

Please provide the Project's, as well as DDEC's, economic contribution as a percentage GDP share of the NWT GDP. Please make a graph showing the trend over time that includes reference, base, closure, and post closure periods.

Response:

In answering this question, it is important to understand the different calculations used for Gross Domestic Product (GDP).

Real GDP at Market Prices is the most commonly used calculation of GDP. It represents value-added production that includes indirect taxes, thus being aligned with the value paid by final consumers. The term ‘real’ is in reference to the removal of inflationary effects on the values used in the calculation. At present, Statistics Canada use a chained method to establish the base price and has set the base year to 2007 (i.e., uses 2007 dollars).

Economic Input-Output Models, for the purpose of socio-economic assessment, project economic, labour and population shifts as a result of economic inputs. These models use GDP at Basic Prices, as opposed to the GDP at Market Prices. This excludes indirect taxes on products, and is the method used when studying the value-added contribution of industries to an economy. Input-Output Models are based on a single period in time, and therefore, use the prices of the day and do not take account of inflation. The base year for the current multipliers produced by Statistics Canada is 2010 (Statistics Canada 2014a). Therefore, the model results show the GDP effects of the Jay Project (Project) based on the Northwest Territories (NWT) economy as it was in 2010. Prices are held constant.

In 2010, the diamond mining industry’s contribution to the NWT’s overall economy using GDP at Basic Prices was $1.357 billion in an economy worth $4.674 billion (a relative contribution of 29 percent [%]). This measure of GDP is not available beyond 2011 (Statistics Canada 2014b).

Conversely, using real GDP at Market Prices (chained [2007] prices), the NWT diamond mining industry’s contribution in 2010 was $658 million in an economy worth $3.675 billion (a relative contribution of 17.9%). By 2013, diamond mining’s contribution was valued at $562.7 million in an economy worth $3.587 billion (a relative contribution of 15.7%) (Statistics Canada 2014c).

Appendix A, the Economic Impact Report (Revised) provides details regarding the Project's GDP contribution to the NWT economy during the three measured phases of the Project (i.e., construction, operations, and closure and reclamation). The construction phase will span five years beginning in the latter half of 2015. Most of the work is expected to take place from 2017 onwards. The total direct GDP effect of this construction on the NWT economy is estimated to equal $163 million from a Project with an estimated cost of $566 million (after subtracting the cost of direct imports). Including indirect and induced effects raises the total Project construction effect on GDP to $208 million.

The operations phase is expected to commence in the latter half of 2020, with the last full year being 2030, and with the final production in 2031. The total direct Project operations effect on territorial GDP is estimated to equal $5.3 billion from a Project with and estimated operational costs of $3.4 billion. The average annual direct contribution of the Project to the NWT's economy during years of full operation is estimated to equal $507 million. Including indirect and induced effects raises the average annual Project operations effect on GDP to $574 million. This contribution represents 12.3% of GDP at Basic Prices in the base year.

Reclamation work associated with the existing Ekati Mine operations and the Project will be carried out during the Project's operations phase. The economic contribution of that portion of the reclamation phase is included in the calculations for the operation phase effects estimated above.

This economic effect of the post-operations reclamation phase is based on an estimated reclamation expenditure of $266 million over the two-year period (i.e., 2032 to 2033). Lake back-flooding and monitoring will continue for several more years; however, the cost and labour associated with those activities is small and is not included in the economic effects calculations.

Using Statistics Canada's Interprovincial Input-Output Model and the Northwest Territories Economic Impact Model, it is estimated that Project reclamation will increase GDP by a total of approximately $100 million over two years (including the direct, indirect, and induced effects).

A forecast of GDP for the entire territory was not required as part of the Terms of Reference for the Jay Project and is not a part of the Economic Impact Report. Therefore, a temporal graphic comparison of the GDP effects of the Project with the GDP of the entire territory has not been provided.

References:

Statistics Canada. 2014a. Industry Accounts Division. Provincial Input-Output Tables, 2010.

Statistics Canada. 2014b. CANSIM Table 379-0030: Gross domestic product (GDP) at basic prices, by North American Industry Classification System (NAICS), provinces and territories, annual (dollars x 1,000,000) Available at: http://www5.statcan.gc.ca/cansim/a26?lang=eng&retrLang=eng&id=3790030&paSer=&pattern=&stByVal=1&p1=1&p2=11&tabMode=dataTable&csid= Accessed: March 15, 2015.

Statistics Canada. 2014c. CANSIM Table 384-0038, Gross domestic product, expenditure-based, provincial and territorial, annual (dollars unless otherwise noted), CANSIM (database). Available at: http://www5.statcan.gc.ca/cansim/a26?lang=eng&retrLang=eng&id=3840038&paSer=&pattern=&stByVal=1&p1=1&p2=-1&tabMode=dataTable&csid=. Accessed: March 10, 2015.

Information Request Number:	DAR-NSMA-IR-24
Source:	North Slave Metis Alliance: Shin Shiga
Subject:	Employment
DAR Section(s):	Response to Jay Project Adequacy Review Items 11.1, 11.2, 11.3, 11.4, 11.5 (Table 3.1-1)

Preamble (NSMA):

The table [3.1-1] clearly shows a remarkably low female employment rate, without any signs of improvement overtime.

Request (NSMA):

Please provide a list of programs and efforts targeted at improving the employment of women by DDEC.

Response:

Please refer to the response to DAR-NSMA-IR-29 for a comprehensive discussion of the employment of women with Dominion Diamond Ekati Corporation.

Information Request Number: DAR-NSMA-IR-25

Source: North Slave Metis Alliance: Shin Shiga

Subject: Socio-Ec

DAR Section(s): Adequacy Review Responses 11.1 to 11.5

Preamble (NSMA):

MVEIRB requested in its Adequacy Review for the evaluation of socio-economic programs.

Request (NSMA):

The NSMA repeats this request: please provide quantitative and qualitative evaluation of the above listed and other socio-economic programs and efforts.

Response:

The socio-economic programs referenced in the Mackenzie Valley Environmental Impact Review Board Adequacy Review, Item 11.3, referred to programs aimed at improving retention and advancement of Aboriginal employees and women. The Adequacy Review response (Dominion Diamond 2015) notes that "By the time of technical review [i.e., the technical sessions currently scheduled for April 2015], Dominion Diamond Ekati Corporation (Dominion Diamond) expects to have further data based on their operation of the Ekati Mine from April 2013 to the end of 2014. This data can be provided, broken out by the human resource indicators requested (retention, gender, advancement)". Pending the ability of Dominion Diamond to internally compile relevant statistics on the success of their programs aimed at improving the retention and advancement of Aboriginal and female employees, it is expected that this information will be made available during the technical sessions, in the socio-economic presentation.

It should be noted that Dominion Diamond acquired the Ekati Mine from BHP Billiton in 2013. The first full year of Dominion Diamond ownership and operation of the Ekati Mine was 2014. Dominion Diamond does not hold historical data regarding the outcomes of social and employment programs prior to their acquisition of the mine. BHP Billiton proprietarily owns this information.

Since submission of the Supplemental Report addressing Adequacy Items 11.1 to 11.5, Dominion Diamond has further developed the following programs aimed at maximizing the employment of Northern Aboriginals, and providing other social support to communities.

Community Liaisons

Dominion Diamond has partnered with two Impact Benefit Agreement (IBA) communities to set up liaison positions, the purpose of which is to provide pre-employment assistance to community members. The liaison provides assistance with the online application system, resume writing, posting upcoming positions, mock-interviews, and maintaining an inventory of potential candidates. The liaison is also responsible for providing community members with information about and advice on how to be successful with respect to the criminal record checks and drug and alcohol testing. The liaison also assists in

additional areas, such as, setting up career fairs for the community and coordinating participants for site visits and site-based community environmental monitoring activities.

Dominion Diamond has faced numerous challenges with potential candidates being successful in the recruitment and security screening processes. The goal of the liaison position is to address some of these challenges. In Lutsel K'e, the liaison position has been in place since November 2014. Dominion Diamond has received a funding proposal from Kugluktuk and a draft job description for consideration, and anticipates having this position in place for April 2015. Evaluations of the positions will occur at the end of 2015 to determine their effectiveness.

Financial Literacy Training

Dominion Diamond, De Beers Canada Inc., and Diavik Diamond Mines Inc. partnered with the Government of the Northwest Territories to create a Financial Literacy course. The course material was completed in 2014, and the pilot project commenced in Behchokǫ̀ in August of the same year. Future courses are planned for Whatì and Lutsel K'e. The Tłı̨chǫ have noted that they would prefer to take the material and the funding and deliver the courses themselves to their membership. The Lutsel K'e course is currently scheduled for March 2015. Following the administration of these courses, feedback will be compiled and reported.

References:

Dominion Diamond (Dominion Diamond Ekati Corporation). 2015. Response to: Jay Project Adequacy Review Items 11.1, 11.2, 11.3, 11.4, and 11.5. Submitted to Mackenzie Valley Environmental Impact Review Board. Yellowknife. NWT. Canada. January 2015.

DOMINION DIAMOND

Information Request Number:	DAR-NSMA-IR-26
Source:	North Slave Metis Alliance: Shin Shiga
Subject:	Employment
DAR Section(s):	Response to Jay Project Adequacy Review Items 11.1, 11.2, 11.3, 11.4, 11.5 (Table 4.1-1)

Preamble (NSMA):

In the table [4.1-1] DDEC provides one explanation why a subset of women in rural areas do not apply to work at mine sites.

Request (NSMA):

Please provide the analysis of the significance of the given explanation relative to the overall potential female workforce for DDEC.

Response:

Please refer to the response to DAR-NSMA-IR-29 for a comprehensive discussion of the employment of women with Dominion Diamond Ekati Corporation.

DOMINION DIAMOND

Information Request Number: DAR-NSMA-IR-27

Source: North Slave Metis Alliance: Shin Shiga

Subject: Socio-Ec

DAR Section(s): Adequacy Review Responses 11.1 to 11.5

Preamble (NSMA):

In the table [4.1-1] DDEC provides one explanation why a subset of women in rural areas do not apply to work at mine sites.

Request (NSMA):

If there is not adequate data to conduct such analysis, please design community consultations specifically designed to improve female employment rate at DDEC.

Response:

Part 1)

This response provides further clarity to the point made in Table 4.2-1 of the Socio-Economic Supplemental Report response to Adequacy Review items (Dominion Diamond 2015). The Dominion Diamond Ekati Corporation (Dominion Diamond) head office is located in Yellowknife. It is here that positions associated with business operations (e.g., Human Resources, Community and Public Relations, accounting, finance, administration, procurement) are based. These types of positions typically work a Monday to Friday schedule, and are more easily altered (in terms of hours worked per day) to accommodate non-standard working hours (i.e., not 9-5). This schedule is more attractive to people that find rotational work challenging, such as those caring for children or other family members. Women in Yellowknife who are the primary care givers for young children may not face the same barriers to employment as those who live in rural communities, who do not have the opportunity to work at Dominion Diamond without moving to Yellowknife.

Rotational work at the Ekati Mine site is more accessible to residents of rural communities, given the less frequent commute schedule (i.e., travelling every two weeks for a 2:2 rotation), and the fact that these communities are fly points from which employees can be transferred to site via a charter. This presents a challenge, and a barrier, for women who are caring for young children in rural communities, and who would seek employment with Dominion Diamond. Rotational employment involves long periods away from your home community and family. This may not be viewed as feasible or even desirable for many women. As a result, some women in rural communities do not apply for positions.

Part 2)

The design of community consultations designed to improve the employment of women at the Ekati Mine is out of the scope of the Developer's Assessment Report for the Jay Project. However, Dominion Diamond is committed to ongoing engagement with communities, and will continue to seek input on

employment barriers, including those discussed above, and possible approaches to breaking down those barriers.

References:

Dominion Diamond (Dominion Diamond Ekati Corporation). 2015. Response to: Jay Project Adequacy Review Items 11.1, 11.2, 11.3, 11.4, and 11.5. Submitted to Mackenzie Valley Environmental Impact Review Board. Yellowknife. NWT. Canada. January 2015.

Information Request Number: DAR-NSMA-IR-28

Source: North Slave Metis Alliance: Shin Shiga

Subject: Socio-Ec

DAR Section(s): Annex XV

Preamble (NSMA):

See recommendation [request].

Request (NSMA):

Please define "traditional" and "non-traditional" roles for women at DDEC.

Response:

Section 14.6.2 of the Developer's Assessment Report (DAR) notes that Dominion Diamond Ekati Corporation (Dominion Diamond) "will continue to actively encourage the employment of women in non-traditional roles." As defined by Dominion Diamond, a woman who works outside the home in a job that is not historically categorized as a female occupation is considered to be working in a "non-traditional" occupation (Dominion Diamond Corporation 2013). Non-traditional occupation, as defined by Statistics Canada, refers to a population (e.g., women) representation of 25 percent (%) or less of an occupational group (House of Commons Canada 2010). Examples of non-traditional occupations for women include occupations in the fields related to primary industry (e.g., forestry operations, mining, oil and gas), construction trades, and in the fields of natural sciences, engineering and mathematics (Statistics Canada 2013). Traditional occupations for women are occupations in which women represent 75% or more of total employed (United States Department of Labor 2013). Examples of traditional occupational roles for women include teaching, nursing and related health fields, clerical or other administrative positions, and sales and service (Statistics Canada 2012).

References:

Dominion Diamond Corporation. 2013. Dominion Diamond's 2013 Socio-Economic Agreement Report.

House of Commons Canada. 2010. Building the Pipeline: Increasing the Participation of Women in Non-Traditional Occupations, Report of the Standing Committee on the Status of Women. Available at: http://www.parl.gc.ca/content/hoc/Committee/403/FEWO/Reports/RP4819341/feworp06/feworp06-e.pdf. Accessed March 13, 2015.

Statistics Canada. 2012. Women in Canada at a Glance Statistical Highlights. Available at: http://www.swc-cfc.gc.ca/rc-cr/stat/wic-fac-2012/sec7-eng.html. Accessed March 13, 2015.

Statistics Canada. 2013. Fact Sheet: Women in Non-Traditional Occupations. Available at: http://www.swc-cfc.gc.ca/initiatives/wesp-sepf/fs-fi/wnto-fetm-eng.html. Accessed March 13, 2015.

United States Department of Labor. 2013. Traditional and non-traditional occupations. Available at: http://www.dol.gov/wb/stats/nontra_traditional_occupations.htm. Accessed March 13, 2015.

DOMINION DIAMOND

Information Request Number: DAR-NSMA-IR-29

Source: North Slave Metis Alliance: Shin Shiga

Subject: Employment

DAR Section(s): Annex XV

Preamble (NSMA):

See recommendation [request].

Request (NSMA):

Please provide explanation for why the number of northern aboriginal women working for DDEC is particularly low. Please describe what DDEC has done to improve this situation, along with the evaluation for such efforts.

Response:

The Northern Women in Mining, Oil and Gas Project (NWMOGP) (Status of Women Council of the NWT 2010) identified the following barriers to the employment of women in the mining and oil and gas industries in the North:

1) Women have not, traditionally, been encouraged to gain an education related to trades-based occupations, and as a result, may lack the technical skills required for positions in mining. As identified by participants of the NWMOGP, a lack of relevant education, and the cost of obtaining an education, were the most prevalent barriers to securing employment in mining.

2) Low levels of literacy, and more unique to women, numeracy (i.e., mathematical skills), are a barrier to pursuing an education in the trades that would provide the skills needed for mining employment.

3) Being the primary or, in some cases, only caregiver for small children can be a barrier to women enter trades-based occupations. The traditional view is that women should remain home to care for children. The lack of qualified childcare facilities is also an issue.

4) There are perceptions that mine sites are work environments best suited for men. Women may feel intimidated in this type of environment, and so may lack the confidence or desire to work in a male-dominated workplace.

5) Wellness issues, including high rates of alcoholism and issues (often associated) with nutrition, physical activity, and sexual health, are prevalent in the Northwest Territories (NWT). These issues can complicate an individual's ability to effectively work.

In Canada, women have historically had lower representation in the mining labour force compared to men. In recent years, however, women's participation has increased; in 1996, women accounted for approximately 10 percent (%) of the mining labour force (MIHRC 2010). By 2006, this number had

increased to 14% (MIHRC 2010). As of 2014, women comprised approximately 19% of the forestry, fishing, quarrying, mining, and oil and gas industries (Statistics Canada 2015). As this number includes multiple industries, as per Statistics Canada's industry classification, it is not exclusively representative of mining. The rate of employment of women in Canadian mining alone in 2014 is likely to be somewhat lower. In 2013, 15% (197/1,336) of the total Dominion Diamond Ekati Mine (Dominion Diamond) workforce was female. Women made up a larger portion of direct employment (15%, or 121/803) than contractor employment (14%, or 76/533) (Dominion Diamond 2014). The rate of employment of women at the Ekati Mine is, therefore, in line with that of the overall Canadian mining industry.

Table 29-1 provides a breakdown of the employment of women at the Ekati Mine, by priority group since 2006. Overall, the employment of women has been relatively constant over the Ekati Mine's history, at between 14% and 18% of the total workforce. Northern women have a much higher representation than southern women at the mine, in most years accounting for over two thirds of all the female workforce. Northern women employed at the Ekati Mine are also more likely to be Aboriginal than non-Aboriginal.

Table 29-1 Employment of Women at the Ekati Mine, by Priority Group (2006 to 2013)

Employment By Gender (Person Years)		2006			2007			2008			2009			2010			2011			2012			2013		
		Women	Men	**Total**	Women	Men	**Total**	Women	Men	**Total**	Women	Men	**Total**	Women	Men	**Total**	Women	Men	**Total**	Women	Men	**Total**	Women	Men	**Total**
Aboriginal	#	78	259	**337**	97	321	**418**	84	324	**408**	117	294	**411**	60	266	**326**	56	262	**318**	90	294	**384**	71	303	**374**
	%	49	30	33	56	32	35	41	26	28	45	25	28	30	26	27	29	26	26	38	26	28	36	27	28
Other Northern	#	60	219	**279**	58	228	**286**	34	270	**304**	92	270	**362**	97	247	**344**	91	242	**333**	78	253	**331**	63	234	**297**
	%	38	25	27	33	22	24	17	22	21	36	23	25	48	24	28	47	24	27	33	22	24	32	21	22
Total Northern	#	138	478	**616**	155	549	**704**	118	594	**712**	209	564	**773**	157	513	**670**	147	504	651	168	547	715	134	537	**671**
	%	87	55	60	89	54	59	58	48	49	81	47	53	78	50	54	77	49	54	71	48	52	68	47	50
Other	#	21	397	**418**	19	470	**489**	87	643	**730**	50	634	**684**	45	515	**560**	45	518	**563**	69	583	**652**	63	602	**665**
	%	13	45	40	11	46	41	42	52	51	19	53	47	22	50	46	23	51	46	29	52	48	32	53	50
Total	**#**	**159**	**875**	**1,034**	**174**	**1,019**	**1,193**	**205**	**1,237**	**1,442**	**259**	**1,198**	**1,457**	**202**	**1,028**	**1,230**	**192**	**1,022**	**1,214**	**237**	**1,130**	**1,367**	**197**	**1,139**	**1,336**
	%	**15**	**85**	**100**	**15**	**85**	**100**	**14**	**86**	**100**	**18**	**82**	**100**	**16**	**84**	**100**	**16**	**84**	**100**	**17**	**83**	**100**	**15**	**85**	**100**

Source: BHP Billiton (2006 through 2011); Dominion Diamond (2012, 2013, 2014).
Note: some totals vary from those reporting in the references sourced below, due to rounding.
% = percent; # = number.

Some positions in the mining industry may be more attractive to women than others. Positions that are "traditionally" held by women include clerical, administrative, and business support services (Statistics Canada 2013). Positions associated with mine construction and operations (e.g., trades, haul truck drivers, mining labourers) are not typically held by women, and are considered "non-traditional"[1] roles (Statistics Canada 2012).

Employment of women in traditional and non-traditional roles at the Ekati Mine is broken down in Table 29-2. While, overall, women are typically more likely to be employed in traditional roles than non-traditional roles, this trend has been shifting over the past decade. Further, more Aboriginal women worked in non-traditional roles than in traditional roles in 2013.

Table 29-2 Employment of Women at the Ekati Mine, by Role Type (2008 to 2013)

Women Employment in Traditional and Non-Traditional Positions (Person Years)		2008			2009			2010			2011			2012			2013		
		Traditional	Non-Traditional	**Total**	Traditional	Non-Traditional	**Total**	Traditional	Non-Traditional	**Total**	Traditional	Non-Traditional	**Total**	Traditional	Non-Traditional	**Total**	Traditional	Non-Traditional	**Total**
Aboriginal	#	50	34	84	68	49	117	10	21	31	8	24	32	10	26	36	12	25	37
	%	54	30	41	57	35	45	32	20	23	40	20	23	37	23	26	31	30	30
Other Northern	#	25	9	34	32	60	92	18	62	80	10	67	77	15	51	66	23	28	51
	%	27	8	17	27	43	36	58	60	60	50	57	56	56	46	48	59	34	42
Total Northern	**#**	75	43	118	100	109	209	28	83	111	18	91	109	25	77	102	35	53	88
	%	81	38	58	83	78	81	90	81	83	90	77	79	93	69	74	90	64	72
Other	#	18	69	87	20	30	50	3	20	23	2	27	29	2	34	36	4	30	34
	%	19	62	42	17	22	19	10	19	17	10	23	21	7	31	26	10	36	28
Total	**#**	**93**	**112**	**205**	**120**	**139**	**259**	**31**	**103**	**134**	**20**	**118**	**138**	**27**	**111**	**138**	**39**	**83**	**122**
	%	**45**	**55**	**100**	**46**	**54**	**100**	**23**	**77**	**100**	**14**	**86**	**100**	**20**	**80**	**100**	**32**	**68**	**100**

Source: BHP Billiton (2006 through 2011); Dominion Diamond (2012, 2013, 2014).
% = percent; #= number.

Dominion Diamond's head office is located in Yellowknife. It is here that positions associated with business operations (e.g., Human Resources, Community and Public Relations, corporate management, accounting, finance, administration, procurement) are based. These types of positions typically work a Monday to Friday schedule. This schedule is more attractive to people that find rotational work challenging, such as those caring for children or other family members. Because of the concentration of office-based, non-rotational women in Yellowknife, and because of the availability of childcare services in the city, women here may be more attracted to employment with Dominion Diamond.

[1] Non-traditional occupation, as defined by Statistics Canada, refers to a population (e.g., women) representation of 25% or less of an occupational group (House of Commons Canada 2010). Traditional occupations for women are occupations in which women represent 75% or more of total employed (United States Department of Labor 2013).

For women with young families, rotational work can pose a challenge. Being away from home, and thus unable to care for young children, for two weeks at a time may not be feasible or desirable for some women, and may prevent them from seeking employment. On a case-by-case basis, Dominion Diamond evaluates alternative shift options for women such as three days on, four off. This shorter period away from the home may allow some women to split caregiving duties with another family member, or to use other childcare arrangements, if available.

As noted above, the lack of necessary education for a position is another barrier to employment that affects women. Dominion Diamond provides scholarships through the Ekati Plus program open exclusively to women in the support of educational attainment, with the aim of removing the barrier associated with the cost of an education.

Dominion Diamond is committed to ongoing engagement with communities to identify concerns related to, among other things, employment of Northerners, including women. As engagement continues, where concerns exist around the employment of women at the Ekati Mine, Dominion Diamond will work with communities to develop strategies to maximize employment, where practical, and to evaluate the effectiveness of the strategies.

References:

BHP Billiton (BHP Billiton Canada Inc.). 2006. Ekati Mine. Annual Report on Northern Employment and Spending 2006 Operations Phase - EKATI Diamond Mine. Yellowknife. NWT. Canada.

BHP Billiton. 2007. Ekati Mine. Annual Report on Northern Employment and Spending 2007 Operations Phase - EKATI Diamond Mine. Yellowknife. NWT. Canada.

BHP Billiton. 2008. Ekati Mine. 2008 Sustainable Development Report Ekati Diamond Mine. Yellowknife, NWT. Canada.

BHP Billiton. 2009. Ekati Mine. Ekati Diamond Mine 2009 Year in Review. Yellowknife, NWT. Canada.

BHP Billiton. 2010. Ekati Mine. Ekati Diamond Mine 2010 Year in Review. Yellowknife, NWT. Canada.

BHP Billiton. 2011. Ekati Mine. Ekati Diamond Mine 2011 Year in Review. Yellowknife, NWT. Canada.

Dominion Diamond (Dominion Diamond Ekati Mine). 2012. Ekati Diamond Mine 2012 Year in Review. Yellowknife, NWT. Canada

Dominion Diamond. 2013. Dominion Diamond’s 2013 Socio-Economic Agreement Report. Yellowknife, NWT. Canada.

Dominion Diamond. 2014. Dominion Diamond’s 2014 Socio-Economic Agreement Report. Yellowknife, NWT. Canada.

House of Commons. 2010. Building the Pipeline: Increasing the Participation of Women in Non-Traditional Occupations, Report of the Standing Committee on the Status of Women. Available at: http://www.parl.gc.ca/content/hoc/Committee/403/FEWO/Reports/RP4819341/feworp06/feworp06-e.pdf. Accessed March 13, 2015.

MIHRC (Mining Industry Human Resources Council). 2010. Canadian Mining Industry Employment and Hiring Forecasts. Available at: http://www.mihr.ca/en/resources/Employment_HiringForecasts2011_FINAL_ENG1.pdf. Accessed March 2015.

Statistics Canada. 2012. Women in Canada at a Glance Statistical Highlights. Available at: http://www.swc-cfc.gc.ca/rc-cr/stat/wic-fac-2012/sec7-eng.html. Accessed March 13, 2015.

Statistics Canada. 2013. Fact Sheet: Women in Non-Traditional Occupations. Available at: http://www.swc-cfc.gc.ca/initiatives/wesp-sepf/fs-fi/wnto-fetm-eng.html. Accessed March 13, 2015.

Statistics Canada. 2015. Employment by Industry and Sex. Date modified: 2015-01-28. Available at: http://www.statcan.gc.ca/tables-tableaux/sum-som/l01/cst01/labor10a-eng.htm. Accessed March 2015.

Status on Women Council of the NWT. 2010. Northern Women in Mining and Pil and Gas Project. Summative Project Evaluation for the Reporting Period April 2007 – February 2010. Available at: http://www.statusofwomen.nt.ca/pdf/summative%20report.pdf. Accessed March 2015.

United States Department of Labour. 2013. Traditional and non-traditional occupations. Available at: http://www.dol.gov/wb/stats/nontra_traditional_occupations.htm. Accessed March 13, 2015.

Information Request Number:	DAR-NSMA-IR-30
Source:	North Slave Metis Alliance: Shin Shiga
Subject:	Socio-Ec
DAR Section(s):	3, Adequacy Review Responses 11.1 to 11.5

Preamble (NSMA):

See recommendation [request].

Request (NSMA):

Please provide data for northern aboriginal employment statistics; in particular, provide employment statistics of the IBA parties.

Response:

While historical human resources data for the Ekati Mine was not transferred to Dominion Diamond Corporation by BHP Billiton, publicly available copies of the mine's annual Socio-Economic Agreement reports provide some level of historical data on employment by hiring priority and gender. Table 30-1 provides a breakdown of employment at the Ekati Mine, by year and hiring priority, from 1999 to 2013. Information has been broken out by direct and contractor employment where available. Data from 2014 are currently under review by Dominion Diamond Ekati Corporation, and will be available at a later date in the form of the annual Socio-Economic Agreement report. Tables 30-2 and 30-3 provide information on employment by hiring priority at the Diavik and Snap Lake mines, respectively.

Employment by Impact Benefit Agreement (IBA) party is confidential, and cannot be provided publicly in this response.

DOMINION DIAMOND

Table 30-1 Employment By Priority, 1999 to 2013

Part A

Employment By Priority (Person Years)		1999	2000	2001	2002	2003	2004	2005	2006			2007			2008		
		Total	Total	Total	Total	Total	Total	Total	Direct	Contractor	Total	Direct	Contractor	Total	Direct	Contractor	Total
Aboriginal	#	235	312	357	401	399	410	429	222	115	336	250	168	418	287	121	408
	%	33	32	30	28	28	34	32	35	29	33	39	31	35	33	21	28
Other Northern	#	259	299	366	419	427	381	392	228	52	279	183	103	286	235	69	304
	%	37	31	31	30	30	32	29	36	13	27	28	19	24	27	12	21
Total Northern	**#**	**495**	**611**	**723**	**820**	**826**	**791**	**821**	**449**	**166**	**615**	**433**	**271**	**704**	**522**	**190**	**712**
	%	**70**	**64**	**62**	**58**	**58**	**65**	**61**	**71**	**42**	**60**	**67**	**50**	**59**	**60**	**33**	**49**
Other	#	214	350	452	592	598	419	517	188	231	418	215	274	489	345	385	730
	%	30	36	39	42	42	35	39	29	58	40	33	50	41	40	67	51
Total	#	709	961	1,174	1,412	1,424	1,209	1,337	637	397	1,034	648	545	1,193	867	575	1,442
	%	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100

Part B

Employment By Priority (Person Years)		2009			2010			2011*			2012			2013		
		Direct	Contractor	Total	Direct	Contractor	Total	Direct	Contractor	Total	Direct	Contractor	Total	Direct	Contractor	Total
Aboriginal	#	255	156	411	240	86	326	243	74	317	267	117	384	272	105	377
	%	32	23	28	31	19	27	30	18	26	32	22	28	34	20	28
Other Northern	#	240	122	362	240	104	344	233	99	333	225	106	331	183	111	294
	%	30	18	25	31	23	51	29	24	27	27	20	24	23	21	22
Total Northern	**#**	**495**	**278**	**773**	**480**	**190**	**670**	**476**	**174**	**650**	**492**	**223**	**715**	**455**	**216**	**671**
	%	**63**	**42**	**53**	**62**	**41**	**54**	**59**	**42**	**54**	**58**	**43**	**52**	**57**	**41**	**50**
Other	#	293	391	684	292	267	559	325	238	563	353	299	652	348	317	665
	%	37	58	47	38	59	46	41	58	46	42	57	48	43	59	50
Total	#	788	669	1,457	772	457	1,229	801	412	1,213	845	522	1,367	803	533	1,336
	%	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100

Source: BHP Billiton 2006 to 2011; Dominion Diamond Corporation 2012, 2013.

% - percent; # = number; Note: Some percent totals may not add to 100% due to rounding.

*Totals for the 2011 year have been adjusted since the date of original publication. For the purposes of this Information Request, the original numbers have been presented in order to show the breakdown of direct and contractor employment.

DOMINION DIAMOND

Table 30-2 Diavik Mine Employment by Priority Group, 2003 to 2013

Employment By Priority (Person Years)		2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Aboriginal	#	221	259	256	245	257	273	269	269	313	238	202
	%	36	36	35	33	33	34	33	30	28	22	20
Other Northern	#	224	259	257	253	267	267	259	292	329	302	283
	%	37	36	35	34	34	33	32	32	29	28	28
Total Northern	**#**	**444**	**518**	**513**	**497**	**524**	**540**	**528**	**561**	**642**	**508**	**485**
	%	**73**	**72**	**71**	**68**	**67**	**67**	**65**	**62**	**56**	**47**	**49**
Other	#	167	202	214	238	261	268	282	346	495	563	512
	%	27	28	29	32	33	33	35	38	44	53	51
Total	**#**	611	720	727	735	785	808	810	907	1,137	1,071	997
	%	100	100	100	100	100	100	100	100	100	100	100

Source: Diavik 2003 to 2014.

Note: Employment is reported in total, including contractors and direct employees.

% - percent; # = number; Note: Some percent totals may not add to 100% due to rounding.

Table 30-3 Snap Lake Mine Employment by Priority Group, 2003 to 2013

Employment By Priority (Person Years)		2005	2006	2007	2008			2009			2010			2011			2012		
		Total	Total	Total	Direct	Contractor	Total	Direct	Contractor	Total	Direct	Contractor	Total	Direct	Contractor	Total	Direct	Contractor	Total
Aboriginal	#	39	93	126	52	87	139	45	47	92	65	58	123	75	70	145	82	67	149
	%	17	11	11	15	24	19	16	33	21	26	37	30	18	27	21	18	23	20
Other Northern	#	56	130	143	88	47	135	54	16	71	64	42	106	67	37	104	79	48	126
	%	24	16	13	25	13	19	19	11	16	26	27	26	16	14	15	17	16	17
Total Northern	**#**	**95**	**223**	**269**	**140**	**134**	**274**	**99**	**63**	**163**	**130**	**99**	**229**	**142**	**107**	**249**	**160**	**115**	**275**
	%	**41**	**27**	**24**	**39**	**36**	**38**	**34**	**44**	**38**	**53**	**63**	**56**	**34**	**41**	**37**	**34**	**40**	**36**
Other	#	137	614	875	218	237	454	188	81	269	247	158	406	273	156	429	305	176	482
	%	59	73	76	61	64	62	66	56	62	100	100	100	66	59	63	66	60	64
Total	**#**	231	838	1,144	358	370	729	287	144	431	247	158	406	415	263	678	466	291	757
	%	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100

Source: De Beers 2008-2012.

% - percent; # = number; Note: Some percent totals may not add to 100% due to rounding.

References:

BHP Billiton. 2006. Ekati Mine. Annual Report on Northern Employment and Spending 2006 Operations Phase - EKATI Diamond Mine.

BHP Billiton. 2007. Ekati Mine. Annual Report on Northern Employment and Spending 2007 Operations Phase - EKATI Diamond Mine.

BHP Billiton. 2008. Ekati Mine. 2008 Sustainable Development Report Ekati Diamond Mine.

BHP Billiton. 2009. Ekati Mine. Ekati Diamond Mine 2009 Year in Review.

BHP Billiton. 2010. Ekati Mine. Ekati Diamond Mine 2010 Year in Review.

BHP Billiton. 2011. Ekati Mine. Ekati Diamond Mine 2011 Year in Review.

De Beers (De Beers Canada Inc.). 2008. Snap Lake Mine Socio-Economic Report 2008.

De Beers. 2009. Snap Lake Mine Socio-Economic Report 2009.

De Beers. 2010. Snap Lake Mine Socio-Economic Report 2010.

De Beers. 2011. Snap Lake Mine Socio-Economic Report 2011.

De Beers. 2012. Snap Lake Mine Socio-Economic Report 2012.

Dominion Diamond Corporation. 2012. Ekati Mine. Ekati Diamond Mine 2012 Year in Review.

Dominion Diamond Corporation. 2013. Dominion Diamond's 2013 Socio-Economic Agreement Report.

DDMI and Rio Tinto (Diavik Diamond Mines Inc. and Rio Tinto). 2003. Socio-economic Monitoring Report.

DDMI and Rio Tinto. 2004. Socio-economic Monitoring Report.

DDMI and Rio Tinto. 2005. Socio-economic Monitoring Report.

DDMI and Rio Tinto. 2006. Socio-economic Monitoring Report.

DDMI and Rio Tinto. 2007. Socio-economic Monitoring Report.

DDMI and Rio Tinto. 2008. Socio-economic Monitoring Report.

DDMI and Rio Tinto. 2009. Socio-economic Monitoring Report.

DDMI and Rio Tinto. 2010. Socio-economic Monitoring Report.

DDMI and Rio Tinto. 2011. Socio-economic Monitoring Report.

DDMI and Rio Tinto. 2012. Socio-economic Monitoring Report.

DDMI and Rio Tinto. 2013. Socio-economic Monitoring Report.

DDMI and Rio Tinto. 2014. Socio-economic Monitoring Report.

DOMINION DIAMOND

Information Request Number:	DAR-NSMA-IR-31
Source:	North Slave Metis Alliance: Shin Shiga
Subject:	Cumulative Effects
DAR Section(s):	17

Preamble (NSMA):

See recommendation [request].

Request (NSMA):

Please include in the RFD case, everywhere applicable, Kennady Diamond Project, Diavik A21, and Jay underground mining.

Response:

Please see the responses to DAR-MVEIRB-IR-78 (Diavik A21 development), DAR-MVEIRB-IR-79 (Jay underground mining), and DAR-MVEIRB-IR-80 (Kennady Diamond Project).

DOMINION DIAMOND

Information Request Number: DAR-NSMA-IR-32

Source: North Slave Metis Alliance: Shin Shiga

Subject: Cumulative Effects

DAR Section(s): 17

Preamble (NSMA):

See recommendation [request].

Request (NSMA):

Please clearly separate reference, baseline, and RFD. Where clear, side by side comparisons of these are not provided, please do. Please apply this to all the Valued Components, including the Cumulative Impacts. Please provide a list of Valued Components that did not have this clarity.

Response:

This response addresses two related Information Requests: DAR-NSMA-IR-32 and DAR-NSMA-IR-33.

Section 17 of the Developer's Assessment Report (DAR) provides a general or high level overview of the cumulative effects results for the Jay Project. The section was not intended to provide comprehensive and detailed methods and results for cumulative effects assessment for each valued component (VC). The analysis and assessment of cumulative effects is appropriately specific to each VC, and is quantitative where possible and qualitative where necessary. Accordingly, tables that present metrics for reference, baseline, and reasonably foreseeable development (RFD) cases are not available for all VCs or all measurement indicators within VCs. For example, changes in habitat area for fish, vegetation, and wildlife VCs is tabulated in the DAR for reference conditions through the RFD Case, but not for qualitative indicators, such as, plant community health and animal movement and behaviour. Because the assessment for socio-economic and culture VCs are necessarily qualitative, there are no tables that present metrics for reference, baseline, and RFD cases.

Table 32-1 identifies the sections in the DAR that provide the approach to cumulative effects assessment and results for VCs.

Table 32-1 Developer's Assessment Report Location of Cumulative Effects Assessment Results for Valued Components

Valued Component	Cumulative Effects Approach	Cumulative Effects Results
Air Quality	Section 7.4.1	Section 7.4.3
Water Quality and Quantity	Section 8.5.1	Section 8.5.6
Fish and Fish Habitat	Section 9.4.1	Section 9.4.4
Vegetation	Section 11.4.1	Section 11.4.3
Barren-ground Caribou	Section 12.4.1	Section 12.4.3

Table 32-1 Developer's Assessment Report Location of Cumulative Effects Assessment Results for Valued Components

Valued Component	Cumulative Effects Approach	Cumulative Effects Results
Wildlife and Wildlife Habitat	Section 13.4.1	Section 13.4.2 to 13.4.6
Socio-economics	Section 14.1.2.8	Sections 14.2 to 14.8
Culture	Section 15.2.6	Section 15.4

DOMINION DIAMOND

Information Request Number:	DAR-NSMA-IR-33
Source:	North Slave Metis Alliance: Shin Shiga
Subject:	Cumulative Effects
DAR Section(s):	17

Preamble (NSMA):

See recommendation [request].

Request (NSMA):

Please provide a table with a list of all VCs and the Project's effects on them, in quantity and percentage, in the key stages during the life of the Project. Please also include in this table the reference, baseline, and RFD cases. Please use the updated RFD case as requested above. Inclusion of the development of Cardinal pipe in RFD is highly desirable. Where such consideration is applicable, please employ the most conservative assumptions for the purpose of creating this table. For ease of comparisons, please include in this table page references to the applicable sections of the DAR.

Response:

As described in the response to DAR-NSMA-IR-01, the Cardinal kimberlite pipe is not economically viable as a stand-alone project because it is a much smaller pipe than the Jay kimberlite pipe and does not support the high costs of a stand-alone dike and other capital costs associated with pit development. As such, the development of the Cardinal pipe does not qualify as a reasonably foreseeable development.

Please see DAR-NSMA-IR-32 for a response regarding the cumulative effects assessment and results for valued components in the Developer’s Assessment Report.

DOMINION DIAMOND

Information Request Number:	DAR-TC-IR-01
Source:	Transport Canada Information Request
Subject:	The dewatering of Lac Du Sauvage for the proposed Jay Pit
DAR Section(s):	General Comment

Preamble (TC):

With the changes from the Navigable Waters Protection Act 2009 to the Navigation Protection Act (NPA), proponents are not required to submit Notice of Works forms to the department for review on water bodies that are not listed in the Schedule under the NPA. Lac Du Sauvage along with the other water bodies impacted do not fall under the schedule, therefore no Notice of Works are required. This is only the case for the dewatering of a navigable water body, which this project falls. The proponent also has the right to have works that are in water bodies that fall outside of the schedule reviewed by the NPP. This is called “Opting-In”. Notice of Work forms may be submitted for project review for works that include water course crossings, water intakes and outfalls, pipelines etc. When this request is made, the NPP will start by conducting a navigational assessment of the water body to determine if it falls under the scope of the NPA. The NPP will need to conduct a navigability assessment on Lac Du Sauvage for the dewatering of the proposed Jay Pit. The information required to assist in this determination are the water depths of the area, distance/area, use of the area for potential recreational, commercial or subsistence use. An open water or spring flow timing site visit may be conducted to obtain all relevant information. Once the review is completed, construction methodology of the dewatering and dike as well as plan and profile views will be required.

Request (TC):

Transport Canada’s Navigation protection Program (NPP) will require the following: A Notice Of Work form that will list out the water body details along with the specific type of work that will impact the water body; TC will need to conduct a navigability assessment on Lac Du Sauvage for the dewatering of the proposed Jay Pit.

Response:

Dominion Diamond intends to “Opt-In” under the *Navigation Protection Act* (NPA) and submit a Notice of Work form for the dike and dewatering activities within Lac du Sauvage as part of the Jay Project. The Notice of Work form will be completed during the Jay Project permitting phase. The Notice of Work form, along with all supporting information requested above and the minimum information required in a Notice to the Minister, will be submitted to the Navigation Protection Program for a navigability assessment.

DOMINION DIAMOND

Information Request Number:	DAR-TC-IR-02
Source:	Transport Canada Information Request
Subject:	Diesel Spill on Misery Road
DAR Section(s):	1, 1.2.4.2

Preamble (TC):

Section 8.3 of the Transportation of Dangerous Goods Regulations (TDGR) requires that a person who has possession of the dangerous goods at the time of an accidental release, a "dangerous goods accident" or a "dangerous goods incident" must submit a follow-up report within 30 days after the occurrence.

Request (TC):

Transportation of Dangerous Goods would like to request a copy of the Spill Report for the incident which occurred on March 8th, 2014.

Response:

On March 8, 2014, a diesel fuel tanker truck operated by Ventures West went off the Misery Haul Road at kilometre 12 and spilled approximately 2,756 litres of diesel. Dominion Diamond conducted the emergency response and the spill was reported to the Northwest Territories (NWT) Spill Line (Spill #14-072) on March 8, 2014. Updates to the Spill Report were submitted on March 9, 2014 and March 11, 2014 and are attached. The Inspector visited the spill on March 11, 2014 and March 19, 2014 and Dominion Diamond submitted the Post Emergency Procedure and Remediation Plan in consultation with the Inspector on March 19,' 2014, which is posted on the Wek'èezhìi Land and Water Board registry here:

http://www.mvlwb.ca/Boards/WLWB/Registry/2013/W2013C0005/W2013C0005%20-%20Ekati%20Exploration%20-%20Notification%20of%20Spill%20Report%20and%20the%20Post%20Emergency%20Procedure%20-%20Mar%2019_14.pdf

Attachment 1

Spill Report

NT-NU SPILL REPORT

OIL, GASOLINE, CHEMICALS AND OTHER HAZARDOUS MATERIALS

NT-NU 24-HOUR SPILL REPORT LINE
TEL: (867) 920-8130
FAX: (867) 873-6924
EMAIL: spills@gov.nt.ca

REPORT LINE USE ONLY

A	REPORT DATE: MONTH – DAY – YEAR **March 8 2014**	REPORT TIME **22:45**	☒ ORIGINAL SPILL REPORT, OR	REPORT NUMBER **14 - 072**
B	OCCURRENCE DATE: MONTH – DAY – YEAR **March 8 2014**	OCCURRENCE TIME **19:00**	☐ UPDATE # TO THE ORIGINAL SPILL REPORT	
C	LAND USE PERMIT NUMBER (IF APPLICABLE) **NA**	WATER LICENCE NUMBER (IF APPLICABLE) **W2012L2-0001**		
D	GEOGRAPHIC PLACE NAME OR DISTANCE AND DIRECTION FROM THE NAMED LOCATION **Ekati Diamond Mine**	REGION ☒ NWT ☐ NUNAVUT ☐ ADJACENT JURISDICTION OR		
E	LATITUDE DEGREES **64** MINUTES **38** SECONDS **34.6**	LONGITUDE DEGREES **110** MINUTES **26** SECONDS **24.4**		
F	RESPONSIBLE PARTY OR VESSEL NAME **Dominion Diamond Ekati Corporation**	RESPONSIBLE PARTY ADDRESS OR OFFICE LOCATION **Ekati Diamond Mine**		
G	ANY CONTRACTOR INVOLVED **Winter Road Truck**	CONTRACTOR ADDRESS OR OFFICE LOCATION **NA**		
H	PRODUCT SPILLED **Diesel**	QUANTITY IN LITRES, KILOGRAMS OR CUBIC METRES **Estimated 15 - 20 L at this time**	U.N. NUMBER **NA**	
	SECOND PRODUCT SPILLED (IF APPLICABLE) **Engine Oil**	QUANTITY IN LITRES, KILOGRAMS OR CUBIC METRES **Estimnated 1-2 L at theis time**	U.N. NUMBER **NA**	
I	SPILL SOURCE **Tanker truck**	SPILL CAUSE **Truck over turned**	AREA OF CONTAMINATION IN SQUARE METRES **5**	
J	FACTORS AFFECTING SPILL OR RECOVERY **Currently trying to source a pumper truck**	DESCRIBE ANY ASSISTANCE REQUIRED **Noen at this time**	HAZARDS TO PERSONS, PROPERTY OR ENVIRONMENT **Further leaks from tanker**	

K ADDITIONAL INFORMATION, COMMENTS, ACTIONS PROPOSED OR TAKEN TO CONTAIN, RECOVER OR DISPOSE OF SPILLED PRODUCT AND CONTAMINATED MATERIALS

At approximately 19:00rs a fuel tanker truck (b train) heading north into Misery camp left the Misery haul road and turned on its side at Approximately km 12 of the haul road. The truck and trailer are approximately 3 to 5 m off and parallel to the haul road, laying on its right side. The ERT extracted the driver and the ruptured fuel tank on the truck was sealed with leak stop; approximately 10 to 15 Litres was spilled on the ground before a spill pool was placed under the tank. Small drip leaks from the manhole access covers on the tanker cars are ongoing, but spill pads and or spill pools are placed under them. Currently a pumper truck is being sourced to allow the overturned trailer to be pumped dry of fuel before up righting the vehicle and trailers. The estimated volume of diesel in the trailers is 52, 200 L (taken from a similar truck at the scene). UTMs are 526754 / 7168780

L	REPORTED TO SPILL LINE BY **Richard Ehlert**	POSITION **Environment**	EMPLOYER **DDEC**	LOCATION CALLING FROM **Ekati Mine Site**	TELEPHONE **(867) 880-2157**
M	ANY ALTERNATE CONTACT **Jamie Steele**	POSITION **Environment Advisor**	EMPLOYER **DDEC**	ALTERNATE CONTACT LOCATION **Ekati Mine Site**	ALTERNATE TELEPHONE **(867) 880-2281**

REPORT LINE USE ONLY

N	RECEIVED AT SPILL LINE BY	POSITION **Station operator**	EMPLOYER	LOCATION CALLED **Yellowknife, NT**	REPORT LINE NUMBER **(867) 920-8130**

LEAD AGENCY ☐ EC ☐ CCG ☐ GNWT ☐ GN ☐ ILA ☐ INAC ☐ NEB ☐ TC | SIGNIFICANCE ☐ MINOR ☐ MAJOR ☐ UNKNOWN | FILE STATUS ☐ OPEN ☐ CLOSED

AGENCY	CONTACT NAME	CONTACT TIME	REMARKS
LEAD AGENCY			
FIRST SUPPORT AGENCY			
SECOND SUPPORT AGENCY			
THIRD SUPPORT AGENCY			

NT-NU SPILL REPORT

OIL, GASOLINE, CHEMICALS AND OTHER HAZARDOUS MATERIALS

NT-NU 24-HOUR SPILL REPORT LINE
TEL: (867) 920-8130
FAX: (867) 873-6924
EMAIL: spills@gov.nt.ca

REPORT LINE USE ONLY

A	REPORT DATE: MONTH – DAY – YEAR **March 9 2014**	REPORT TIME **17:45**	☐ ORIGINAL SPILL REPORT, OR	REPORT NUMBER **14 - 072**
B	OCCURRENCE DATE: MONTH – DAY – YEAR **March 8 2014**	OCCURRENCE TIME **19:00**	☒ UPDATE # **14-072** TO THE ORIGINAL SPILL REPORT	

C	LAND USE PERMIT NUMBER (IF APPLICABLE) **NA**	WATER LICENCE NUMBER (IF APPLICABLE) **W2012L2-0001**
D	GEOGRAPHIC PLACE NAME OR DISTANCE AND DIRECTION FROM THE NAMED LOCATION **Ekati Diamond Mine**	REGION ☒ NWT ☐ NUNAVUT ☐ ADJACENT JURISDICTION OR
E	LATITUDE DEGREES **64** MINUTES **38** SECONDS **34.6**	LONGITUDE DEGREES **110** MINUTES **26** SECONDS **24.4**
F	RESPONSIBLE PARTY OR VESSEL NAME **Dominion Diamond Ekati Corporation**	RESPONSIBLE PARTY ADDRESS OR OFFICE LOCATION **Ekati Diamond Mine**
G	ANY CONTRACTOR INVOLVED **Winter Road Truck**	CONTRACTOR ADDRESS OR OFFICE LOCATION **NA**

H	PRODUCT SPILLED **Diesel**	QUANTITY IN LITRES, KILOGRAMS OR CUBIC METRES **Unknown - up to 511 Litres**	U.N. NUMBER **NA**
	SECOND PRODUCT SPILLED (IF APPLICABLE) **Engine Oil**	QUANTITY IN LITRES, KILOGRAMS OR CUBIC METRES **Unknown - esitmnated at 40 Litres**	U.N. NUMBER **NA**

I	SPILL SOURCE **Tanker truck**	SPILL CAUSE **Truck over turned**	AREA OF CONTAMINATION IN SQUARE METRES **5**
J	FACTORS AFFECTING SPILL OR RECOVERY **Currently trying to source a pumper truck**	DESCRIBE ANY ASSISTANCE REQUIRED **Noen at this time**	HAZARDS TO PERSONS, PROPERTY OR ENVIRONMENT **Further leaks from tanker**

K — ADDITIONAL INFORMATION, COMMENTS, ACTIONS PROPOSED OR TAKEN TO CONTAIN, RECOVER OR DISPOSE OF SPILLED PRODUCT AND CONTAMINATED MATERIALS

Diesel from the roll over is currently being off loaded to another tanker. At Approximately 16:30 the first trailer tank was emptied and the second near finished (last compartment). The tanks will be further emptied by accessing the tanks from the manhole covers on top of the tanks. Planning for the up-righting of the truck and trailers is set for 10th April 2014. A revision to the earlier spill report is that initially the fuel tanks on the truck were estimated at 100L, but it was confirmed from another truck that they would be approximately 511 Litres (135 gal). It is unknown as to how much of this tank leaked. In addition to the fuel, it's estimated that 40 Litres of engine oil and 20 – 30 Liters of radiator fluid were released from the truck.

L	REPORTED TO SPILL LINE BY **Richard Ehlert**	POSITION **Environment**	EMPLOYER **DDEC**	LOCATION CALLING FROM **Ekati Mine Site**	TELEPHONE **(867) 880-2157**
M	ANY ALTERNATE CONTACT **Jamie Steele**	POSITION **Environment Advisor**	EMPLOYER **DDEC**	ALTERNATE CONTACT LOCATION **Ekati Mine Site**	ALTERNATE TELEPHONE **(867) 880-2281**

REPORT LINE USE ONLY

N	RECEIVED AT SPILL LINE BY	POSITION **Station operator**	EMPLOYER	LOCATION CALLED **Yellowknife, NT**	REPORT LINE NUMBER **(867) 920-8130**

LEAD AGENCY ☐ EC ☐ CCG ☐ GNWT ☐ GN ☐ ILA ☐ INAC ☐ NEB ☐ TC | SIGNIFICANCE ☐ MINOR ☐ MAJOR ☐ UNKNOWN | FILE STATUS ☐ OPEN ☐ CLOSED

AGENCY	CONTACT NAME	CONTACT TIME	REMARKS
LEAD AGENCY			
FIRST SUPPORT AGENCY			
SECOND SUPPORT AGENCY			
THIRD SUPPORT AGENCY			

NT-NU SPILL REPORT

OIL, GASOLINE, CHEMICALS AND OTHER HAZARDOUS MATERIALS

NT-NU 24-HOUR SPILL REPORT LINE
TEL: (867) 920-8130
FAX: (867) 873-6924
EMAIL: spills@gov.nt.ca

REPORT LINE USE ONLY

A	REPORT DATE: MONTH – DAY – YEAR **March 11 2014**	REPORT TIME **16:45**	☐ ORIGINAL SPILL REPORT, OR	REPORT NUMBER **14 - 072**
B	OCCURRENCE DATE: MONTH – DAY – YEAR **March 8 2014**	OCCURRENCE TIME **19:00**	☒ UPDATE # **14-072** TO THE ORIGINAL SPILL REPORT	

C	LAND USE PERMIT NUMBER (IF APPLICABLE) **NA**	WATER LICENCE NUMBER (IF APPLICABLE) **W2012L2-0001**
D	GEOGRAPHIC PLACE NAME OR DISTANCE AND DIRECTION FROM THE NAMED LOCATION **Ekati Diamond Mine**	REGION ☒ NWT ☐ NUNAVUT ☐ ADJACENT JURISDICTION OR
E	LATITUDE DEGREES **64** MINUTES **38** SECONDS **34.6**	LONGITUDE DEGREES **110** MINUTES **26** SECONDS **24.4**
F	RESPONSIBLE PARTY OR VESSEL NAME **Dominion Diamond Ekati Corporation**	RESPONSIBLE PARTY ADDRESS OR OFFICE LOCATION **Ekati Diamond Mine**
G	ANY CONTRACTOR INVOLVED **Winter Road Truck**	CONTRACTOR ADDRESS OR OFFICE LOCATION **NA**

H	PRODUCT SPILLED **Diesel**	QUANTITY IN LITRES, KILOGRAMS OR CUBIC METRES **2,756 Litres**	U.N. NUMBER **NA**
	SECOND PRODUCT SPILLED (IF APPLICABLE) **Engine Oil and Radiator Fluid from truck**	QUANTITY IN LITRES, KILOGRAMS OR CUBIC METRES **Unknown - est. at 40L oil & 20-30 L rad fluid**	U.N. NUMBER **NA**

I	SPILL SOURCE **Tanker truck**	SPILL CAUSE **Truck over turned**	AREA OF CONTAMINATION IN SQUARE METRES **estimated at 5**
J	FACTORS AFFECTING SPILL OR RECOVERY **Snow Cover**	DESCRIBE ANY ASSISTANCE REQUIRED **None at this time**	HAZARDS TO PERSONS, PROPERTY OR ENVIRONMENT **N/A**

K — ADDITIONAL INFORMATION, COMMENTS, ACTIONS PROPOSED OR TAKEN TO CONTAIN, RECOVER OR DISPOSE OF SPILLED PRODUCT AND CONTAMINATED MATERIALS

After the tractor and trailers were placed back on their wheels they were taken back to EKATI and the volumes of product remaining in the trailer tanks was verified. The total product loaded, Bill of Lading 53,376 liters, initial recovery 49,652 and 968 liters recovered at main camp for a total loss of product of 2,756 liters.

An initial load of contaminated snow has been removed, but the clean-up is continuing at this point.

L	REPORTED TO SPILL LINE BY **Richard Ehlert**	POSITION **Environment**	EMPLOYER **DDEC**	LOCATION CALLING FROM **Ekati Mine Site**	TELEPHONE **(867) 880-2157**
M	ANY ALTERNATE CONTACT **Jamie Steele**	POSITION **Environment Advisor**	EMPLOYER **DDEC**	ALTERNATE CONTACT LOCATION **Ekati Mine Site**	ALTERNATE TELEPHONE **(867) 880-2281**

REPORT LINE USE ONLY

N	RECEIVED AT SPILL LINE BY	POSITION **Station operator**	EMPLOYER	LOCATION CALLED **Yellowknife, NT**	REPORT LINE NUMBER **(867) 920-8130**

LEAD AGENCY ☐ EC ☐ CCG ☐ GNWT ☐ GN ☐ ILA ☐ INAC ☐ NEB ☐ TC — SIGNIFICANCE ☐ MINOR ☐ MAJOR ☐ UNKNOWN — FILE STATUS ☐ OPEN ☐ CLOSED

AGENCY	CONTACT NAME	CONTACT TIME	REMARKS
LEAD AGENCY			
FIRST SUPPORT AGENCY			
SECOND SUPPORT AGENCY			
THIRD SUPPORT AGENCY			

DOMINION DIAMOND

Information Request Number:	DAR-TC-IR-03
Source:	Transport Canada Information Request
Subject:	Diesel Spill on Misery Road
DAR Section(s):	1.2.4.2

Preamble (TC):

Risk Assessment for Accidents and Malfunctions of the Jay Project outlines the Risk Mitigations in Section 3. Emergency Response and Spill Contingency Plans and the Hazardous Waste Management Plans are listed as operational controls for risk

Request (TC):

Transportation of Dangerous Goods would like to request a copy of the Emergency Response and Spill Contingency Plans and Hazardous Waste Management Plans for this project for review.

Response:

The Spill Contingency Plan Version 8.1 was prepared by Dominion Diamond and submitted to the Wek'èezhìi Land and Water Board (WLWB) on January 30, 2014. The WLWB approval for the Spill Contingency Plan includes a public/regulatory review process. The WLWB approved the Version 8.1 of the Spill Contingency Plan on February 17, 2014. The Spill Contingency Plan is located on the WLWB registry here:

http://www.mvlwb.ca/Boards/WLWB/Registry/2012/W2012L2-0001/W2012L2-0001%20-%20Ekati%20-%20Spill%20Contingency%20Plan%20-%20Version%208.1%20-%20Jan%2030_14.pdf

The Hazardous Waste Management Plan was prepared by Dominion Diamond and submitted to the WLWB on May 7, 2014 as part of the Waste Management Plan. The WLWB approved the Waste Management Plan and the Hazardous Waste Management Plan on August 11, 2014. The Waste Management Plan is located on the WLWB registry here:

http://www.mvlwb.ca/Boards/WLWB/Registry/2012/W2012L2-0001/W2012L2-0001%20-%20Ekati%20-%20Waste%20Management%20Plan%20-%20May%207_14.pdf

As per Part B, Item 4 of Water Licence W2012L2-0001, the Spill Contingency Plan and the Waste Management Plan, where the Hazardous Materials Management Plan is located, are reviewed annually and updated if required. Both Plans are currently undergoing their annual reviews that will be completed in the summer of 2015.

DOMINION DIAMOND

Information Request Number:	DAR-Tłı̨chǫ-IR-01
Source:	Tłı̨chǫ Lands Protection Department: Sjoerd van der Wielen
Subject:	Non-Traditional Land Use
DAR Section(s):	14

Preamble (Tłı̨chǫ):

The Jay Project DAR claims that the Non-traditional Land Use (NTLU) RSA is the area most likely to be used by community residents, but that changes in the NTLU RSA are not expected and thus the assessment of will focus more heavily on the NTLU LSA. However there is inadequate justification for this limited scoping; the claim that NTLUs in the RSA is unlikely to change due to the Project is a question that can be investigated and not one that can be assumed.

Request (Tłı̨chǫ):

1.1 Please justify and identify how the conclusion that changes in the NTLU RSA are not likely to be expected.

Response:

The Non-Traditional Land Use (NTLU) assessment (Section 14.8 of the Developer's Assessment Report [DAR]) focuses on effects in the NTLU local study area (LSA), which was determined to be the area where the Jay Project (Project) could have the greatest potential for direct effects on current land-based activity. To avoid understating the potential effects of the Project on NTLU, a regional-level analysis was not undertaken, based on the expectation that there would not be far-reaching effects from the development of an additional pit at the existing Ekati Mine. The NTLU LSA corresponds to an area around Lac du Sauvage where NTLU activities could potentially be impacted by changes to terrestrial and aquatic resources, water, and air. In the DAR, it was considered that there were no pathways between the Project and regional NTLU effects, given the nature of the Project as an extension of an existing mine, and that effects on NTLU would generally be local in nature. However, further discussion of the potential regional effects from the Project on NTLU is provided below.

Table 1-1 shows the pathway analysis for regional effects on the NTLU valued component (VC). For the purpose of the NTLU assessment, the following activities have been chosen as key indicators:

- non-renewable resource extraction;
- tourism;
- hunting (outfitting);
- fishing (commercial);
- outdoor recreation; and,
- parks and protected areas.

The rationale has been provided below for predicting no linkage between the Project and a regional level effect.

Table 1-1 Pathway Analysis for Regional Non-Traditional Land Use Effects

Valued Component	Key Indicator	Project Component or Activity	Effects Pathway	Environmental Design Features and Mitigation	Pathway Assessment
NTLU	Non-renewable resource development	Construction and Operations	The Project could interfere with other non-renewable resource development interests within its footprint	• The Project is within the existing Ekati Mine claim block, and does not overlap geographically with other non-renewable resource extraction interests • The development of the Project will occur in a manner that does not impede other non-renewable resource extraction activities	No Linkage
NLTU	Hunting	Construction and Operations	The Project could affect the availability of wildlife for hunting in the RSA	• Employ mitigation measures detailed in the wildlife and habitat pathway analysis (DAR Section 13) • See description of effects on wildlife below	No Linkage
NLTU	Fishing	Construction and Operations	The Project could affect the availability of fish for fishing in the RSA	• Employ mitigation measures detailed in the fish and fish habitat pathway analysis (DAR Section 9) • See description of effects on fish below	No Linkage
NLTU	Hunting, fishing, and other land-based recreation and tourism	Construction and Operations	Project-related noise could have an effect on hunting, fishing and land-based tourism in the RSA	• Employ mitigation measures for noise control (DAR Appendix 13B) • See description of effects from ambient noise below	No Linkage
NLTU	Hunting, fishing and other land-based recreation and tourism	Construction and Operations	Project-related visual effects could have an effect on hunting, fishing and land-based tourism in the RSA	• Where possible, minimize the above-ground visibility of waste rock piles • See description of effects on the visual environment below	No Linkage
NLTU	Parks and protected areas	Construction and Operations	Project-related disturbances could affect parks and protected areas	• The Project will not be built within any parks or protected areas	No linkage

NTLU = Non-Traditional Land Use; RSA = regional study area; DAR = Developer's Assessment Report.

Hunting

Species hunted by non-traditional hunters in the Northwest Territories (NWT) include black bear, grizzly bear, hare and ground squirrels, moose, muskox, wolf, wolverine, polar bear, ptarmigan and grouse, and woodland caribou (see Annex XV of the DAR). While the caribou assessment identified Project effects to barren-ground caribou, barren-ground caribou are not hunted in the LSA by communities located in the NWT due to the 2011-2015 NWT Barren-ground Caribou Strategy. Therefore, there is no primary linkage between the Project and non-traditional hunting of barren-ground caribou.

The Wildlife and Wildlife Habitat assessment (DAR Section 13) indicated that the Project has the potential to affect the abundance and distribution of grizzly bears and wolverine. Black bear and moose were not selected as VCs for the DAR. The wildlife assessment did not identify a primary linkage between the Project and the abundance or distribution of wolf or upland birds (including ptarmigan and grouse). The Project is, therefore, not expected to have an effect on the abundance or distribution of these species for non-traditional hunting.

The potential pathways between Project effects and hunted wildlife were assessed, and the primary pathways were as follows:

- Direct loss and fragmentation of wildlife habitat from the Project footprint may cause changes in abundance and distribution of grizzly bear and wolverine.
- Sensory disturbance (lights, smells, noise, dust, viewscape) may cause changes to habitat quality, and the movement and behaviour of grizzly bear and wolverine, and influence population abundance and distribution.
- Increased traffic on the Misery Road and Jay Road, as well as the above-ground power line along these roads may create barriers to wolverine and grizzly bear movement which may affect wolverine and grizzly bear population connectivity, abundance, and distribution.

Mitigation measures detailed in the wildlife and habitat pathway analysis (DAR Section 13.3) will be employed.

The grizzly bear and wolverine effects study area (ESA) is larger in size than the NTLU LSA, and includes the communities of Wekweètì, Umingmaktok, and Bathurst Inlet, but is smaller in size when compared to the NTLU RSA. The Project is predicted to result in a small direct and indirect disturbance of less than 0.1 percent (%) of the suitable habitat for wolverine and less than or equal to 0.1% of high and good quality habitats for grizzly bear within the ESA, relative to the 2014 baseline condition. Effects to wildlife do not necessarily translate to the same magnitude of effect for hunters. However, it is not expected that the addition of the Jay Project to the existing Ekati Mine operation would noticeably impede the ability of hunters and guide outfitters to hunt grizzly bear or wolverine at a regional level. Therefore, a linkage between the Project and regional effects on hunting of grizzly and wolverine is not anticipated.

Fishing

Sport fishing in the NTLU RSA includes Arctic Char, Arctic Grayling, Brook Trout, Bull Trout, Burbot, Ciscoes, Dolly Varden, Goldeneye, Inconnu, Lake Trout, Northern Pike, Rainbow Trout, Suckers, and Walleye (Annex XV of the DAR). Section 9 of the DAR selected Arctic Grayling, Lake Trout, and Lake Whitefish as VCs in the fish and fish habitat ESA.

The potential pathways between Project effects and fish were assessed and the primary pathways were as follows:

- The construction of the horseshoe dike and Jay Pit within Lac du Sauvage will result in the direct loss or alteration of habitat, affecting fish and other aquatic life within Lac du Sauvage and Lac de Gras (i.e., confined to the NTLU LSA).
- The dewatering of the diked area will result in the direct loss or alteration of habitat in Lac du Sauvage, affecting fish and other aquatic life within Lac du Sauvage and Lac de Gras (i.e., confined to the NTLU LSA).
- Dewatering Lac du Sauvage within the diked area will require removal of fish from the area (i.e., confined to the NTLU LSA).
- The construction of the horseshoe dike and diversion channel may alter access to tributary stream habitats to Lac du Sauvage, resulting in habitat loss for Arctic Grayling, Lake Trout, and Lake Whitefish (i.e., confined to the NTLU LSA).
- Operational activities and discharge (e.g., discharge of treated domestic wastewater, altered drainage, runoff from facilities, including waste rock storage areas, pit inflows, dike seepage, release of nitrogen compounds from blasting residues, fine processed kimberlite. management) may change surface water quality and affect fish and other aquatic life in Lac du Sauvage and Lac de Gras (i.e., confined to the NTLU LSA).
- Pumping water to back-flood the Jay Pit and diked area of Lac du Sauvage may affect water levels and riparian habitat in Lac du Sauvage and Lac de Gras, and water levels, flows, and riparian habitat in the Lac du Sauvage-Lac de Gras Narrows, affecting fish and other aquatic life (i.e., confined to the NTLU LSA).
- Reconnection of the back-flooded area of Lac du Sauvage to the remaining watershed and post-closure releases of water (e.g., Misery Pit overflow and seepage, waste rock storage area runoff, Long Lake Containment Facility discharge) may change long-term water quality in Lac du Sauvage and Lac de Gras and affect fish and other aquatic life (i.e., confined to the NTLU LSA).

The Fish and Fish Habitat Assessment (Section 9) did not identify any primary pathways for fish in the Coppermine River, or in other areas beyond the NTLU LSA. As a result, fish populations in the NTLU regional LSA would not be affected, and therefore, no regional effects to non-traditional effects to fishing are expected.

Effect of Noise on Hunting, Fishing and Land-Based Recreation and Tourism

Both the noise LSA (1.5 kilometre [km] boundary around the Project footprint) and RSA (7 km boundary from the centre of the Project) are within the LSA.

As most loud noise generated from the construction and operation of the Project is predicted to be within 1 km of the Project footprint (i.e., within the LSA), noise effects would not extend to the RSA. Therefore, no linkage between noise generated by the Project and regional effects on non-traditional hunting, fishing, and recreational land-based tourism is expected.

Effect of Visual Changes on Hunting, Fishing, and Land-Based Recreation and Tourism

To assess the maximum extent that the Project may be seen by non-traditional land users in the surrounding area, visibility of the Project was based on the Jay waste rock storage area (WRSA), which would be tallest and largest structure. Land users located within a 2 km area surrounding the WRSA would likely be able to notice the visual disturbance. However, as noticeability of the WRSA is expected to diminish outwards within a distance of 30 km, the effect of the Project on the visual environment is not expected to impede the ability of non-traditional land users to hunt, fish, or recreate outside of the NTLU LSA (i.e., no regional effect is anticipated). Further, Project-related traffic is expected to be concentrated to the mine site (i.e., within the NTLU LSA). The Project is not expected to generate a large amount of traffic regionally in areas around communities that may be used for NTLU activities. Ground transportation of consumables is limited seasonally to the existing winter road running south of the Project.

Similarly, while there is potential for additional light disturbance resulting from Project operations, effects on the NTLU activities in the RSA are not expected. Relative to existing conditions, the increase in ambient light from the Project is expected to be localized to the area around the Jay Pit, in the area northeast of the existing Misery Pit facilities. Further, it is unlikely that the area outside of the LSA, near the Project, will be used by non-traditional hunters, fishers, and recreational enthusiasts at night, when light effects would be most noticeable. Therefore, no valid linkage between the Project and non-traditional hunting, fishing, and land-based recreation and tourism in the RSA is predicted.

DOMINION DIAMOND

Information Request Number: DAR-Tłı̨chǫ-IR-02

Source: Tłı̨chǫ Lands Protection Department: Sjoerd van der Wielen

Subject: Temporal Boundaries

DAR Section(s): 14

Preamble (Tłı̨chǫ):

The Jay Project DAR uses the temporal boundaries of 2014-2032 and the period from 1998-2014 as the baseline upon which the socio-economic assessment effects are to be measured. It is also stated that the socio-economic assessment may be "dated given the limitations of public [sic] available data" (p. 14-12). There is no indication of what limitations were encountered, for what kinds of data, and how the socio-economic assessment was compromised as a result.

Request (Tłı̨chǫ):

2.1) Please provide a rationale, if it is indeed the era in which large scale diamond mining began or otherwise, for the temporal boundaries chosen for the socio-economic assessment.

2.2) Please identify the limitations in data that were encountered and how the socio-economic assessment was compromised as a result.

Response:

2.1) Section 14 of the Developer's Assessment Report (DAR) uses the period of 1998-2014 to describe recent social and economic conditions and trends in the Northwest Territories and local study area communities prior to the development of the Jay Project (i.e., the existing environment). This period was chosen to reflect conditions in an environment where operational diamond mining activity was occurring. Using this temporal period allows the existing environment section to describe the influence of mining on socio-economic trends, where data are available, and correlation is appropriate (e.g., the impact of mining on employment, Gross Domestic Product). In the absence of data that clearly and defensibly links the mining industry to socio-economic indicators, no such correlation is made to avoid speculation. Overall, the existing environment describes conditions and trends against which the Jay Project's effects can be assessed.

The past data presented in the socio-economic existing environment section are used to describe trends leading up to and influencing the conditions in the baseline year (i.e., 2014). The assessment then uses the most recent publicly available information, paired with past data trends to describe the Base Case. The Base Case (2014-2032) describes what the socio-economic environment could be like in the future, without the Jay Project. The Assessment Case then adds the Jay Project to this same temporal period to determine how the Project would influence not only baseline conditions (i.e., the year in which the DAR was written), but also the socio-economic environment in the years beyond, for the life of the Project.

2.2) The “limitation of publicly available data” (DAR Section 14.1.2.5, p. 14-12) referenced in the preamble above refers to the fact that the territorial and federal censuses used in the description of baseline socio-economic conditions are not conducted on an annual basis. At the time of writing the DAR, the most recent publicly available census demographic, economic, and employment information was sourced from either the 2011 Statistics Canada Community Profiles and National Household Census, or the 2012 Government of the Northwest Territories Census. As a result, data in the socio-economic baseline (against which the Project effects are assessed) is not presented for the year of writing (i.e., 2013/2014), but rather for the most recent year in which publicly available census information exists.

While there is some limitation in the availability of public information contemporary to the date of writing the DAR, this does not necessarily imply a compromise of the integrity of the socio-economic assessment. While there have been meaningful changes in the territorial economy, population, and labour force over the period of 1998-2014, these changes have not, on an annual basis, been rapid or extreme. Rather, overall trends such as urbanization, economic growth, and population change have occurred gradually, and with discernable trends, as described in the socio-economic baseline. Therefore, it is reasonable and appropriate to use information on these topics from 2011/2012 as a proxy for baseline (i.e., 2013/2014) conditions, with additional consideration given to how past socio-economic trends in these areas will influence conditions in 2013/2014.

Information Request Number:	DAR-Tłı̨chǫ-IR-3
Source:	Tłı̨chǫ Lands Protection Department: Sjoerd van der Wielen
Subject:	Project Effects on Population Demographics
DAR Section(s):	14.2.3

Preamble (Tłı̨chǫ):

The Jay Project DAR states that the construction phase of the Project is not expected to have a noticeable impact on in-migration. No basis for this claim is apparent not any probability assigned for its likelihood and quantity.

Request (Tłı̨chǫ):

Please quantify and justify the claim that the Project is unlikely to have an impact on interprovincial migration.

Response:

The construction phase is not expected to attract a large amount of Northwest Territories (NWT) resident labour because there is more security and a greater variety of jobs available in the operations of the existing diamond mines. The typical range of Northern participation in construction has been between 20% to 30%. This range was used in the Northwest Territories Economic Impact Model (NWTEIM) to calculate future participation in the development work associated with A21 at the Diavik Mine and the Jay Project (Project) (Appendix A).

It is true that the development work at the Ekati and Diavik mines and the construction of the Gahcho Kué Project will bring about a period of increased demand for labour that the NWT resident labour market cannot meet; however, this period will be short lived, from 2016 to 2018 (Appendix A). The labour demand during this period will be similar to what was experienced from 2005 to 2008. That period was marked by major development work at the Ekati and Diavik mines and the construction of the Snap Lake Mine. During that timeframe, the NWT's population experienced a small decline from 43,401 in 2005 to 43,350 in 2008 (NWT Bureau of Statistics 2015).

Note that the NWT population is projected to rise in the Base Case (referred to as the "Baseline Scenario" in Appendix A, Economic Impact Report [Revised]) from 43,623 in 2014 to 44,230 in 2019 (Appendix A) small portion of this growth (20%) is attributable to the development work at the Ekati and Diavik mines and the opening of the Gahcho Kué Mine, with the majority attributable to the natural growth rate exceeding the underlying negative net migration that is assumed to range between 300 and 350 during this period. As a result, the addition of the Project construction to the NWT economy would not have a measurable effect on migration beyond what is in the Base Case.

References:

NWT Bureau of Statistics. 2015. Population Estimates. Available at http://www.statsnwt.ca/population/population-estimates/ accessed March 15, 2015.

DOMINION DIAMOND

Information Request Number: DAR-Tłı̨chǫ-IR-04

Source: Tłı̨chǫ Lands Protection Department: Sjoerd van der Wielen

Subject: Project Effects on Population Demographics

DAR Section(s): 14.2.3

Preamble (Tłı̨chǫ):

The Jay Project DAR also states that not all individuals who are employed at the Project will migrate from rural LSA communities to Yellowknife and thus the magnitude of this effect is determined to be low. This basis of this judgment and the determination that not all employees will migrate is not quantified and is unclear. For instance, what number (not provided) of people migrating would move the determination from low to medium or from medium to high?

Request (Tłı̨chǫ):

4.1 Please justify and provide a rationale for the determination of a low magnitude of effect for migration from rural LSA communities to Yellowknife.

Response:

The basis for the conclusion that the Jay Project (Project) is expected to have a low magnitude[1] effect on rural to urban migration (Section 14.2.3 of the Developer's Assessment Report) is because the Project extends the life of the Ekati Mine, and therefore, does not create new permanent positions that might entice migration from small communities to Yellowknife. While the rural to urban migration trend is already occurring, and is not wholly attributable to mining employment, it is expected that as people take up positions with the Project made available by attrition, some will choose to move from rural local study area (LSA) communities to Yellowknife to be closer to amenities. A limited number of positions will become available during operations due to natural attrition at the Ekati Mine, but this number is expected to be small, and not be influential at a population level. Project employment provides incomes needed for successful relocation and participation in the private housing market. Further, the inclusion of Yellowknife as a point of hire community removes the barrier associated with transportation to and from the Project, for people that chose to relocate to Yellowknife.

[1] Low magnitude indicates a discernible effect on a valued component, but one that is not expected to materially affect people's quality of life.

The construction phase is not expected to attract a large amount of Northwest Territories (NWT) resident labour, with most construction labour needs being filled from non-resident labour. Construction positions are often more temporary in nature than operations positions, and are typically highly specialized. There is more security and a greater variety of jobs available in the operations of the existing diamond mines. It is true that the development work at the Ekati and Diavik mines and the construction of the Gahcho Kué Project will bring about a period of increased demand for labour that the NWT resident labour force cannot meet; however, this period will be short lived, from 2016 to 2018 (Appendix A, Economic Impact Report [Revised]). The labour demand during this period will be similar to that experienced from 2005 to 2008. This period was marked by development work at the Ekati and Diavik mines and the construction of Snap Lake Mine. During that timeframe, the NWT's population declined from 43,401 in 2005 to 43,350 in 2008 (GNWTBS 2014).

Once into this operations phase, the Project aims to keep existing NWT residents employed, but it will not create new jobs on net.

Given consideration of the Project effects on employment, the assessment concludes that the Project would have a low magnitude effect on rural to urban migration.

One of the key mitigations for out-migration from rural to urban communities is to remove the barrier to employment in rural communities. Dominion Diamond flies out employees (by charter) from all LSA communities and preferentially hires construction labour and the operations workforce from LSA communities (including Yellowknife).

References:

GNWTBS. (Government of Northwest Territories - Bureau of Statistics). 2014. Population Estimates. Available at: http://www.statsnwt.ca/population/population-estimates/. Accessed March 2015.

DOMINION DIAMOND

Information Request Number: DAR-Tłı̨chǫ-IR-5

Source: Tłı̨chǫ Lands Protection Department: Sjoerd van der Wielen

Subject: Project Effects on Population Demographics

DAR Section(s): 14.2.3

Preamble (Tłı̨chǫ):

The Jay Project DAR claims that the Project will soften the blow of out-migration from the closing of other mines in the NWT, but uses a no-growth baseline, which may exaggerate the contribution of the Project. Furthermore, the use of a no-growth baseline is contradicted later in the DAR when, in section 14.6.2., the authors state that “investment in mining and other economic activity will continue, even if diamond mining falls into decline”.

Request (Tłı̨chǫ):

Please justify the use of a no-growth baseline in light of the observation of the DAR authors that there is likely to be continued economic investment apart from diamond mining.

Response:

The statement from Section 14.6.2 of the Developer’s Assessment Report (DAR) referenced in the preamble uses the term ‘other economic activity’ to capture the continuation of existing economic activity, such as, public service employment, territorial expenditures on infrastructure and services, self-employment, or tourism. It is not in reference to other major private projects or investment (e.g., oil and gas development), that is, things that would be included as reasonably foreseeable developments). In the DAR, the “no new growth” scenario refers to the operating mines in the Northwest Territories (NWT) operating according to their current mine plans, as described below.

Section 14 of the DAR provides two scenarios that exclude the Jay Project (Project). The Current (no new growth) Scenario is a scenario where the Ekati, Diavik, and Snap Lake mines operate according to their current mine plan, with no additional projects added. In Appendix A, the Economic Impact Report (Revised), the A21 pipe at the Diavik Mine has been added to the Current (no new growth) Scenario since it is now a part of the current mine plan for the Diavik Mine. The Base Case Scenario adds the Gahcho Kué Project to the Current (no new growth) Scenario. This latter scenario, the Base Case Scenario, is the one used when examining the effects of the Project.

The reason for including the Current (no new growth) Scenario in the DAR was that, at the time the Terms of Reference for the Project were issued, there was still some questions regarding the future of the Gahcho Kué Project. However, it would not have been prudent to exclude the Gahcho Kué Project from the Base Case comparisons, as it would represent a new development that brings substantial new demand for labour and Northern goods and services. Therefore, the two scenarios were included in the report in order to separate the effects of the different new projects entering the NWT economy.

The addition of A21 pipe development at the Diavik Mine to the Base Case Scenario does alter the labour market. Please see the response to Information Request Number DAR-MVEIRB-IR-71 for a summary of the effects on the labour market and Appendix A for a complete explanation of the effects of the A21 development on labour and the economy. With A21, the labour market and population of the NWT remain relatively steady through to 2023. There is a slight decline in population from 2021 to 2024 due to the lack of new growth in the Project Scenario and because the development phases of the four existing diamond mines (including Gahcho Kué) will be over at that time.

The question of out-migration depends heavily on the NWT population's tolerance to unemployment. The model assumes several variables influence the propensity to out-migrate, including job creation/job losses, unemployment rates, ethnicity, age, and historical trends. During the ten-year period of 2021 to 2030, the Project will have a positive effect on the population because the jobs it creates lowers the propensity of NWT residents to out-migrate. The addition of the Project keeps unemployment rates below 9 percent (%) until 2024 when they grow above this mark due to the effects of the Diavik Mine closure. The unemployment rate will exceed 10% by 2028 as a result of the closure of the Gahcho Kué Mine. As the job losses mount and the labour market softens, the propensity of the NWT population to out-migrate away increases.

While the Project is being examined as a separate project, it actually represents an extension of an existing project (i.e., the Ekati Mine). Therefore, the Project represents a degree of stability to the NWT economy, its labour market, and its population.

DOMINION DIAMOND

Information Request Number: DAR-Tłı̨chǫ-IR-06

Source: Tłı̨chǫ Lands Protection Department: Sjoerd van der Wielen

Subject: Socio-Ec - Inflation

DAR Section(s): 14.3.4

Preamble (Tłı̨chǫ):

The Jay DAR states that diamond mining and the construction phase operation phases of the Jay Project specifically will not, by itself, have an effect on inflation or cause inflation as it will not cause new people to migrate into the NWT (increase net in-migration) or create new jobs. However, no evidence is brought forth to support this latter assertion. Additionally, in Section 14.6.1.4 of the DAR, the authors write, "Mining activity has generated employment and incomes, which has in turn affected inflation and consumer prices in the territory". This contradiction is not recognized or reconciled. The conclusion that the Project will not have an effect on inflation despite its projected importance for the GDP of the NWT is also contradictory to the statement of authors that the Project could in fact help combat deflation (and therefore affecting inflation). This effect which is framed positively however is an isolated market and does not consider other markets and geographic idiosyncrasies that may manifest as inter- and intra-community differences of experiences of inflation.

Request (Tłı̨chǫ):

1) Justify the assumption that people will not move to Yellowknife and how a low rating was determined in terms of magnitude.

2) Please reconcile the contradictory statements that the Project is to have no effect on inflation.

3) Please describe and provide evidence on inflationary pressures linked to mining and the Project regarding markets other than housing and in a more geographically nuanced fashion.

4) With respect to all of these questions, indicate how these trends will impact on Tłı̨chǫ communities in particular.

Response:

1) The basis for the conclusion that the Jay Project (Project) is expected to have a low magnitude[1] effect on rural to urban migration In Section 14.2.3 of the Developer's Assessment Report is because the Project extends the life of the Ekati Mine, and therefore, does not create new permanent positions that might entice migration from small communities to Yellowknife. While the rural to urban migration trend is already occurring, and is not wholly attributable to mining employment, it is expected that as people take up positions with the Project made available by attrition, some will choose to move from rural local study area (LSA) communities to Yellowknife to be closer to amenities (a limited number of positions will become available during operations

[1] Low magnitude indicates a discernible effect on a valued component, but one that is not expected to materially affect people's quality of life

due to natural attrition at the mine, but this number is expected to be small, and not be influential at a population level). Project employment provides incomes needed for successful relocation and participation in the private housing market. Further, the inclusion of Yellowknife as a point of hire community removes the barrier associated with transportation to and from the Project, for people that chose to relocate to Yellowknife.

The construction phase is not expected to attract a large amount of Northwest Territories (NWT) resident labour, with most construction labour needs being filled from non-resident labour. Construction positions are often more temporary in nature than operations positions, and are typically highly specialized. There is more security and a greater variety of jobs available in the operations of the existing diamond mines. It is true that the development work at the Ekati and Diavik mines and the construction of the Gahcho Kué Project will bring about a period of increased demand for labour that the NWT resident labour force cannot meet; however, this period will be short lived, from 2016 to 2018 (Appendix A, Economic Impact Report [Revised]). The labour demand during this period will be similar to that experienced from 2005 to 2008. This period was marked by development work at the Ekati and Diavik mines and the construction of Snap Lake Mine. During that timeframe, the NWT's population declined from 43,401 in 2005 to 43,350 in 2008 (NWT Bureau of Statistics 2015).

Once into the operations phase, the Jay Project aims to keep existing NWT residents at the Ekati Mine employed, but it will not create new jobs on net.

Given the consideration of the Project effects on employment, the assessment concludes that the Project would have a low magnitude effect on rural to urban migration.

One of the key mitigations for out-migration from rural to urban communities is to remove the barrier to employment in rural communities. Dominion Diamond flies out employees (by charter) from all LSA communities and preferentially hires construction labour and the operations workforce from LSA communities (including Yellowknife).

2-4) Regarding the question of inflation, the Jay Project will not, by itself, have an effect on inflation.

Historical data have shown inflation in Yellowknife has followed a path very similar to that of Canada as a whole. This was true during the period from 2000 to 2005 when the population of the territory grew by 3,000 residents, and has continued to be true in the past five years, where population has remained steady (NWT Bureau of Statistics 2015). Thus, there is no evidence that the mining industry has been the cause of inflation in the NWT. It is also important to recognize that the Jay Project represents an extension of an existing mine, and so it would not be expected to create a new inflationary effect.

The NWT is a price taker (i.e., a buyer whose purchases and sales are not substantial enough to influence the market for a good or service) for the majority of consumer goods and services. Any changes in price NWT residents pay for food, energy, transportation, and clothing are imported into the territory because the cost of producing these goods or services has changed or because of upward pressure on prices due to a disequilibrium between worldwide supply and demand. This is as true in Tłı̨chǫ communities as it is in Yellowknife.

The added cost of goods and services experienced in small, isolated, or remote communities when compared to costs in Yellowknife are a function of the increased transportation and storage costs, and the small markets that exist in these communities. None of these factors (transportation, storage, or market conditions related to providing goods and services in these communities) will be affected by the extended operation of the Ekati Mine through the Jay Project.

The population of the NWT is not predicted to increase as a result of the Jay Project. This eliminates the possibility that prices will rise because of a larger consumer base. Note again, that population has not been shown by historical data to be a factor in inflation in Yellowknife for the past 15 years.

Appendix A describes the potential for deflation in an economic scenario whereby the existing mines all close with no economic activity replacing the lost production or lost jobs. The possible deflation would not occur where the NWT is a price taker, however. For example, the price of gasoline will not change as a result, nor would the price of food. However, the example given in Appendix A was that of housing prices. The price of private-market housing would likely decline in the event that there was a significant decline in population. The price effect on housing would be experienced in Yellowknife more than elsewhere in the LSA because it has one of the more active private markets in the territory, meaning there are many buyers and sellers. The price of private homes in Tłı̨chǫ communities might also decline where residents of these communities relocate and must sell their homes at a time when there is little or no demand for that home.

It is predicted that the Jay Project will help to maintain the territory's population base, and therefore, it will also have a positive effect in preventing deflation in the areas where NWT consumers have some influence over prices. However, this does not imply that the Project would be causing price movements in excess of what would be experienced otherwise, or inflation.

References:

NWT Bureau of Statistics. 2015. Population Estimates. Available at http://www.statsnwt.ca/population/population-estimates/ accessed March 15, 2015.

DOMINION DIAMOND

Information Request Number:	DAR-Tłı̨chǫ-IR-7
Source:	Tłı̨chǫ Lands Protection Department: Sjoerd van der Wielen
Subject:	Residual Impact Classification and Significance: Employment
DAR Section(s):	14.4.4

Preamble (Tłı̨chǫ):

The Jay DAR often states that the Project will soften the decline in mining employment. A primary means by which this will be purportedly accomplished is by employing northern workers from the closing mines to fill positions associated with attrition. However, no numbers are provided regarding rates of attrition at Diavik, Snap Lake, or Ekati. It is not clear what assumptions are being made with regard to the hiring rate and attrition rate between the mines and the Project. Further, project changes (e.g., A-21) could influence these rates.

Request (Tłı̨chǫ):

Please provide an expected timeline of attrition vis-à-vis hiring rates and whether the timelines coincide, keeping in view the changes announced by Diavik on A-21.

Response:

At the time of writing of the Developer's Assessment Report (DAR) for the Jay Project (Project), economic details of the A21 dike and pit at the Diavik Mine were not included in the mine plans for this operations. As a result, assumptions were made regarding the economic details of A21 in the socio-economic assessment (Section 14 of the DAR). Economic modelling with inputs into the socio-economic assessment has been revised to reflect the more advanced mine plan information for A21.

The addition of A21 to the baseline does affect the NWT labour market. For reference, please see Appendix A, Economic Impact Report (Revised), that has included A21. Also, see the response to DAR-MVEIRB-IR-71 that addresses the labour market changes that result from the addition of A21 to the Base Case.

The estimates for Northwest Territories (NWT) resident participation in the job opportunities created by the Project were derived from the NWT Economic Impact Model (NWTEIM). It contains a detailed model of the NWT labour market, that is linked to the historical and projected economic production and labour demands of the mining industry and to a demographic model of the NWT population. These linkages are dynamic, meaning that changes in one area create a response in another that causes further responses elsewhere in the model, and that this cycle continues until there are no additional measurable changes.

The model does not precisely match the loss of one job at one mine with the creation of another job at another mine. However, it does observe the labour market at a more macro level, and reacts to job losses and job creation. It is assumed that a large increase in labour demand combined with a decreasing number of unemployed will result in an increase in the number of NWT residents working but at a decreasing rate. The absolute number of employed NWT residents goes up, but the relative number goes

down. The model is also built to respond in the opposite direction when jobs are being lost and unemployment rates are climbing.

Both of these effects can be seen in the results. As described in the response to DAR-MVEIRB-IR-71, the number of developments occurring between 2015 and 2018 creates a situation where the increasing labour demand puts excess pressure on the existing NWT labour market (developments at this time include work on the Lynx and Pigeon pipes at the existing Ekati Mine, construction of the Gahcho Kué Mine, development of the A21 pipe at the Diavik Mine, and development of the Project). The larger number of workforce participants does push the historical bounds for the diamond mining industry, but is well within the capacity of the labour market at that time. The question of attrition at the operating NWT diamond mines is not relevant since the absolute number of jobs is increasing.

Beyond that initial period of increase labour demand, a number of the development projects that caused the upward pressure will have been completed, with the result being a decrease in labour demand. Beyond 2023, when job losses are mounting due to the closure of the Diavik Mine and then later the Gahcho Kué and Snap Lake mines, the NWTEIM responds to the changes by increasing the rate of (or relative) participation of NWT resident labour. However, the absolute number of jobs filled by NWT residents goes down. It is expected that, during this period, assuming an attrition rate at the Ekati Mine of roughly 13 percent (based on the mine's 2013 attrition rate), the Project will maintain some level of labour demand, and will seek to hire from the qualified, trained Northern workforce made available by the closure of the other NWT diamond mines.

DOMINION DIAMOND

Information Request Number:	DAR-Tłı̨chǫ-IR-08
Source:	Tłı̨chǫ Lands Protection Department: Sjoerd van der Wielen
Subject:	Residual Impact Classification and Significance: Employment
DAR Section(s):	14

Preamble (Tłı̨chǫ):

No details are provided on procedures or particular policies that will be in place to ensure that northern workers are preferentially hired.

Request (Tłı̨chǫ):

8.1 Please provide details on procedures that will be implemented to ensure that northern workers are preferentially hired.

Response:

Dominion Diamond is committed to hiring Northerners preferentially. The approach to this is twofold. First, Dominion Diamond sets internal policies that target Northern and Aboriginal candidates for employment. For example, southern applicants will not be short-listed for entry level positions, which are open first to Northerners and Northern Aboriginals.

Community Development Officers in communities outside Yellowknife keep up to date records of people seeking employment, and are made aware of new openings by Dominion Diamond. Dominion Diamond also maintains a database of resumes of interested applicants from communities.

Dominion Diamond also takes the following initiatives in relation to employment from Northern Aboriginal communities:

- identification of community members with skill sets;
- community partnerships to provide pre-employment training;
- assist Impact Benefit Agreement (IBA) communities in developing a labour force inventory; and,
- establish community liaisons employed by the community but funded through Dominion Diamond. The liaison will be the company's point of contact in the community and will mainly be responsible for pre-employment assistance.

Dominion Diamond also strives to advance the existing Aboriginal labour force. In 2014, there were 60 promotions at the Ekati Mine. Aboriginal employees made up approximately 40 percent of these promotions, which is in line with Aboriginal representation in the mine's direct labour force. Examples of promotions include movement from a haul truck driver position to a support operator, or from a support operator to a production loader. Advancement of existing personnel is a priority for Dominion Diamond, and many positions are advertised internally prior to being sent out to the general labour force. This internal movement of employees into increasingly advanced positions creates openings for entry-level positions that, as noted above, are filled by priority with Northern and Northern Aboriginal applicants.

The second aspect of Dominion Diamond's approach to maximizing Northern employment by actively seeking to remove barriers to employment.

Table 8-1 identifies barriers to employment, advancement, and retention of Northern and Northern Aboriginal people with Dominion Diamond, and the company's response to these barriers.

Table 8-1 Barriers to Employment and Dominion Diamond Responses

Indicator	Barrier	Dominion Diamond Response	Additional Comments
Employment	In the small rural communities, women with children do not tend to apply for rotational positions. Most of Dominion Diamond's employment is rotational, except in Yellowknife, where Dominion Diamond's corporate head office is situated.	On a case-by-case basis, Dominion Diamond evaluates alternative shift options for women such as 3 on, 4 off.	Women with children are more likely to apply for positions that become open in Dominion Diamond's offices in Yellowknife. There are, however, fewer openings there and these positions require the employee to reside in Yellowknife, or be willing to move.
	Criminal records can prevent potential workers from passing security clearance.	Dominion Diamond conducts case-by-case security assessments. If an applicant self-declares a criminal record, security investigators consider when the offence was committed, and the severity of the crime before making a recommendation as to the hiring of the individual.	Through this process, some candidates with criminal records can be considered for employment opportunities. There are still problems associated with getting an official pardon, including the cost of the pardon, and the lengthy processing time. Dominion Diamond would prefer that the Community Development Officer from the applicant's home community pursue the pardon. This would occur during pre-employment, before the candidate applies for a position.
	Drug and alcohol abuse can prevent potential workers from passing pre-employment medical clearance. Failure to pass the medical clearance is the most common barrier to employment.	Drug testing is conducted prior to employment at the mine and while employed, if there is suspected drug and alcohol use. If an applicant fails the drug test, this does not prejudice them, and they are able to immediately apply for other employment opportunities with Dominion Diamond in the future. In the past, the applicant would have to wait for months before they were permitted to re-apply. Dominion Diamond contributes to projects and initiatives to address health and wellness issues, including substance abuse problems in communities. Dominion Diamond will pay for drug and alcohol treatment for the worker which may include residential treatment, out- patient services and/or educational counselling. This is in addition to the Employee and Family Assistance Program, which is part of the employee benefits package.	Workers will be reinstated after the alcohol/drug issue has been addressed. Drug testing is booked in advance and is required for all positions with Dominion Diamond. People over 40 have to have an Electrocardiogram; however, failure to achieve medical clearance is mainly related to the presence of drugs or alcohol. The test reveals recent drug and alcohol use, in the last 48 hours.
Employment	Low levels of literacy can prevent employees from going through the application process.	Community liaison or Community Development Officer identify gaps in education and literacy of potential applicants in their community. Dominion Diamond provides support for initiatives aimed at improving literacy pre-employment through IBAs.	It has been observed that pre-employment readiness has been improving, particularly amongst the young.

Table 8-1 Barriers to Employment and Dominion Diamond Responses

Indicator	Barrier	Dominion Diamond Response	Additional Comments
	People living in remote communities or those who are unfamiliar with the online application process may not be able to access employment opportunities and need other options.	The Dominion Diamond Aboriginal employment coordinator recruits the majority (approximately 90%) of entry-level positions directly from Aboriginal communities. Community Development Officers have a listing of all candidates interested in employment in their community, and provides this list to the Aboriginal Employment Coordinator. Dominion Diamond maintains a database of candidates from IBA communities, including their resumes. Dominion Diamond also accepts unsolicited resumes from communities sent by fax or mail. These options are only open to communities in the NWT, and are not available to southern applicants, who must use the online system. Further, southern applicants will not be short listed for entry-level positions.	Employment opportunities are advertised, and made available to interested community members.
Retention	Drug and alcohol abuse can result in termination of employment.	Dominion Diamond conducts “for cause” drug and alcohol testing after an incident where it is suspected that drugs or alcohol was a contributing factor, or if there is unusual behaviour exhibited by an employee. Dominion Diamond pays for addictions counselling, including both out-patient and residential treatment programs.	Some employees are able to successfully deal with their addiction following counselling and treatment, allowing them to return to work.
	In the event that an individual with low literacy levels passes through the application process, and their literacy problems begin to pose a risk to safety (e.g., not being able to pass the online safety programs), employment may necessarily be terminated.	Dominion Diamond is reinstating the Workplace Learning Program, and is introducing an adult educator position, with the goal of improving the education and literacy of employees. Where a gap in education is identified, the adult educator will work with the employee to close said gap. If an employee is unable to improve their literacy to an acceptable level through the Workplace Learning Program, or with the help of the adult educator, they may be terminated. If this occurs, Dominion Diamond is open to reinstating the employee, should they bring their literacy up to an acceptable level. Dominion Diamond has also hired an Aboriginal workplace advisor who will work with the adult educator. This role involves coaching and mentoring employees.	There may be issues associated with English as a Second Language; however, literacy issues dominate, even among the young.
	Competition from other resource sectors in other parts of Canada (e.g., the oil sands in northern Alberta) has affected retention, particularly of workers in senior positions.	Dominion Diamond offers competitive wages and benefit packages, and transportation allowances to pick up points and many communities are designated as pick up points.	

Table 8-1 Barriers to Employment and Dominion Diamond Responses

Indicator	Barrier	Dominion Diamond Response	Additional Comments
Retention	Stress and bereavement can lead employees to feel that they cannot continue employment at the mine.	Dominion Diamond takes a flexible approach to stress and bereavement leave, and evaluates, on a case-by-case basis, the appropriate length of leave to meet the needs of the employee, as reasonable.	Allowing for flexible leaves of absence, where reasonable, can provide employees with an option other than resignation, improving retention.
	Increased incomes associated with mining can enhance access to drugs and alcohol, and can result in poor spending habits that threaten household stability. This in turn can affect employment and the retention of employees.	Dominion Diamond is instituting a financial literacy program conducted in communities. Course material can be provided to the community for delivery to interested members, or can be delivered by the Dominion Diamond adult educator. There are many modules to the program, including budgeting, loans, and home ownership.	To date, the program has been rolled out in Behchokǫ̀ , where ten people attended. Chiefs are in support of the program, and are recommending it to community members. It may take time to achieve momentum and positive word of mouth recommendations.
	Some employees may feel that, in order to take part in cultural activities, they cannot continue to work at the mine due to schedule conflicts.	Most positions with the mine are on a 2:2 rotation. Dominion Diamond also offers up to one week unpaid cultural leave to participate in activities such as organized community hunts. Further, communities try to schedule these events in a manner that does not conflict with the schedule of those employed at the mine.	There is also a cultural room at camp, and cultural celebrations
Advancement	Low levels of literacy can prevent employees from advancing their careers at the mine.	Dominion Diamond is reinstating the Workplace Learning Program, and is introducing an adult educator position, with the goal of improving the education and literacy of employees. Where a gap in education is identified, the adult educator will work with the employee to close said gap.	Employees are self–referred or are referred to the Workplace Learning Program through their Team Leader.
	Low levels of literacy and numeracy can prevent pre-apprentices from successfully pursuing apprenticeships or writing the exam. Costs associated with travelling to write the exam and costs to take the exam are paid by the student, and can be prohibitive.	The adult educator meets with pre-apprentices to identify education gaps, and recommend areas for improvement (e.g., maths, sciences, literacy) prior to writing apprenticeship exams. Dominion Diamond allows pre-apprentices one failed attempt at the test, without impunity. A second successful writing is accepted as a pass.	Improving education prior to writing apprenticeship exams improves the chance of an employee's success. This allows for career advancement.
	Aboriginal employees may not feel able to advance into managerial or leadership roles that have, in the past, been filled primarily by non-Aboriginal candidates.	Dominion Diamond has introduced an Aboriginal Workplace Advisor position. This position works with Aboriginal employees and provides coaching and mentoring, in conjunction with skills development provided by the adult educator. There is also a Supervisor Training Program aimed at building the capacity of people in supervisory roles, including Aboriginal employees.	Aboriginal employees have a support system in place to encourage their development and advancement, including advancement into leadership positions.
Transportation	Transportation from non-fly-point communities to the mine site can deter residents from those communities from applying for employment at the mine.	Dominion Diamond is committed to providing transportation allowances for workers living in communities that are neither fly points, nor points of hire, to facilitate transportation to and from the mine.	Geographic location has been removed as a barrier for communities in the Slave region.

% = percent; NWT = Northwest Territories; IBA = Impact Benefit Agreement.

DOMINION DIAMOND

Information Request Number:	DAR-Tłı̨chǫ-IR-09
Source:	Tłı̨chǫ Lands Protection Department: Sjoerd van der Wielen
Subject:	Education
DAR Section(s):	14

Preamble (Tłı̨chǫ):

It is stated in the Jay Project DAR that the Project is not expected to have an effect on teacher retention. However, no distinction is made between communities and the DAR assumes that all communities (and therefore retention rates) are alike despite other sections of the report (e.g., 14.6.1.3) explicitly noting differences between communities in their composition and the challenges they face.

Request (Tłı̨chǫ):

9.1 Please provide information on how teacher retention rates might vary between communities and provide more detailed inter-community comparisons more generally for claims made.

Response:

Publicly available data on the actual retention rate of teachers in each of the socio-economic local study area (LSA) communities are not available. However, qualitative information provided by school boards can shed light on general teacher retention at school in communities. Overall, teacher retention is more challenging in small communities than in Yellowknife.

Teacher retention for the Yellowknife School Board No.1 was described to be ‘very good’ (Scarf 2015). Similarly, teacher retention in the Yellowknife Catholic School Board was described to be high, and most teachers are retained (Toner 2015). Teacher retention in the smaller LSA communities, such as Fort Resolution and Lutsel K'e, is lower than in the larger communities (Brown 2015). Teacher turnover in small communities such as Lutsel K'e has been variable. In the past decade, Lutsel K'e had a relatively small turnover of teachers (one to two out of seven or eight funded teachers) (Brown 2015). Teacher retention in Fort Resolution is comparable to that of Lutsel K'e, with an annual turnover of two to three teachers, out of a total of 10 to 12 (Brown 2015).

In the Tłı̨chǫ region (which includes the communities of Behchokǫ̀, Whatì, Wekweètì, Gamètì), the highest teacher turnover rates were experienced in schools in the communities of Whatì, Wekweètì, and Gamètì. From 2008 to 2010, Behchokǫ̀, which has the two largest schools in the Tłı̨chǫ region, had high levels of teacher retention (Northern News Service Online 2010). Teacher retention in the Tłı̨chǫ region has been cyclical, but has been referred to by the head of the Education Division for the Tłı̨chǫ Community Services Agency, as consistent for the most part (Northern News Service Online 2010).

Teacher retention information for Kugluktuk was not publicly available by the time this response was prepared.

References:

Brown, Curtis. Superintendent. South Slave Divisional Education Council. Fort Smith, Northwest Territories. E-mail communication with Golder Associates. March 16, 2015.

Northern News Service Online. 2010. Teacher turnover rates down. Available at: http://www.nnsl.com/frames/newspapers/2010-09/sep13_10tt.html. Accessed March 20, 2015.

Scarf, Stacey. Manager of Human Resources. Yellowknife Education District No.1. Yellowknife, Northwest Territories. Telephone conversation with Golder Associates. March 12, 2015.

Toner, Janet. Assistant Superintendent. Yellowknife Catholic School Board. Yellowknife, Northwest Territories. Telephone conversation with Golder Associates. March 13, 2015.

DOMINION DIAMOND

Information Request Number:	DAR-Tłı̨chǫ-IR-10
Source:	Tłı̨chǫ Lands Protection Department: Sjoerd van der Wielen
Subject:	Education
DAR Section(s):	14

Preamble (Tłı̨chǫ):

The Project DAR also states that through primary and secondary school programs aimed at informing students about the importance of education in the pursuit of mining employment, and through apprenticeship programs, the Project would promote staying in school. No evidence is provided to substantiate these claims.

Request (Tłı̨chǫ):

10.1 Please clarify suggestions that Project education efforts in K-12 settings promote childhood education and retention.

Response:

Section 14.5.1.4 of the Developer's Assessment Report (DAR) states:

> *Community and Aboriginal relations personnel from Ekati Mine have developed a presentation that is delivered by Ekati Mine staff to students in high schools and is aimed at encouraging educational achievement. The presentation brings workers from different areas of mining (e.g., tradespeople, administrative staff, professional staff) to talk about their jobs, and the associated educational requirements. It also presents the income potential of the various skill levels associated with positions at the mine, and notes the education requirements associated with each type of position. Dominion Diamond staff have noted that the presentation reminds students of the importance of education for furthering their careers, and that it receives positive responses from students. Dominion Diamond would like to see this presentation delivered earlier in the K-12 system, to help motivate students at an early age, thereby laying the foundation for future educational success.*

The statement from the DAR referenced above is not based on tracked student retention numbers correlated to the school programs. The programs referenced above are aimed at promoting educational attainment and staying in school. It has been anecdotally suggested that these programs do have some success at promoting school retention, based on the observations of Dominion Diamond Ekati Corporation staff. Whether or not educational attainment itself is enhanced by the programs is not known. It is difficult to measure something that has not occurred (e.g., educational attainment of children currently in school). However, it is not unreasonable to suggest that some students may be encouraged to complete their studies if they see opportunity.

Section 14.5.3 of the DAR further states the effect of the Project on the promotion of staying in school and educational attainment as follows:

> *It is expected that, through primary and secondary school programs aimed at informing students about the importance of education in the pursuit of mining employment, and through apprenticeship programs, that the Project would continue to promote staying in school.*

The assertion made in the DAR is that the Project will promote (i.e., encourage), through the previously mentioned programs, staying in school and educational attainment. It is not asserted that this promotion would necessarily result in enhanced educational attainment, however. Early school leaving has many facets and reasons for non-completion and withdrawal are complex and often have their beginning in years previous to high school. This makes any assertion as to the success of promotional efforts speculative.

DOMINION DIAMOND

Information Request Number:	DAR-Tłı̨chǫ-IR-11
Source:	Tłı̨chǫ Lands Protection Department: Sjoerd van der Wielen
Subject:	Education
DAR Section(s):	14

Preamble (Tłı̨chǫ):

The DAR states that on the job Project training and apprenticeship programs will continue to build capacity in the NWT labour force, maximizing the ability of trained workers to transition to other employment opportunities as the mining industry wanes over the next two decades. However it is unclear what kind of capacity would be build and whether individuals trained in mining would have the capacity to be employed in other industries.

Request (Tłı̨chǫ):

11.1 Please provide more detail on the types of capacity generated by the Project and the corresponding employment positions in which such capacity may be complementary, and how aboriginal employment will be maximized.

Response:

The following provides a summary of the types of capacity built by the Project that can be transferred to other areas following closure. However, the economic and employment context at the time of post-closure of the Jay Project is not predictable with high certainty. Given this uncertainty, the discussion of transfer of skilled labour to other opportunities is generalized.

General Transferable Employment Capacity Post-Closure

Following closure, skills developed by employees while employed with Dominion Diamond's Ekati Mine could be transferred to other employment opportunities in the North. For example, many corporate staff positions (e.g., administration, accounting, procurement, human resources) would have developed skill sets transferable to other industries including resource extraction, the public sector and tourism – three of the most prominent employers in the Northwest Territories (NWT). Positions associated with the transportation of goods, personnel, and ore could also transfer their skills to other industries that require trained transportation professionals. Certifications and formal training (e.g., H2S, OHS, CHRP) obtained while employed with Dominion Diamond would be desirable to other employers and are broadly transferable to other industries. Training obtained by employees in the trades (e.g., welders, mechanics, electricians) would be transferrable to other industries (e.g., oil and gas, construction).

Operations Capacity Transferable to Closure and Reclamation Activities

The closure and reclamation activities associated with the Jay Project would draw upon the skills of the existing labour force, creating the opportunity for operations workers to maintain employment into this final stage of the Ekati Mine life. Demand for employment would, however, taper during closure and reclamation given reduced activity, and so not all current employees could be retained. Section 14.4.3.1

of the Developer's Assessment Report (DAR) indicates that the Project would yield an estimated 1,132 full time equivalents (FTEs) annually, on average, during operations. During final closure and reclamation, it is estimated that the Project would require approximately 282 FTEs, over the course of the two years of peak activity (DAR Section 14.4.3.1). There would be some positions associated with monitoring following the initial period of closure and reclamation.

Some positions associated with earth moving, truck driving, facility maintenance, the camp and equipment operation would be maintained during closure and reclamation. Entry level, semi-skilled, and skilled positions would be more commonly associated with these activities. There would be less demand for professional and managerial positions during the closure and reclamation phase. Ongoing environmental monitoring would require a small number of positions, which could be filled by operations employees.

Maximizing Aboriginal Employment

Dominion Diamond is committed to hiring Northern Aboriginal employees, wherever possible. The approach to this is twofold. First, Dominion Diamond sets internal policies that target Aboriginal candidates for employment. For example, southern applicants will not be short-listed for entry level positions, which are open first to Northerners and Northern Aboriginals. Community Development Officers in communities outside Yellowknife keep up to date records of people seeking employment, and are made aware of new openings by Dominion Diamond. Dominion Diamond also maintains a database of resumes of interested applicants from communities.

The Dominion Diamond Community Development Strategy indicates the following initiatives that the company will take in relation to employment from Northern Aboriginal communities:

- Identification of community members with skill sets.
- Community partnerships to provide pre-employment training.
- Assist Impact Benefit Agreement communities in developing a labour force inventory.
- Establish community liaisons employed by the community but funded through Dominion Diamond. The liaison will be the company's point of contact in the community and will mainly be responsible for pre-employment assistance.

Dominion Diamond strives to not only consider Aboriginal candidates for new employment opportunities, but to also advance their existing Aboriginal labour force. In 2014, there were 60 promotions at the Ekati Mine. Aboriginal employees made up approximately 40 percent of these promotions, which is in line with Aboriginal representation in the mine's direct labour force. Examples of promotions include movement from a haul truck driver position to a support operator, or from a support operator to a production loader. Advancement of existing personnel is a priority for Dominion Diamond, and many positions are advertised internally prior to being sent out to the general labour force. This internal movement of employees into increasingly advanced positions creates openings for entry-level positions that, as noted above, are filled by priority with Northern and Northern Aboriginal applicants.

The second aspect of Dominion Diamond's approach to maximizing Northern Aboriginal employment is to actively seek to remove barriers to employment faced by Northern Aboriginal applicants. Refer to the

response to DAR-Tłı̨chô-IR-8 for a breakdown of the barriers faced by the Northern labour force (including Northern Aboriginals), and Dominion Diamond's responses.

DOMINION DIAMOND

Information Request Number:	DAR-Tłı̨chǫ-IR-12
Source:	Tłı̨chǫ Lands Protection Department: Sjoerd van der Wielen
Subject:	Education
DAR Section(s):	14

Preamble (Tłı̨chǫ):

The DAR states that, “The magnitude of the Project’s effect on educational attainment in the NWT is not measureable, and so is cautiously considered low to moderate.” However, as it is not measureable it is unclear on what basis this determination was made. The DAR also states that, “The Project will act to maximize education and training for communities in the NWT, building educational foundations, and capacity in the trained labour force. As a result, the Project’s effect on education in the NWT is considered significant (Table 14.5-1).” This determination contrasts with the significance ratings provided in Table 14.5-1 in which all effects are uncertain and generally low.

Request (Tłı̨chǫ):

12.1 Please justify the determination of significance for education overall when the magnitude of effects are generally low.

12.2 Please provide a rationale for how a magnitude determination was made on the Project’s effect on educational attainment under great uncertainty.

Response:

The response to question 12.2 aids in the understanding of the response to question 12.1. Therefore, question 12.2 has been addressed first in this response.

12.2) As stated in Section 14.5 of the Developer’s Assessment Report (DAR) for the Jay Project (Project), the prediction of Project effects on education is cautious, with a magnitude range of low to moderate. While it may initially seem reasonable to assign a moderate magnitude[1] to all of the Project’s effects on education, the inherent uncertainty around many socio-economic effects tempers the description of magnitude. Where uncertainty is high (e.g., the Project’s ability to influence interest in completing education), a range of magnitude has been provided to reflect that the Project’s effects could vary, having a low to moderate effect. Where the Project will have a discernible effect on an indicator, but one that is not expected to be substantial enough to materially affect a key indicator, a low magnitude was assigned (i.e., Project-related taxes in support of educational funding, and the maintenance of some level of demand for mining-related educational services).

Where the Project has the potential to have a noticeable effect on a key indicator, resulting in a change that can be felt at the community level, a moderate magnitude was predicted. This was considered the case for the Project’s direct training and support of employee education, where skills and training obtained through Project employment are expected to allow employees to advance in

[1] Refer to the response to 12.1 below for further details on assigning magnitude.

their careers, and will build the capacity of new workers who take up positions associated with attrition. While community-level shifts in educational attainment are not quantitatively attributed solely to one development, the positive effect of the Project on education is expected to contribute to the overall support of educational attainment in communities.

12.1) The determination of significance for the socio-economic assessment is described in detail in Section 14.1.2.7.2 of the DAR. In general, most socio-economic effects are not quantified against a threshold given that such thresholds do not exist for most socio-economic indicators. The determination of significance for socio-economic effects relies on qualitative analysis, past experience, the results of engagement activities, and the proposed social management strategies of the developer. That is, significance is assigned after benefit enhancement measures have been applied and are assumed to be effective.

The DAR assesses effects to education as low to moderate in magnitude, but local to regional in extent and long-term in duration. Given the Project's potential to make a meaningful change, Project effects on education were deemed significant. Further descriptions of the Project's effect on education are described below, to add further context to what is written in the DAR.

Project Training and Support for Community Education

The Project will continue to build capacity in the mining labour force through training. For employees, the Project will continue to implement Ekati workforce development programs aimed at developing job-specific progression and employee potential with the goal of advancement. The Project would continue the existing health and safety, leadership and supervision training programs including a Supervisory Development Program, the Ekati Leadership Program, and the Northern Leadership Development Program.

Dominion Diamond Ekati Corporation (Dominion Diamond) is reinstating the Workplace Learning Program, and is introducing an adult educator position, with the goal of improving the education and literacy of employees. Where a gap in education is identified, the adult educator will work with the employee to close the gap. The adult educator meets with pre-apprentices to identify education gaps, and recommend areas for improvement (e.g., maths, sciences, literacy) prior to writing apprenticeship exams. Dominion Diamond has also hired an Aboriginal workplace advisor who will work with the adult educator to identify areas where employee education gaps can be improved upon. This role involves coaching and mentoring employees.

Through their Community Development Strategy, Dominion Diamond has identified possible initiatives to further support community education beyond their immediate workforce, including establishing a community partnership to provide pre-employment training to community members, aimed at preparing them for entry level careers at the Ekati Mine. Dominion Diamond also intends to continue educational contributions and scholarships for post-secondary studies to community members, with the goal of removing the financial barrier associated with pursuing an education beyond high school (e.g., trades, technical diplomas and university degrees).

Dominion Diamond also has a multi-year funding agreement to support the Territorial Skills Canada Competition in the Northwest Territories. The 17th annual Territorial Skills Competition will be held in Yellowknife on April 21, 2015. The competition is a one-day event that highlights trades and technology careers for students, parents, educators, and the general public. It gives young Northerners a chance to show their skills in their chosen trade or technology contest. Participation in the Territorial Skills Competition provides an opportunity for apprentices at the Ekati Mine to demonstrate their skills and for Dominion Diamond to show its support for apprenticeship positions. In past years, many apprentices from the Ekati Mine have participated in this territorial competition and some advanced to the national competition.

Early Education

Pre-trades demonstrations will be held annually on a rotational basis with Impact Benefit Agreement (IBA) communities. Recently, demonstrations have been held in Behchokǫ̀ (2012) and Lutsel K'e (2014). Dominion Diamond intends to liaise with schools in IBA communities to determine what trades the students in the community are interested in, and what trades their facilities can accommodate. Trades people are selected from among Dominion Diamond staff, with a focus on highlighting local Aboriginal tradespeople wherever possible. The demonstration begins with a presentation on Dominion Diamond, the trades positions available at the Ekati Mine, safety, and the importance of education and maintaining good grades and attendance to establish the appropriate pre-requisite education for training programs. Students are given a demonstration of the chosen trades, and have the opportunity to ask questions of the tradespeople. During the demonstration, tradespeople discuss the challenges students may face and how to maintain focus on goals and objectives in order to be successful in their education. To date, the feedback from communities on the pre-trades demonstrations has been highly positive.

Dominion Diamond provides annual contributions to the schools in rural IBA communities, and has also contributed to schools in Yellowknife and Fort Resolution. Each year, the company receives proposals for various projects such as an Aboriginal Grad Coach Program, out on-the-land cultural programs, programs intended to improve student attendance, school wellness programs, initiatives to provide students with healthy snacks and meals, Information Technology (IT) equipment purchases, library updating and expansion, playground construction, and literacy initiatives.

Students from IBA communities have the opportunity for a tour of the Ekati Mine site on a bi-annual basis. Dominion Diamond rotates between half of the IBA communities one year and the other half in the following year. Dominion Diamond liaises with the schools to identify jobs that students are interested in learning more about and then provides the opportunity to see firsthand what those positions entail. Students are given a tour of facilities including accommodations, offices in the truck shop, the process plant, recreation room, movie room, cafeteria, gymnasium, and fitness centre. Following the tour, a presentation to support staying in school similar to the presentation provided to schools during the career fairs is delivered. The presentation includes an overview of Dominion Diamond and the Ekati Mine, the opportunities available and how staying in school, completing an education and maintaining good attendance levels can lead to employment at the mine.

Long-Term Nature of Education Effects

Improved educational attainment, as an effect, is considered long-term, and is not reversible. This builds capacity in the labour force by establishing a trained body of workers who can readily participate in future employment opportunities that require a skilled work force, and is a significant effect.

DOMINION DIAMOND

Information Request Number:	DAR-Tłı̨chǫ-IR-13
Source:	Tłı̨chǫ Lands Protection Department: Sjoerd van der Wielen
Subject:	Education
DAR Section(s):	14

Preamble (Tłı̨chǫ):

It is also puzzling why demand for mining-related education services should be an indicator of educational contributions by the Project. How is supporting education services that may no longer be relevant in the future (in light of declines in mining) beneficial?

Request (Tłı̨chǫ):

13.1 Please explain how demand for mining-related educational services is an appropriate indicator for educational contributions.

Response:

Sufficient demand for educational services in a region can both prompt development of new programs, and maintain the need for existing programs. One such example is the development of the Mine Training Society (MTS) in response to the demand of the mining industry for trained, Northern labour. Without sufficient demand for a program, the program is at risk of being cancelled.

As existing employees at the Ekati Mine transition to new roles, and as positions made available through attrition are filled by new applicants, the Project is expected to generate demand for trained, Northern labour, thereby maintaining some level of demand for education and training services offered by organizations like Aurora College and the MTS. As other mining activity in the region slows, the Jay Project's demand for educational services may contribute to a sustained need for the educational organizations that offer the programs.

Many of the education and training services gained in the mining industry, through organizations such as the MTS or Aurora College, are applicable to employment opportunities in other sectors. For example, building technical skills are transferrable to other industries (Alberta Oil 2012). Safety boot camps, cook and cook apprentice training, the heavy equipment operator program, and the general construction training program offered by the MTS (NWT & Nunavut Chamber of Mines 2014) are required for some mining positions, but can also be transferred to other industries in the future (e.g., construction, oil and gas, some aspects of tourism). The current support of the programs through demand from the mining industry builds long-term capacity in these areas, and can contribute to the ability of educational organizations to offer these programs in the long term to other industries that may advance as the mining industry wanes.

For additional reference, programs offered by the MTS and Aurora College are listed in Table 13-1 below.

Table 13-1 Programs Offered by Aurora College and the Mine Training Society

Programs Offered by Aurora College	Programs Offered by the Mine Training Society
Aboriginal Language and Cultural Instructor Program (ALCIP) II	Mineral Process Operating Technician
Apprenticeship Carpenter	Camp Cook*
Apprenticeship Electrician	Cook Apprenticeship
Apprenticeship Heavy Duty Equipment Technician	Heavy Equipment Operator*
Apprenticeship Housing Maintainer	Geoscience Field Assistant
Apprenticeship Plumber/Gasfitter Program	Introduction to Underground Mining*
Bachelor of Education Program	Underground Mining
Bachelor of Science in Nursing	General Construction
Business Administration	Safety Boot Camps
Business Administration Access	
Camp Cook	
Certificate in Adult Education	
Community Health Representative	
Developmental Studies (ABE)	
Early Childhood Development	
Environment and Natural Resources Technology Access	
Environment and Natural Resources Technology Program	
Environmental Monitor Training Program	
Heavy Equipment Operator Program	
Introduction to Underground Mining	
Literacy Outreach Centre	
Master of Nursing, Nurse Practitioner Primary Health Care Stream	
Nursing Access	
Observer/Communicator Training Program	
Office Administration	
Office Administration - Community Office Procedures Program	
Office Administration - Computers in the Workplace	
Office Administration - Office Administration Certificate Program	
Oil Burner Mechanic (TQ) Special	
Personal Support Worker	
Pre-Apprenticeship Carpentry	
Pre-Apprenticeship Heavy Equipment Technician	
Social Work	
Social Work Access	
Supply Management Training Diploma (SCMA)	
Teacher Education Access	
Trades Access	
Trades Access II	
Traditional Arts	
Underground Miner Training Program	

Source: Aurora College 2014; NWT & Nunavut Chamber of Mines 2014.

*In partnership with Aurora College.

References:

Alberta Oil. 2012. Arctic drilling review exposes gaps in northern training. Available at: http://www.albertaoilmagazine.com/2012/03/skills-competition/. Accessed March 10, 2015.

Aurora College. 2014. Credit Programs by Department. Available at: http://www.auroracollege.nt.ca/_live/pages/wpPages/ProgramsByDepartment.aspx. Accessed March 9, 2015.

NWT & Nunavut Chamber of Mines. 2014. Measuring Success 2014: NWT Diamond Mines Continue to Create Benefits. Available at: http://www.miningnorth.com/_rsc/site-content/library/publications/Measuring_Success_NWT_Diamond_Mining.pdf. Accessed March 9, 2015.

DOMINION DIAMOND

Information Request Number:	DAR-Tłı̨chǫ-IR-14
Source:	Tłı̨chǫ Lands Protection Department: Sjoerd van der Wielen
Subject:	Health and Well-being
DAR Section(s):	14

Preamble (Tłı̨chǫ):

The Jay Project DAR guards against what appears to be evidence of the negative effects of mining on communities' health and well-being by stating that "Elements such as pre-existing and coexisting trends, changes in data collection methodologies and government policies and programs all confound interpretation of the data," and that "the two groups identified in the report, affected (i.e., LSA) and unaffected communities, are not completely comparable as experimental and control groups." Unfortunately this high standard of evidence is generally not possible and furthermore has not appeared to be a requirement for any of the other claims made with regard to the Project in the DAR.

Request (Tłı̨chǫ):

14.1 Please reconcile the standards of evidence required to determine effects on health and well-being as compared to other sections of the DAR.

Response:

Determining effects on health and well-being due to mining is not as straightforward as determining effects on other indicators, such as, employment, labour income, Gross Domestic Product, and government revenue. In the case of the latter category of indicators, a review of project information such as workforce requirements, hiring and procurement policies, and capital expenditure estimates can yield quantitative predictions about how the Project will directly affect the economy, population, employment, and demand on infrastructure and services.

When determining the relationship between a single project, in the context of a number of projects, and indicators of health and well-being, it is not valid to point to a particular trend or change and state that a specific project is the direct cause of this trend or change. In an assessment of effects of a project on health and well-being, the approach is to examine the existing trends, and consider Project components or activities that may indirectly or directly affect indicators. Benefit enhancement and mitigation measures are then proposed, and the relationships between the project and health and well-being in northern communities is discussed in the Developer's Assessment Report (DAR).

The DAR for the Jay Project examines health and well-being trends that have developed in communities to date, from the beginning of diamond mining and as mining activity increased in the Northwest Territories (NWT). The DAR does not, however, draw conclusions about the causal relationship between mining activity and existing health and wellbeing trends. Rather, it seeks to describe how the Jay Project could potentially influence these trends and what Dominion Diamond Ekati Corporation (Dominion Diamond) can do in response to community concerns with respect to health and well-being.

There is difficulty in disentangling socio-economic change (particularly to health and well-being indicators) resulting from mining specifically, as opposed to from other forces of change. It is, therefore, difficult to establish a direct correlation between the mining industry alone, and broad trends (both positive and negative) in health and well-being indicators in the NWT. It is reasonable, however, to predict *potential* changes to specific indicators of health and wellbeing in the current environment as a result of mining.

An example of the challenge in isolating the effects of mining on health and well-being indicators are the indicators described in the Communities and Diamonds reports released by the Government of the Northwest Territories (GNWT). The reports summarize predictions made in environmental assessments (EAs) for the Snap Lake, Ekati, and Diavik mines and are a compilation of survey and statistical data from numerous territorial and national sources. The indicators in the reports were chosen based on the indicators presented in the diamond mine EAs and on consultation with stakeholders. Predictions made in the diamond mine EAs have not always come to be in either rural local study area (LSA) communities or Yellowknife and in all cases, even where predictions were correct, the causal link between mining projects and health and well-being indicators are not clear in these reports (Table 14-1; GNWT-ITI 2013, 2014). For example, investigators in these reports propose that higher income and rotational work may be the cause of an increase in hunting and fishing activity, without identifying alternative factors such as rising fur prices and community based programs for hunters, which could also account for this relationship (Gibson 2008). Gibson (2008) notes that effects on communities can be more complex than the use of quantitative indicators are able to capture, and that more effort is needed to fully understand how people experience the diamond mines.

Table 14-1 Communities and Diamonds Annual Report 2013: Observed Trends and Predicted Trends

Indicator	Trends Observed		Trends Predicted		
	Small Local Communities	Yellowknife	Diavik EA	Ekati EA	Snap Lake EA
Potential Years of Life Lost	↓	\	↑	↑	↓
Physician diagnosed injuries	↓	↓	↑	↑	↓
Nurse diagnosed injuries	↓	↓	-	-	-
Suicides	\	\	\	\	↑
Sexually Transmitted Infections	↑	↑	↑	\	↑
Teen Births	↓	\	\	\	↑
Single Parent Families	↑	↑	\	↑	↑
Children Receiving Services	↑	\	↑	\	↑
Spousal Assault	↑	\	↑	↑	↑
Admission of Women and Children to Shelters	↑	\	-	-	-
Total Crime	↑	↑	↑	↑	↑
Violent Crime	↑	↑	-	-	-
Property Crime	↑	↑	-	-	-
Federal Statute (Drug Crimes)	↑	↑	-	-	-
Other Criminal Code Crimes	↑	↑	-	-	-
Home Ownership	\	↑	↑	↑	↑

Table 14-1 Communities and Diamonds Annual Report 2013: Observed Trends and Predicted Trends

Indicator	Trends Observed		Trends Predicted		
	Small Local Communities	Yellowknife	Diavik EA	Ekati EA	Snap Lake EA
Crowding	↓	\	↓	↓	↓
Households in Core Need	↓	↑	↓	↓	↓
Language	↓	↓	↓	↓	↓
Trapping	↑	↓	↓	↓	-
Hunting or Fishing	↑	↓	↑	↓	-
Eating Country Foods	↑	\	↑	↓	-
Average Income	↑	↑	↑	↑	↑
Wage Disparity	↓*	↓*	↑	↑	↑
Income Assistance	↓	\	↓	↓	↓
Employment	↑	\	↑	↑	↑
Unemployment	↓	\	↓	↓	↓
Participation	↑	\	↑	↑	↑
People with High School or Greater	↑	↑	↑	↑	↑
People with less than Grade 9	↓	↓	↓	↓	↓
Number of Businesses	\	↓	↑	↑	↑

Source: GNWT-ITI (2013).

Note on Arrows: Green coloured arrows indicate a positive trend, while red indicate a negative trend. An arrow pointing up reflects an increase in the indicator, while an arrow pointing down indicates a decrease.

*The Communities and Diamonds report summary table of trends indicates that wage disparity is increasing but the data and text suggest the opposite (i.e., decreasing wage disparity).

EA = Environmental Assessment; - = not predicted.

Given that the Jay Project is an extension of the existing Ekati Mine, and does not represent a completely new development to the territory, the assessment assumes that if all else is equal then the Jay Project itself would not lead to new or different trends in health and well-being indicators. In other words, while the Jay Project is expected to contribute to existing trends in health and well-being indicators, and potential future trends can be discussed, there is less confidence in these predictions than about other conclusions that rely primarily on an understanding of Project economics. External factors outside of the direct control of Dominion Diamond will continue to influence health and well-being in the NWT.

Dominion Diamond acknowledges that mining projects have the potential to affect health and well-being in communities. While the degree to which a single project affects health and well-being cannot necessarily be quantified in the same manner as effects on population, economics or employment, project-specific initiatives and agreements aimed at enhancing the health and well-being of employees and communities are discussed.

Dominion Diamond is committed to maintaining a healthy, safe and supportive work environment for employees and contractors, and supporting community initiatives that are intended to address local needs. Potential initiatives related to community health and well-being include the following:

- Community partnership programs to provide sport, recreation, and outdoor traditional activities.
- Community and school partnerships to develop youth mentorship and leadership programs.
- Community partnerships to define Traditional Knowledge projects and to preserve oral histories and genealogical archives.
- Support for traditional activities (e.g., fall hunt) and training in traditional skills (e.g., moccasin, dreamcatcher, and drum making).
- Funding or partnership for community-building activities.
- Community and government partnership to develop facilities for sport and other recreation activities.

Due to the complexity of the relationships between mining and health and well-being in northern communities, and the need for more effort to understand how people experience the diamond mines, ongoing socio-economic monitoring and engagement (including the implementation of programs and initiatives) are important in order to build knowledge and meaningfully address local concerns. Dominion Diamond is committed to such ongoing engagement, and to responding to community input regarding the health and well-being of people and their communities.

References:

Gibson V, 2008. Negotiated Spaces: Work, Home and Relationships in the Dene Diamond Economy, PhD Thesis, University of British Columbia, off print, 300 pp.

GNWT-ITI (Government of Northwest Territories – Industry, Tourism and Investment). 2013. Communities and Diamonds: Socio-Economic Impacts in the Communities of Behchoko, Detah, Gameti, Lutselk'e, N'dilo, Wekweeti, Whati and Yellowknife. 2012 Annual Report of the Government of the Northwest Territories under the BHP Billiton, Diavik and De Beers Socio-Economic Agreements.

GNWT-ITI. 2014. Communities and Diamonds: Socio-Economic Impacts in the Communities of Behchoko, Detah, Gameti, Lutselk'e, N'dilo, Wekweeti, Whati and Yellowknife. 2013 Annual Report of the Government of the Northwest Territories under the BHP Billiton, Diavik and De Beers Socio-Economic Agreements.

DOMINION DIAMOND

Information Request Number:	DAR-Tłı̨chǫ-IR-15
Source:	Tłı̨chǫ Lands Protection Department: Sjoerd van der Wielen
Subject:	Health and Well-being
DAR Section(s):	14.6

Preamble (Tłı̨chǫ):

Some information is provided regarding rising incomes however the disparity between the lowest and highest earning individuals, families, and communities is not provided.

Request (Tłı̨chǫ):

15.1 Please provide more comprehensive statistics on economic inequalities.

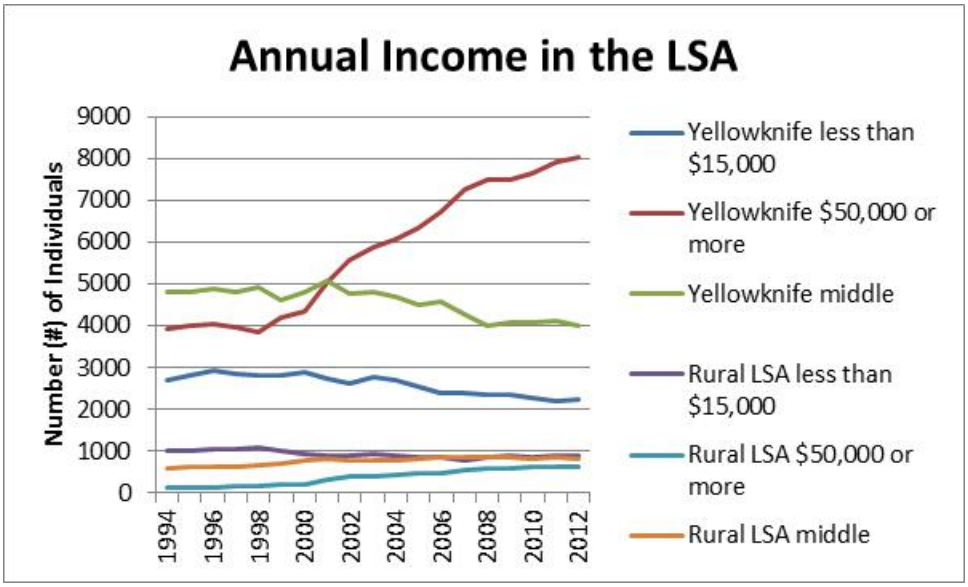
Response:

Overall Local Study Area – Level Trend

The gap between the number of lower, middle, and higher income earners in the rural local study area (LSA) communities has narrowed since 1994, while the number of middle and higher income earners is increasing (Figure 15-1). The number of lower income earners in rural LSA communities is also decreasing, but at a slower rate. In Yellowknife, the rate of increase in the number of higher income earners is much higher than that for middle and lower income earners. The number of higher income earners has been higher than the number of middle and lower income earners since 2002.

It should be noted that, throughout this response, dollars are presented at the value in the year in which they are reported (i.e., they are not constant, or chained). As a result, inflation and other factors (e.g., wage increases associated with re-negotiated contracts, or with raises) influence the trend of upward incomes. The number of individuals and families making less than the lower income thresholds (i.e., $15,000 and $30,000, respectively) would be expected to reduce over time as inflation drives wages up. Conversely, the number of individuals and families making more than the higher income thresholds (i.e., $50,000 and $75,000, respectively) would be expected to increase over time.

Figure 15-1 Annual Individual Income in the Local Study Area

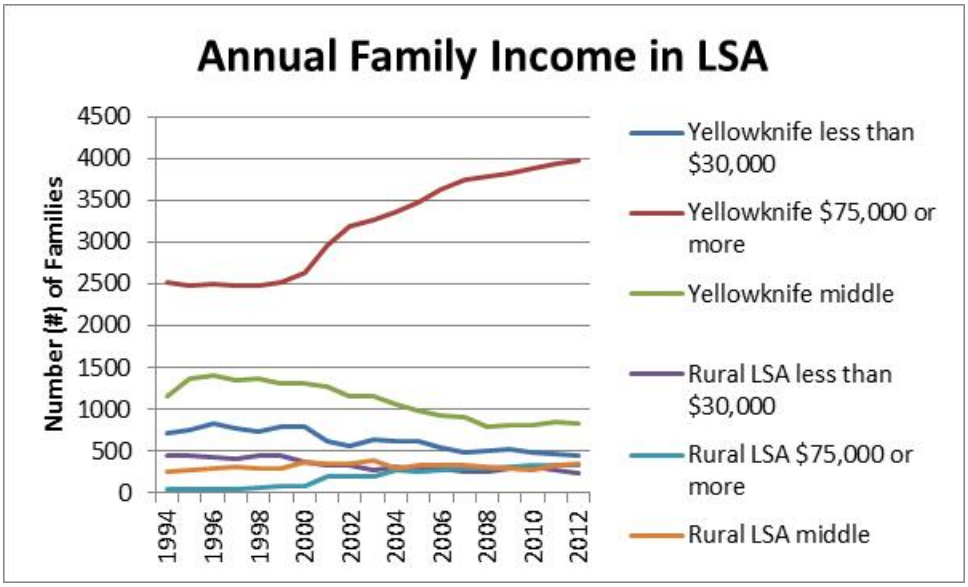


Source: NWT Bureau of Statistics 2015a.
LSA = local study area.

The gap between the number of rural LSA families with high incomes and the number with low incomes has closed over the past two decades (Figure 15-2). Overall, there were fewer families with incomes below $30,000 in 2011 than in 1994. In 1994, in rural LSA communities, 55 percent (%) to 73% of families had incomes under $30,000. By 2012, this number had decreased to 13% to 31%. The same pattern occurred in Yellowknife, where the number of families living with less than a $30,000 annual income decreased from 16% to 8%.

More families earned over $75,000 per year in all LSA communities in 2012 than in 1994. This increase has been most pronounced in rural LSA communities, where the number of families with over $75,000 in annual income increased from less than 20% in the 1990s to over 30% to 40% in 2012.

Figure 15-2 Annual Family Income in the Local Study Area



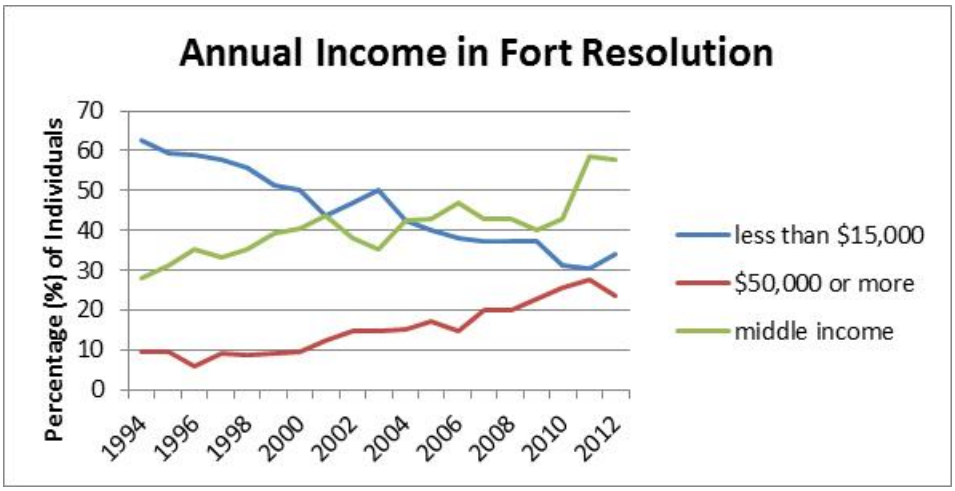
Source: NWT Bureau of Statistics. 2015b.
LSA = local study area.

Income Disparity between Individuals in the Local Study Area

Graphic representations of the trend in individual incomes are presented below by community for the years 1994-2012 (NWT Bureau of Statistics 2015a) and summarized by community.

Fort Resolution: The gap in the proportion of higher income (i.e., earning over $50,000 annually) and lower income (i.e., earning under $15,000 annually) tax filers in Fort Resolution is narrowing and there has been a decrease in the proportion of lower income earners since 1994 (Figure 15-3). There has also been an increase in the proportion of higher income earners since 2001. Lower income earners (34% or 130 tax filers) still represent a higher proportion of the population than higher income earners (23% or 90 tax filers). The proportion of middle income earners has also increased over this period and has been higher than lower income earners since 2005.

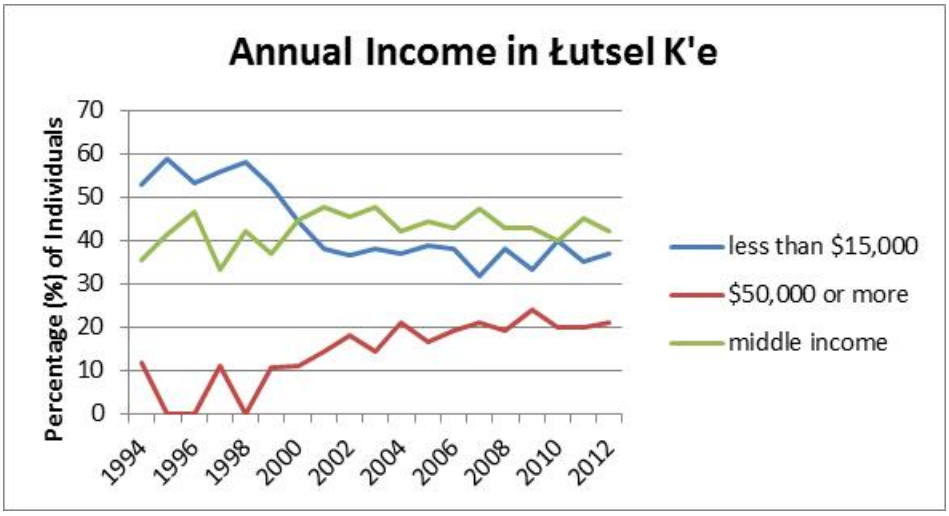
Figure 15-3 Annual Individual Income, Fort Resolution



Source: NWT Bureau of Statistics 2015a.

Lutsel K’e: The gap in the proportion of higher income and lower income tax filers in Lutsel K’e is narrowing and there has been a decrease in lower income earners since 1999 and an increase in higher income earners since 2001 (Figure 15-4). Lower income earners (37% or 70 tax filers) still represent a higher proportion of the population than higher income earners (21% or 40 tax filers). The proportion of middle income earners has also increased over this period and has been higher than lower income earners since 2000.

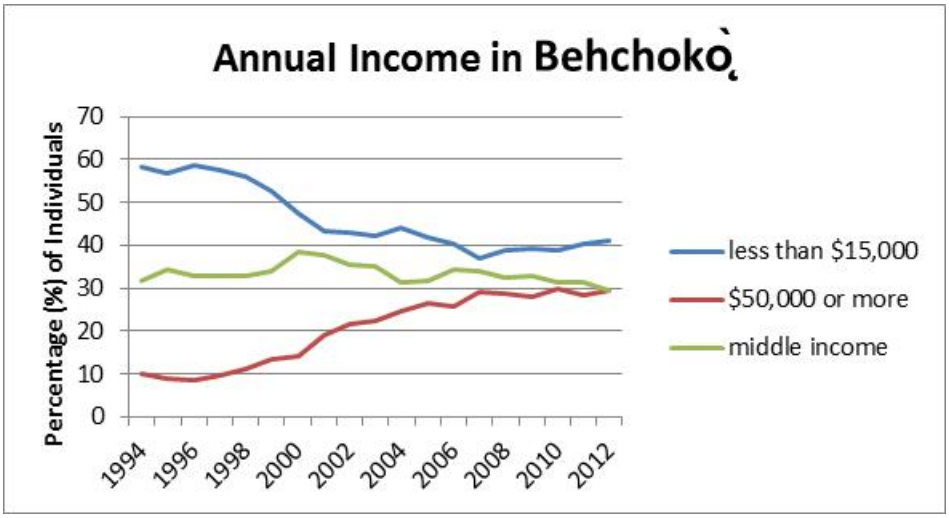
Figure 15-4 Annual Individual Income, Lutsel K’e



Source: NWT Bureau of Statistics 2015a.

Behchokǫ̀: The gap in the proportion of higher income and lower income tax filers in Behchokǫ̀ is narrowing and there has been a decrease in lower income earners since 1996 and an increase in higher income earners since 2001 (Figure 15-5). Lower income earners (41% or 530 tax filers) still represent a higher proportion of the population than higher income earners (30% or 380 tax filers). The proportion of middle income earners has remained stable compared to lower and higher income earners and is now equal to higher income earners.

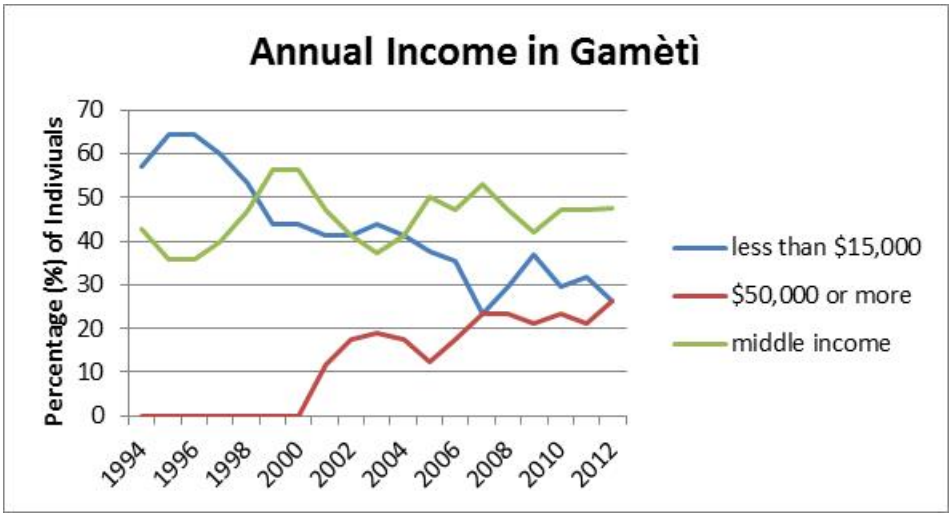
Figure 15-5 Annual Individual Income, Behchokǫ̀



Source: NWT Bureau of Statistics 2015a.

Gamètì: The gap in the proportion of higher income and lower income tax filers in Gamètì is narrowing and there has been a decrease in lower income earners since 1997 and an increase in higher income earners since 2001 (Figure 15-6). Lower income earners and higher income earners represent the same proportion of the population (26% or 50 tax filers for each category). The proportion of middle income earners has fluctuated but has remained stable overall compared to lower and higher income earners. Middle income earners have, proportionally been above the proportion of lower income earners since 2005.

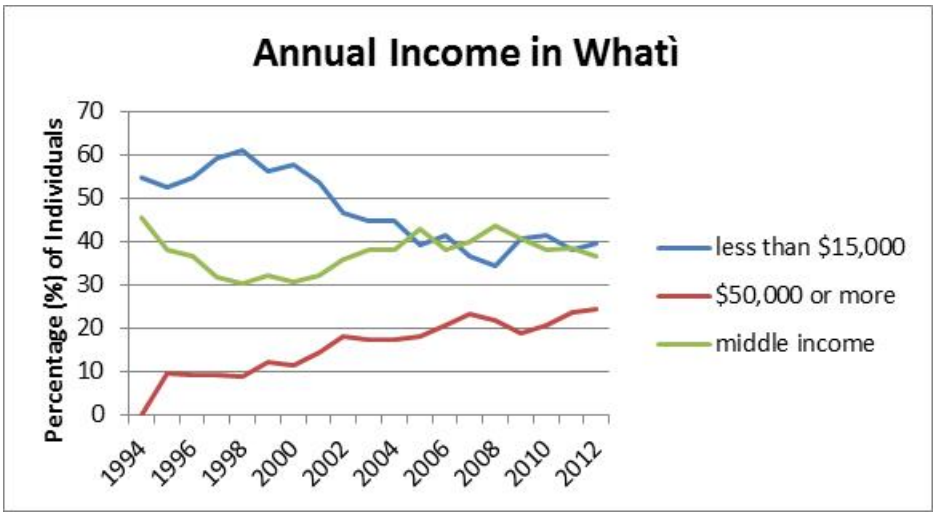
Figure 15-6 Annual Individual Income, Gamètì



Source: NWT Bureau of Statistics 2015a.

Whatì: The gap in the proportion of higher income and lower income tax filers in Whatì is narrowing and there has been a decrease in lower income earners and an increase in higher income earners since 1994 (Figure 15-7). Lower income earners (39% or 130 tax filers) still represent a higher proportion of the population than higher income earners (24% or 80 tax filers). The proportion of middle income earners has decreased overall and has closely matched the proportion of lower income earners since 2005.

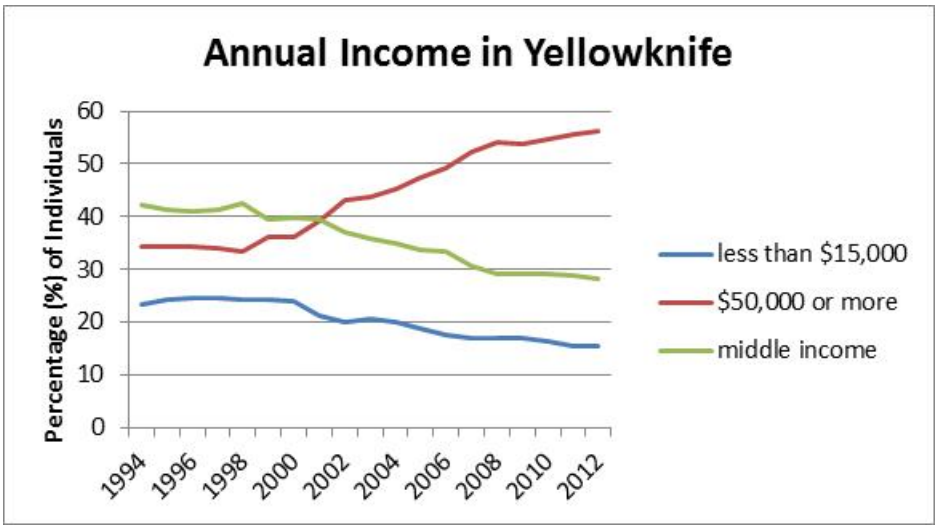
Figure 15-7 Annual Individual Income, Whatì



Source: NWT Bureau of Statistics 2015a.

Yellowknife: The gap in the proportion of higher income and lower income tax filers in Yellowknife is widening and there has been a decrease in lower income earners and an increase in higher income earners since 2001 (Figure 15-8). Higher income earners have represented a higher proportion of the population than lower and middle income earners since 2002. The proportion of middle income earners has decreased and has closely matched the trend for lower income earners.

Figure 15-8 Annual Individual Income, Yellowknife



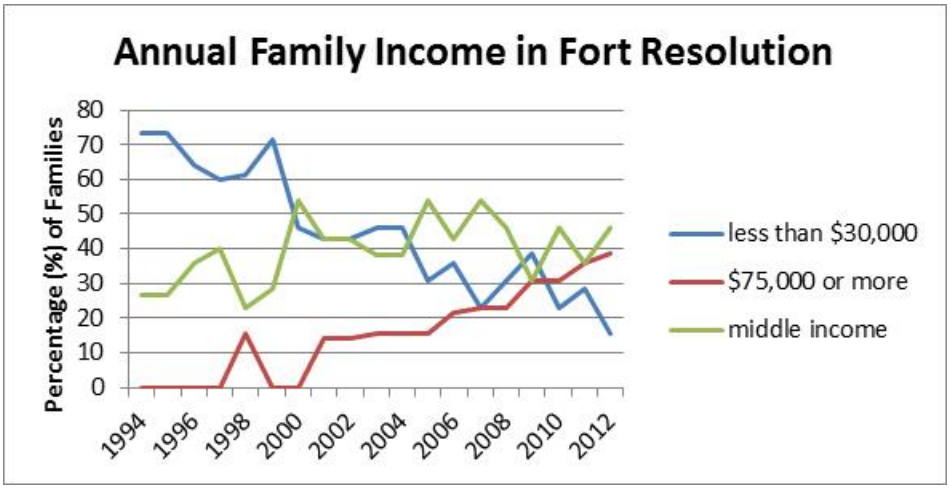
Source: NWT Bureau of Statistics 2015a.

Income Disparity between Families in the Local Study Area

Graphic representations of the trend in family incomes are presented below by community for the years 1994-2012 (NWT Bureau of Statistics 2015b) and summarized by community.

Fort Resolution: The gap in the proportion of higher income and lower income families in Fort Resolution is narrowing and there has been a decrease in lower income families since 2000 and an increase in higher income families since 2001 (Figure 15-9). Higher and middle income families have represented a higher proportion of the population than lower income families since 2010.

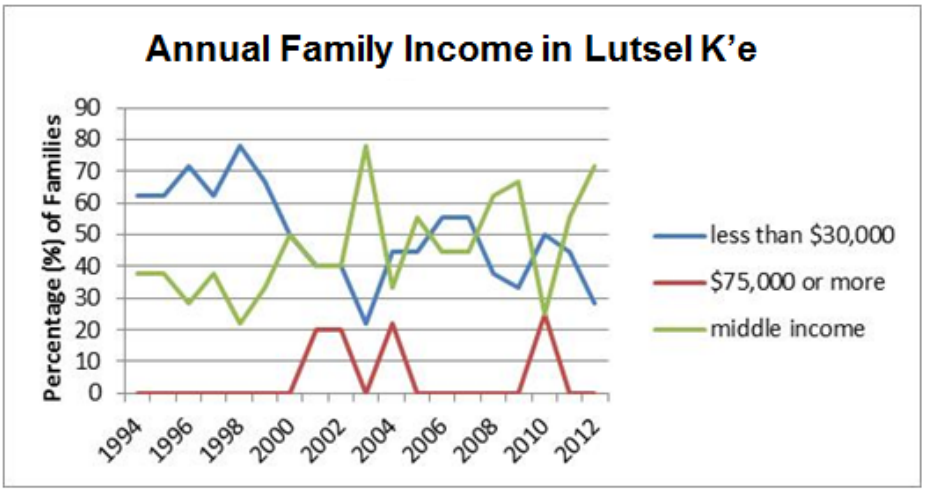
Figure 15-9 Annual Family Income, Fort Resolution



Source: NWT Bureau of Statistics 2015b.

Lutsel K'e: There are no evident trends in the gap between family income categories or in the proportion of higher income families. Overall, compared to the 1990s, there has been a higher proportion of middle income families than lower income families in the 2000s and 2010s (Figure 15-10).

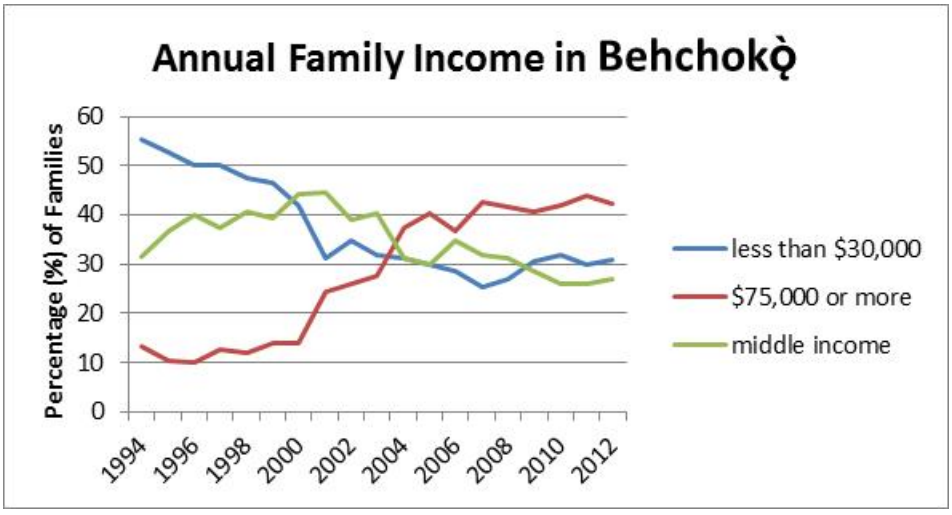
Figure 15-10 Annual Family Income, Lutsel K'e



Source: NWT Bureau of Statistics 2015b.

Behchokǫ̀: The gap in the proportion of higher income and lower income families in Behchokǫ̀ is narrowing and there has been an overall decrease in lower income families since 1994 and an increase in higher income families since 2001 (Figure 15-11). Since 2006, the number of low income families has begun to rise, while the number of middle income families has continued to fall. Higher income families have represented a higher proportion of the population than lower and middle income families since 2004. The proportion of middle income families has remained stable compared to lower and higher income families and has more recently dropped below lower income families (27% or 140 families compared to 31% or 160 families).

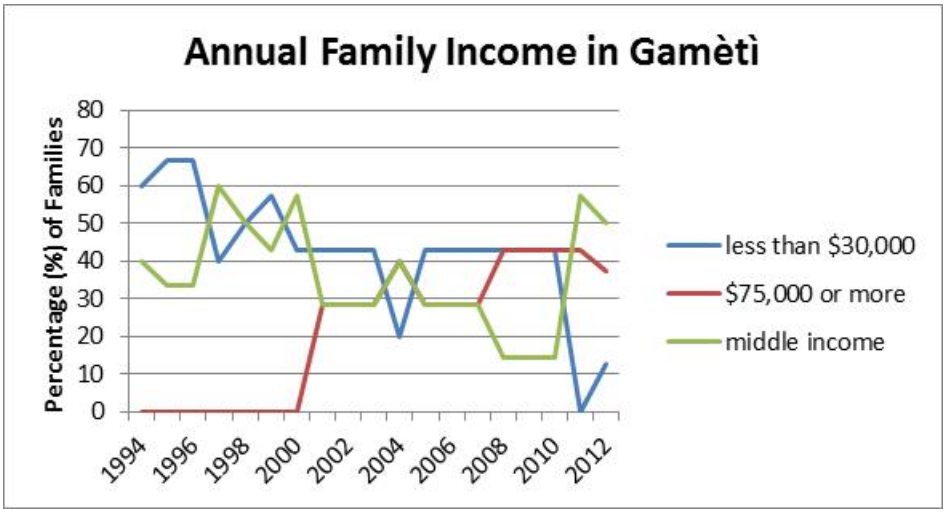
Figure 15-11 Annual Family Income, Behchokǫ̀



Source: NWT Bureau of Statistics 2015b.

Gamètì: The proportion of higher income families has been increasing since 2001 and the proportion of lower income families has decreased since 1999. Middle (50% or 40 families) and higher income families (38% or 30 families) now represent a larger proportion of the population than lower income families (13% or 10 families) (Figure 15-12).

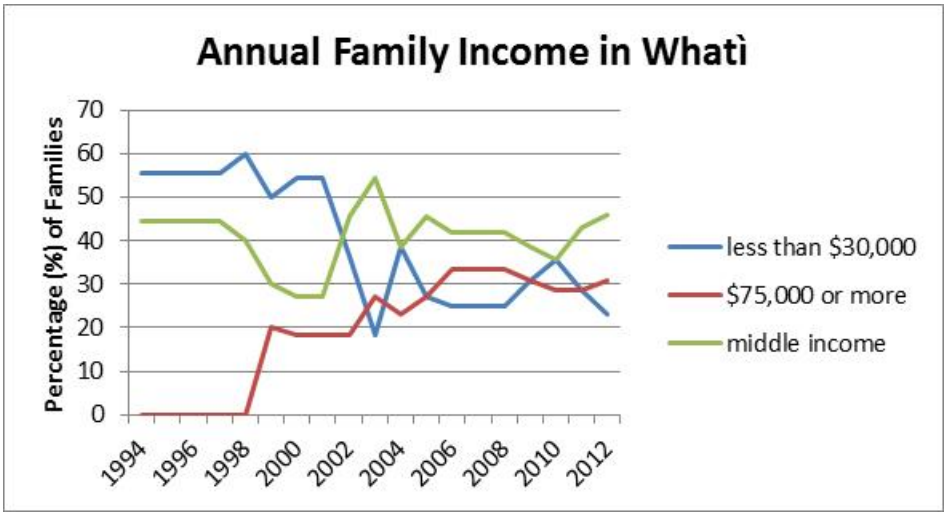
Figure 15-12 Annual Family Income, Gamètì



Source: NWT Bureau of Statistics 2015b.

Whatì: The gap in the proportion of higher income and lower income families in Whatì is narrowing and there has been a decrease in lower income families since 2001 and an increase in higher income families since 2003 (Figure 15-13). Higher and middle income families (77% or 100 families) represented a higher proportion of families in 2012, reversing the trend between 1994 and the early 2000s.

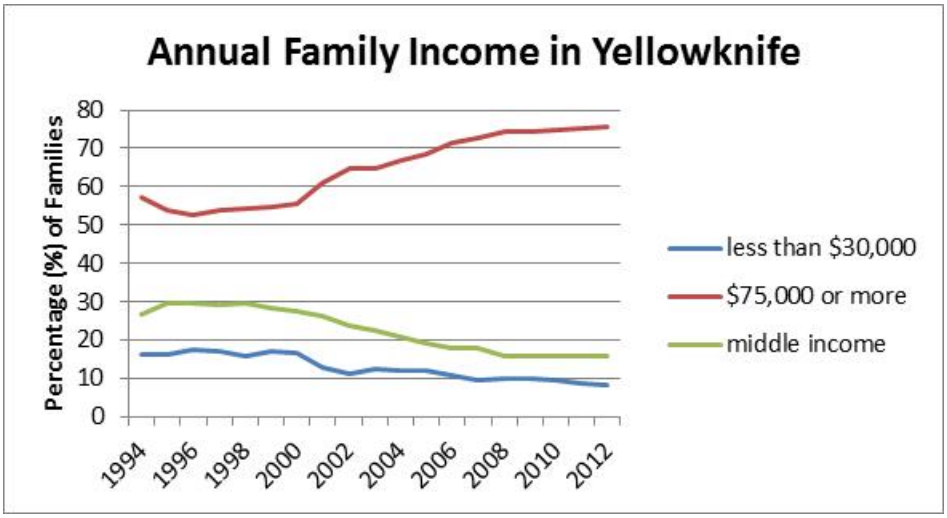
Figure 15-13 Annual Family Income, Whatì



Source: NWT Bureau of Statistics 2015b.

Yellowknife: The gap in the proportion of higher income and lower income families in Yellowknife is widening and there has been a decrease in lower income families and an increase in higher income families since 2001 (Figure 15-4). The proportion of middle income families has also decreased and has closely matched the trend for lower income families.

Figure 15-14 Annual Family Income, Yellowknife



Source: NWT Bureau of Statistics 2015b.

References:

NWT Bureau of Statistics. 2015a. Persons with Incomes Less than $15,000 or $50,000 or More: 1994-2012. Available at: http://www.statsnwt.ca/labour-income/income/index.html. Accessed March 2015.

NWT Bureau of Statistics. 2015b. Families with Income Less than $30,000 or $75,000 or More: 1994-2012. Available at: http://www.statsnwt.ca/labour-income/income/index.html. Accessed March 2015.

DOMINION DIAMOND

Information Request Number: DAR-Tłı̨chǫ-IR-16

Source: Tłı̨chǫ Lands Protection Department: Sjoerd van der Wielen

Subject: Health and Well-being

DAR Section(s): 14

Preamble (Tłı̨chǫ):

Trends such as increasing crime and suicide rates in diamond mining communities (14.6.1.1) and the "prevalence of single-parent families in the NWT…[where the] sharpest increase has been in rural LSA communities" (14.6.1.4) are not examined further, and numbers are not provided on mortality and disease rates between the communities in the LSA and those outside the LSA. Instead, the Project DAR states, "inequities between people and communities…are not easily mitigated, and so may persist", and conclude that health and well-being is not "expected to be different from that of the existing Ekati Mine." No discussion is provided on how these existing conditions in rural LSA communities may be worsened or cause greater damage by persisting, rather it is assumed that the continuation of the status quo will not equate to further damage as a ceiling has already been reached.

Request (Tłı̨chǫ):

16.1 Please provide more information on how the Project may continue the trends noted in the DAR related to crime, suicide, family composition, and all other aspects of health and well-being and how they may be worsened by their persistence.

Response:

Section 14.6 of the Developer's Assessment Report (DAR) examines what has occurred in communities to date, from the beginning of diamond mining and as mining increased in the Northwest Territories (NWT) and makes professional judgements about the likelihood of these trends continuing or changing with the development of the Jay Project. Because the Jay Project is essentially an extension of the existing Ekati Mine, the assessment assumes that if all else is equal then the Jay Project itself would not lead to new or different trends in health and well-being indicators.

To summarize trends in health and well-being indicators, results from the most recent Communities and Diamonds report are listed below (GNWT-ITI 2014). The health and well-being indicators in the annual Communities and Diamonds reports were chosen based on the indicators presented in the Diavik, Snap Lake, and Ekati environmental assessments (EAs) and on engagement with stakeholders.

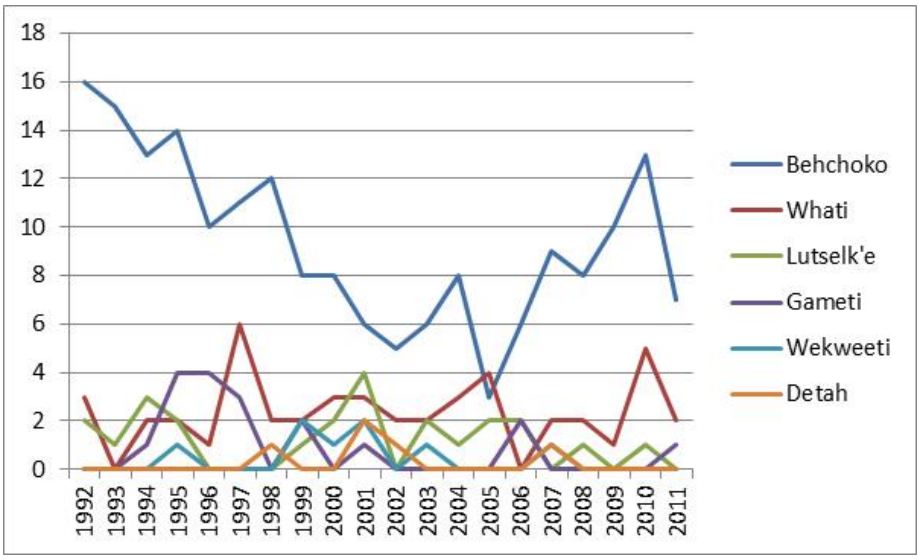
- Potential Years of Life Lost (PYLL) (Trend: no clear trend)
  - PYLL rates in small local communities[1] have remained within historical (pre-mining) boundaries since the diamond mines opened. PYLL rates in small local communities have also remained lower than rates in other NWT communities, but higher than in Yellowknife.

[1] Small local communities include Behchokǫ̀, Dettah, Gamètì, Lutsel K'e, N'dilo, Wekweètì, and Whatì.

- Since the mines opened, the PYLL rate in Yellowknife has been both higher and lower than before the mines opening.
- The Communities and Diamonds report concludes that PYLL rates follow a natural cycle that may be unrelated to mining.

- Suicide (Trend: no clear trend)
  - Suicide rates have been higher in small local communities than in Yellowknife since 2003/2005.
  - These rates should be interpreted with caution. For example, the number of suicides in Behchokǫ̀, Dettah, Gamètì, Lutsel K'e, N'dilo, Wekweètì, and Whatì fluctuated between 0 to 2 per year between 1992 and 2009. This makes it difficult to identify any trends from the data or to infer a relationship between suicides and mining in the NWT.
  - Please see the response to DAR-YKDFN-IR-12 for further details on suicide rates.
- Teen Births (Trend: no clear trend)
  - Teen Birth rates remain higher in small local communities than in Yellowknife and in the rest of the NWT.
  - Before mining, Teen Birth rates were high and steady. There was a steep drop in rates from 1999 to 2004, but they have since started to increase. Current (2009/2011 – the most recent publicly available data) rates remain below historical levels.
  - As with suicide, there is no clear trend for the number of teen births in small local communities, as the numbers are low and tend to fluctuate annually (see Figure 16-1 below).
  - The data do not indicate that mining activity has influenced teen birth rates in the NWT.

Figure 16-1 Number of Teen Births in Small Local Communities



Source: GNWT-ITI (2014).

- Single-Parent Families (Trend: negative, increasing rates)
  - In small local communities, the rate of single-parent families had been steady before the mines opened, but went up quickly after the mines began operations.
  - The rate in other small and regional NWT communities has also gone up, but not as quickly as in small local communities.
  - The rate is also increasing in Yellowknife, but not as much as in small local communities.
- Injuries (Trend: positive, decreasing rates)
  - The rate of physician-diagnosed injuries has been decreasing since 1994/1995.
  - Because rates have been dropping since before the mines opened the data does not suggest a linkage between mining activity and the rate of physician-diagnosed injuries.
  - The rate of nurse-diagnosed injuries has increased slightly since 2000/2001. However, the way nurses record injuries changed in 2000. Due to this change, injuries reported by nurses cannot be compared before and after mining began.
- Sexually Transmitted Infections (Trend: negative, increasing rates)
  - The sexually transmitted infections (STI) rates in small local communities has been higher than in other NWT communities since before mining began.
  - The STI rate has been going up across the NWT, but more quickly in small local communities.
  - Until 2005, the STI rate in Yellowknife was no higher or lower than before the mines opened but since then has been increasing more quickly than in other parts of the NWT.
  - STI rates are also increasing in the rest of Canada.
  - The Communities and Diamonds report concludes that many factors influence STI rates and it is not possible to say whether STI rates are impacted by mining activity.
- Tuberculosis (Trend: no clear trend)
  - The annual rate of new Tuberculosis cases has not changed much in the ten years prior to 2013 (the latest year of available data). However, outbreaks still occur in the NWT and the rate in the NWT is much higher than in the rest of Canada.
  - There was an outbreak in the mid-1990s before mines opened. After which, the number of new cases went back to rates seen before the outbreak.
  - New cases in Yellowknife have remained consistent before and after mining.
  - The data do not indicate a relationship between Tuberculosis cases and mining activity.
- Children Receiving Services: (Trend: no clear trend)
  - Data on the number of children receiving services have been heavily influence by child welfare policy. This means that rates for children receiving services before and after mining began cannot be compared.

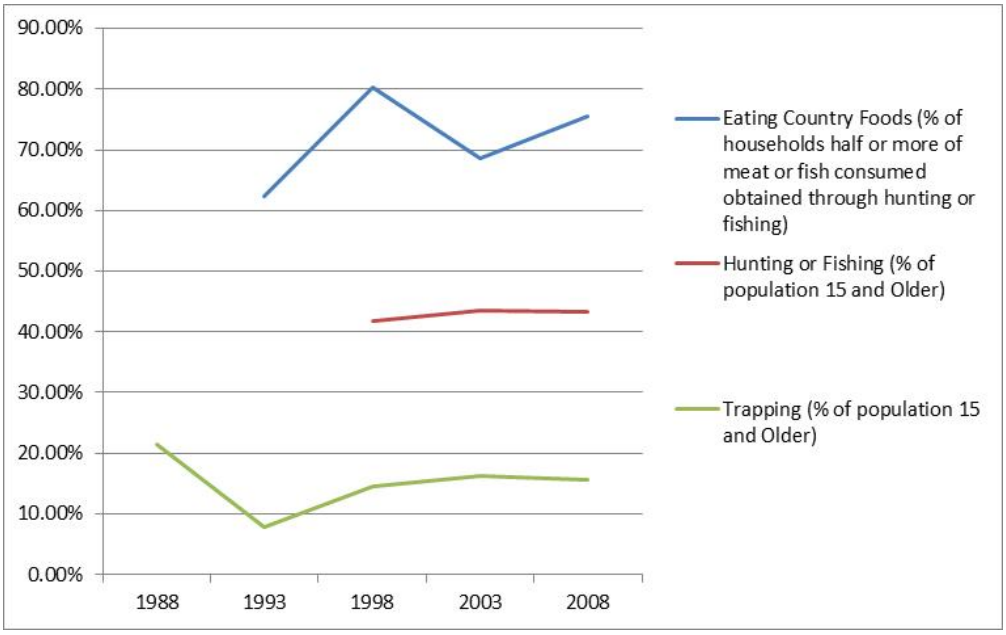
  - The number of children receiving services in small local communities fluctuates from year to year.
  - The number of children receiving services in Yellowknife has remained stable.
- Spousal Assault: (Trend: no clear trend)
  - When the mines first opened, the rate of reported spousal assault was going down. Since then, there were increases in 2002, 2006, and 2010, and more recent decreases in 2011 and 2012.
  - In Yellowknife, the trend is flatter, and the rate in 2012 is similar to the rate in 1996.
  - The data do not indicate a relationship between spousal assault and mining activity.
- Admission of women and children to shelters: (Trend: no clear trend)
  - The admission of women and children into NWT shelters peaked in 2002/2003, but steadily dropped in 2005/2006 and has not changed much since.
  - Before-mine and active-mine phases cannot be compared for this indicator since data have only been collected since 1999.
- Crime (Trend: negative, increasing rates)
  - Overall crime rates have been increasing in small local communities and Yellowknife.
  - These increases are strongly driven by property crimes and other criminal code offences including mischief and disturbing the peace. These types of crimes are linked to alcohol use which is considered a criminal code offence in small local communities.
  - Before 1999 in Yellowknife and before 2002 in the rest of the NWT, territorial *Liquor Act* offences were reclassified as criminal code offences (under the Other crimes category).
  - Mining activity may indirectly contribute to crime rates in communities. Local study area (LSA) communities have raised concerns during consultations that higher disposable incomes are related to increased alcohol and drug use which is associated with violent, property, and traffic crimes and other criminal code offences.
  - See response to DAR-YKDFN-IR-11 for more details on crime rates in communities.
- Housing (Trends: positive)
  - Home ownership:
    - Since 1986, home ownership increased in Yellowknife until 2004, and then experienced small declines to 2011 (the most recent year of data available).
    - In small local communities, home ownership has remained constant, staying between 52% and 59% between 1986 and 2011.
  - Crowding:
    - The number of dwellings with more than six people has decreased in small local communities, in Yellowknife, and in the NWT overall.

- Households in Core Need:
  - In small local communities, the rate of core need[2] fell substantially between 1996 and 2004, and has increased between 2004 and 2009 (the most recent year of data available) but remains below rates in 1996 and 2000. This trend is linked in the Communities and Diamonds report to a decrease in the number of people employed in the resource industry in 2009.
  - For Yellowknife, core need increased from 1996 to 2000 but remained relatively unchanged from 2000 to 2009.
  - The Communities and Diamonds report concludes that the availability of mining employment opportunities and other employment from economic development is important to decreasing core need.

- Aboriginal language (Trend: negative, decreasing rates)
  - In small local communities, knowledge of Aboriginal languages was decreasing before the mines opened. The rate is still decreasing as of 2011 (the most recent year of data available).
  - The data do not suggest a relationship between mining activity and knowledge of Aboriginal languages; however, for safety reasons, knowledge of English is required on mining sites and greater use of English at work can influence language use in the home and could therefore influence how language is passed down to future generations.
  - See response to DAR-YKDFN-IR-12 for more discussion of the impact of the loss of knowledge of Aboriginal languages in communities.
- Traditional activities (Trends: positive)
  - The data do not suggest a linkage between pre-mining and post-mining activity and rates of participation in traditional activities.
  - In general, the most recent rates (2008) are above rates recorded in 1998, except for trapping (see Figure 16-2).

[2] A household is said to be in core housing need if its housing falls below at least one of the adequacy, affordability or suitability, standards and it would have to spend 30% or more of its total before-tax income to pay the median rent of alternative local housing that is acceptable (CMHC 2014).

Figure 16-2 Traditional Activities in Small Local Communities



Source: GNWT-ITI (2014).

Overall, any causal links between mining projects and health and well-being indicators are not clear in the Communities and Diamonds reports. Gibson (2008), for example, argues that causal linkages suggested in these reports can be tenuous as investigators primarily attempt to link change to mining instead of considering other causal factors, thus over- or under-estimating the industry's influence. For example, investigators in these reports propose that higher income and rotational work may be the cause of an increase in hunting and fishing activity, without identifying alternative factors such as rising fur prices and community based programs for hunters, which could also account for this relationship. Gibson (2008) notes that effects on communities can be more complex than the use of quantitative indicators are able to capture, and that more effort is needed to fully understand how people experience the diamond mines.

The data in the Communities and Diamonds reports indicate negative trends for single-parent families, crime, and Aboriginal language and that these trends may be influenced indirectly by mining activity. Therefore, these trends may continue in a negative direction during the construction and operations phases of the Jay Project. Due to the Jay Project's expected effects on employment and income in the NWT (i.e., maintaining current levels), the influence of the Jay Project on these trends compared to Base Case conditions was not expected to be significant. In other words, while these negative trends may continue during construction and operations, they will not be made any better or worse due to the employment and incomes of the Jay Project.

When statements are made in the DAR that these trends will persist (i.e., not change or continue in the same direction), this is not meant to imply that a ceiling has been reached or that the persistence of the status quo will not lead to more damage (e.g., more crime or single-parent families). The intent of these statements is to explain that the Jay Project is not expected to have new or different effects on health and well-being indicators. The Project functions primarily to extend the life of the Ekati Mine. Therefore, the

usual means by which a new Project may affect communities (e.g., new jobs, new income, new business opportunities) are not pronounced due to the nature of the Jay Project. We regret having used the terms “persist” and “persistence” due to these apparent implications.

Because the Jay Project extends the life of the Ekati Mine, mitigation measures put in place for Ekati and ongoing engagement should also be implemented for the Jay Project. Dominion Diamond acknowledges that mining projects have the potential to affect health and well-being in communities. While the degree to which a single project affects health and well-being cannot necessarily be quantified in the same manner as effects on population, economics, or employment (or with the same level of confidence), project-specific initiatives and agreements aimed at enhancing the health and well-being of employees and communities are proposed (see response to DAR-Tlicho-IR-14 for further discussion on the assessment of effects on health and well-being).

Dominion Diamond is committed to maintaining a healthy, safe and supportive work environment for employees and contractors, and supporting community initiatives that are intended to address local needs. Potential initiatives related to community health and well-being include the following:

- Community partnership programs to provide sport, recreation, and outdoor traditional activities.
- Community and school partnerships to develop youth mentorship and leadership programs.
- Community partnerships to define Traditional Knowledge projects and to preserve oral histories and genealogical archives.
- Support for traditional activities (e.g., fall hunt) and training in traditional skills (e.g., moccasin, dreamcatcher, and drum making).
- Funding or partnership for community-building activities.
- Community and government partnership to develop facilities for sport and other recreation activities.

Due to the complexity of the relationships between mining and health and well-being in northern communities, and the need for more effort to understand how people experience the diamond mines, ongoing socio-economic monitoring and engagement (including the implementation of programs and initiatives) are important in order to build knowledge and meaningfully address local concerns. Dominion Diamond is committed to such ongoing engagement, and to responding to community input regarding the health and well-being of people and their communities.

References:

CMHC (Canada Mortgage and Housing Corporation). 2014. Housing in Canada. Definitions and Variables. Available at: http://cmhc.beyond2020.com/HiCODefinitions_EN.html. Accessed March 2015.

Gibson V. 2008. Negotiated Spaces: Work, Home and Relationships in the Dene Diamond Economy, PhD Thesis, University of British Columbia, off print, 300 pp.

GNWT-ITI (Government of Northwest Territories – Industry, Tourism and Investment). 2014. Communities and Diamonds: Socio-Economic Impacts in the Communities of Behchoko, Detah, Gameti, Lutselk'e, N'dilo, Wekweeti, Whati and Yellowknife. 2013 Annual Report of the Government of the Northwest Territories under the BHP Billiton, Diavik and De Beers Socio-Economic Agreements.

DOMINION DIAMOND

Information Request Number:	DAR- TŁĮCHǪ-IR-17
Source:	Tłı̨chǫ Lands Protection Department: Sjoerd van der Wielen
Subject:	Contributions to Monitoring
DAR Section(s):	5

Preamble (Tłı̨chǫ):

Dominion Diamond currently has existing monitoring programs in place to track effects on wildlife, aquatics, and air quality. Dominion Diamond has reported that they will discuss with potentially affected Aboriginal groups on ways to collaboratively involve community members in these monitoring programs. The goal of this involvement is to assist in mitigating residual concerns about effects on traditionally harvested resources and concerns about human and ecological health effects in the general Ekati area. However it is not clear on the approaches that will be taken, level of engagement that will take place, and plan that will be used to achieve the goal of mitigating residual concerns.

Request (Tłı̨chǫ):

17.1 Please provide details of proposed engagement with Tłı̨chǫ on additional monitoring programs.

17.2 Please provide further details on whether new traditional knowledge will be considered and integrated within existing and/or additional monitoring programs. Please advise on whether project changes will occur due to this knowledge.

Response:

17.1 Dominion Diamond is committed to engaging with Impact Benefit Agreement communities by building on and advancing past engagement practices, undertaking regular engagement meetings between Dominion Diamond senior management, and community leadership. With respect to additional monitoring programs, this engagement will take a number of forms:

- quarterly meetings between Dominion Diamond senior management and community leadership – for the Tłı̨chǫ, this is usually done through the Kwe Beh Working Group;
- specific meetings and/or workshops with Tłı̨chǫ members on additional monitoring programs being proposed including with Tłı̨chǫ Lands Department staff;
- annual community presentations of environmental monitoring information;
- various technical workshops and Board process for reviews of technical documents under the Water Licence; and,
- leadership/elder/youth site visits for environmental monitoring programs (typically annual).

Dominion Diamond describes its approach to community engagement in its Ekati Mine Community Engagement Plan, a report that is reviewed every year and approved by the Wek'èezhìi Land and Water Board. The Plan will apply equally to activities related the Jay Project if the Project is approved.

17.2 Dominion Diamond is committed to considering and integrating Traditional Knowledge (TK) into its environmental monitoring programs Currently, Dominion Diamond runs a number of monitoring programs that utilize traditional knowledge experts to provide input including the Misery power line wildlife monitoring program and the Misery Pit bird monitoring program. A similar monitoring program is proposed for the Jay Road.

Other examples of inclusion of TK into environmental monitoring programs include:

- Annual TK caribou camps at the Ekati Mine to discuss traditional indicators of health and behavior. Dominion Diamond environment staff also review different caribou mitigations and complete caribou behavior surveys with the community members.
- Grizzly bear hair snagging post locations were selected based on knowledge of high quality habitat provided by community members.
- Caribou crossings on the Misery Road were constructed with engagement with community members.

As well, Dominion Diamond supports a number of TK projects that can provide direct input into the Project and may result in changes. For example, the What'aa-Esker Research project led by Georgina Chocolate with support from the Tłı̨chǫ Department of Culture and Lands Protection and the Kwe Beh Working Group.

It is also important to note that Dominion Diamond has made significant changes to the Project based on engagement with communities and traditional knowledge holders. The most apparent of these was the change from the 'Jay-Cardinal' to a 'Jay-Only' project. As well, decisions related to where to cross the esker and in the design of the Jay Road and the mitigations with respect to caribou movement in that area were largely done as a result of input from traditional knowledge holders.

Dominion Diamond will continue to seek ways to incorporate TK into the Project.

DOMINION DIAMOND

Information Request Number:	DAR-Tłı̨chǫ-IR-18
Source:	Tłı̨chǫ Lands Protection Department: Sjoerd van der Wielen
Subject:	Archeology and Traditional Land Use
DAR Section(s):	2

Preamble (Tłı̨chǫ):

Since purchasing the Ekati Mine, Dominion Diamond has made several commitments to affected communities to support the ongoing collection and documentation of Traditional Knowledge for communities, and for integration into Project design, planning, operations, and eventual closure and reclamation activities. Dominion Diamond recognizes the significance of traditional land use activities and the connections local communities maintain with the Lac de Gras area, and will work with the communities to balance the traditional and present-day land uses so that the cultural connections can be maintained for future generations.

Request (Tłı̨chǫ):

18.1 Please provide Dominion Diamond's approach for integration of Traditional knowledge into Project design, planning, operations and eventual closure and reclamation activities.

Response:

Section 5 (Traditional Knowledge) of the Developer's Assessment Report (DAR) outlines how local and Traditional Knowledge (TK) information was integrated into Jay Project (Project) planning, including the Project design, the environmental assessment, and the development of monitoring plans and the reclamation and closure plan.

For example, after the Traditional Knowledge (TK) baseline was prepared, each technical discipline was provided with a summary of the local knowledge and TK that related to their respective component. Generally, the various components used the information to inform their assessment methodology and identification of pathways.

Dominion Diamond also engaged and continues to engage with communities during key Project milestones. The key Project milestones are listed in Section 5.3.2 and included the Mackenzie Valley Environmental Impact Review Board scoping workshops (January 2014), community workshops (March and July 2014), site visits (summer 2014), and post-Project application engagement (November 2014 onwards).

To further identify TK related to the Project, Dominion Diamond funded two community-led activities:

- The activities with the Yellowknives Dene First Nation included a site visit with an archaeologist to provide advice on locations of cultural significance around Lac du Sauvage, and to provide advice on the crossing of the esker for the Project (August 11 to 12, 2014). This project also includes funding for a workshop with Elders to provide additional TK on the Project and to enter relevant TK data for the Ekati area into the Yellowknives Dene First Nation's Community Knowledge Keeper database.

- The What'aa Project with the Tłı̨chǫ involves the study by Tłı̨chǫ Elders of varying properties of natural eskers close to Mesa Lake, Northwest Territories, to identify community-based concepts that may be useful in planning, construction, and reclamation of mine waste rock piles. Dominion Diamond's activities included arranging a site visit for Tłı̨chǫ Government representatives and Elders with an engineer to provide advice on the crossing of the esker for the Project (July 16, 2014).

Traditional knowledge was used in Project design. For example, local and TK information was used in the pre-screening assessment (Section 2.4.6) to assess various alternatives for Project design; the assessment of alternative means of carrying out the Project (Section 2.4.7) that was a more focused assessment of design alternatives; and the Level 2 Assessment (Section 2.5), that included a consideration of access roads.

Section 5.3.6 summarizes the use of local and TK information in monitoring plans and reclamation. Dominion Diamond currently has existing monitoring programs in place to track effects on wildlife, aquatics, and air quality. Dominion Diamond will discuss with potentially affected Aboriginal groups collaborative ways for community members to be involved in these programs. The goal of this involvement is to assist in mitigating residual concerns about effects on traditionally harvested resources and concerns about human and ecological health effects in the general Ekati Mine area.

Dominion Diamond will support affected Aboriginal communities' participation in meaningful programs designed to assist in the retention of their cultural connection to the land. Examples of potential programs include the following:

- collaboration between Dominion Diamond and affected Aboriginal groups in reclamation design and implementation so that reclamation occurs in a way that is consistent with the needs of potentially affected Aboriginal groups;
- environmental monitoring programs;
- community ceremonies at Project milestones, such as initiation and decommissioning; and,
- cultural gatherings and camps in the general Ekati area.

DOMINION DIAMOND

Information Request Number: DAR-Tłı̨chǫ-IR-19

Source: Tłı̨chǫ Lands Protection Department: Sjoerd van der Wielen

Subject: Archeology/Traditional Land Use

DAR Section(s): 2

Preamble (Tłı̨chǫ):

In the Lac de Gras area, people often camped near areas where caribou, fish, and water were available such as on small bays along the shore, on protected islands, and areas where channels with swift currents kept the water open in winter, including the Lac du Sauvage-Lac de Gras Narrows. The Narrows (a relatively short stream connection between Lac du Sauvage and Lac de Gras) was identified as a fishing location, particularly during winter because of the swift currents that keep that channel open (Weledeh Yellowknives Dene 1997). Traditional knowledge also identifies this area as potential spawning habitat. Other potential spawning locations include locations above and below the Narrows, and adjacent to the western shoreline of Lac du Sauvage in internal basin Ac. The Tłı̨chǫ Dene also express their concern with the destruction of the lands and waters and the effects the mine will have on their ability to fish at Ek'atì area (DCI 1995).

Request (Tłı̨chǫ):

19.1 Please provide more detailed locations, information and mitigation measures of high value spawning habitat that have been identified through traditional knowledge in the Jay Pipe area.

19.2 Please provide detailed mitigation measures to directly address the concern with the destruction of used lands and waters within the Project area.

Response:

19.1 Traditional Knowledge identifies shoreline locations of the diked area in Lac du Sauvage as potential spawning habitat, as summarized in the Developer's Assessment Report (DAR Section 9.2.7; Map 19-1). Other potential spawning locations include locations above and below the Narrows. Detailed information on the spatial distribution and abundance of shoal habitats in Lac du Sauvage, including the Jay Pipe area and the areas identified as potential spawning habitat through traditional knowledge, is provided by three complementary methods and resulting datasets for the Environmental Assessment of the Jay Project. This combined approach reduces the uncertainty in the description of baseline conditions, increasing the reliability of the residual impact classification in the DAR. The methods and results of the baseline descriptions of shoal habitat are discussed in detail in the Fish and Fish Habitat Baseline Report (Annex XIV; Section 2.2.4, 3.1.3.1, 3.2.3.1), and summarized in Section 9 of the DAR (Section 9.2.3.3, 9.2.4.1.1, 9.2.7).

The first dataset classified habitat for the entire area of Lac du Sauvage using hydroacoustic data and verified habitat information collected from previous surveys. The hydroacoustic data created a map of fines (including silt, sand), coarse substrates (including gravel, cobble, boulder, and bedrock) and mixed substrates (combination of fine and coarse materials). From the map, a description of substrate per depth stratum (0 to 2 metres [m]; 2 to 6 m, 6 to 10 m, and greater than 10 m) was provided for a ranking, or evaluation, of habitat according to the key life history functions

for fish, including potential spawning shoals (see Section 9.4.2.1 of the DAR). For example, coarse substrates at moderate depths (2 to 6 m) are likely preferred depths for spawning substrates for Lake Trout and Lake Whitefish, in part, because the depths are shallow enough to expose substrates to any wave action and water currents that keep substrates clear of silt and organic debris, but are also deep enough to exceed maximum ice thickness during winter (reviewed in Marsden et al. 1995).

A second, complementary dataset of substrate types was created using the more detailed habitat data of fines, cobble, and boulder, which were visually derived for littoral areas (0 to 2 m, and 2 to 5 m depths) from orthophotos and ground-truthed substrate delineations (Map 19-1).

The area (or quantity) of available substrate types per depth stratum in Lac du Sauvage are provided for both habitat datasets in DAR Tables 9.4-3 and 9.4-4. These tables provide information on shallow coarse substrate habitats that have potential to provide spawning habitat within the Project footprint (i.e., dike and dewatered area) and the spawning areas identified by Traditional Knowledge. The habitat statistics based on substrate and depth assist in understanding the distribution and abundance of potential spawning locations. It is important to note that spawning areas are also associated with areas affected by wave action and water currents that are believed to keep these areas free of silt and organic debris, and also free of epibenthic predators of eggs, such as sculpins (reviewed in Richardson et al. 2001). Although wave action and water currents are not quantified in baseline descriptions of spawning habitat in Lac du Sauvage, the expectation is that shoals centrally located in the lake, but also closer to the eastern shoreline (i.e., well outside the diked area) would be preferred spawning locations given prevailing winds are from a north or northwest direction (Section 7.2.1.1).

Based on the hydroacoustic data, the Jay Project footprint in Lac du Sauvage includes 7.86 hectares (ha) of potential spawning habitats (i.e., coarse substrates at depths of 2 to 6 m) within the dike and dewatered area. The relative change of potential spawning habitat at the scale of Lac du Sauvage is only 5.9 percent (%) given that the total area of coarse substrate at depths of 2 to 6 m in the lake is 134.4 ha. An assessment of detailed habitat types in shoal areas along the lake shorelines provided similar findings. For example, the lake footprint includes 7.83 ha of boulder/cobble within the 2 to 5 m depth stratum, and the relative change is only 6.1% given that there is 128.4 ha of boulder/cobble habitat available in the lake. The relative changes of the shoal habitat measurement endpoints are much smaller at the scale of the Effects Study Area (ESA), which includes Lac du Sauvage and Lac de Gras.

538000 540000 542000 544000

7168000 7166000 7164000

Ad Ac Ab

Cisco: Unsuitable
Lake Trout: Unsuitable
Round Whitefish: Unsuitable

Cisco: Fair
Lake Trout: Fair
Round Whitefish: Poor

Cisco: Fair
Lake Trout: Fair
Round Whitefish: Fair

Cisco: Good
Lake Trout: Good
Round Whitefish: Fair

S2 S3 S4 S5 S7 S8

Lake Ad4 Lake Ad3 Lake Ad2 Lake Ad1 Lake C16 Lake C1 Lake C15 Lake C14 Lake C13 Lake C12 Lake C9 Lake C17 Lake C10 Lake C11 Lake Ac10 Lake Ac11 Lake C8 Lake Ac9 Lake Ac8 Lake Ac7 Lake Ac6 Lake Ac5 Lake Ac4 Lake Ac13 Lake Ac12 Lake B19 Lake Ac14 Lake B22 Lake Ac15 Lake B21 Lake B20 Lake Ac16 Lake B28 Lake B15 Lake B0 Lake B1 (Christine Lake) Lake B29 Lake B24 Lake B2 Lake B14 Lake B3 Lake B13 Lake B4 (Cujo Lake) Lake B25 Lake Ac36 Lake Ac35 Lake Ac2 Lake Ac3 Lake Ab7 Lake Ab1 Lac du Sauvage

Proposed Jay Waste Rock Storage Area
Proposed Jay Dike Alignment
Drawdown Area
Proposed Laydown
Proposed Jay Pit
Proposed Misery Discharge Diffuser Location
Proposed Jay Project Magazine
Proposed Mine Inflows Pumping System
Proposed Runoff Pumping System
Proposed Sub-basin B Diversion Channel
Proposed Ore Transfer Pad
Proposed Jay Road, Pipeline and Power Line

N

LEGEND

- WATERCOURSE
- WATERBODY
- BATHYMETRY CONTOUR (5 M INTERVAL)
- ELEVATION CONTOUR (10 M INTERVAL)
- INTERNAL BASIN DIVIDE
- SPAWNING HABITAT

SPAWNING SHOALS (S)

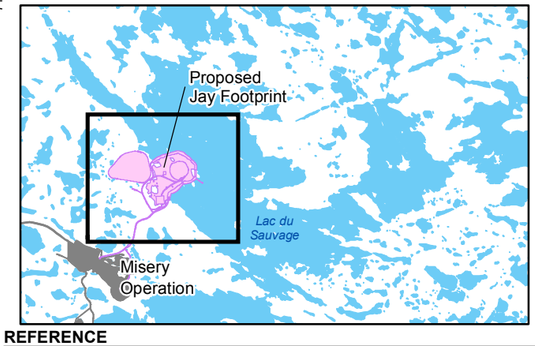
- *CISCO: SUITABILITY*
- *LAKE TROUT: SUITABILITY*
- *ROUND WHITEFISH: SUITABILITY*
- SPAWNING AREA IDENTIFIED BY TRADITIONAL KNOWLEDGE

SUBSTRATE TYPE (0-5 METRES)

- BO/CO - BOULDER/COBBLE
- BO/FI - BOULDER/FINES
- BR - BEDROCK
- FI - FINES
- FI/BO - FINES/BOULDER
- FI/CO - FINES/COBBLE

JAY PROJECT FOOTPRINT

- EXISTING SHORELINE OF DEWATERED AREA
- POWER LINE
- PROPOSED JAY PROJECT INFRASTRUCTURE
- PROPOSED JAY ROAD NORTH (HAUL ROAD)
- PROPOSED JAY ROAD (HAUL ROAD, PIPELINE AND POWER LINE)
- PROPOSED OPERATION ROADS



REFERENCE

1. TRADITIONAL KNOWLEDGE SPAWNING AREAS DIGITIZED FROM DOCUMENT: WELEDEH YELLOWKNIVES DENE, 1997
2. GOLDER. 1997. TECHNICAL MEMORANDUM #12-2, SHOAL HABITAT SURVEY, LAC DE GRAS AND LAC DU SAUVAGE, SUMMER 1996. ENVIRONMENTAL BASELINE PROGRAM. SUBMITTED TO DIAVIK DIAMOND MINES INC. YELLOWKNIFE, NWT, CANADA. DOC NO. TM12-2.
3. CANVEC © NATURAL RESOURCES CANADA, 2012
4. NATURAL RESOURCES CANADA, CENTRE FOR TOPOGRAPHIC INFORMATION, 2012
5. BATHYMETRIC DATA OBTAINED FROM AURORA, 2013

DATUM: NAD83 PROJECTION: UTM ZONE 12N

DOCUMENT

DAR-TLICHO-IR-19

500 0 500
SCALE 1:25,000 METRES

PROJECT
DOMINION DIAMOND
JAY PROJECT
NORTHWEST TERRITORIES, CANADA

TITLE
SHORELINE HABITAT AND SPAWNING SHOALS NEAR THE PROPOSED JAY PROJECT IN LAC DU SAUVAGE

Golder Associates

PROJECT		1419751	FILE No. POSTDAR_IR_Aqua_013_GIS	
DESIGN	CS	31/03/15	SCALE AS SHOWN	REV 0
GIS	ANK	02/04/15		
CHECK	CS	02/04/15	MAP 19-1	
REVIEW	KM	02/04/15		

G:\CLIENTS\DOMINION\DDEC Jay and Lynx Projects\Figures\13-1328-0041 Jay & Lynx EAAquatics\POST-DAR IR\POSTDAR_IR_Aqua_013_GIS.mxd

The third complementary data set relied on was from previous baseline studies in Lac de Gras and Lac du Sauvage. Baseline conditions were described by the shoal habitat survey conducted in 1996 in Lac du Sauvage and Lac de Gras (Golder 1997a). All but one (shoal S2) of the 21 shoals identified by Golder (1997a) in Lac du Sauvage fall outside of the proposed diked area. Shoal S2 is located adjacent to the dike, but was classified as an unsuitable shoal for spawning by Lake Trout, Cisco, and Round Whitefish. This is consistent with the prediction that preferred shoals would fall to the east and south of the diked area given the likely direction of prevailing winds from the north or northwest (Section 7.2.1.1). A more recent assessment by Rescan (2007) of shoals in Lac du Sauvage documented similar findings, concluding that less than 5 percent of all shoals in the Jay Pipe area are 'good' habitat for spawning activity by Lake Trout, Lake Whitefish, and Round Whitefish. Most of the high-quality shoal habitats in the ESA are located in Lac de Gras (Golder 1997a, b, c). Generally, shoals in Lac du Sauvage are not as deep or numerous, and have been found to provide less potential spawning habitat of good to fair quality for Lake Trout, Cisco, and Round Whitefish relative to shoal habitat in Lac de Gras (Golder 1997a; DDMI 1998). This is consistent with the Traditional Knowledge reported in Weledeh Yellowknives Dene (1997).

The results of the 2013 baseline habitat surveys in Lac du Sauvage were consistent with findings reported in earlier studies (Golder 1997a; Rescan 2007) that identified limited, mostly low quality or unsuitable spawning shoal habitat for the fish valued components (VCs), based on water depths and substrate in the proposed dike and dewatered area. Given the limited availability of spawning shoal habitat for fish VCs identified within the proposed diked area in Lac du Sauvage, and the availability of habitat elsewhere, any effect to fish VCs resulting from a decrease in shoal habitat within the Project footprint is expected to be negligible. Important environmental design features and mitigation practices of the mine plan for minimizing effects to fish habitat includes a mine designed with a reduced Project footprint that maximizes the use of the existing infrastructure at the Ekati Mine, and commitments to provide a healthy functioning ecosystem for fish within the dewatered area at closure (Section 3.5.8; Section 9.4.3.1.1).

19.2 The mine plan for the Jay Project utilizes a number of environmental design features and mitigation practices to eliminate or reduce the potential for Project activities to result in adverse environmental effects to fish and fish habitat. The effectiveness of mitigation related to blasting, fish screens, and diversion channels specific to fish and fish habitat is discussed provided in Section 9.3.2.1 of the DAR. In addition, mitigation to minimize effects to surface hydrology and water quality will also minimize potential effects to fish and fish habitat. A summary of the mitigation measures and associated effectiveness for the hydrology and water quality pathways is provided in Section 8.4.2.1 of the DAR. However, some losses of fish habitat associated with the dike and dewatered area will be unavoidable. Any such losses to shoal habitat will be addressed in the final offsetting plan (based on the Conceptual Offsetting Plan in Section 9A of the DAR) submitted with the application to Fisheries and Oceans Canada for a *Fisheries Act* Authorization during the regulatory phase of the Project. The conceptual fish-out plan and offsetting plan have been developed through engagement efforts between Dominion Diamond and affected communities to help identify mitigations that can be implemented. As an example, plans to involve community members and to distribute fish harvested from the diked area are currently part of the conceptual fish-out plan (see Appendix 9B of the DAR). The details of the final fish-out and offsetting plans will be refined to incorporate additional feedback received through ongoing engagement that will occur during the permitting phase of the project.

References:

DDMI (Diavik Diamond Mines Inc.). 1998. Diavik Diamonds Project Environmental Assessment – Environmental Effects Report on Fish and Water Quality. Diavik CD-ROM series, second edition. Yellowknife, NWT, Canada.

Golder (Golder Associates Ltd.). 1997a. Technical Memorandum #12-2, Shoal Habitat Survey, Lac de Gras and Lac du Sauvage, Summer 1996. Environmental Baseline Program. Submitted to Diavik Diamond Mines Inc. Yellowknife, NWT, Canada. Doc No. TM12-2.

Golder. 1997b. Technical Memorandum #13-3, Inland Lake Survey Report. 1996 Environmental Baseline Program. Submitted to Diavik Diamond Mines Inc. Yellowknife, NWT, Canada. Doc No. TM13-3.

Golder. 1997c. Technical Memorandum #14-2, Intensive Shoreline Habitat Survey. 1996 Environmental Baseline Program. Submitted to Diavik Diamond Mines. Yellowknife, NWT, Canada. Doc No. TM14-2.

Marsden JE, Casselman JM, Edsall TA, Elliott RF, Fitzsimons JD, Horns WH, Manny BA, McAughey SC, Sly PG, Swanson BL. 1995. Lake Trout Spawning Habitat in the Great Lakes – A Review of Current Knowledge. J Great Lakes Res. 21(Suppl. 1):487-497.

Rescan (Rescan Environmental Services Ltd.). 2007. Ekati Diamond Mine. 2006 Jay Pipe Aquatic Baseline. Prepared for BHP Billiton Diamonds Inc. Yellowknife, NWT, Canada, 325 pp.

Richardson ES, Reist JD, Minns CK. 2001. Life history characteristics of freshwater fishes occurring in the Northwest Territories and Nunavut, with major emphasis on lake habitat requirements. Can Manuscr Rep Fish Aquat Sci 2569: vii + 146 p.

Weledeh Yellowknives Dene. 1997. Weledeh Yellowknives Dene: A Traditional Knowledge Study of Ek’ati. Yellowknives Dene First Nation Council, Dettah, NWT, Canada

DOMINION DIAMOND

Information Request Number: DAR-TŁĮCHǪ-IR-20

Source: Tłı̨chǫ Lands Protection Department: Sjoerd van der Wielen

Subject: Secondary Pathways (Barren-Ground Caribou)

DAR Section(s): 12.3.2.2.2

Preamble (Tłı̨chǫ):

Accidental spills from equipment, storage areas, and pipelines could affect caribou health. Effects on caribou health from chemicals have been identified as a concern by local and traditional knowledge (Section 12.2.3). Water will be transferred between mine water management areas via pumping and pipeline systems. Mitigations and management identified in the existing WPKMP and environmental design features will be in place to limit the potential for pipeline failure. The integrity and performance of the pumping and pipeline systems will be monitored throughout the Project construction and operations phases to prevent the unintentional release of minewater to the environment. If any leaks and spills occur from the pipeline, clean-up will follow existing procedures in place at the Ekati Mine. However, no details are provided on management around accidental spills, as well as mitigation measures to ensure minimal impacts on fish, water, vegetation and wildlife.

Request (Tłı̨chǫ):

20.1 Please provide detailed management plan around accidental spills in Project area and areas where Project equipment will be operating and transporting materials.

Response:

Dominion Diamond will utilize the Spill Contingency Management Plan (the Plan established for the Ekati Mine), as a basis to derive the Plan for the Jay Project. The Plan for the Ekati Mine is a requirement of the Water Licence (W2012L2-0001) for the mine, that is reveiwed annually with updates approved by the Wek'èezhìi Land and Water Board (WLWB). It was developed specifically to establish and document practices for responsible management of controlled substance spills at the Ekati Mine, and to address any environmental spill emergency that may occur at the mine's operating sites (including satellite facilities, such as Misery Camp and Exploration activities), which includes the planned region for the Jay Project (identified as a 2014 Exploration Work Area). This Plan identifies spill prevention processes, and actions and measures to be taken in the event of a spill at any of the Ekati Mine operating sites.

For the Jay Project, the Plan for the Ekati Mine will be revised as part of the permitting process to reflect any necessary changes related to new facilities and infrastructure and activities. The Plan will continue to cover all aspects of the Ekati Mine (e.g., Ekati and Misery camps, fuel bulk storage locations, equipment maintenance, routine site inspections along pipelines, training) and include facilities and infrastructure that will be added as a result of the Project (e.g., dike, Jay waste rock storage area, pipelines, pumping systems and sumps associated with water management, roads, power line extension from the Misery camp to the Jay Pit, ore transfer pads and laydowns, truck shop, and magazine storage). The established Ekati Mine spill prevention processes, and emergency procedures and responses in the event of any spills (as reviewed annually) will apply to the new areas and activities introduced to the Ekati Mine through the Jay Project.

DOMINION DIAMOND

Information Request Number: DAR-Tłı̨chǫ-IR-21

Source: Tłı̨chǫ Lands Protection Department: Sjoerd van der Wielen

Subject: Pathways with No Linkage (Barren-Ground Caribou)

DAR Section(s): 12

Preamble (Tłı̨chǫ):

Local and traditional knowledge have identified dust as a concern for caribou food, particularly effects on lichens (Section 12.2.3). Construction and operation of the Project will generate air emissions such as carbon monoxide (CO), oxides of sulphur (SOx includes sulphur dioxide [SO2]), oxides of nitrogen (NOx), particulate matter (PM2.5), and total suspended particulates (TSP). Air emissions such as SOx and NOx can result from the use of fossil fuels in generators, vehicles, machinery, and explosives. There is lack of information on detailed mitigations around these concerns regarding the protection of caribou food and habitat.

Request (Tłı̨chǫ):

21.1 Please provide detailed mitigation measures to decrease impacts on caribou food and surrounding habit.

22.2 IEMA has for years reviewed the caribou mitigation strategies, and in particular, Kim Poole has provided sound independent judgement and advice. How will independent review of this particularly sensitive VEC be ensured in this time of crisis?

Response:

21.1 The Developer's Assessment Report describes the mitigation measures that will protect caribou from harm and that will enable their continued movement though the Ekati Mine site. The mitigation measures are based on those that have been developed at the Ekati Mine over the past 15 years of mine operations. The mitigation measures have been augmented for the Jay Project where needed to address a new or increased risk. For example, Dominion Diamond has proposed to increase early monitoring of caribou movement by working with the Government of the Northwest Territories to access satellite collar maps. This provides advanced warning of when caribou may be approaching the Ekati Mine. Also, Dominion Diamond proposes to construct additional kimberlite stockpile areas so that the Ekati Mine can operate through brief road closures if this is necessary to allow caribou to safely move through the mine site.

Dominion Diamond is confident that these descriptions of mitigation measures are sufficient for this environmental assessment, given that the Jay Project (Project) is an extension of an existing mine. As is also the case with other monitoring and mitigation plans, Dominion Diamond anticipates that the detailed wildlife monitoring and mitigation plans will be provided during the permitting phase of the Project. This approach provides confidence that the detailed mitigation plans and monitoring programs are designed specifically for the Project as it has been approved through the Environmental Assessment process.

The Northwest Territories *Wildlife Act* will require that Dominion Diamond provide a Wildlife and Wildlife Habitat Protection Plan (WWHPP) and a Wildlife Effects Monitoring Program (WEMP) for the Ekati Mine (inclusive of the Jay Project). These plans will provide a compilation of details and procedures for caribou monitoring and mitigation. The WWHPP will contain details on mitigation policies, practices, and procedures, and the results from adaptive management that has been implemented during the operation of the Ekati Mine, and how mitigations will be specifically modified for the Jay Project. The WEMP will provide details on the study designs and sampling methods used to test effects predictions and the effectiveness of mitigation.

21.2 Dominion Diamond cannot answer for the Independent Environmental Monitoring Agency and Government of the Northwest Territories with respect to the replacement of Kim Poole.

DOMINION DIAMOND

Information Request Number: DAR-Tłı̨chǫ-IR-22

Source: Tłı̨chǫ Lands Protection Department: Sjoerd van der Wielen

Subject: Fish and Fish Habitat

DAR Section(s): 18

Preamble (Tłı̨chǫ):

The area of the cumulative changes from direct loss of lake habitat is expected to be approximately?586 ha or less than 1% of the lake habitat in the ESA relative to the reference condition (i.e., pre- development). The incremental and cumulative direct loss of stream habitat from the Project is expected to be approximately 877 m or 1.6% of the selected tributary habitats in the ESA relative to the reference condition. There are no reasonably foreseeable developments in the ESA for fish and other aquatic life. Dominion Diamond will work with Fisheries and Oceans Canada and local Aboriginal communities on developing an offsetting plan to counterbalance for losses in fish habitat productivity.

Request (Tłı̨chǫ):

22.1 Please provide details of engagement with local Aboriginal communities on developing mitigation measures to offset the loss of fish and other ecological habitat (i.e., offsetting plan).

22.2 Please provide clarification and impacts (direct and indirect) on the potential loss of traditional knowledge and livelihoods as a result of disturbances to Aboriginal fisheries.

Response:

22.1 Details of the Dominion Diamond engagement with local Aboriginal communities on the development of offsetting measures are provided in the Conceptual Offsetting Plan submitted with the Developer's Assessment Report (DAR; Appendix 9A). The purpose of the Conceptual Offsetting Plan is to summarize anticipated Jay Project (Project) effects on fish and fish habitat, describe the initial options considered for providing offsetting, and outline a proposed conceptual plan to offset the serious harm to fish according to Fisheries and Ocean's Canada (DFO) Policy (DFO 2013a,b). Preliminary offsetting options to counterbalance the unavoidable residual effects from the Project have been identified through the community and regulatory engagement process associated with the Project (Section 9A5.3). Meetings between Dominion Diamond and DFO have occurred on several occasions.

As noted in Section 9A2 of the DAR, engagement meetings started in early 2014 to discuss potential offsetting options being considered by Dominion Diamond for the Jay-Cardinal project (now the Jay Project). Two sets of community workshops took place with the first held in March and the second set held in June and July, 2014. The first set of meetings was held at the Explorer Inn in Yellowknife. The second set of meetings was held at various venues in Behchokǫ̀, Lutsel K'e, N'Dilo, Yellowknife, and Kugluktuk. Representatives from Dominion Diamond and Golder Associates Ltd. (Golder) were present to provide information and answer questions.

At each meeting, participants were told that once the Project was explained, they would have the opportunity to learn more about the potential impacts on fish and to discuss the topics in more detail. Participants were invited to introduce themselves around the table. They were encouraged to ask questions and contribute to the topics scheduled for the day (e.g., fish-out, offsetting options). The following meetings with the communities took place (from Section 9A2.1.2):

- March 10, 2014 – North Slave Métis Alliance (NSMA) Community Engagement Workshop.
- March 11, 2014 – Yellowknives Dene First Nation (YKDFN) and Łutselk'e Dene First Nation (LKDFN) Community Engagement Workshop.
- March 12, 2014 – Tłı̨chǫ Community Engagement Workshop.
- March 13, 2014 – Kitikmeot Inuit Association (KIA) Community Engagement Workshop.
- June 17, 2014 – LKDFN Community Engagement Workshop.
- June 24, 2014 – Kwe Beh Community Engagement Workshop.
- June 25, 2014 – YKDFN Community Engagement Workshop.
- June 26, 2014 – NSMA Community Engagement Workshop.
- June 27, 2014 – KIA Community Engagement Workshop.
- July 15, 2014 – LKDFN Community Engagement Workshop Follow-up.

These meetings described above included presentations and specific discussion of fish offsetting concepts. Other community engagement activities held by Dominion Diamond (described in Section 4 of the DAR) were also used to discuss Project effects on fish and fish offsetting concepts on a progressive basis as information was developed.

Comments and concerns that were expressed during the discussions related to offsetting in the community meetings included the following in chronological order of the meetings (from Section 9A2.1.2.1 in the DAR):

- Concern was expressed by the NSMA members (March 10, 2014) with respect to the location of proposed offsetting plans, preferring local options, and whether the abundance and species of fish outlined adequately reflected those impacted by mine development.
- Several local opportunities were put forward at the YKDFN-LKDFN meeting on March 11, 2014; these included removal of a truck and equipment from Drybones Bay, enhancement of fisheries on the Yellowknife and Cameron rivers, and rehabilitation of a stream near Lutsel K'e.
- Improving habitat quality at the northern tip of N'Dilo and Back Bay was also proposed by the YKDFN (March 11, 2014); however, there were concerns this may interfere with ongoing remediation efforts.
- Community-based proposals for offsetting should include fisheries and water quality monitoring in the region, and a focus on employment of local youth (YKDFN, March 11, 2014).

- The Tłı̨chǫ community expressed interest in studying fisheries responses to the Colomac Mine, local dumping, and climate change (March 12, 2014).
- KIA community representatives suggested local offsetting plans should focus on traditional fishing areas in the region, such as the Tree, Anialik, Kogakyoak, and Coppermine rivers (March 13, 2014). The community representatives expressed interest in funding for aquatic monitoring programs on the north end of the river.
- Interest was expressed by the LKDFN representatives in direct community involvement in fish health and water quality monitoring programs for the region (June 17, 2014).
- Local habitat restoration options are generally preferred for habitat offsetting as they would provide greater benefit to the community and offer greater potential for direct community involvement (YKDFN, June 25, 2014).
- Concerns were expressed regarding the potential loss of spawning habitat in Lac du Sauvage and whether new spawning habitat would be created to replace it (YKDFN, June 25, 2014).
- Interest was expressed in pursuing local fisheries research as a part of habitat offsetting plans, as well as the creation of an inventory of suitable areas that would benefit from habitat restoration, with input from Dominion Diamond, and the community (YKDFN, June 25, 2014).
- Community representatives plan to discuss offsetting plans within their communities and prepare a list of local offsetting options for Dominion Diamond at a later date (YKDFN, June 25, 2014).
- A number of suggestions were made for potential fish habitat offsetting plans by the NSMA (June 26, 2014); these included restocking (no particular species or stocks were identified) the lakes surrounding the Yellowknife area, including Prelude, Pontoon, and other lakes along the Ingraham Trail that have been overfished over the years, the re-establishment of a traditional Walleye fishery at Mosquito Creek, and enhancement of streams along Great Slave Lake, including the Stagg River on the North Arm, to improve the Great Slave Lake fishery.
- Habitat offsetting could be done in a creek that supported Jackfish (Northern Pike) near Lutsel K'e. It was reported that at one time, hundreds of Jackfish moved through the creek, but they do not use the creek anymore because of weeds and overgrowth (LKDFN, July 15, 2014).

An informal meeting between Moise Rabesca (Rabesca's Resources Ltd.) and Cam Stevens and Paul Vescei (Golder) was also held on the afternoon of June 19, 2014 at the Sah Naji Kwe Camp. Golder briefly informed Moise on the Project, potential effects from the Project, and the potential for the application of habitat offsetting on Tłı̨chǫ lands under the Fisheries Productivity Investment Policy (DFO 2013b). Potential offsetting measures in the area were discussed. It was decided that additional follow-up with other Traditional Knowledge holders of fisheries in Marian and Russell lakes, such as Joe MacKenzie, would be beneficial as part of future engagement efforts (for more information see Section 9A5.2.3 of Appendix 9A).

The Conceptual Offsetting Plan submitted with the DAR demonstrates that it is reasonable to assume at this time that feasible offsetting options exist (Section 9A5.3), and that a final offsetting plan can be identified and implemented for the Jay Project. Furthermore, Dominion Diamond will continue to advance the initial options presented in Conceptual Offsetting Plan to determine if they

are feasible as offsetting measures and acceptable to DFO. Dominion Diamond will also continue to engage with local communities and DFO on additional potential options. A final offsetting plan will be developed through engagement with DFO and local communities during the permitting phase of the Project.

22.2 Section 15 of the DAR addresses the Subject of Note (SON): Impacts to Cultural Aspects from Project Components identified in the Terms of Reference (TOR). The TOR identified impacts to traditional activities, and the potential for increased or reduced harvesting success, as components to be addressed under this SON. In the DAR, these components were represented by the term Traditional Land Use (TLU). Through community meetings and the review of literature pertaining to potentially affected Aboriginal groups, traditional harvesting was identified as a major component of Aboriginal culture, Traditional Knowledge (TK), and Aboriginal livelihoods.

Continued opportunities to participate in traditional fish harvesting was identified as an assessment endpoint under the Traditional Land Use Valued Component (VC; Section 15.2.2 of the DAR). Assessment endpoints are a qualitative expression used to assess the significance of effects to a VC and represent the key properties of the VC that should be protected for future human generations.

Effects to the assessment endpoint are evaluated using measurement indicators, which represent properties of the environment that when changed, could result in, or contribute to, an effect on continued that assessment endpoint. To assess the effects on continued opportunities to participate in traditional fish harvesting, the following measurement indicators were identified (Table 15.2-1 of the DAR):

- the availability of fish ;
- disturbance of preferred fishing areas;
- physical access to preferred fishing areas;
- sensory disturbances (i.e., viewscape, light, and noise);
- social and economic factors affecting participation in TLU ;
- Aboriginal land users' intangible relationship with the land; and
- concerns regarding ecological and human health.

Some of these measurement indicators are based on analyses of the results from other disciplines (i.e., the availability of fish is based upon the results of the fish and fish habitat assessment in Section 9 of the DAR). Section 9.6.1.2 of the DAR concludes that the amount of cumulative change to fish habitat in the ESA is expected to result in either no measurable residual effect, or a minor residual effect, to population abundance and distribution of the fish VCs (Arctic Grayling, Lake Trout, and Lake Whitefish). Effects may include a minor residual effect to the distribution of fish. No measurable effects to self-sustaining and ecologically effective populations are predicted for fish VCs, where self-sustaining and ecologically effective populations of fish are the foundation for ongoing fisheries productivity.

Section 15.4.1.2.2 of the DAR discusses the incremental and cumulative effects on the continued opportunity to undertake traditional fishing. There will be a small loss of fishing areas in the diked and dewatered portions of Lac du Sauvage. As concluded in the fish and fish habitat assessment (Sections 9.4.4 and 9.6.1.2 of the DAR), this is not expected to result in a measurable effect on the ability of traditionally important fish species to be self-sustaining and ecologically effective. Fish located within the diked area will be removed through a fish-out program (Appendix 9B), which will be planned and carried out with the involvement of the potentially affected Aboriginal groups.

Cumulatively, access for harvesters has been altered in the region due to existing developments. The Tibbitt to Contwoyto Winter Road has increased the ease of access into the barrenlands for Aboriginal harvesters, but also allowed for additional competition for resources from non-Aboriginal harvesters (DKFN 2012). Regarding the incremental effects of the Project on access to fishing areas, no change in road access is expected due to the Project because the Jay Road will not be accessible to the public. Boat access through the Lac du Sauvage-Lac de Gras Narrows may be used to access fishing areas at the Narrows, Lac de Gras, and Lac du Sauvage. No measurable changes in the navigability of the Narrows are predicted due to the Project, during periods when boat use is expected. Similarly, the expected cumulative changes in water levels and flows, provided in Section 8.5.3.3.5 of the DAR are not expected adversely affect navigation in Lac du Sauvage, the Narrows, or Lac de Gras.

In addition to the effects on fish distribution and fishing areas, sensory disturbances are expected due to the Project in combination with existing developments. Cumulatively, positive and negative effects on social and economic factors affecting participation in TLU are expected. An increased concern in ecological and human health is considered to exist for previous and existing developments, and will continue for the Project and reasonably foreseeable developments. Each of these effects has the potential to alter TLU practices for affected Aboriginal groups. However, the extent to which Aboriginal harvesters will alter their harvesting practices due to these effects is unknown. Further information regarding the changes expected to each of these measurement indicators is provided in Section 15.4.1.1 of the DAR.

As a result of the factors discussed in Section 15.4.1.2.2, the residual impact classification of cumulative effects to the opportunities to participate in traditional fishing were determined to be negative in direction, low to moderate magnitude, regional, long-term, continuous, and irreversible (Section 15.4.1.3.1 of the DAR). These effects are not considered to significantly affect the assessment endpoint of maintaining continued opportunities to participate in traditional fishing.

A discussion of Aboriginal land user’s intangible relationship with the land was provided in Section 15.4.1.1.6 of the DAR. At the request of the Mackenzie Valley Environmental Impact Review Board, Dominion Diamond also held a workshop in February 2015 with the KIA, NSMA, LKDFN, Tłı̨chǫ Kwe Beh, and YKDFN. The purpose of the workshop was to provide a forum for a more focused discussion on how the Jay extension of the Ekati Mine might affect the respective communities and their culture. The results of the workshop are being prepared and not available at time of writing.

Measurement indicators in the TLU assessment included those to which no agreed upon thresholds exist. As a result, the extent to which these indicators may influence continued opportunities for

TLU, including fish harvesting, is difficult to measure. Therefore, Dominion Diamond has considered traditional land use in its proposed monitoring programs. As described in Section 15.5 of the DAR, to address this, Dominion Diamond will meet with potentially affected Aboriginal groups about establishing a monitoring program that tracks the avoidance by traditional land users of the Ekati area. A potential goal of such a program, dependent upon the engagement with potentially affected Aboriginal communities, would be to track the existing TLU of the general Ekati area, any changes resulting from the Project development, and the underlying reasons behind any changes observed, such as loss of TK.

References:

DFO (Fisheries and Oceans Canada). 2013a. Fisheries Protection Policy Statement. Ottawa, ON, Canada. ISBN 978-1-100-22885-3.

DFO. 2013b. Fisheries Productivity Investment Policy: A Proponent's Guide to Offsetting. Ottawa, ON, Canada. ISBN 978-1-100-22930-0.

DKFN (Deninu K'ue First Nation). 2012. The Deninu K'ue Ethno-history Report. Prepared for De Beers Canada Inc. for the Gahcho Kué Project. NWT, Canada.

Information Request Number: DAR-Tłı̨chǫ-IR-23

Source: Tłı̨chǫ Lands Protection Department: Sjoerd van der Wielen

Subject: Aquatic Effects Monitoring Program

DAR Section(s): 18

Preamble (Tłı̨chǫ):

The Ekati Mine Aquatic Effects Monitoring Program will be expanded to monitor Project effects to the aquatic environment related to changes in surface hydrology, water quality, sediment quality, aquatic life other than fish (plankton and benthic invertebrates), and fish (fish health, fish tissue chemistry). The accompanying Ekati Mine Aquatic Response Framework will also be expanded to provide pre-defined 'early-warning' levels that will prompt adaptive management responses if necessary.

Request (Tłı̨chǫ):

23.1 Please clarify whether Aboriginal traditional knowledge will be integrated into the Aquatic Effects Monitoring program.

Response:

As described in Section 9C2.1 of the Conceptual Aquatic Effects Monitoring Program (AEMP) (Appendix 9C of the Developer's Assessment Report, the AEMP will integrate traditional knowledge where appropriate. In addition, Special Studies, which are not core components of the AEMP, but rather studies proposed with the intent to supplement the AEMP components, may be also conducted for this purpose. It is expected that traditional knowledge will be incorporated in a manner consistent with current practice at the Ekati Mine established over 15 years of mine operations and environmental monitoring, and other AEMP programs in the area (De Beers 2013; Golder 2014). There will also be opportunity for community engagement and comment on the conceptual design of the AEMP during the water licensing phase of the Jay Project.

References:

De Beers (De Beers Canada Inc.). 2013. 2013 Aquatics Effects Monitoring Program Design Plan in Support of Water Licence (MV2011L2-0004), Snap Lake Project. Snap Lake Project. Submitted to the Mackenzie Valley Land and Water Board. Yellowknife, NWT, Canada.

Golder (Golder Associates Ltd.). 2014. Diavik Diamond Mines Inc. – Aquatic Effects Monitoring Program – Study Design Version 3.5. Prepared for Diavik Diamond Mines (2012) Inc. (DDMI). Yellowknife, NWT, Canada. May 2014.

DOMINION DIAMOND

Information Request Number: DAR-Tłı̨chǫ-IR-24

Source: Tłı̨chǫ Lands Protection Department: Sjoerd van der Wielen

Subject: Project Effects on Caribou

DAR Section(s): 12

Preamble (Tłı̨chǫ):

The prediction confidence and uncertainty section devotes much discussion to the uncertainty of climate change and fires. Several aspects of uncertainty are not fully discussed: a) The DAR acknowledges that "little specific research has been completed on how low voltage distribution lines affect caribou movement and distribution" (pg. 12-123), but does not discuss implications;

Request (Tłı̨chǫ):

24.1 DDEC should re-examine these sources of uncertainty and reconsider how they would affect the conclusions of the DAR with regard to predicted effects on caribou.

Response:

A qualitative analysis of the potential effects of the power distribution line was presented in the Developer's Assessment Report (DAR) Section 12.4.2.2.2 (pages 12-97 and 12-98). The analysis identified a range of magnitude of observed effects from power lines, roads, traffic, and human activity levels on caribou (Berger et al. 2000; Reimers et al. 2000; Vistnes and Nellemann 2001; Reimers et al. 2007; Vistnes et al. 2008). Potential effects from corona noise were also discussed and evaluated (Flydal et al. 2003, 2009; Harper 2014). Overall, the limited information suggests that above-ground power lines have smaller effects on caribou movement and distribution than roads and traffic. Therefore, the focus of mitigation and monitoring for the power distribution lines, Jay and Misery roads is directed at Jay Road design, caribou crossings, modification of traffic patterns, and road closures.

The uncertainty associated with the shortage of specific research on low voltage distribution lines and caribou movement and distribution was considered and determined not to affect the conclusions in the DAR.

References:

Berger R, Martinez I, Wisener M. 2000. Analysis of GPS Relocation Data (1995-1999) for the Owl Lake Woodland Caribou – Report to Manitoba Hydro, Manitoba Conservation, Pine Falls Paper Company, Manitoba Model Forest and Time to Respect Earth's Ecosystems. 88 pp + appendices.

Flydal K, Rogstad I, Per E, Reimers E. 2003. Reindeer (Rangifer tarandus tarandus) Perception of noise from powerlines. Rangifer 23:21-24.

Flydal K, Korslund L, Reimers E, Johansen F, Colman JE. 2009. Effects of power lines on area use and behaviour of semi-domestic reindeer in enclosures. Int J Ecol: 2009.

Harper M. 2014. Lines Designer, McGregor Construction 2000 Ltd. Calgary, AB, Canada. E-mail. July 8, 2014.

Reimers E, Flydal K, Stenseth R. 2000. High Voltage Power Lines and Their Effect on Reindeer: A Research Programme in Progress. Polar Res:75-82.

Reimers E, Dahle B, Eftestøl S, Colman JE, Gaare E. 2007. Effects of a power line on migration and range use of wild reindeer. Biol Conserv 134: 484-494.

Vistnes I, Nellemann C. 2001. Avoidance of cabins, roads, and power lines by reindeer during calving. J Wildlife Manage 65: 915–925.

Vistnes II, Nellemann C, Jordhøy P, Støen, O-G. 2008. Summer distribution of wild reindeer in relation to human activity and insect stress. Polar Biol 31:1307-1317.

DOMINION DIAMOND

Information Request Number: DAR-Tłı̨chǫ-IR-25

Source: Tłı̨chǫ Lands Protection Department: Sjoerd van der Wielen

Subject: Project Effects on Caribou

DAR Section(s): 12

Preamble (Tłı̨chǫ):

b) Only Bathurst cows (not bulls) are being collared on range use patterns and timing, the implications of this are not considered;

c) The DAR does not appear to address the implications of the apparent extreme collapse in Bathurst herd numbers in 2014 (Boulanger et al. 2014b), and likely lower resilience to development impacts.

Request (Tłı̨chǫ):

25.1 DDEC should re-examine these sources of uncertainty and reconsider how they would affect the conclusions of the DAR with regard to predicted effects on caribou.

Response:

b) The Developer's Assessment Report (DAR) implicitly considers the implications of only female Bathurst herd caribou being collared for the spatial and temporal analysis of range use patterns. The assessment of the effects of the Project is based on the best available data, which are limited to cows only. Overall changes in ungulate population sizes are generally accepted to depend upon combinations of adult female survival rates and calf recruitment rates (Gaillard et al. 1998). Both of these rates can be robustly assessed with female animals alone.

c) Population modelling was completed in response to Mackenzie Valley Environmental Review Board (MVEIRB) Jay Project Adequacy Review Item 8.8 and presented in the response to DAR-MVEIRB-15 (hereafter "modelling report"). Modelling the apparent continued decline of the Bathurst herd between 2012 and 2014 (Boulanger 2014b) would require demographic vital rates different from those used for the core population modelling presented in the modelling report, which was identified in the report (page 12).

Specifically, for the 2012 to 2014 period, calf:cow ratios were obtained from Government of the Northwest Territories composition surveys completed in October 2012 (2012 birth year, 24 calves:100 cows) and spring 2014 (2013 birth year, 32 calves:100 cows). However, adult female survival rates from the same period are important in the interpretation of recruitment from calf:cow ratios as they affect the denominator in the ratio. For example, if adult female survival in an interval is 50% and calf survival is 100%, then the denominator is half of what is was at the start of the interval and the calf:cow ratio doubles even though the number of calves does not change. Data to confidently estimate adult female survival for 2012 to 2014 are not available. The approach to estimating a set of vital rates for the Bathurst herd used in Boulanger et al. (2011, 2014a) has not been applied to account for the apparent 2012 to 2014 decline. The vital rates

provided following the 2012 calving ground photographic survey (Boulanger et al. 2011, 2014a) are the most recent vital rates that have been calculated for the Bathurst herd that reconcile all available sources of information (Adamczewski 2015). The information required for the determination of vital rates (Boulanger et al. 2014a) requires information not gathered in the 2014 reconnaissance survey.

In the absence of empirical vital rates for the Bathurst herd for the 2012 to 2014 period, the modelling report (page 12) identified that adult survival rates between 51% and 62% were consistent with the 2014 Bathurst herd reconnaissance survey population estimate. Regardless of the specific vital rates that would fit the observed population data, the end result would be the same: an annual decline of 48% over a two-year period.

The absence of information from adult male caribou was implicitly considered in the determination of significance in the DAR and is not considered to be a source of uncertainty that reduces confidence in the impact predictions and determination of significance. As noted in the modelling report (pages 12-13), the current low population of the Bathurst herd should allow more selective use of habitat. As there is no strong mechanism by which development reduces adult female survival, the negative trend in population growth associated with the current estimates of vital rates is predicted to be similar with and without the development-related cumulative changes in habitat quantity and quality, and caribou behaviour and energetics. Consequently, the use of a lower annual adult female survival rate (e.g., consistent with a decline as indicated by results of the 2014 reconnaissance survey) will not change the conclusions regarding the classification of impacts and determination of significance on caribou.

References:

Adamczewski J. 2015. Wildlife Biologist, Ungulates – Environment & Natural Resources, Wildlife Division, Government of the Northwest Territories. Phone call with J. Rettie, Golder Associates. March 2, 2015.

Boulanger J, Croft B, Adamczewski J. 2014a. An Estimate of Breeding Females and Analyses of Demographics For The Bathurst Herd of Barren-ground Caribou: 2012 Calving Ground Photographic Survey. Integrated Ecological Research Unpublished File Report No. 142 for Environment and Natural Resources, GNWT. 81 pp.

Boulanger J, Croft B, Cluff D. 2014b. Trends in size of the Bathurst caribou herd from the 2014 calving ground reconnaissance survey. Integrated Ecological Research. July 31, 2014.

Boulanger J, Gunn A, Adamczewski J, Croft B. 2011. A Data-Driven Demographic Model to Explore the Decline of the Bathurst Caribou Herd. J Wildlife Manage 75: 883-896.

Gaillard JM, Festa-Bianchet M, Yuccoz N. 1998 Population dynamics of large herbivores: variable recruitment with constant adult survival. Trends Ecol Evol 13:58-63.

DOMINION DIAMOND

Information Request Number: DAR-Tłı̨chǫ-IR-26

Source: Tłı̨chǫ Lands Protection Department: Sjoerd van der Wielen

Subject: Clarification of the effects of mining on Bathurst caribou numbers

DAR Section(s): 12

Preamble (Tłı̨chǫ):

The DAR draws the conclusion that effects on the Bathurst caribou herd will be limited from previous and existing mines, however this conclusion rests on a single citation (Adamczewski et al. 2009). This is insufficient basis for such a conclusion.

Request (Tłı̨chǫ):

26.1 Please provide additional sources and/or evidence that previous and existing mines are not a major contributor to the decline to the Bathurst caribou herd. Please provide information on the Jay Project could exacerbate the Bathurst caribou herd's continuing decline. Consideration of this effect in this time of crisis is vital.

Response:

The residual cumulative effects of the Jay Project and previous, existing, and reasonably foreseeable developments on the Bathurst caribou herd are examined in detail in the Developer's Assessment Report (DAR). The conclusion presented in the DAR was based on several lines of evidence. A pathways analysis (DAR Section 12.3) was used to identify all potential effects pathways through which the Project could affect barren-ground caribou. The screening process identified primary pathways, which result in environmental changes that could contribute to residual adverse significant effects on barren-ground caribou. Section 12.4.2 of the DAR presents the detailed residual effects analyses for each of the three primary pathways identified in Section 12.3. Relevant scientific literature and regional monitoring reports are cited throughout Section 12 in support of methods, assumptions, and existing relevant data. The cumulative effects from previous and existing mines are represented in DAR analyses as the differences between the reference condition and the 2014 baseline condition. The addition of the Jay Project is presented as the Application Case in the DAR.

Loss of habitat and increases in habitat fragmentation were assessed separately for each seasonal range. Considering the cumulative changes from reference condition to the 2014 baseline condition, rock association (exposed bedrock or boulder fields; with very little vegetative cover) made up no more than 0.3 percent (%) of reference condition landscape in any seasonal range; its coverage was reduced by 5% in the spring range, 15% in the post-calving range, and by 16% in the autumn range. Eskers decreased by 1.3% in the post-calving range. In all other habitats, in all seasonal ranges, there was less than a 0.7% decrease in any habitat type between the reference condition and 2014 baseline condition. The disturbance footprint increased from reference condition to 2014 baseline condition by approximately 55,000 hectares (ha) in spring range, 30,000 ha in post-calving range, 46,000 ha in autumn range, and 54,000 in winter range.

The Project footprint covers approximately 1,132 ha, of which 62% is terrestrial habitat and 38% is aquatic habitat (less than 0.01% of the effects study area). It is estimated that 4 ha of esker will be disturbed by the Project (DAR Section 11.4.2.2). From the 2014 baseline condition to the Application Case with the addition of the Project there was less than 0.1% reduction in area for any habitat in any seasonal range. The Project footprint did not intersect with the winter range and there was no change in the winter range disturbance area. Changes in numbers of patches and nearest neighbour distances for each habitat type in each season were similarly small.

The changes in habitat quality, behaviour, and movement were assessed through an examination of loss of habitat quality within zones of influence around development; these were also calculated separately for each seasonal range (DAR Section 12.4.2.2). In the 2014 baseline condition, the amount of preferred caribou habitat declined from the reference condition in each seasonal range due to development and associated zones of influence. Decreases in the amount of preferred habitat between reference conditions and the 2014 baseline condition were 0.9% of the spring range (which includes the calving period), 5.3% of the post-calving range, 6.0% of the autumn range, and 5.4% of the winter range. With the application of the Project to the existing landscape, predicted losses of preferred habitat are between 0.0% and 0.2% for each of the four seasonal ranges. As with habitat loss, the changes in habitat quality are also small.

The third line of evidence was based on energy balance and predicted changes to calf production (DAR Section 12.4.3.2.3). The energetic costs from encounters with existing developments and the cost of migration from being deflected around the Ekati and Diavik zone of influence was predicted to cause a 3.6% decline in the annual parturition rate. The loss in parturition was predicted to increase to 3.9% with the addition of the Jay Project.

Collectively, the residual effects from the changes in measurement indicators in the 2014 baseline condition and following the application of the Jay project should not have a significant influence on the ability of the Bathurst caribou herd to be self-sustaining and ecologically effective. The citation of Adamczewski et al (2009) is presented in support of the conclusions inferred from the analysis of changes in measurement indicators. Further, Adamczewski et al. (2009) presents a summary of previous and existing data and information regarding the Bathurst herd that was available at that time.

Subsequent to the DAR, population modelling was completed in response to Mackenzie Valley Environmental Review Board (MVEIRB) Jay Project Adequacy Review Item 8.8. The response was presented in a submission to the Board on February 2, 2015 as DAR-MVEIRB-15 and serves as an additional line of evidence for the determination that the Project and previous and existing developments are predicted to have no significant cumulative effects on the Bathurst herd.

References:

Adamczewski JZ, Boulanger J, Croft B, Cluff D, Elkin B, Nishi J, Kelly A, D'Hont A, Nicholson C. 2009. Decline of the Bathurst Caribou Herd 2006-2009: A technical evaluation of field data and modeling. Draft technical report December 2009. GNWT.

DOMINION DIAMOND

Information Request Number: DAR-Tłı̨chǫ-IR-27

Source: Tłı̨chǫ Lands Protection Department: Sjoerd van der Wielen

Subject: Cumulative Effects on Caribou

DAR Section(s): 17

Preamble (Tłı̨chǫ):

Although uncertainty exists as to the Bathurst caribou herd's recovery threshold, the Jay project will have some effect on the herd and will contribute to cumulative effects, even if minor in degree. It is unknown whether the Jay Project's contribution would push the herd beyond this threshold.

Request (Tłı̨chǫ):

27.1Please detail any adverse effects on the Bathurst Caribou herd. As to the additional risk posed by the Jay Project please provide concrete and detailed mitigation measures that would offset the Jay Project's effects, so that the Bathurst herd would be better off after the Jay Project.

Response:

The Jay Project is expected to contribute little to the cumulative effects on barren-ground caribou; most changes are likely to be ecologically not measurable. For example, incremental direct and indirect changes of the Jay Project to preferred seasonal habitats are predicted to be between 0.0% and 0.2% (Section 12.4.2.2.2 of the Developer's Assessment Report [DAR]). The incremental decrease in fecundity from the Base Case to the Application Case (which includes the Project) was predicted to be 0.3% (Section 12.4.2.3.2 of the DAR). The cumulative effects analysis shows that natural factors (such as population cycles and insect harassment) remain the determining factors in caribou energetics, abundance and distribution. The population modelling completed for MVEIRB-IR-15 (Adequacy Review Item 8.8) demonstrates that the Bathurst herd's ability to increase is dependent on caribou vital rates and is not prevented by cumulative effects of development disturbance. Conservative assumptions were used throughout the assessment to predict maximum effects and manage uncertainty. Analysis of primary pathways and measurement indicators (lines of evidence) demonstrate that the adverse incremental and cumulative changes from the Project and other developments do not significantly contribute to cumulative effects on caribou abundance and distribution.

Monitoring and mitigation will be undertaken to measure and reduce incremental effects of the Jay Project and decrease uncertainties about effects from development. The Ekati Mine Wildlife Effects Monitoring Program will be expanded to encompass the Jay Project and a Wildlife and Wildlife Habitat Protection Plan is anticipated to be required under the Northwest Territories *Wildlife Act*.

Dominion Diamond is now and will continue to work diligently and collaboratively with the Government of the Northwest Territories (GNWT) and other community and industry partners on regional programs. The DAR, and associated follow up work, demonstrates that the Jay Project will not cause significant adverse effects on the Bathurst herd. Dominion Diamond will maintain its commitment throughout the life of the

Jay Project to doing what it reasonably can to contribute to and support GNWT-led regional programs to improve the state of the Bathurst caribou herd.

DOMINION DIAMOND

Information Request Number:	DAR- TŁĮCHǪ-IR-28
Source:	Tłı̨chǫ Lands Protection Department: Sjoerd van der Wielen
Subject:	Changes in Board Members at the Independent Environmental Monitoring Agency
DAR Section(s):	

Preamble (Tłı̨chǫ):

The Agency informed the Tłı̨chǫ about changes made in the IEMA composition. The Government of the Northwest Territories, the Government of Canada and Dominion Diamond Ekati Corp. jointly appoint three of the seven Directors, following consultation with the appropriate Aboriginal governments. The three Directors jointly appointed by these parties (Bill Ross, Laura Johnston and Kim Poole) were notified on February 9, 2015 that their appointments would end in March 2015. Consultations have begun on replacements and it is expected that new appointments will be made soon.

Request (Tłı̨chǫ):

28.1 Please advise on how the long term capacity that was held between these three scientists will be made up for in future agency developments. Please also advise on the thinking behind loss of three key individuals who have great respect and authority on the topic at the time of critical change occurs within the EA process for Jay Pipe. Why were all three let go at once, rather than staging the exit? How will the gutting of this expertise be made up for in future work?

Response:

We note this Information Request is outside of the scope of the Environmental Assessment (EA) process for the Jay Project. However, the following is provided for the information of the reviewer.

As contemplated by the Environmental Agreement, Dominion Diamond worked with the Government of the Northwest Territories and the federal government, in consultation with the Aboriginal Peoples, to identify highly qualified, technically competent and experienced northern candidates to serve on this important Board.

Dominion Diamond is committed to building a strong and viable northern-based mining company with a strong northern workforce. To facilitate this, Dominion Diamond has made a number of important changes to build a strong northern company with a resident workforce including: headquartering the company and its senior management in the Northwest Territories; making changes to its internal processes to retain and encourage a northern resident workforce, including cancelling the charter from Edmonton to Yellowknife; and increasing opportunities for northerners (i.e., increasing the number of apprenticeship positions). Dominion Diamond applied this same principle of northern residency to the appointment of the Agency Board of Directors who oversee the Ekati Mine.

Dominion Diamond believes that the Independent Environmental Monitoring Agency (IEMA) has the capacity to continue to undertake its important monitoring role for Ekati Mine including for the Jay EA

process, and if the Jay EA goes ahead on schedule, in the Water Licence and Land Use Permitting processes. The Agency still has full quorum on its board and a competent staff to support its work. We note that the four members appointed by the Aboriginal Peoples, as well as Mr. Bill Ross, continue to serve on the Agency Board, and we understand the Agency is in the process of briefing the two new members to ensure a smooth transition. As well, we understand that IEMA has retained Mr. Kim Poole as a technical expert for the environmental assessment process.

DOMINION DIAMOND

Information Request Number: DAR-TŁĮCHǪ-IR-29

Source: Tłįchǫ Lands Protection Department: Sjoerd van der Wielen

Subject: Residual Effects Analysis

DAR Section(s): 12.4.2.1.2

Preamble (Tłįchǫ):

Due to project effects an estimated 4 ha of esker will be disturbed (Section 11.4.2.2). Based on cumulative changes from 2014 baseline condition, Eskers have also decreased by 0.8%, 1.3%, and 0.9% in spring, post-calving, and autumn ranges, respectively. Given the importance of Eskers for Tłįchǫ traditional hunting sites and wildlife movement corridors, it is critical that DAR incorporate Tłįchǫ knowledge in the planning of waste rock piles. Mitigations integrating Tłįchǫ knowledge, specifically elders, to avoid creating unsafe esker conditions that may result in negative impacts to wildlife and Tłįchǫ members from practicing their traditional rights on the land.

Request (Tłįchǫ):

29.1 To reduce Project impacts on the eskers Tłįchǫ Elders should be consulted on alternative mitigation measures on waste rock pile configuration based on key species present on eskers, the type of animals that use eskers in the Project area, and the reasons for their use. Tłįchǫ knowledge would then be used to inform key design principles for waste rock piles from the Project, as well as reclamation guidance. The Tłįchǫ have issued a report on TK related to Eskers, and the company is requested to comment on how this knowledge will be integrated into project planning and design.

Response:

In the Developer's Assessment Report (DAR), Dominion Diamond proposed to construct caribou crossings at appropriate discrete locations along the Jay Road. After receiving input from Aboriginal communities during our engagement process and during site visits, Dominion Diamond has changed its approach to caribou crossings along the Jay Road to reflect that feedback, as described below.

Because of the importance of the esker for caribou movement as identified through community engagement, the portion of the Jay Road that cuts through the esker will be constructed as a caribou crossing. The pipelines will be covered over with crushed rock along this section of road, except where there are valves or joints that require visual inspection for safe operation. Dominion Diamond will strategically construct the pipelines to reduce the number of joints or valves through the esker crossing.

Dominion Diamond's community engagement program has indicated that the area to be crossed by the Jay Road is important for caribou movement. In response to the feedback received through community engagement, Dominion Diamond proposes to construct an increased number of caribou crossings along the main section of the Jay Road (i.e., roughly between King Pond Dam and the approach to the active operations area at Lac du Sauvage). This main section of the Jay Road will be constructed with frequent and wide caribou crossings that will respect the communities' identification of the importance of this area for caribou movement. Caribou crossings will not be built in areas where raised safety berms are required

by the Mines Inspector, or at locations where there are necessary joints and valves in the pipelines that require visual inspection for safe operation. The pipelines will be strategically designed to reduce the number of locations that cannot be constructed as caribou crossings due to joints and valves. This approach also makes beneficial use of 'lessons-learned' from the original Misery Road, where caribou crossings were only installed after construction of the road.

Caribou crossings will be constructed using crushed rock (200 millimetres or less in size) so that the side slopes of the road are flatter and easier walking for caribou than the large roadfill rock. In the caribou crossing areas, the pipelines will also be covered with crushed rock. Once the road is constructed, monitoring, including by Aboriginal community members, will be implemented to assess the effectiveness of the constructed caribou crossings.

Dominion Diamond estimates that 102 million cubic metres of waste rock will be produced from the mining of the Jay Pit, with the majority being placed in the Jay waste rock storage area (WRSA). The height of the pile will vary, but the maximum height is estimated to be about 80 metres (m) above the existing land. The WRSA is designed and constructed to be a physically stable structure that will remain in place following the completion of mining.

While caribou are not anticipated to regularly use the rock pile, caribou may occasionally be present at the WRSA. Dominion Diamond has designed the WRSA to be a neutral feature of the land by providing for the construction of several caribou egress ramps as the rock pile progresses. The ramps will provide multiple areas for caribou or other wildlife to safely egress from the pile. In selecting the location of the ramps, Dominion Diamond will consider input from community engagement and rely upon observations during the operations period.

The planned location for the Jay waste rock storage area is at least 200 m away from the natural esker and 100 m away from Lac du Sauvage. A single waste rock pile was selected to reduce the overall area of ground disturbance and fragmentation of land. Dominion Diamond recognizes there is a trade-off between the height and side slopes of the pile and the amount of land covered. If the side slopes of the pile are made flatter and the pile a lower height, then more of the land becomes covered by the boulders and rock. As a result, a decision was made to slightly increase the height of the pile over other waste piles at the Ekati Mine to minimize the amount of land covered.

Dominion Diamond was pleased to support the Tłı̨chǫ Government What’aa – Eskers Research Project conducted by the Tłı̨chǫ researcher and with the participation of Tłı̨chǫ Elders. We recognize and appreciate the assistance provided by staff members of the Departments of Lands and Culture Protection and the Kwe Beh Working Group to prepare the report. Dominion Diamond is grateful to the Elders who participated in the research project and shared their knowledge, information and opinions contained in the report, to aid in mine site development and for purposes of closure planning. Dominion Diamond acknowledges that the interviews and report findings are the property of the Tłı̨chǫ Government.

Dominion Diamond recognizes that eskers hold a long-standing importance for the Tłı̨chǫ people, other traditional people, and for wildlife. Eskers vary in size, height, shape, and composition. These variations influence the types and degrees of wildlife use and the vegetation that grows on each. Natural eskers can have:

- smooth surfaces, that make it easier for walking for both people and animals, as they are comprised of sand and gravel particles, these eskers have more vegetation and provide cover and food.
- rough irregular surfaces, that are comprised of rocks and boulders, travel on these eskers is difficult and people and animals generally avoid, little vegetation grows on these eskers.

Dominion Diamond recognizes that waste rock piles more closely resemble the rough, irregular, rock and boulder covered natural eskers rather than the smooth, sandy eskers. As such, they are difficult to travel on, and in general, become areas that people and many animals, such as caribou, would naturally avoid. Due to the rocky nature, they are less suitable for vegetation. Although caribou are not anticipated to regularly use the rock pile, they may occasionally be present; therefore, as the waste rock pile is built, several egress ramps will be constructed, to provide multiple routes off the pile for the use of caribou or other wildlife. The rough bouldery surface of the rock pile may still provide area of dens such as wolves and foxes, and burrowing areas for animals, such as, ground squirrels and hares.

Tłı̨chǫ Elder’s advice has also been utilized in the development of the closure and restoration for the plan for the esker, at the completion of the Jay Project. Esker material excavated during construction of the road crossing will be stockpiled and retained for use during closure. During closure, the power line and pipelines along the Jay Road will be removed; once road access to the dike is no longer required, natural drainage patterns around the esker will be re-established, and the natural grades of the esker will be re-established. Stockpiled esker material will be used to dress the re-graded esker.

Dominion Diamond will continue to work with the Tłı̨chǫ and other communities on aspects of facility design, construction, monitoring, and closure, and to incorporate traditional knowledge.

DOMINION DIAMOND

Information Request Number: DAR-YKDFN-IR-01

Source: Yellowknives Dene First Nation: Todd Slack

Subject: Conceptual Closure

DAR Section(s): Appendix 3B

Preamble (YKDFN):

The project states that its goal is “to return Ekati Mine site to a viable, and wherever practicable, self-sustaining ecosystems that are compatible with a healthy environment, human activities and the surrounding environment”.

YKDFN note that the project does not provide any clarity on what it will do to promote a viable ecosystem. The waste rock pile will be covered with rock and the pit will be flooded and the project may ‘enable’ natural regrowth in the riparian and shallow areas of the dyke. However, without clarity on just what is going to be done, this will allow the project to do nothing and those who have depended on this area will simply have more gravel, rocky covered hills and a part of the lake that doesn’t provide any benefit.

In the past companies have simply deferred discussions about closure until later dates, but without solid commitments and clarity on what end uses are expected (and can be achieved – it doesn’t do much good to have the ability to fish in a dead lake or expect caribou to survive on gravel). YKDFN require this information during the EA to assess the balance between impacts and benefits.

Request (YKDFN):

1) Please provide clarity on what actions will be done within the diked area to promote ecosystem recovery. For precision in understanding, we ask the company to avoid language that does not have certainty (e.g. ‘may’ or ‘when necessary’) or if absolutely required as the response, please include clear triggers as to when the action would be undertaken.

2) Please explain what commitments the company is making for the type of self-sustaining ecosystems that will be established. For example, Gahcho Kue’s commitment to a successful closure in Kennady Lake was the successful establishment and reproduction of Lake Trout. For each component listed (ex. Jay Pit, Dyke, WRSA, Misery Pit, Lynx Pit), please provide the commitment for the ecosystem that will be re-established for that component and what the potential end uses are.

3) Caribou have used this crossing for thousands of years. Similarly, this has been a key harvesting location for the Dene. Please explain what recourses exist should the Bathurst Herd not return and use this area as they have in the past.

Response:

1) After back-flooding of the diked area is complete, water quality monitoring will be conducted to assess conditions. Once water quality conditions within the diked area meet specific objectives that will support aquatic organisms and is similar to conditions in the main basin of Lac du Sauvage, the dike will be breached to allow connectivity with the main basin. The water quality acceptability criteria will be pre-determined through the water licencing process through the Wek'èezhìı Land and Water Board prior to closure. Based on the current hydrodynamic modelling completed for the Developers Assessment Report (DAR, see Appendix 8F), surface water circulation is predicted to occur such that mixing of surface waters within the diked area with the main basin of Lac du Sauvage will occur. Final design of the dike breaches will be developed during the final closure design phase. Due to the connectivity of the diked area with adjacent habitats, natural colonization after breaching is predicted to occur. There will be no physical or chemical barriers preventing fish from entering the diked area once the dike has been breached and it is expected that fish and other aquatic organisms will naturally colonize the diked area from adjacent habitats carried in by lake currents or through normal daily or seasonal movements. The outer edges of the dike remnants will be available to fish and may provide fish habitat.

   At closure, natural streams that were diverted during operations will be reconnected to Lac du Sauvage. This will provide additional inputs or aquatic organisms and nutrients from upstream habitats to help colonize the diked area and will also result in Arctic Grayling returning to the natural streams during spring spawning migrations. The natural lake shoreline within the diked area will be re-established and reclaimed at closure, with vegetation planting in localized areas completed as necessary (see Appendix 3B of the DAR).

2) Commitments for the diked area and Jay Pit at closure are that after back-flooding and reconnection to Lac du Sauvage, the diked area will support a similar aquatic community that is present in the main basin of Lac du Sauvage through natural colonization. The loss of the diked area is not expected to have a residual effect on fish populations in Lac du Sauvage during operations (see Section 9.4.3.1.1 of the DAR). As a result, the recovery of the diked area is expected to occur rapidly from adjacent habitats in Lac du Sauvage. Larger, mobile species that forage across a large home range are expected to enter the diked area freely and would colonize new habitats immediately. Plankton and drifting larval life-stages will be carried into the diked area from natural currents and would also be present immediately after the dike is breached. Although the Jay Pit represents a permanent loss of lake bottom habitat, the area above the pit will provide suitable conditions for pelagic species such as Lake Trout and Cisco. Shallow boulder habitats are present along the shorelines and islands within Lac du Sauvage and Lac de Gras and the dike is expected to provide similar habitat function at closure. The fish and fish habitat assessment of the DAR has assumed that connectivity to Arctic Grayling spawning habitats in streams B1 and Ac35 will be sustained during operations via a diversion channel and will be reconnected with the natural channels entering Lac du Sauvage at closure.

As per the approved Interim Closure and Reclamation Plan for these pits, the commitments for the Lynx and Misery pits are to provide for the safety of people and wildlife, and water quality conditions that are safe for use by fish (BHP Billiton 2011; Dominion Diamond 2014). Please also see the response to DAR-IEMA-IR-50. The closure commitments for waste rock storage areas at the Ekati Mine are that they will be safe for wildlife (BHP Billiton 2011).

3) There is no reason to expect that caribou will not continue to use the Narrows between Lac du Sauvage and Lac de Gras. Caribou use of this area can be described by rapid movements of large numbers of caribou. This area has been frequented by hunter and likely predators for thousands of years, has been crossed by the Tibbitt to Contwoyto Winter Road since 1982, has seen mineral exploration and mining since 1996, has been used by a nearby sport hunting camp from the mid-1980s, and continues to be used by caribou. There will be no physical barriers to caribou movement following closure. Ultimately, the Narrows concentrates caribou during their southern migration, and this fact will not change as long as caribou continue to migrate from northern calving grounds to boreal wintering grounds.

References:

BHP Billiton (BHP Billiton Canada Inc.). 2011. Ekati Diamond Mine Interim Closure and Reclamation Plan. Prepared for the Wek'eezhii Land and Water Board. 842 pp.

Dominion Diamond (Dominion Diamond Ekati Corporation). 2014. Ekati Diamond Mine 2014 Closure and Reclamation Progress Report. Prepared for the Wek'eezhii Land and Water Board. 154 pp.

DOMINION DIAMOND

Information Request Number:	DAR-YKDFN-IR-02
Source:	Yellowknives Dene First Nation: Todd Slack
Subject:	Conceptual Closure - Waste Rock
DAR Section(s):	2, Appendix 3B

Preamble (YKDFN):

The project plans to construct a waste rock pile astride the key caribou corridor that leads to the narrows between Lac de Gras and Lac de Savage. We have previously identified this as a major concern, which the project has not mitigated – the alternatives assessment provided does not seem to properly value caribou relative to other factors.

Request (YKDFN):

1) Please provide costing and explanation as to why the project is not using Lynx and Misery as locations to deposit the waste rock. This would reduce the magnitude of the waste rock pile and likely allow the project to improve the orientation and shape of the rock pile so it didn't obstruct caribou migrations.

2) Please explain why the project has prioritized saving two minor water courses over caribou migration when considering the size and shape of the current proposal for the waste rock pile. For example, if it was longer and aligned along the lake, it would present less of an obstacle for caribou migrating through the area.

3) Please explain why the project has not prioritized caribou when considering whether two smaller waste rock piles should be utilized. Essentially, the project has unilaterally (over the concerns of communities) decided that the water diversion they would be required to make is more important to avoid than greater impacts to caribou.

4) The project has stated that two waste rock piles would have 'more complex' seepage water management. Please explain these complexities and assess those values against minimizing impacts to caribou, particularly considering section 2.5.2.2.1 notes that "collection of seepage water is not required".

5) Please explain what actions the project will undertake to rebuild the esker following the completion of the project.

Response:

1) In-pit waste rock deposition with water cover for closure can be a practical and environmentally beneficial approach for some mining projects and, for this reason, was considered for the Jay Project (Project). However, in-pit deposition of waste rock was quickly eliminated from consideration because it is not practical or environmentally beneficial for the Project. Section 2.5.2 of the Developer's Assessment Report (Developer's Assessment Report [DAR]; Page 2-45) states the following:

DOMINION DIAMOND

> *"In addition to the alternatives discussed below, options for in-lake and in-pit waste rock storage were considered but were not selected. Storage of waste rock in the basin of Lac du Sauvage was not selected due to potential regulatory and permitting issues that may not be resolved within the required Project timeframe, and because other viable waste rock management alternatives exist. Storage of waste rock in mined pits, such as Misery, Lynx, Panda, and Koala was rejected due to uneconomic hauling and placement requirements."*

During development of the Jay Pit, approximately 102 million cubic metres (m^3) of waste rock will be produced, of which approximately 76 million m^3 will be non-potentially acid generating granitic rock and 26 million m^3 will consist of potentially acid generating (PAG) metasediments. Although it is estimated that only 50 percent (%) of the metasediments are PAG, experience from mining these materials at the Ekati Mine indicate that there is no practical means of distinguishing and separating them during handling and disposal; therefore, all metasediments will be classified and handled as PAG material (DAR Section 3.5.6).

The two most proximal pits to the Project are the Misery Pit and the Lynx Pit, which are located at respective distances of approximately 6 kilometres (km) and 10 km. There would be significant additional economic costs to haul the rock from the Jay Pit to these pits, and there would be a significant increase in the quantity of fuel used to haul the rock to these pits, which would increase greenhouse gas emissions and affect air quality. Pits located at the main Ekati Mine site are further away (i.e., greater than 35 km), and as a result, movement of rock to these pits is not economically viable.

The Misery Pit has an approximate capacity of 40 million m^3. Water management for the Project will use the Misery Pit, and therefore, it is not available for waste rock disposal. The Lynx Pit has an approximate capacity of 5.2 million m^3. The size of the Lynx Pit is insufficient, even for the storage of the metasediments. Due to the small storage capacity for waste rock in the Lynx Pit, an on land Waste Rock Storage Area (WRSA) would still need to be constructed to store the majority of the waste rock produced (97 million m^3), and therefore, the footprint of the Jay WRSA would not be significantly reduced.

2) As part of the alternatives assessment, several options for on-land placement of waste rock from the Project were evaluated (Section 2.5.2 of the DAR). As presented in Table 2.5-2 in Section 2.5.2.4 of the DAR, the assessment considered many aspects such as offsets to waterbodies/aquatic habitat, water diversion requirements, offsets to the esker, potential effects on caribou migration, pile height, pile footprint area and habitat quality, water management, and haul distance. WRSA Alternative 1 was chosen as the best location.

   A single WRSA was assessed as being less of a detriment to caribou in comparison to having two separate piles: to minimize fragmentation and disturbance of the land. Elongating the WRSA along Lac du Sauvage to increase setback from the esker, could potentially increase the barrier the WRSA poses to caribou during spring migration. Modifying the layout of the WRSA (elongating) towards the north would require a permanent water diversion channel to divert flow from Lake C1 and Lake C17 around the WRSA to Lac du Sauvage. The channel would represent a change to flow conditions and likely need to permanently maintain connectivity for fish between Lake C1 and

Lac du Sauvage. Lake C1 is a relatively deep lake (maximum depth of 23.5 m), with populations of Round Whitefish, Lake Trout, Arctic Grayling, and Slimy Sculpin.

3) As discussed in point 2 above and in Table 2.5-2 in Section 2.5.2.4 of the DAR, many factors contributed to WRSA Alternative 1 being selected. In terms of potential effects on caribou, WRSA Alternative 3 has a larger footprint by spreading the placement out over two areas and the southern location (Alternative 2) would adversely affect higher quality caribou habitat than the northern location. At the local scale, the presence of two WRSAs would result in increased habitat fragmentation and decreased connectivity relative to one larger WRSA for caribou and other wildlife.

4) Having two WRSAs, increases the total perimeter length, and therefore, increases the length for inspection and potentially sampling. As described in the response to DAR-GNWT-IR-24, precipitation over the Jay WRSA is generally anticipated to infiltrate into the pile and freeze resulting in a low proportion of runoff. Collection of seepage water is not anticipated based on geochemical testing and past experience at the Ekati Mine. However, collection of seepage water into the minewater management system remains a possible contingency; only in the event that seepage management becomes necessary is there potential for it to be more complex.

5) Esker material disturbed during construction will be stockpiled for use in restoration during the closure phase of the Project. During closure, the pipelines and power lines will be removed and the area where the esker was cut will be rebuilt. During restoration, the esker will be graded to match the surrounding terrain. The surface will be dressed with material that was saved and stockpiled from the esker cut during construction. Any natural channels that are modified near the esker as part of road and pipeline construction will be re-established in the closure phase.

DOMINION DIAMOND

Information Request Number: DAR-YKDFN-IR-03

Source: Yellowknives Dene First Nation: Todd Slack

Subject: Air Quality

DAR Section(s): 7

Preamble (YKDFN):

The project has set a significance criteria in such a way that almost no project would exceed the threshold.

Request (YKDFN):

1) Please provide a chart that lists the measured/assessed air quality parameters for the guideline used, the baseline, current, and application case. As part of this chart, please indicate the percentage increase from baseline/pre-mine.

2) What was the use of considering the air quality guidelines as part of this assessment given the fact that they would have no influence in the final assessment? For example, the project is likely to exceed air quality guidelines several hundred days per year. This would represent an exceedance 9 out of every 10 days.

3) Please provide a clear explanation as to why the project will accept a 90% failure rate when it comes to meeting air quality guidelines.

4) Please indicate the number of days that the project has previously failed to meet the terms and conditions of its water license.

5) Please indicate the number of days that the project predicts that it will exceed the terms and conditions of its water license in the future.

6) What is the purpose of monitoring when the significance threshold is set in such a way that management actions will never be required?

7) Would the Chernobyl nuclear plant accident have exceeded the threshold for air quality?

Response:

Item 1

Dispersion modelling was used to provide air quality predictions in the vicinity of the Project, as presented in Section 7 of the DAR. Base Case and Application Case scenarios were modelled. The Base Case describes current air quality without the Jay Project. The Application Case represents predictions of the cumulative effects of the developments in the Base Case combined with the effects from the Project. The assessment of effects for the Jay Project adopted a conservative approach by assessing predicted concentrations against air quality standards at the edge of the immediate disturbance area where

predicted concentrations are greatest. This is a conservative approach because the Northwest Territories Ambient Air Quality Standards (NWT AAQS; GNWT-ENR 2014) are applicable at the “fenceline” of a development, which for the Ekati Mine has previously been considered to be the claim block. This ensures that assessment of effects for the purpose of environmental assessment of the Jay Project is robust and a likely an overestimate of effects.

Background (reference) concentrations were added to the model predicted values; therefore, all predicted concentrations are higher than the background concentrations. As receptors immediately adjacent to the disturbed area were considered in the assessment, predicted concentrations of compounds at the Maximum Points of Impingement (MPOI) compared to the background concentrations discussed in the update to the DAR (Golder 2015) appear large on a percentage scale. However, the predicted concentrations decrease progressively with increasing distance from the disturbed area boundary.

Tables 3-1 to 3-5 present the following information for sulphur dioxide (SO_2), nitrogen dioxide (NO_2), carbon monoxide (CO), particulate matter of mean aerodynamic diameter less than 2.5 microns ($PM_{2.5}$), and total suspended particulate (TSP) predictions in the Base Case and Application Case:

- maximum predicted concentration outside of the project disturbance footprint;
- regulatory criteria (NWT AAQS) which the maximum predicted concentrations were compared against;
- background concentrations (representing regional ambient air quality in absence of influence from local anthropogenic emissions [i.e., reference conditions]) that were added to the model predicted concentrations;
- maximum predicted concentrations as percentages of the regulatory criteria;
- maximum predicted concentrations as percentages of the background concentrations;
- change between Base Case and Application Case maximum predicted concentrations as percentages relative to the regulatory criteria; and,
- change between Base Case and Application Case maximum predicted concentrations as percentages relative to the background concentrations.

Table 3-1 Comparison of Regional Base Case and Application Case for SO_2 in LSA

Averaging Period	Criteria (NWT Ambient Air Quality Standards)	Background/ Reference Conditions (Pre-mine) (µg/m³)	Base Case			Application Case			Change Between Base Case and Application Case Percentages Relative to Criteria (%)	Change Between Base Case and Application Case Percentages Relative to Background/ Reference (%)
			Maximum Predicted Concentrations Excluding Development Area (µg/m³)	Percent of Criteria (%)	Percent Change From Background/ Reference (%)	Maximum Predicted Concentrations Excluding Development Area (µg/m³)	Percent of Criteria (%)	Percent Change From Background/ Reference (%)		
1-hour	450	0.0	15.6	3.5	—	15.6	3.5	—	0.0	—
24-hour	150		5.9	3.9	—	5.9	3.9	—	0.0	—
Annual	30		0.4	1.3	—	0.4	1.3	—	0.0	—

LSA = local study area; NWT = Northwest Territories; SO_2 = sulphur dioxide gas; µg/m^3 = micrograms per cubic metres; "—" = not applicable.

The background (reference conditions) SO_2 value without the influence of existing mine activities is negligible. Therefore, the percentage change from the background value cannot be calculated. The predicted maximum SO_2 concentrations in the Base Case are related to the existing mining activities within the study area; therefore, the values did not change with the Project. The predicted maximum SO_2 concentrations are at 3.9% of the NWT AAQS or lower.

Table 3-2 Comparison of Regional Base Case and Application Case for NO_2 in LSA

Averaging Period	Criteria (NWT Ambient Air Quality Standards)	Background/ Reference Conditions (Pre-mine) (µg/m³)	Base Case			Application Case			Change Between Base Case and Application Case Percentages Relative to Criteria (%)	Change Between Base Case and Application Case Percentages Relative to Background/ Reference (%)
			Maximum Predicted Concentrations Excluding Development Area (µg/m³)	Percent of Criteria (%)	Percent Change From Background/ Reference (%)	Maximum Predicted Concentrations Excluding Development Area (µg/m³)	Percent of Criteria (%)	Percent Change From Background/ Reference (%)		
1-hour	400	0.0	499.9	125.0	—	500.4	125.1	—	0.1	—
24-hour	200		140.3	70.2	—	320.9	160.5	—	90.3	—
Annual	60		42.1	70.2	—	77.8	129.7	—	59.5	—

LSA = local study area; NWT = Northwest Territories; NO_2 = nitrogen dioxide gas; µg/m^3 = micrograms per cubic metres; "—" = not applicable.

The background (reference conditions) NO_2 value without the influence of existing mine activities is negligible. Therefore, the percentage change from the background value cannot be calculated. The predicted maximum NO_2 concentrations in both Base Case and Application Case are above the NWT AAQS and located near edge of disturbance boundary near existing mines and the Project. However, as discussed in DAR, Section 7.4.2.2.2 and in the response of DAR-EC-IR-04, the area of exceedance is confined to an area within a few hundred metres from the edge of the disturbance boundary and the frequencies of exceedance are no more than two days per year in the Application Case.

Table 3-3 Comparison of Regional Base Case and Application Case for CO in LSA

Averaging Period	Criteria (NWT Ambient Air Quality Standards)	Background/ Reference Conditions (Pre-mine) (µg/m³)	Base Case			Application Case			Change Between Base Case and Application Case Percentages Relative to Criteria (%)	Change Between Base Case and Application Case Percentages Relative to Background /Reference (%)
			Maximum Predicted Concentrations Excluding Development Area (µg/m³)	Percent of Criteria (%)	Percent Change From Background/ Reference (%)	Maximum Predicted Concentrations Excluding Development Area (µg/m³)	Percent of Criteria (%)	Percent Change From Background/ Reference (%)		
1-hour	15,000	0.0	1,418.8	9.5	—	2,407.2	16.0	—	6.6	—
8-hour	6,000		981.9	16.4	—	1,949.4	32.5	—	16.1	—

LSA = local study area; NWT = Northwest Territories; CO = carbon monoxide; µg/m^3 = micrograms per cubic metres; "—" = not applicable.

The background (reference conditions) CO value without the influence of existing mine activities is negligible. Therefore, the percentage change from the background value cannot be calculated. The predicted maximum CO concentrations are located at the disturbance boundary of the approved mines and the Project. The Application Case predicted maximum CO concentrations are 33% of the NWT AAQS or lower and well below NWT AAQS.

Table 3-4 Comparison of Regional Base Case and Application Case for $PM_{2.5}$ in LSA

Averaging Period	Criteria (NWT Ambient Air Quality Standards)	Background/ Reference Conditions (Pre-mine) (µg/m³)	Base Case			Application Case			Change Between Base Case and Application Case Percentages Relative to Criteria (%)	Change Between Base Case and Application Case Percentages Relative to Background/ Reference (%)
			Maximum Predicted Concentrations Excluding Development Area (µg/m³)	Percent of Criteria (%)	Percent Change From Background/ Reference (%)	Maximum Predicted Concentrations Excluding Development Area (µg/m³)	Percent of Criteria (%)	Percent Change From Background (%)		
24-hour	28	1.9	93.7	335	4,832	322.3	1,151.1	16,863	816	12,032
Annual	10		14.0	140	637	39.1	391.0	1,958	251	1,321

LSA = local study area; NWT = Northwest Territories; $PM_{2.5}$ = particulate matter of particle diameter less than 2.5 µm (micrometres); $\mu g/m^3$ = micrograms per cubic metres; "—" = not applicable.

As discussed earlier in the response and in greater detail in the response to DAR-YKDFN-IR-28, a conservative background value (which is higher than the observed monitored value at the proposed Project site) was added to all model predicted values. The maximum $PM_{2.5}$ concentrations are at the edge of the existing mines and the Project, adjacent to the primary sources of emissions (e.g., haul road and the mine pits). Due to the proximity of these locations to the emission sources, the predicted concentrations are high and well above the NWT AAQS. However, the predicted concentrations decrease markedly with distance from the disturbance boundary. As discussed in Section 7.4.2.2.4 of the DAR, the Application Case maximum 24-hour and annual $PM_{2.5}$ concentrations are predicted to fall below the applicable NWT AAQS at 5 km and 1 km from the disturbance boundary, respectively. The measured $PM_{2.5}$ concentrations at the existing Ekati Mine are generally lower than the model predicted concentrations in the Base Case. Coupled with the conservative nature of emission estimation used in the assessment, it is expected the actual $PM_{2.5}$ concentrations outside of the disturbance boundary will be lower than the predicted concentrations.

Table 3-5 Comparison of Regional Base Case and Application Case for TSP in LSA

Averaging Period	Criteria (NWT Ambient Air Quality Standards)	Background/ Reference Conditions (Pre-mine) (µg/m³)	Base Case			Application Case			Change Between Base Case and Application Case Percentages Relative to Criteria (%)	Change Between Base Case and Application Case Percentages Relative to Background/ Reference (%)
			Maximum Predicted Concentrations Excluding Development Area (µg/m³)	Percent of Criteria (%)	Percent Change From Background/ Reference (%)	Maximum Predicted Concentrations Excluding Development Area (µg/m³)	Percent of Criteria (%)	Percent Change From Background (%)		
24-hour	120	3.1	1,096.5	914	35,271	4,298.4	3,582	138,558	2,668	103,287
Annual	60		194.1	324	6,161	511.7	853	16,407	529	10,245

LSA = local study area; NWT = Northwest Territories; TSP = Total suspended particulates; µg/m^3 = micrograms per cubic metres; "—" = not applicable.

The predicted maximum TSP concentrations are located adjacent to the haul roads and mine pits, the main sources of TSP emissions. Due to the proximity of the of these locations to the emission sources, the predicted concentrations are high and well above the NWT AAQS. However, the predicted concentrations decrease markedly with distance from the disturbance boundary. As discussed in Section 7.4.2.2.5 of the DAR, the maximum concentrations are predicted to fall below the 24-hour and annual NWT AAQS for TSP within 3 km and 1 km from the disturbance boundary, respectively.

Items 2 to 6

The air quality significance is not solely based on magnitude which is based on compliance with NWT AAQS (GNWT-ENR 2014) as stated in the DAR (see Table 7.6-1). It also includes other considerations such as likelihood (of the maximum predicted impacts), uncertainty (including conservatism in the assumptions and assessment approach), geographic extent (Project effect confined to the Local Study Area [LSA]), duration of the effect, frequency of the effect, reversibility of the effect, and the level of scientific understanding to the impacts based on previous studies at similar projects. For the air quality assessment in the DAR, a significant impact was considered to be one where irreversible and long-term changes in air quality would be expected after mitigation and other design features are implemented. If a prediction is reversible and short-term or medium-term in duration, but it is above the established threshold at times, it would receive a not significant rating. Conversely, if a compound is expected to result in an irreversible and long-term change in air quality but it is below the established guideline, it may receive a rating of significant. Dominion Diamond believes that the significance definition chosen for air quality assessment is appropriate for the following reasons:

- All air quality effects were local in geographic extent, and compliance met within the LSA.
- All effect durations were considered to be medium-term (for the lifetime of the Project).
- All effects were reversible, and would cease with the completion of the Project.
- No reversible effects were long-term, and no effects above the NWT AAQS thresholds were irreversible or long-term.

As discussed in Item 1 above, as well as in the response to DAR-LKDFN-IR-11, the air quality assessment predictions were compared to the NWT AAQS at the edge of the disturbed area. The NWT AAQS are typically applied at the facility property boundary, which for the Ekati Mine as previously been considered to be the claim block. This is a conservative approach adopted of the purpose of the environmental assessment of the Jay Project.

The air quality assessment also includes a number of conservative assumptions in the emission estimation which can result in conservative predictions. The Project will adopt best available technology economically achievable to mitigate emissions, including management practices to mitigate fugitive dust emissions. The Air Quality Monitoring and Management Plan for the Project will include appropriate monitoring to determine the effects of the Project and the adaptive management action to mitigate if an effect is detected that represents a significant risk to the receiving environment.

As described n the DAR, Dominion Diamond will amend the existing Ekati Mine Air Quality Management and Monitoring Program (AQMMP) to address monitoring and mitigation of air quality for the Jay Project. Summary results of the AQMMP are reported each year in the Annual Environmental Agreement and Water Licence Report. Every three years an extended sampling program is completed and a separate AQMMP report is prepared that presents monitoring results in more detail. Results from the AQMMP to date suggest that mitigation and environmental design features implemented at the Ekati Mine are currently effective at limiting changes to air quality. If results from the AQMMP detect effects that represent a significant risk to the receiving environment adaptive management will be implemented.

Adaptive management may include increased monitoring, changes in monitoring plans, additional mitigation, or improvements to environmental design features.

Air quality results are used in the 3-year re-evaluation of the Aquatic Effects Monitoring Program that is reviewed by the Wek'èezhìi Land and Water Board as a requirement of the Ekati Mine Water Licence. This provides an evaluation of potential linkages between air quality monitored under the AQMMP with monitoring results in the aquatic receiving environment. Compliance with the Ekati Mine Water Licence is excellent.

Detailed changes to the AQMMP for the Project will be developed during the regulatory permitting phase of the Project. The Government of Northwest Territories, Environment Canada, aboriginal communities and other organizations will be engaged during the amendment of the AQMMP.

An overarching purpose of monitoring is to test and verify impact predictions and the effectiveness of mitigation, and provide feedback for adaptive management for modifying and/or implementing additional mitigation to avoid or minimize effects. Follow-up monitoring also provides information for reducing uncertainty of effects in future environmental assessments.

Within the context of a monitoring plan, a significance threshold is defined as a magnitude of change over a particular period that may result in significant adverse effects. In general, significance thresholds are the levels of change that, if exceeded, would result in significant adverse effects to the valued components identified in the monitoring plan. They are intended to support the monitoring goal of preventing adverse effects from occurring. Significance thresholds may be considered a "no-go condition", such that management actions and adaptive management would be used to prevent a significance threshold from ever being reached.

Item 7

The air quality assessment for the Jay Project assessed the dispersion of pollutants expected to be released due to the industrial activities of the Project and other industry in the vicinity of the Project. The NWT AAQS apply to the predictions of the air quality assessment and in the Northwest Territories. The Chernobyl accident involved a malfunction at a nuclear operation in Ukraine, with emission types (i.e., radiation) and physical parameters unrelated to the Project. To assess the Chernobyl accident would require the application of completely different regulations and different applicable criteria endpoints, and any determination of effects from the Chernobyl accident would not be comparable to the assessment of the Project.

References:

GNWT-ENR (Environment and Natural Resources, Government of the Northwest Territories). 2014. Guideline for Ambient Air Quality Standards in the Northwest Territories. Yellowknife, NWT, Canada, 5 pp.

Golder (Golder Associates Ltd.). 2015. Technical Memorandum. Jay Project Air Quality Assessment Update. Prepared for Dominion Diamond Ekati Corporation. Yellowknife, NWT, Canada. January 19, 2015. Submitted to the Mackenzie Valley Environmental Impact Review Board on January 19, 2015.

Rescan (Rescan Environmental Services Ltd.). 2006. Ekati Diamond Mine CALPUFF Air Dispersion Modelling Assessment, October 2006.

DOMINION DIAMOND

Information Request Number:	DAR-YKDFN-IR-04
Source:	Yellowknives Dene First Nation: Todd Slack
Subject:	Air Quality
DAR Section(s):	7

Preamble (YKDFN):

The section on dust does not make it clear how far and wide the dispersion is going to be expected to travel. Ekati and other minesites have demonstrated a dust signal above baseline far further than expected.

Request (YKDFN):

1) Please provide a thorough and detailed discussion on the observed range of dust dispersion and deposition observed at this site and others in the NWT.

2) The project has noted a reduced diversity of vegetation abundance and complexity in and around dust generation sources (roads etc). Please provide a recovery curve for the recolonization and return of abundance for impacted areas post closure.

3) As part of this recovery, please provide a discussion on the amount of dust and particulates to be generated by the roads after closure and reclamation.

4) If dust is known to be impacting the area surrounding the mine, please provide a discussion as to the effectiveness of dust control measures and why they failed to mitigate the predictable impacts in this case.

Response:

1) Please refer to Maps 4-7 to 4-12 in the Jay Project Air Quality Assessment Update (Golder 2015) submitted with the adequacy review information which show the predicted dispersion of total suspended particulate (TSP) from the air quality modelling assessment. Base Case describes the existing environment prior to the application of the Project, to provide an understanding of the current conditions that may be influenced by the Project. Existing (2015) conditions include the cumulative effects from all existing developments and activities that are planned and approved (e.g., Lynx Project). Application Case represents predictions of the cumulative effects of the developments in the Base Case combined with the effects from the Project. The predictions from the modelling show that during the Application Case, TSP dispersion should decrease near the main Ekati Mine infrastructure and increase near the Jay Project location.

   Maximum exceedances of the Government of the Northwest Territories Ambient Air Quality Standards (NWT AAQS) for TSP occur to the north of the main Ekati Mine infrastructure in the Base Case scenario, and exceedances above the NWT AAQS for TSP are generally constrained to being less than one kilometre (km) from the disturbed areas, although exceedances do extend to

approximately 2 km near the Misery Pit, with exceedances of the 24-hour predictions being further from the disturbed areas than the annual predictions.

In the Application Case scenario, maximum exceedances of the NWT AAQS for TSP are predicted to occur near the Jay Project. Exceedances are limited to being less than 1 km from the disturbed areas except near the Project, where they extend up to approximately 4 km from the disturbed areas for the 24-hour predictions and up to 1 km from the disturbed areas for the annual predictions. The modelling predicts the dispersion of TSP to have maximal concentrations outside of the disturbed area predominantly to the Northeast and to the Southeast of the Project location.

Dominion Diamond monitors for dust at the Ekati Mine, and this is reported in the Air Quality Management and Monitoring Program reports. The most recent report covers the years 2009 to 2011 (BHP Billiton 2012). Results from the 2011 air quality monitoring report indicate that dustfall levels dropped off at distances of 300 and 1,000 metres (m) downwind of Fox Road, with average concentration values of 1.64 and 0.31 milligrams per square decimetre per day (mg/dm^2/d), respectively (BHP Billiton 2012). The average of all background samples from approximately 36 and 21 kilometres (km) away from the Ekati main camp was 0.20 mg/dm^2/d. Similar observations would be expected for the Jay Project (Project). The results of the air quality modelling (presented in the response to DAR-LKDFN-IR-10) predicted that the estimated maximum dust deposition rate will only exceed the most stringent dustfall guideline (1.7 mg/dm^2/d) between British Columbia and Alberta within 500 m outside of the Project footprint. The highest deposition rates predicted would be mostly associated with the Jay Pit and haul roads.

The following sources provide additional information on dust at nearby diamond mines in the NWT:

- The Diavik Aquatic Effects Monitoring Program (DDMI 2014);
- Determination of Natural Winter Mitigation of Road Dust Emissions from Mining Operations in Northern Canada (Golder 2012); and,
- The Snap Lake Vegetation Monitoring Program (DBCI 2006).

To elaborate specifically on the evaluation of dustfall from other operations in the region, an excerpt from the recent AEMP Version 3.0 (2011 to 2013) Summary Report for the Diavik Diamond Mine, Northwest Territories (DDMI 2014) is provided below. It provides the most recent and relevant detailed statistical analysis of dustfall and the extent of its travel in the region.

> *"Air and water quality issues associated with airborne fugitive dust caused by mining activities has been identified as being of particular concern and is required to be included in the Diavik Mine environmental monitoring programs (DDMI 2006a,b). Since there is the potential for dust from the Diavik Mine to deposit onto Lac de Gras, the dust deposition monitoring program has been included as a component of the AEMP.*
>
> *The objective of the Diavik dust deposition monitoring program is to monitor the levels of dust fall in the area surrounding the Diavik Mine and to confirm the predictions set forth in the Environmental Assessment (DDMI 1998b). More specifically, the program has been designed and implemented to identify:*

- *total particulate deposition rates at various distances from the Diavik Mine and to compare the observed deposition rates to predictions outlined in DDMI (1998b); and,*
- *the physical and chemical characteristics of particulate material that may be deposited into Lac de Gras from mining activities.*

Diavik dustfall gauge and snowdust data were analyzed in MATLAB, version 8.0 for Windows (MathWorks, Inc., Natick, Massachusetts). The goals of the analysis are as follows:

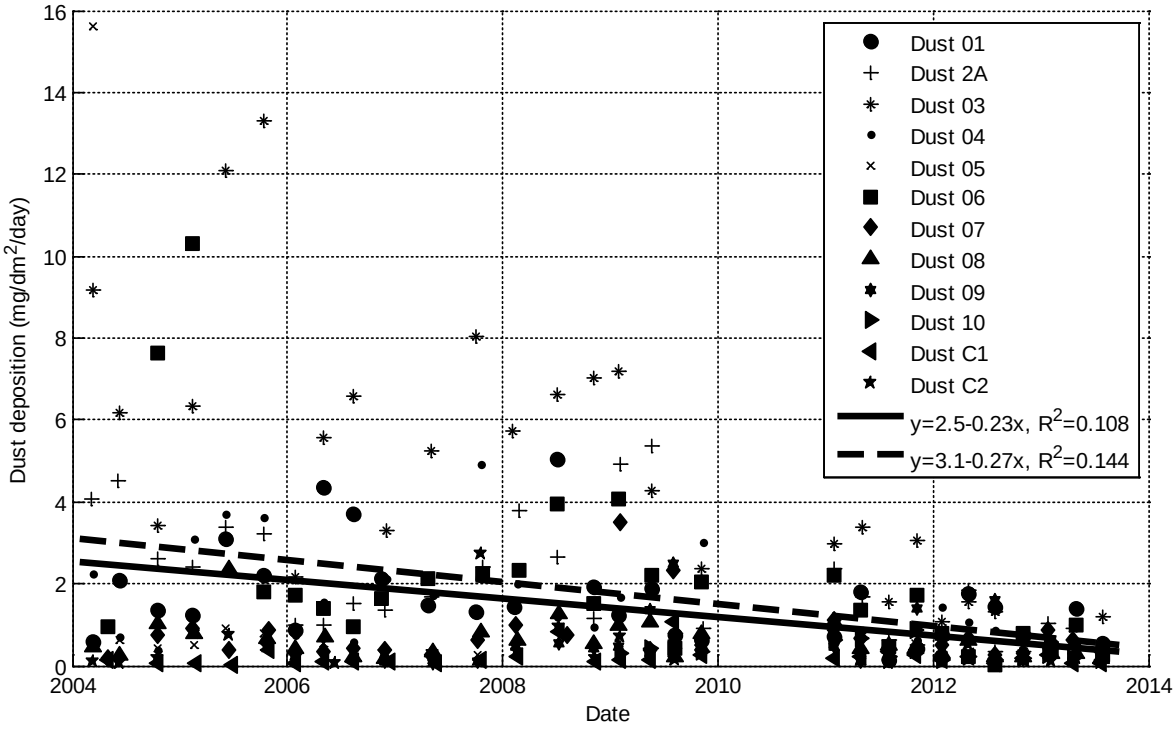
- *To determine the background rates of dust deposition.*
- *To determine if there are temporal trends in the rates of dust deposition (e.g., seasonal trends, annual trends).*
- *To determine if there are spatial trends in the rates of dust deposition.*
- *To use the dust deposition rate data to evaluate snow chemistry data.*

Seasonal trends in dust deposition recorded at the dustfall gauges were evaluated based on a visual inspection of the data. Annual trends in dust deposition were evaluated using simple linear regression.

A combined spatial-temporal analysis of the dustfall gauge and snowdust data was also completed. First, seasonal dustfall gauge data were aggregated into annual dust deposition rates, expressed in milligrams per decimeter squared per year (mg/dm^2/year), to form a time-basis consistent with the annual snowdust measurements of dust deposition rates. Dustfall and snowdust data were then grouped into four-year temporal periods: 2002 – 2005, 2006 – 2009, and 2010 – 2013. Dust deposition rates are plotted against both the distance (in kilometers [km]) from the geographic centre of the Mine and the distance from the Mine boundary. Trends in dust deposition as a function of distance from the centroid and from the Mine boundary were fit using a first-order decay function, whose goodness-of-fit was evaluated using the coefficient of determination (r2) from the least-squares regression. The 95% confidence intervals of the fit to a first order decay were also computed and displayed.

Seasonal dustfall gauge data were aggregated into annual values so that their time-base is consistent with that of the snowdust data. Data from each station were then averaged into three temporal bins spanning the time periods 2002 – 2005, 2006 – 2009, and 2010 – 2013.

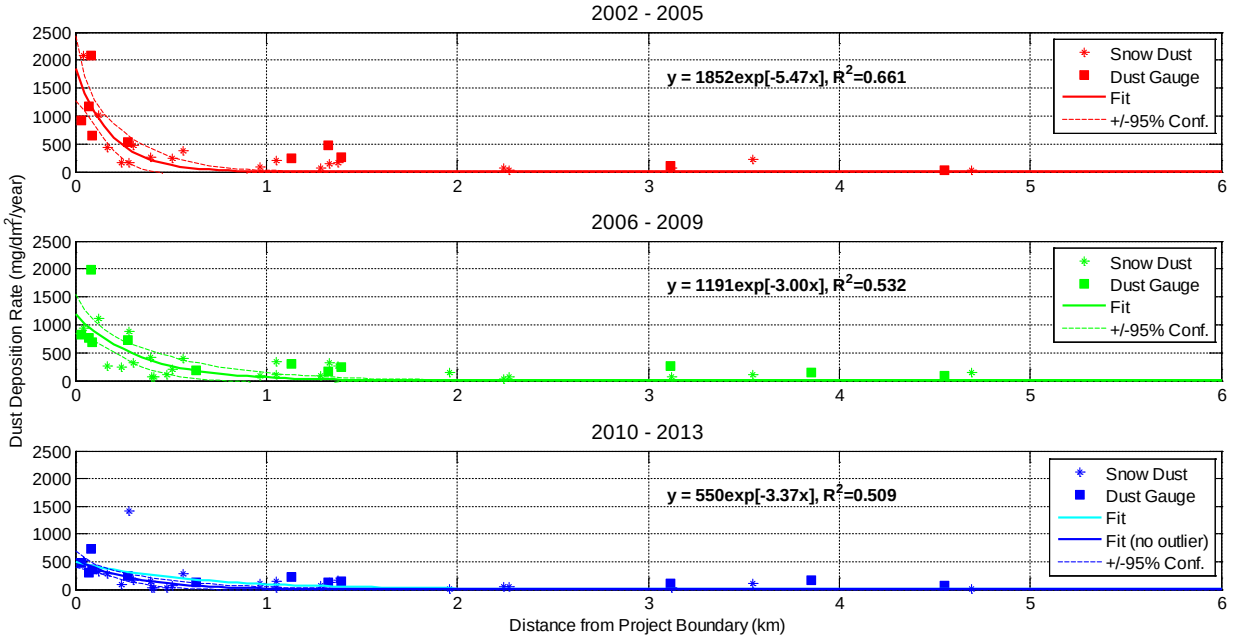
Figure 4-1 Linear Regression of Dust Deposition Rates as a Function of Year



Source - AEMP Version 3.0 (2011 to 2013) Summary Report for the Diavik Diamond Mine, Northwest Territories

Figure 4-2 plots the dust deposition versus distance from the Diavik Mine Boundary. Results of the fit to a first-order decay function are plotted as solid lines along with the 95% confidence intervals as dashed lines. Equations for the fit and the r2 values are included as text within each sub-plot.

Figure 4-2 First-Order Decay Estimates of Dust Deposition as a Function of Distance From the Diavik Mine Boundary (Top Panel: 2002 To 2005; Middle Panel: 2006 To 2009; Bottom Panel: 2010 To 2013)



Source - AEMP Version 3.0 (2011 to 2013) Summary Report for the Diavik Diamond Mine, Northwest Territories

Based on this spatial-temporal analysis of the Diavik Mine Annual Environmental Monitoring Program data, the following conclusions were drawn:

- *Estimates of dust deposition rates at the Diavik Mine boundary have shown a reduction from 1,850 mg/dm^2/year for the 2002 to 2005 period to 550 mg/dm^2/year for the 2010 to 2013 period.*
- *Between 2002 and 2009, dust deposition rates beyond approximately 500 to 700 m from the Diavik Mine Boundary were, on average, indistinguishable from background values.*
- *From 2009 to 2013, dust deposition rates beyond approximately 400 m from the Diavik Mine boundary were, on average, indistinguishable from background values.*

Note that the 2002-2005, 2006-2009, and 2010-2013 monitoring periods correspond to the Construction, Open-Pit, and Underground Phases of the mine."

2) Dust deposition is expected to result in local changes to the species composition, growth, and biomass of the plant communities receiving dust inputs, not necessarily a reduction in diversity or cover (Grantz et al. 2003; Brunbjerg et al. 2012; Miller et al. 2012). Lichens and mosses that derive some of their moisture and nutrient requirements from the atmosphere can be sensitive to the effects of dust (Farmer 1993). Species such as *Sphagnum* moss and most species of lichen are sensitive to dust deposition, and decrease close to dust sources. Although *Sphagnum* and lichens may decrease,

more tolerant species, such as haircap moss (*Polytrichum* spp.), Bryum moss (*Bryum* spp.), cottongrass (*Eriophorum* spp.), and willow (*Salix* spp.) tend to increase with dust deposition (Farmer 1993; Auerbach et al. 1997).

The sensitivity of the receiving environment to dust is dependent on the vegetation type present. Long-term vegetation monitoring results at the Diavik Mine indicated that the most pronounced vegetation effects occur within heath tundra vegetation (Golder 2014). The results also showed a distinct pattern of lower terricolous (ground dwelling) lichen cover, higher litter cover, and higher total vascular plant species richness in plots adjacent to the mine site compared to reference plots (Golder 2014).

Effects from dust generation at the Diavik Mine are resulting in changes to plant community and species level diversity, as indicated by mean total vascular plant species richness that was 34% higher on heath tundra exposure plots and 22% higher on shrub exposure plots compared to the reference plots (Golder 2014). The difference in species richness was mostly attributed to the higher number of grass and forb species in the plots, which may be a response to the lower lichen cover that was observed.

The amount of time for vegetation to recover following mine closure and removal of the dust source is not known. Recovery of a plant community is related to the type, size, magnitude of the disturbance, and the plant community type it occur in (Speed et al. 2010). In this case, dust is a small magnitude disturbance where it is expected that it would cause a shift in the local plant community. Because a shift in the plant community has been observed, it is not likely to recover to a similar composition; however, it is expected that the plant community would be functional, even though it is not the same as that in the previous undisturbed state. In addition, external factors such as climate and fire can disrupt the successional trajectory and recovery of the plant community, which also influences the amount of time for recovery and what the final plant community will be (Miller et al. 2010)

3) The majority of fugitive dust emissions from haul and facility roads is from entrainment by vehicles driving on the roads, as well as activities on the roads, such as grading. Fugitive dust from unpaved roads comes primarily from the active layer at the surface of the road which is regenerated by the action of the wheels of vehicles on the roads or from grading and other similar operations. It is expected that the fugitive dust emissions from the roads will quickly diminish after closure of the roads as the supply of fine particles in the surface layer is exhausted, and as fine particles in the surface layer are not being replenished by vehicle activity. Once the roads have been reclaimed, fugitive dust emissions from the reclaimed roads should be reduced to near background levels, as the surface layer will likely become vegetated over time and will no longer remain as an active emission source of fugitive dust.

4) Results of the Ekati Mine air quality monitoring program have shown that dustfall generated during winter months (October 1 to May 31) are generally below background concentrations, and dustfall generated during the summer months (June 1 to September 30) represents the bulk of the total annual dust source (BHP Billiton 2012). This result is consistent with a study completed for De Beers Canada Inc. (Golder 2012) that showed winter conditions provide a high level of natural mitigation (approximately 96%) to suppress dust generation and dustfall, and that road watering during summer months will result in approximately 80% suppression of dust generation, and for periods between 4

and 6 hours after watering. The Ekati Mine uses a combination of chemical dust suppressants and road watering during the summer season. Therefore, dust suppressants and road watering, and natural mitigation during winter, will have a strong influence on limiting fugitive dust generation and dustfall on receiving terrestrial environments. Even with active and passive mitigation, dust deposition is predicted to result in localized (within 100 m to 500 m) measurable changes in plant species richness and relative abundance.

References:

Auerback NA, Walker MD, Walker DA. 1997. Effects of Roadside Disturbance on Substrate and Vegetation Properties in Arctic Tundra. Ecological Applications 7(1):218–235.

BHP Billiton (BHP Billiton Canada Inc.). 2012. EKATI Diamond Mine: 2011 Air Quality Monitoring Program. Prepared by Rescan Environmental Services Ltd., Yellowknife, NWT, Canada.

Brunbjerg AK, Borchsenius F, Eiserhardt WL, Ejmaes R, Svenning J. 2012. Disturbance Drives Phylogenetic Community Structure in Coastal Dune Vegetation. Journal of Vegetation Science 23: 1082–1094.

DBCI (De Beers Canada Incorporated). 2006. Snap Lake Project Vegetation Monitoring Program 2006 Annual Report. Located at: http://www.slema.ca/wp-content/uploads/2011/02/Vegetation-Monitoring-Program-2006-Annual-Report-PDF.pdf

DDMI (Diavik Diamond Mines Inc.). 2014. Aquatic Effects Monitoring Program 2013 Annual Report. Located at: http://www.mvlwb.ca/Boards/WLWB/Registry/2007/W2007L2-0003/AEMP/W2007L2-0003%20-%20Diavik%20-%20AEMP%20-%202013%20Annual%20Report%20-%20Mar%2031_14.pdf

Farmer AM. 1993. The effects of dust on vegetation – a review. Environmental Pollution 79:63-75.

Golder (Golder Associates Ltd.). 2012. Determination of Natural Winter Mitigation of Road Dust Emissions from Mining Operations in Northern Canada. Located at: http://reviewboard.ca/upload/project_document/EIR0607-001_Road_Dust_Emission_Study_-_De_Beers_Canada.PDF

Golder 2014. 2013 Wildlife Monitoring Report Appendix A: 2013 Comprehensive Vegetation and Lichen Monitoring Program. Submitted to Diavik Diamond Mines Inc., NWT, Canada Located at: http://www.mvlwb.ca/Boards/WLWB/Registry/2007/W2007L2-0003/W2007L2-0003%20-%20Diavik%20-%20Wildlife%20Monitoring%20Program%20-%202013%20Report%20-%20Mar%2031_14.pdf

Golder 2015. Jay Project Air Quality Assessment Update. Technical memorandum submitted to Dominion Diamond. January 19, 2015. Yellowknife. NWT. Canada.

Grantz DA, Gamer JHB, Johnson DW. 2003. Ecological effects of particulate matter. Environment International 213-239.

Miller A, Reilly D, Bauman S, Shea K. 2012. Interactions Between Frequency and Size of Disturbance Affect Competitive Outcomes. Ecological Research 27: 783–791.

Miller TE, Gornish ES, Buckley HL. 2010. Climate and coastal dune vegetation: disturbance, recovery, and succession. Plant ecology 206: 97-104.

Speed JD, Copper EJ, Jonsdottir IS, van der Wal R, Woodin SJ. 2010. Plant community properties predict vegetation resilience to herbivore disturbance in the Arctic. J Ecol 98: 1002-1013.

DOMINION DIAMOND

Information Request Number: DAR-YKDFN-IR-05

Source: Yellowknives Dene First Nation: Todd Slack

Subject: Air Quality

DAR Section(s): 7

Preamble (YKDFN):

Section 7.2.3.5 notes that Dioxins and Furans are assumed to be very low.

Request (YKDFN):

1) Please provide baseline values, current measured levels and predictions for the Jay application case, along with guidelines that the project intends to meet.

2) Similarly, please provide the baseline values found sediment and soils found in the surrounding environment, with current measured levels and predicted application levels. Please include the interim sediment quality guideline for comparison and a discussion on prevailing winds at site readers can understand the likely deposition.

3) Please provide a discussion on how the project will demonstrate compliance with national standards and what actions they will take should their monitoring show that they are not in compliance, with concise timelines.

Response:

1) The Base Case value for dioxins and furans emission rate is 2.312×10^{-8} tonnes per year (t/y) and is presented in Table 7.4-3 in Section 7.4.2 of the Developer's Assessment Report (DAR) for the Jay Project (Project). The Project is not expected to require waste incineration capacity additional to that currently in place for the Ekati Mine. Existing high efficiency waste incinerators that were commissioned at the Ekati Mine in 2012 will be used for the duration of the Project. Therefore, dioxin and furan emissions and the resulting ground-level concentrations are expected to remain unchanged between the Base Case and Application Case.

   The Ekati Mine uses modern incineration equipment that is designed to achieve dioxin and furan concentrations below the federal emission guideline (Dominion Diamond 2014a) and will continue this practice for the Project. Stack tests in 2013 done at the Ekati Mine incinerators passed the Canadian Council of Ministers of Environment Canada-Wide Standards (CCME CWS) for dioxins and furans, and mercury (Dominion Diamond 2014b).

2a) Baseline soil concentrations of dioxins and furans are provided in the Human and Wildlife Health Risk Assessment Report for the Jay Project, Appendix A (Baseline Data Collection and Results), Table A-3 (Polycyclic Aromatic Hydrocarbon, Total Organic Carbon, and Dioxin and Furan Concentrations in Soil). A summary of the baseline values for dioxins and furans in soil are presented in Table 5-1.

Table 5-1 Dioxin and Furan Concentrations in Soil

Parameter	14-DDR-12-S-01	14-DDR-14A-S-01	14-DDR-14B-S-01	14-DDR-19-S-01	14-DDR-23-S-01	14-DDR-24-S-01	14-DDR-24-S-02
Dioxins and Furans [ng/kg]							
2,3,7,8-TCDD	<0.019	<0.25	<0.072	<0.31	<0.056	<0.11	<0.029
1,2,3,7,8-PeCDD	<0.026	<0.22	<0.061	<0.21	<0.036	<0.048	<0.018
1,2,3,4,7,8-HxCDD	<0.024	<0.28	<0.052	<0.20	<0.023	<0.029	<0.023
1,2,3,6,7,8-HxCDD	<0.022	<0.27	<0.048	<0.18	<0.022	<0.027	<0.022
1,2,3,7,8,9-HxCDD	<0.023	<0.27	<0.050	<0.19	<0.022	<0.028	<0.022
1,2,3,4,6,7,8-HpCDD	0.031	1.50	<0.058	2.37	<0.048	0.130	0.070
OCDD	0.146	24.1	0.22	14.2	0.130	0.440	0.687
Total-TCDD	<0.019	<0.25	<0.072	<0.31	<0.056	<0.11	<0.029
Total-PeCDD	<0.026	<0.22	<0.061	0.32	<0.036	0.731	<0.018
Total-HxCDD	<0.024	<0.28	<0.052	<0.20	<0.023	0.056	<0.023
Total-HpCDD	0.054	1.73	<0.058	4.23	<0.048	<0.033	0.136
2,3,7,8-TCDF	<0.022	0.92	<0.069	<0.40	<0.040	<0.089	<0.032
1,2,3,7,8-PeCDF	<0.020	<0.21	<0.034	<0.14	<0.027	<0.055	<0.020
2,3,4,7,8-PeCDF	<0.018	<0.19	<0.029	<0.13	<0.025	<0.051	<0.018
1,2,3,4,7,8-HxCDF	<0.017	0.120	<0.036	<0.10	<0.020	<0.027	<0.013
1,2,3,6,7,8-HxCDF	<0.014	<0.080	<0.029	<0.084	<0.017	<0.022	<0.011
1,2,3,7,8,9-HxCDF	<0.027	0.32	<0.059	0.18	<0.040	<0.034	0.035
2,3,4,6,7,8-HxCDF	<0.017	<0.088	<0.036	<0.092	<0.021	<0.021	<0.013
1,2,3,4,6,7,8-HpCDF	<0.012	<0.39	<0.026	<0.19	<0.018	<0.037	<0.018
1,2,3,4,7,8,9-HpCDF	<0.022	<0.76	<0.048	0.72	<0.045	<0.063	<0.033
OCDF	<0.035	1.07	<0.060	<0.31	<0.050	<0.041	<0.036
Total-TCDF	0.434	2.08	<0.069	2.69	0.149	1.59	0.121
Total-PeCDF	0.274	<0.21	<0.034	2.67	0.381	1.14	0.333
Total-HxCDF	0.078	0.43	<0.059	0.55	0.068	0.163	0.082
Total-HpCDF	<0.022	<0.76	<0.048	<0.41	<0.045	<0.063	<0.033

Note: Concentrations are in dry weight

Predicted Application Case soil concentrations are modelled if there is expected to be a change in the deposition rates as a result of the Project. Deposition rates of dioxins and furans were not predicted to increase as a result of the Project, and therefore, Application Case soil concentrations were not modelled (Golder 2015).

2b) Baseline sediment concentrations of dioxins and furans are provided in response to DAR-MVEIRB-21 (adequacy review response submitted on 19 January 2015), and in the 2014 Water and Sediment Quality Supplemental Baseline Report (Dominion Diamond 2015). In all 2014 samples (Table 5-2), the mid-point toxic equivalency (TEQ) values ranged from 0.140 to 0.610 picogram per gram (pg/g) (median = 0.315 pg/g), remaining below the interim sediment quality guideline of 0.850 pg/g (CCME 2001). Deposition rates of dioxins and furans were not predicted to increase as a result of the Project.

Table 5-2a Dioxin and Furan Concentrations in Sediment

Lake		Guidelines		Lac du Sauvage						Lac de Gras			
Station	Unit	ISQG (I)	PEL (P)	Aa-1	Ab-1	Ac-1	Ad-1	Ae-1	Af-1	S3	S5	FF2-2	FF2-5
Mid Point Toxic Equivalency (PCDD/F)	pg/g	0.85	21.5	0.283	0.296	0.610	0.180	0.246	0.236	0.356	0.448	0.140	0.178

Table 5-2a Dioxin and Furan Concentrations in Sediment, concluded

Lake	Unit	Guidelines		Counts Lake	Lake C1	Christine Lake	Lake P5
		ISQG (I)	PEL (P)				
Mid Point Toxic Equivalency (PCDD/F)	pg/g	0.85	21.5	0.513	0.432	0.524	0.333

Note:
(I) = concentration higher than the Interim Sediment Quality Guideline.
(P) = concentration higher than the Probable Effects Level.
Canadian Council of Ministers of the Environment Sediment Quality Guideline (CCME 2001); ISQG = Interim Sediment Quality Guideline; PEL = Probable Effect Level; pg/g = picograms per gram; PCDD/F = polychlorinated dibenzodioxins and polychlorinated dibenzofurans.

3) It is Dominion Diamond's intention to amend the existing Ekati Mine Air Quality Management and Monitoring Program (AQMMP) to address monitoring and mitigation of air quality for the Jay Project. The AQMMP at the Ekati Mine is a requirement under Section VII of the Environmental Agreement. Summary results of the AQMMP are reported each year in the Annual Environmental Agreement and Water Licence Report. Every three years an extended sampling program is completed and a separate AQMMP report is prepared that presents monitoring results in more detail. Results from the AQMMP to date suggest that mitigation and environmental design features implemented at the Ekati Mine are currently effective at limiting changes to air quality. If results from the AQMMP detect effects that represent a significant risk to the receiving environment adaptive management will be implemented. Adaptive management may include increased monitoring, changes in monitoring plans, additional mitigation, or improvements to environmental design features.

   Detailed changes to the AQMMP for the Project will be developed during the regulatory permitting phase of the Project. The Government of Northwest Territories, Environment Canada, aboriginal communities and other organizations will be engaged during the amendment of the AQMMP.

References:

CCME (Canadian Council of Ministers of the Environment). 2001. Canadian Sediment Quality Guidelines for the Protection of Aquatic Life: Polychlorinated Dibenzo-p-dioxins and Polychlorinated Dibenzofurans (PCDD/Fs). In: Canadian Environmental Quality Guidelines, 1999, Canadian Council of Ministers of the Environment, Winnipeg, MB, Canada.

Dominion Diamond. 2014a. Ekati Mine Waste Management Plan, January 2014. Available at: http://www.mvlwb.ca/Boards/WLWB/Registry/2012/W2012L2-0001/W2012L2-0001 - Ekati - Waste Management Plan – Version 1.0 – Jan 30_14.pdf. Accessed: September 1, 2014.

Dominion Diamond. 2014b. Ekati Incinerator Stack Emissions Test Results, March 2014. Available at: http://www.mvlwb.ca/Boards/WLWB/Registry/2012/W2012L2-0001/W2012L2-0001 - Ekati - Incinerator Stack Emissions Test Results – Mar 30_14.pdf. Accessed: September 1, 2014.

Dominion Diamond (Dominion Diamond Ekati Corporation). 2015. 2014 Water and Sediment Quality Supplemental Baseline Report for the Jay Project. Prepared by Golder Associates Ltd., April 2015. Yellowknife, NWT, Canada.

Golder (Golder Associates Ltd.). 2015. Jay Project Air Quality Assessment Update, Golder Technical Memorandum, January 19, 2015.

DOMINION DIAMOND

Information Request Number:	DAR-YKDFN-IR-07
Source:	Yellowknives Dene First Nation: Todd Slack
Subject:	Socio-Ec
DAR Section(s):	14

Preamble (YKDFN):

The National Household Survey is data of variable and uncertain reliability, with many jurisdictions, businesses and agencies choosing not to use the dataset. Though this is acknowledged within the text, there is no discussion or evidence why the data from Yellowknife should be considered reliable when so many other authoritative sources (ex. City of Toronto) have rejected it. Given the barriers associated with collecting data in the NWT it seems unlikely that the data is appropriate for impact predictions here when it's being rejected in less onerous urban settings.

Request (YKDFN):

1) Please provide a discussion why the parties should accept and rely on the data that is used for the analysis. As part of this discussion, please provide relevant facts surrounding NWT and small community response rates.

2) Provide an analysis on the historic response rates for the Household Survey and the long form census in Yellowknife and across the North.

3) Please provide any other data (including that collected by NWT Statistics) or analysis which suggests that the National Household Survey is considered representative.

Response:

1) The Developer's Assessment Report (DAR) acknowledges the limitation in publicly available data for the discussion of socio-economic baseline conditions. In the interest of presenting data that are comparable by topic area, the DAR attempts to use data sets that are complete for the topic area (e.g., federal and territorial census, household surveys). The territorial and federal censuses used in the description of baseline socio-economic conditions are not conducted on an annual basis. At the time of writing the DAR, the most recent publicly available census demographic, economic, and employment information was sourced from either the 2011 Statistics Canada Community Profiles and National Household Survey, or the 2012 Government of the Northwest Territories Census. As a result, data in the socio-economic baseline (against which the Project effects are assessed) are not presented for the year of writing (i.e., 2013/2014), but rather for the most recent year in which publicly available census information exists.

   While there is some limitation in the availability of public information contemporary to the date of writing the DAR, this does not necessarily imply a compromise of the integrity of the socio-economic assessment. While there have been meaningful changes in the territorial economy, population, and labour force over the period of 1998-2014, these changes have not, on an annual basis, been rapid or

extreme. Rather, overall trends such as urbanization, economic growth, and population change have occurred gradually, and with discernable trends, as described in the socio-economic baseline. Therefore, it is deemed reasonable to use information on these topics from 2011/2012 as a proxy for baseline (i.e., 2013/2014) conditions, with additional consideration given to how past socio-economic trends in these areas will influence conditions in 2013/2014. It should be noted that the baseline year is a snapshot of conditions at the time of writing.

Regarding response rates: The global non-response rate (GNR) for Statistic Canada's 2011 National Household Survey (NHS) is used as an indicator of data quality. The GNR combines complete non-response (household) and partial non-response (question) into a single rate. A lower GNR indicates a lower risk of non-response bias (Statistics Canada 2013a). Non-response contributes to an increase in the total variance of estimates as the sample size observed is reduced from that originally sought (Statistics Canada 2015a). In addition, non-response introduces a bias in estimates as non-respondents may have different characteristics than respondents.

To mitigate this, Statistics Canada conducted a non-response follow-up to maximize the survey's response rate by contacting a subsample of those who had not yet responded to the NHS (Statistics Canada 2013b). After taking the subsample into account, Statistics Canada then weighted the response to accurately represent the NHS's target population by calculating sampling weights, adjusting the weights for the survey's total non-response and calibrating the weights against census totals.

2) Table 7-1 lists Statistics Canada's Global Non-Response Rates for the socio-economic local study area (LSA) communities in the 2001 and 2006 Census of Population and the 2011 NHS.

Table 7-1 Statistics Canada Global Non-Response Rates for Socio-Economic Local Study Area Communities, 2001, 2006, 2011

Community	2001 Census of Population		2006 Census of Population		2011 National Household Survey
	A	B	A	B	
Behchokǫ̀	≥5%, but <10%	≥5%, but <10%	<5%	≥5%, but <10%	22.1
Dettah	<5%	<5%	≥10%, but <25%	≥5%, but <10%	8.3
Fort Resolution	<5%	<5%	<5%	<5%	17.9
Gamètì	≥5%, but <10%	<5%	≥5%, but <10%	≥10%, but <25%	23.3
Lutsel K'e	<5%	≥5%, but <10%	≥5%, but <10%	≥10%, but <25%	22.9
N'Dilo	n/a	n/a	n/a	n/a	n/a
Wekweètì	<5%	≥5%, but <10%	≥5%, but <10%	≥5%, but <10%	15.1
Whatì	<5%	<5%	≥5%, but <10%	≥5%, but <10%	33.5
Yellowknife	<5%	<5%	≥5%, but <10%	≥5%, but <10%	14.7
Kugluktuk	<5%	<5%	<5%	<5%	37.5
Bathurst Inlet	n/a[(a)]	n/a*	n/a*	n/a*	n/a*
Umingmaktok	n/a*	n/a*	n/a*	n/a*	n/a*
Northwest Territories	<5%	<5%	<5%	<5%	16.1

Source: Statistics Canada (2013c-l; 2015b).

a) These communities do not have permanent population of large enough size to sample confidentially.

A = short census questionnaire (100% data).

B = long census questionnaire (20% data).

3) As noted in the response to point 1, there is some limitation in the publicly available data used in the socio-economic baseline. Different sources may present data differently. In some cases, differences in census data can be attributed to different rounding practices by the enumerating authority in question. Where there are differences in the data reported, the socio-economic baseline reports data for linked topics based on the most complete source, in the interest of maintaining constant, comparable data sets. For the reference of the reviewer, a breakdown of where different data sets have been used has been provided below.

   Table 7-2 is a listing of every section and topic where data from the NHS was used in Section 14 of the DAR.

Table 7-2 Instances of National Household Survey Used in the Socio-Economic Assessment

Use of 2011 National Household Survey in Socio-Economic Assessment	
Section	**Topic**
14.1.2.4.1	2011 Population of Socio-Economic Local Study Area (LSA) Communities
14.2.1.2[(a)]	Demographics – Population breakdown of LSA Community Populations in 2011
14.5.1.1	Educational attainment of people over the age of 15 in NWT and LSA communities

a) Topic also included reference to 2011 National Household Survey Aboriginal Population Profile.

Table 7-3 provides an example of how data on the same topic, for the same year, can vary between sources, showing a comparison of population data collected from the 2011 NHS and data from the Northwest Territories Bureau of Statistics and the Nunavut Bureau of Statistics.

Table 7-3 2011 Population of Socio-Economic Local Study Areas

Community	National Household Survey	Bureau of Statistic Data
Behchokǫ̀	1,915	2,021
Dettah	210	216
Fort Resolution	470	488
Gamètì	250	263
Lutsel K'e	280	306
N'Dilo	n/a	n/a
Wekweètì	140	145
Whatì	490	490
Yellowknife	18,830	20,037
Kugluktuk	1,440	1,552
Bathurst Inlet	n/a	n/a
Umingmaktok	n/a	n/a
Northwest Territories	40,800	43,501

Source: NWTBS (2014a); Nunavut Bureau of Statistics (2014).

Note: Data from the National Household Survey have been updated since the publication of the DAR, but does not represent a substantial change from conditions reported in the DAR.

n/a: Data not available for Umingmaktok or Bathurst Inlet, given that these communities are seasonally populated by a small number of individuals.

Table 7-4 is a comparison of population data by Aboriginal identity collected from the 2011 NHS and data from the Northwest Territories Bureau of Statistics and the Nunavut Bureau of Statistics. Comparable data for educational attainment of people over the age of 15 in the NWT and LSA communities were not available. Data at the community level from the Northwest Territories Bureau of Statistics (NWTBS) and the Nunavut Bureau of Statistics are not disaggregated to the specific categories that are measured by the NHS (i.e., attainment of trade or apprenticeship certificate or diploma, non-university certificate/diploma).

Table 7-4 Local Study Area Community Population, 2011

Community	Total		Aboriginal				Non-Aboriginal			
			#	#	%	%	#	#	%	%
	National Household Survey	NWT Bureau of Statistics	National Household Survey	NWT Bureau of Statistics	National Household Survey	NWT Bureau of Statistics	National Household Survey	NWT Bureau of Statistics	National Household Survey	NWT Bureau of Statistics
Behchokǫ̀	1,915	2,021	1,795	1,903	93.7	94.2	120	118	6.3	5.8
Dettah	210	216	205	216	97.6	100.0	5	x	2.4	n/a
Fort Resolution	470	488	425	446	90.4	91.4	45	42	9.6	8.6
Gamètì	250	263	240	254	96.0	96.6	10	x	4	n/a
Lutsel K'e	280	306	240	280	85.7	91.5	40	26	14.3	8.5
Wekweètì	140	145	130	140	92.9	96.6	10	x	7.1	n/a
Whatì	490	490	455	468	92.9	95.5	35	22	7.1	4.5
Yellowknife	18,830	20,037	4,780	4,907	25.4	24.5	14,050	15,130	74.6	75.5
Kugluktuk[(A)]	1,440	1,535	1,315	1,344	91.3	87.6	125	191	8.7	12.4
Northwest Territories	40,800	43,501	21,155	22,259	51.9	51.2	19,645	21,242	48.1	48.8

Note: Data from the National Household Survey has been updated since the publication of the DAR.

x - The following information is suppressed, but is included in the NWT total:

a) Communities with a population of 50 or less.

b) Unorganized areas.

c) Cells with values of 10 or less.

d) Details for communities with less than 100 persons.

A) Data for Kugluktuk are sourced from the Nunavut Bureau of Statistics.

Source: Developer's Assessment Report, Section 14); NWTBS (2014b); Nunavut Bureau of Statistics (2014).

References:

Dominion Diamond Corporation. 2014. Developer's Assessment Report Jay Project. Section 14, Maximizing Benefits and Minimizing Impacts to Communities.

Northwest Territories Bureau of Statistics (NWTBS). 2014a. Community Totals, 2001-2014. Available at: http://www.statsnwt.ca/population/population-estimates/. Accessed March 11, 2015.

NWTBS. 2014b. Community Population by Ethnicity, 2001-2014. Available at: http://www.statsnwt.ca/population/population-estimates/. Accessed March 11, 2015.

Nunavut Bureau of Statistics. 2014. Nunavut Population Estimates by Region and Community, 2006 to 2014

Statistics Canada. 2013a. NHS Profile, 2011 – Global non-response rate (GNR). Available at: http://www12.statcan.gc.ca/nhs-enm/2011/dp-pd/prof/help-aide/gnr-tgn.cfm?Lang=E. Accessed March 12, 2015.

Statistics Canada. 2013b. NHS User Guide – National Household Survey, 2011. Available at: http://www12.statcan.gc.ca/nhs-enm/2011/ref/nhs-enm_guide/99-001-x2011001-eng.pdf. Accessed March 12, 2015.

Statistics Canada. 2013c. Behchokò, CG, Northwest Territories (Code 6103031) (table).National Household Survey (NHS) Profile. 2011 National Household Survey. Statistics Canada Catalogue no. 99-004-XWE. Ottawa. Released September 11, 2013. https://www12.statcan.gc.ca/nhs-enm/2011/dp-pd/prof/details/page.cfm?Lang=E&Geo1=CSD&Code1=6103031&Data=Count&SearchText=behchoko&SearchType=Begins&SearchPR=01&A1=All&B1=All&Custom=&TABID=1 (accessed March 12, 2015).

Statistics Canada. 2013d. Detah, SET, Northwest Territories (Code 6106021) (table). National Household Survey (NHS) Profile. 2011 National Household Survey. Statistics Canada Catalogue no. 99-004-XWE. Ottawa. Released September 11, 2013. https://www12.statcan.gc.ca/nhs-enm/2011/dp-pd/prof/details/page.cfm?Lang=E&Geo1=CSD&Code1=6106021&Data=Count&SearchText=detah&SearchType=Begins&SearchPR=01&A1=All&B1=All&Custom=&TABID=1 (accessed March 12, 2015).

Statistics Canada. 2013e. Fort Resolution, HAM, Northwest Territories (Code 6105018) (table).National Household Survey (NHS) Profile. 2011 National Household Survey. Statistics Canada Catalogue no. 99-004-XWE. Ottawa. Released September 11, 2013. https://www12.statcan.gc.ca/nhs-enm/2011/dp-pd/prof/details/page.cfm?Lang=E&Geo1=CSD&Code1=6105018&Data=Count&SearchText=fort%20resolution&SearchType=Begins&SearchPR=01&A1=All&B1=All&Custom=&TABID=1 (accessed March 12, 2015).

Statistics Canada. 2013f. Gamètì, CG, Northwest Territories (Code 6103049) (table). National Household Survey (NHS) Profile. 2011 National Household Survey. Statistics Canada Catalogue no. 99-004-XWE. Ottawa. Released September 11, 2013. https://www12.statcan.gc.ca/nhs-enm/2011/dp-pd/prof/details/page.cfm?Lang=E&Geo1=CSD&Code1=6103049&Data=Count&SearchText=gameti&SearchType=Begins&SearchPR=01&A1=All&B1=All&Custom=&TABID=1 (accessed March 12, 2015).

Statistics Canada. 2013g. Lutselk'e, SET, Northwest Territories (Code 6105020) (table).National Household Survey (NHS) Profile. 2011 National Household Survey. Statistics Canada Catalogue no. 99-004-XWE. Ottawa. Released September 11, 2013. https://www12.statcan.gc.ca/nhs-enm/2011/dp-pd/prof/details/page.cfm?Lang=E&Geo1=CSD&Code1=6105020&Data=Count&SearchText=lutselk%27e&SearchType=Begins&SearchPR=01&A1=All&B1=All&Custom=&TABID=1 (accessed March 12, 2015).

Statistics Canada. 2013h. Wekweètì, CG, Northwest Territories (Code 6103052) (table).National Household Survey (NHS) Profile. 2011 National Household Survey. Statistics Canada Catalogue no. 99-004-XWE. Ottawa. Released September 11, 2013. https://www12.statcan.gc.ca/nhs-enm/2011/dp-pd/prof/details/page.cfm?Lang=E&Geo1=CSD&Code1=6103052&Data=Count&SearchText=wekweeti&SearchType=Begins&SearchPR=01&A1=All&B1=All&Custom=&TABID=1 (accessed March 12, 2015).

Statistics Canada. 2013i. Whatì, CG, Northwest Territories (Code 6103034) (table). National Household Survey (NHS) Profile. 2011 National Household Survey. Statistics Canada Catalogue no. 99-004-XWE. Ottawa. Released September 11, 2013. https://www12.statcan.gc.ca/nhs-enm/2011/dp-pd/prof/details/page.cfm?Lang=E&Geo1=CSD&Code1=6103034&Data=Count&SearchText=whati&SearchType=Begins&SearchPR=01&A1=All&B1=All&Custom=&TABID=1 (accessed March 12, 2015).

Statistics Canada. 2013j. Yellowknife, CY, Northwest Territories (Code 6106023) (table).National Household Survey (NHS) Profile. 2011 National Household Survey. Statistics Canada Catalogue no. 99-004-XWE. Ottawa. Released September 11, 2013. https://www12.statcan.gc.ca/nhs-enm/2011/dp-pd/prof/details/page.cfm?Lang=E&Geo1=CSD&Code1=6106023&Data=Count&SearchText=yellowknife&SearchType=Begins&SearchPR=01&A1=All&B1=All&Custom=&TABID=1 (accessed March 11, 2015).

Statistics Canada. 2013k. Kugluktuk, HAM, Nunavut (Code 6208059) (table). National Household Survey (NHS) Profile. 2011 National Household Survey. Statistics Canada Catalogue no. 99-004-XWE. Ottawa. Released September 11, 2013. https://www12.statcan.gc.ca/nhs-enm/2011/dp-pd/prof/details/page.cfm?Lang=E&Geo1=CSD&Code1=6208059&Data=Count&SearchText=kugluktuk&SearchType=Begins&SearchPR=01&A1=All&B1=All&Custom=&TABID=1 (accessed March 12, 2015).

Statistics Canada. 2013l. Northwest Territories (Code 61) (table). National Household Survey (NHS) Profile. 2011 National Household Survey. Statistics Canada Catalogue no. 99-004-XWE. Ottawa. Released September 11, 2013. https://www12.statcan.gc.ca/nhs-enm/2011/dp-pd/prof/details/page.cfm?Lang=E&Geo1=PR&Code1=61&Data=Count&SearchText=northwest%20territories&SearchType=Begins&SearchPR=01&A1=All&B1=All&Custom=&TABID=1 (accessed March 12, 2015).

Statistics Canada. 2015a. Sampling and Weighting Technical Report, National Household Survey, 2011. Available at: http://www12.statcan.gc.ca/nhs-enm/2011/ref/reports-rapports/sw-ep/99-002-x2011001-eng.pdf. Accessed March 13, 2015.

Statistics Canada. 2015b. Sophia Nicole Ir. Statistics Canada Information Officer. Ottawa, Canada. E-mail. March 13-17.

DOMINION DIAMOND

Information Request Number: DAR-YKDFN-IR-08

Source: Yellowknives Dene First Nation: Todd Slack

Subject: Socio-Ec

DAR Section(s): 14

Preamble (YKDFN):

The project presents the hiring and contracting targets, but does not provide any indication of the company's success in meeting those targets (Section 14.4.4.1.1 notes that northern participation at the mine was 47% - when the commitment to be met was 60%).

Request (YKDFN):

1) Please provide a chart that indicates the projects rate of northern and aboriginal hiring since it opened.

2) Please provide a chart that indicates the project's success at meeting its contracting targets.

3) For each year that the project did not achieve the desired hiring target please provide a discussion of:

    a. The consequences and penalties incurred as a result of the company failure

    b. The additional actions that the company undertook to come into compliance with the promises that they made to the residents of the NWT.

4) For each year that the project did not achieve the desired contracting target please provide a discussion of:

    a. The consequences and penalties incurred as a result of the company failure

    b. The additional actions that the company undertook to come into compliance with the promises that they made to the residents of the NWT.

5) For this project, please provide a discussion of the company's commitment to meeting their hiring and contracting targets. As part of this discussion, please provide the contingencies and triggers for those contingences, should the company fall short of their commitment. Lastly, please explain what mechanisms of enforcement there are to ensure that promises of community benefits will be delivered by this project.

Response:

Questions 1), 2):

The Socio-Economic Agreement (SEA) for the Ekati Mine sets the following targets for the operations phase of the mine (Mining North 1996):

- Northern employment will be 62 percent (%) of total employment associated with the operations phase of the Project, including Contractor employment, at production below 18,000 tonnes per day (tpd).
- Aboriginal employment will equal to at least 50% of the Northern Resident employment (implying that, at minimum, 31% of the total workforce should be Aboriginal).

One challenge in the Ekati Mine reaching its targets has been that, while the proponent (i.e., BHP Billiton 1999-2012; Dominion Diamond 2013 onward) may internally meet their hiring targets in terms of direct employment of Northerners and Northern Aboriginals, it may be difficult for contractors to achieve the same results. Where no competitive Northern contractor is available to meet specialized service requirements of a mine, the proponent must, necessarily, source from southern-based firms. While a mine, given its longevity in one region and consistent demand for labour, is able to hire locally, and developing the local labour force through training and employment initiatives, southern-based contractors may not be in a position to improve the capacity of northerners. This scenario has been the case for the Ekati Mine.

Table 8-1 provides a breakdown of direct and contractor employment at the Ekati Mine, by year and hiring priority, from 1999 to 2013. The Ekati Mine met the employment targets set in the SEA regarding Northern Employment (i.e., 62%) in 1999, 2000, 2001, and 2004, and the targets regarding Aboriginal employment (i.e., 31%) in 1999, 2000, 2004, 2005, 2006, and 2007.

In years where a SEA target was met (either in the context of direct employment, contracting, or total employment), the cell in Table 8-1 has been highlighted in green. This is only applicable to the rows depicting total Aboriginal and Northern employment. While the 2014 SEA report for the Ekati Mine is not yet available, early evaluation of the mine's SEA performance indicates that targets for the direct hire of Northern and Aboriginal employment have been achieved.

Dominion Diamond is committed to increasing the number of Northerners and Northern Aboriginals employees at the Ekati Mine and to work to meet the targets in the SEA. For example, the company is in the process of reviewing its contracts as they expire, and will work with incumbent and future contractors, including Northern contractors, to create incentives to increase the overall Northern workforce percentages. Measures to enhance Northern training and employment moving forward, and to support Dominion Diamond in their effort to continue to meet the SEA targets, are described further in the Socio-Economic Supplemental Report to Adequacy Review Items 11.1 to 11.5 (Dominion Diamond 2015).

Table 8-1 Employment by Priority, Person Years, 1999 to 2013

Employment[a] By Priority (Person Years)		1999	2000	2001	2002	2003	2004	2005	2006			2007			2008			2009			2010			2011[b]			2012			2013		
		Total	Total	Total	Total	Total	Total	Total	Direct	Contractor	Total	Direct	Contractor	Total	Direct	Contractor	Total	Direct	Contractor	Total	Direct	Contractor	Total	Direct	Contractor	Total	Direct	Contractor	Total	Direct	Contractor	Total
Aboriginal	#	235	312	357	401	399	410	429	222	115	336	250	168	418	287	121	408	255	156	411	240	86	326	243	74	317	267	117	384	272	105	377
	%	33	32	30	28	28	34	32	35	29	33	39	31	35	33	21	28	32	23	28	31	19	27	30	18	26	32	22	28	34	20	28
Other Northern	#	259	299	366	419	427	381	392	228	52	279	183	103	286	235	69	304	240	122	362	240	104	344	233	99	333	225	106	331	183	111	294
	%	37	31	31	30	30	32	29	36	13	27	28	19	24	27	12	21	30	18	25	31	23	51	29	24	27	27	20	24	23	21	22
Total Northern	#	**495**	**611**	**723**	**820**	**826**	**791**	**821**	**449**	**166**	**615**	**433**	**271**	**704**	**522**	**190**	**712**	**495**	**278**	**773**	**480**	**190**	**670**	**476**	**174**	**650**	**492**	**223**	**715**	**455**	**216**	**671**
	%	**70**	**64**	**62**	**58**	**58**	**65**	**61**	**71**	**42**	**60**	**67**	**50**	**59**	**60**	**33**	**49**	**63**	**42**	**53**	**62**	**41**	**54**	**59**	**42**	**54**	**58**	**43**	**52**	**57**	**41**	**50**
Other	#	214	350	452	592	598	419	517	188	231	418	215	274	489	345	385	730	293	391	684	292	267	559	325	238	563	353	299	652	348	317	665
	%	30	36	39	42	42	35	39	29	58	40	33	50	41	40	67	51	37	58	47	38	59	46	41	58	46	42	57	48	43	59	50
Total	#	709	961	1,174	1,412	1,424	1,209	1,337	637	397	1,034	648	545	1,193	867	575	1,442	788	669	1,457	772	457	1,229	801	412	1,213	845	522	1,367	803	533	1,336
	%	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100

Source: BHP Billiton (2006 to 2011); Dominion Diamond Corporation (2012, 2013).
Note: Some historical totals may vary slightly from those reported in the most recent socio-economic agreement report (2013) given changes to the reporting procedure. Totals are reflective of those reported in the Developer's Assessment Report.
Some percent totals may not add to 100% due to rounding.
Cells highlighted in green are years where a SEA target was met (either in the context of direct employment, contracting, or total employment).
a) Operations non-capital employment.
b) Totals for the 2011 year have been adjusted since the date of original publication. For the purposes of this Information Request, the original numbers have been presented in order to show the breakdown of direct and contractor employment.
% - percent; # = number.

Procurement

The Ekati Mine SEA sets a procurement target of 28% North purchase of goods and services during construction and 70% during operations. Table 8-2 provides a breakdown of procurement by priority group at the Ekati Mine.

Table 8-2 Procurement by Priority Group, 1999 to 2013

	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Aboriginal	51	67	106	123	124	121	133	123	125	98	72	71	75	108	88
Northern	229	103	222	231	232	201	242	203	265	180	106	101	122	157	157
Subtotal	280	260	328	354	356	322	375	326	390	278	178	172	197	265	245
Other	76	56	58	60	61	91	100	92	90	58	90	113	130	134	149
Total	356	316	386	414	417	413	475	518	480	336	268	285	327	399	394
Percentage															
Aboriginal	14%	21%	27%	30%	30%	29%	28%	29%	26%	29%	27%	25	23%	27%	22%
Northern	64%	61%	58%	56%	56%	49%	51%	49%	55%	54%	40%	35%	37%	39%	40%
Total Northern	79%	82%	85%	86%	85%	78%	79%	78%	81%	83%	66%	60%	60%	66%	62%

In the event that a good or service is not offered by Northern businesses, Dominion Diamond must, out of necessity, procure from other sources. To describe this in greater detail, additional analysis of Dominion Diamond's 2013 procurement data has been summarized into Table 8-3, which shows procurement by major category, and the portion of each category procured from Northern sources. Data for 2014 procurement have not yet been aggregated, but will be available at a later date in the Ekati Mine annual SEA report.

Table 8-3 Procurement by Category and Source, 2013

Procurement Category	Expenditure	Northern Expenditure	Percent Northern
Fuels and Lubricants	$83,100,455	$2,187,768	**2.6%**
Earth Moving Equipment	$73,641,692	$70,277,947	**95.4%**
Freight, Cargo and Mail Transport	$50,012,990	$49,746,529	**99.5%**
Mine drilling and blasting services	$34,725,690	$34,724,964	**100.0%**
Vehicle Repair and Maintenance	$17,212,810	$17,212,810	**100.0%**
Personal and Domestic Services	$14,441,241	$14,441,241	**100.0%**
Passenger Transport	$13,125,902	$8,764,996	**66.8%**
Feeding, Crushing & Support Equipment	$9,806,851	$0	**0.0%**
Building Construction and Maintenance	$9,762,839	$7,764,062	**79.5%**
Environmental Services	$7,300,229	$3,005,934	**41.2%**
Computer, Data & IT Support Services	$6,977,389	$124,666	**1.8%**

Table 8-3 Procurement by Category and Source, 2013

Procurement Category	Expenditure	Northern Expenditure	Percent Northern
Professional Engineering Services	$6,950,534	$2,973,134	42.8%
Chemicals and Additives	$5,549,359	$3,943	0.1%
Human Resources Services	$4,938,625	$4,000,321	81.0%
Hardware	$4,238,295	$4,068,673	96.0%
Community and social services	$4,216,595	$3,955,724	93.8%
Vehicle Components & Parts (excluding Tyres)	$4,128,100	$3,694,749	89.5%
Earth Moving Tyres	$3,826,828	$1,100,643	28.8%
Financial & Insurance Services	$3,734,777	$0	0.0%
Pumps, Compressors and Filters	$3,378,499	$2,221,724	65.8%
Electrical Equipment and Components	$2,995,891	$1,104,422	36.9%
Castings, Moldings, Extrusions	$2,724,489	$0	0.0%
Data & IT Support	$2,550,147	$0	0.0%
Security & Safety Equipment	$2,032,457	$1,653,776	81.4%
Telecommunication and Information Services	$1,971,346	$1,725,572	87.5%
Buildings, Structures and Support Bases	$1,871,712	$0	0.0%
Bearings and gears	$1,834,942	$1,834,942	100.0%
Underground Mining Equipment	$1,827,890	$1,738,561	95.1%
Accommodation and Meeting Facilities	$1,822,940	$1,785,330	97.9%
Production and Project Management services	$1,518,825	$0	0.0%
Healthcare Services	$1,256,660	$303,170	24.1%
Pipes, Valves and Fittings	$1,078,340	$538,975	50.0%
HVAC, Boilers and Accessories	$842,980	$390,604	46.3%
IT Equipment and Accessories	$721,918	$0	0.0%
Customs, Taxation and Regulatory	$717,386	$433,318	60.4%
Non-mining Machinery Repair services	$691,245	$348,114	50.4%
Training and Education Services	$648,080	$118,009	18.2%
Printing, Translation and Photographic Services	$534,732	$142,059	26.6%
Laboratory, Measuring and Testing Equipment	$496,666	$0	0.0%
Temporary personnel services	$494,112	$127,575	25.8%
Marketing, Advertising and Promotion	$435,858	$385,869	88.5%
Construction Materials	$223,974	$197,981	88.4%
Mining Machinery Repair services	$190,867	$11,357	6.0%
Vehicle and Machinery Rental Services	$179,757	$179,757	100.0%
Domestic Appliances and Consumer Products	$175,678	$124,891	71.1%
Hand and speciality tools	$175,318	$0	0.0%
Utilities	$167,204	$167,204	100.0%
Material handling machinery and equipment	$153,246	$0	0.0%

Table 8-3 Procurement by Category and Source, 2013

Procurement Category	Expenditure	Northern Expenditure	Percent Northern
Elements and Gases	$147,295	$27,932	**19.0%**
Fabrication services	$141,389	$0	**0.0%**
Industrial Processing Machinery	$131,805	$0	**0.0%**
Medical Equipment and Accessories and Supplies	$119,164	$110,913	**93.1%**
Legal Services	$117,904	$51,513	**43.7%**
Geology and field data processing services	$82,531	$0	**0.0%**
Cleaning Services	$70,943	$63,813	**90.0%**
Office Supplies	$67,884	$62,072	**91.4%**
Management Advisory Services	$67,637	$0	**0.0%**
Memberships & Associations	$45,952	$20,952	**45.6%**
Security & Safety Services	$29,183	$27,888	**95.6%**
Cleaning Equipment and Supplies	$2,620	$2,620	**100.0%**

% : 50% or more procured in the North.
% : 25% to 49.9% procured in the North.
% : 0.1% to 24.9% procured in the North.
% : 0.0% procured in the North.

Source: Developer's Assessment Report, Section 14.

Note: This table excludes other uncategorized procurement expenditures. The value of uncategorized procurement expenditures is small relative to the values presented in this table, and so do not represent a substantial expenditure.

In 2013, the majority of the top expenditure categories at the Ekati Mine were accrued to the North. Earth moving equipment, drilling, blasting, vehicle repair, and domestic services are largely procured from the North, with 80% to 100% of procurement being accrued to Northern businesses. Other services (e.g., transportation, marketing, accommodations, human resources, communications, and social services), construction materials and labour, hardware, and select equipment (e.g., bearings, safety equipment, plumbing supplies, vehicle parts) are also procured predominantly from Northern sources (Table 8-3). Overall, in most areas where goods and services can be procured in the North, Dominion Diamond exceeds the procurement targets outlined in the SEA.

In 2009, Dominion Diamond began reporting its fuel purchase as a southern expenditure because it is purchased from the Strathcona refinery in Alberta. This change in reporting led to a significant change in performance against targets, despite no actual change to business practices, as the purchase of fuels and lubricants is the single largest procurement expenditure at the mine.

In areas where the majority of the demand for goods and services cannot be procured from Northern sources, Dominion Diamond is not able to meet the SEA procurement targets. Specialized equipment, tools and machinery, most fuel needs, and select technical services (e.g., lab testing, finance and insurance services, large-scale information technology (IT) and data support) are currently not procured from Northern sources. Goods and services associated with the fabrication and maintenance of specialized equipment, tools and machinery are, similarly, procured outside the North (Table 8-3).

This is to be expected, given the lack of large-scale manufacturing and fuel supply industries in the North. While some technical services (e.g., training, engineering, environmental, and legal services), are available in the North, given the small size of the labour force (i.e., 23,300[1] [GNWT Bureau of Statistics 2015]), the capacity of Northern suppliers may not be sufficient to meet the needs of a large mining operation, thereby necessitating the use of non-Northern service providers to some extent.

Questions 3a) and 4a)

The SEA for the Ekati Mine does not include any explicit "consequences and penalties incurred as a result of the company failure". Dominion Diamond, however, recognizes the importance of maintaining their social licence to operate in the region, and actively strives to hire, contact, and procure from Northerners and Northern Aboriginals. As noted below in the response to questions 3b) and 4b), Dominion Diamond is committed to working with communities to identify barriers to employment, and adaptively manages their hiring and employment procedures in an effort to maximize Northern employment.

Question 3b)

Dominion Diamond is committed to hiring Northern wherever possible. There are, however, barriers to Northerners and Northern Aboriginals obtaining employment. In an effort to address these barriers, and to meet their SEA hiring targets, Dominion Diamond first identifies issues, and then adapts hiring policies and employment procedures.

Dominion Diamond has collaborated with communities and undertaken various activities to identify barriers to employment and social issues in communities. Table 8-4 lists these activities, and provides a description of how issues are identified, and addressed.

Table 8-4 Issue Identification Activities

Issue Identification Activity	Description
Impact Benefit Agreement (IBA) meetings	IBA meetings are held annually with the North Slave Métis Alliance and the Kitikmeot Inuit Association. Bi-annual IBA meetings are held with the Tłı̨chǫ and Akaitcho. Dominion Diamond presents employment, training, and business spend statistics, by IBA group, and provides an overview of the community development investments (i.e., donations) provided since the last meeting. This meeting is a forum for the IBA groups to bring forward any concerns or issues they may have concerning the implementation of those agreements.
Jay Project engagement	Jay Project engagement sessions are held on a quarterly basis and involve Community Development staff, community leadership, and in some cases, the communities as a whole. Issues and concerns raised are recorded, and brought to the attention of the appropriate department (e.g., Human Resources, procurement).
Leadership meetings at site with their membership	The Tłı̨chǫ and Akaitcho have held private meetings at the Ekati Mine site between their leadership and their membership employed at the mine. This is an opportunity for their members to raise issues or concerns they may have about their employment experience at Ekati Mine with their leadership directly. The leadership then convey these concerns to Dominion Diamond for follow up.
Site visits	IBA groups are invited to site for tours of various parts of the Ekati Mine. This is an opportunity for Aboriginal groups to learn about the mine and to bring forward issues or concerns they may have.

[1] The majority of those in the labour force are not employed in positions associated with direct contracting of goods and services related to mining.

Table 8-4 Issue Identification Activities

Issue Identification Activity	Description
Liaison position	Dominion Diamond and an IBA group have partnered to establish pilot project liaison positions to provide pre-employment assistance. This position will assist with resumes, the online application system, posting job opportunities, mock interviews, and will provide advice on successfully completing the drug tests and criminal record checks required for employment at Ekati Mine. The liaison will also assist with Jay Project meeting logistics, participants for community events at site, and other areas Dominion Diamond may need an on the ground contact in their community.
Community Development investments	Dominion Diamond makes contributions to projects identified by communities that fall within guidelines. Communities have identified initiatives to address poverty, homelessness, health, wellness, culture, traditional knowledge, training, school equipment, and school programs.
SEA Report & Community Meetings	Various forms of engagement and consultation are performed annually on the Ekati Mine's SEA data where employment, training, and business spend statistics are shared; additional topics discussed range from wellness to safety statistics. Engagement has occurred in a variety of forms, ranging from distribution and invitation to comment on the annual reports to in-person community meetings in IBA communities and fly-point communities. Issues and concerns raised are recorded, and brought to the attention of the appropriate department.

IBA = Impact Benefit Agreement.

Table 8-5 provides a summary of specific barriers to employment identified through review of human resources records and ongoing engagement activities with mine employees and communities.

Table 8-5 Barriers to Employment and Dominion Diamond Responses

Barrier	Dominion Diamond Response	Additional Comments
In the small rural communities, women with children do not tend to apply for rotational positions. Most of Dominion Diamond's employment is rotational, except in Yellowknife, where Dominion Diamond's corporate head office is situated.	On a case-by-case basis, Dominion Diamond evaluates alternative shift options for women such as 3 on, 4 off.	Women with children are more likely to apply for positions that become open in Dominion Diamond's offices in Yellowknife. There are, however, fewer openings there and these positions require the employee to reside in Yellowknife, or be willing to move.
Criminal records can prevent potential workers from passing security clearance.	Dominion Diamond conducts case-by-case security assessments. If an applicant self-declares a criminal record, security investigators consider when the offence was committed, and the severity of the crime before making a recommendation as to the hiring of the individual.	Through this process, some candidates with criminal records can be considered for employment opportunities. There are still problems associated with getting an official pardon, including the cost of the pardon, and the lengthy processing time. Dominion Diamond would prefer that the Community Development Officer from the applicant's home community pursue the pardon. This would occur during pre-employment, before the candidate applies for a position.

Table 8-5 Barriers to Employment and Dominion Diamond Responses

Barrier	Dominion Diamond Response	Additional Comments
Drug and alcohol abuse can prevent potential workers from passing pre-employment medical clearance. Failure to pass the medical clearance is the most common barrier to employment.	Drug testing is conducted prior to employment at the mine and while employed, if there is suspected drug and alcohol use. If an applicant fails the drug test, this does not prejudice them, and they are able to immediately apply for other employment opportunities with Dominion Diamond in the future. In the past, the applicant would have to wait for months before they were permitted to re-apply. Dominion Diamond contributes to projects and initiatives to address health and wellness issues, including substance abuse problems in communities. Dominion Diamond will pay for drug and alcohol treatment for employees which may include residential treatment, out- patient services and/or educational counselling. This is in addition to the Employee and Family Assistance Program, which is part of the employee benefits package.	Workers will be reinstated after the alcohol/drug issue has been addressed. Drug testing is booked in advance and is required for all positions with Dominion Diamond. People over 40 have to have an Electrocardiogram. However, failure to achieve medical clearance is mainly related to the presence of drugs or alcohol; the test reveals recent drug and alcohol use, in the last 48 hours.
Low levels of literacy can prevent employees from going through the application process.	Community liaison or Community Development Officer identify gaps in education and literacy of potential applicants in their community. Dominion Diamond provides support for initiatives aimed at improving literacy pre-employment through IBAs.	It has been observed that pre-employment readiness has been improving, particularly amongst the young.
People living in remote communities or those who are unfamiliar with the online application process may not be able to access employment opportunities and need other options.	The Dominion Diamond Aboriginal employment coordinator recruits the majority (approximately 90%) of entry level positions directly from Aboriginal communities. Community Development Officers have a listing of all candidates interested in employment in their community, and provides this list to the Aboriginal Employment Coordinator. Dominion Diamond maintains a database of candidates from IBA communities, including their resumes. Dominion Diamond also accepts unsolicited resumes from communities sent by fax or mail. These options are only open to communities in the NWT, and are not available to southern applicants, who must use the online system. Further, southern applicants will not be short listed for entry level positions.	Employment opportunities are advertised, and made available to interested community members.

Question 4b):

Section 4.5.1 of the SEA provides the following measures aimed at encouraging contractors to adhere to SEA targets:

> *"[Dominion Diamond] hereby commits to take all reasonable steps to ensure that its Contractors at the Project adopt a hiring policy that is consistent with this Agreement. [Dominion Diamond] shall, where appropriate, in connection with bids for contracts on the Project:*

(i) require all Contractors to expressly state their commitment to hiring Northern Residents;

(ii) evaluate bids on the basis of whether appropriate commitments to hire Northern Residents are included or planned for in the bid;

(iii) incorporate the successful bidder's commitments to hire Northern Residents into the contract document; and

(iv) require all contractors to regularly report on their Northern Resident hires and to explain their performance to management."

Dominion Diamond actively seeks opportunities to contract with Northern and Northern Aboriginal businesses wherever possible. All bids for contracts at the Ekati Mine are evaluated through an evaluation process that includes Northern/Northern Aboriginal ownership and content as a standard evaluation criteria against which bidders are rated. The standard Ekati Mine contract that all contractors are required to accept includes the SEA Northern hire targets and a requirement for all contractors to strive for achievement.

Once a contact is awarded, regular contract performance meetings are held with contractor management process to review all aspects of contract performance, including SEA Northern hire targets. The performance meetings are organized by the Ekati Mine's Procurement Team, who are accountable for all aspects of contractor performance, including SEA Northern hire targets. Contractors are given access to Ekati Mine resources, such as the Aboriginal employment coordinators, to assist in achieving SEA Northern hire targets.

In addition to the targets established through the SEA, the four Ekati Mine Impact Benefit Agreements (IBAs) provide additional means and opportunities for preferential contracting of Northern Aboriginal companies. The details of these programs are confidential to each IBA and cannot be published; however, Dominion Diamond meets periodically with each group to determine if there are additional contracting opportunities.

Question 5):

Dominion Diamond purchased the Ekati Mine in April 2013 and has only operated the mine from that date. As the new operator of the Ekati Mine, Dominion Diamond is committed to working collaboratively with its northern partners to meet its targets to hiring and procuring from the North.

"Contingencies" (assumed here to mean strategies aimed at maximizing Northern employment and procurement) have been described above. There is no set "trigger" for Dominion Diamond's efforts to hire and procure from the North. Rather, through ongoing engagement with communities and collaborating with the Government of the Northwest Territories, Dominion Diamond strives to proactively identify barriers faced by Northerners, and to adaptively manage their employment and procurement procedures to maximize Northern employment and procurement.

Reference:

BHP Billiton (BHP Billiton Canada Inc.). 2006. Ekati Mine. Annual Report on Northern Employment and Spending 2006 Operations Phase - EKATI Diamond Mine. Yellowknife, NWT, Canada.

BHP Billiton. 2007. Ekati Mine. Annual Report on Northern Employment and Spending 2007 Operations Phase - EKATI Diamond Mine. Yellowknife, NWT, Canada.

BHP Billiton. 2008. Ekati Mine. 2008 Sustainable Development Report Ekati Diamond Mine. Yellowknife, NWT, Canada.

BHP Billiton. 2009. Ekati Mine. Ekati Diamond Mine 2009 Year in Review. Yellowknife, NWT, Canada.

BHP Billiton. 2010. Ekati Mine. Ekati Diamond Mine 2010 Year in Review. Yellowknife, NWT, Canada.

BHP Billiton. 2011. Ekati Mine. Ekati Diamond Mine 2011 Year in Review. Yellowknife, NWT, Canada.

Dominion Diamond Corporation. 2012. Ekati Mine. Ekati Diamond Mine 2012 Year in Review. Yellowknife, NWT, Canada.

Dominion Diamond Corporation. 2013. Dominion Diamond's 2013 Socio-Economic Agreement Report. Yellowknife, NWT, Canada.

Dominion Diamond (Dominion Diamond Ekati Corporation). 2015. Response to: Jay Project Adequacy Review Items 11.1, 11.2, 11.3, 11.4, and 11.5. Submitted to Mackenzie Valley Environmental Impact Review Board. Yellowknife, NWT, Canada. January 2015.

DOMINION DIAMOND

Information Request Number: DAR-YKDFN-IR-09

Source: Yellowknives Dene First Nation: Todd Slack

Subject: Socio-Ec

DAR Section(s): 14

Preamble (YKDFN):

The project discusses the cross-cultural awareness program that it will establish.

Request (YKDFN):

Please provide an update on the establishment of this program, as it is some months since the submission of the DAR. As part of this update, please provide the curriculum and objectives of the program.

Response:

Dominion Diamond is currently developing a Cultural Awareness training program that will be a two-pronged program. The first aspect will be online training that new employees will be required to complete upon their arrival to site and prior to being released to report to work. The second aspect to the overall program will be a classroom-based portion that will provide employees with more specific local information including, but not limited to, Aboriginal groups and communities, harvesting and the importance of the environment, archeological details and the importance of the land to spirituality, community concerns in relation to mining, and residential schools and the impacts of colonization. All employees will be required to participate in both parts of the training. The development of the program is well underway. The various components of the classroom-based portion have been identified and mostly developed with feedback already been sought from Aboriginal employees on site to ensure information is accurate and scope sufficient. Development will continue for the rest of the summer with rollout expected in the last quarter of 2015.

Another program that Dominion Diamond has implemented is the Cultural Experience program, which is intended to augment the Cultural Awareness training program. This program is geared primarily towards our supervisory-level staff; however, space permitting we will extend the offer to general employees where possible. An example of this participation is Dominion Diamond participates on a bi-annual basis in an overnight on-the-land Tlicho Trails of Our Ancestors canoe journey. Participants travel by charter to the Tlicho community hosting the Tlicho Gathering that year and join the Tlicho canoers coming from the outlying communities to the Gathering.

It is important that Dominion Diamond employees become familiar with Aboriginal culture and have the opportunity for direct interaction with Aboriginal people in a cultural setting. To this end, Dominion Diamond is expanding the Cultural Experience program to include other cultural activities including attending handgames tournaments, drumdances and other overnight on-the-land excursions. Participating employees will be accompanied by an Aboriginal guide, which will ensure proper explanation of the cultural activity and therefore enhance the overall experience for participating employees. This is

an important opportunity to cultivate positive relationships and to create a greater understanding of northern Aboriginal people and culture.

DOMINION DIAMOND

Information Request Number:	DAR-YKDFN-IR-10
Source:	Yellowknives Dene First Nation: Todd Slack
Subject:	Socio-Ec
DAR Section(s):	14

Preamble (YKDFN):

The project provides a pathway assessment, which includes the mitigations for each effects pathway. YKDFN are concerned with the level of effort and rigour that was applied – particular from an impacted community perspective.

Request (YKDFN):

1) The project has selected a number of mitigations aimed at reducing territorial in-migration. Please provide a discussion on the efficacy of these measures.

2) The project has selected a number of mitigations aimed at reducing intra-territorial migration. Please provide a discussion on the efficacy of these measures.

3) Please provide a discussion on the benefit of increasing GDP to the NWT. As part of this discussion, please address the following:

   a. What is the GDP impact of associated with the collapse of the Caribou Herd

   b. Please provide an economic assessment of the caribou collapse on the Yellowknives Dene communities of Ndilo and Dettah, given historic harvesting rates.

   c. Please provide a discussion on whether the collapse of the Bathurst Caribou herd is a net positive for GDP.

   d. Please provide a series of alternative assessment methods that look not just at the value of spending on goods and services, but on happiness and community strength/health.

4) Please provide a discussion on the level of government revenues that would accrue to the people of the Northwest Territories under alternative tax and royalty revenues, such as those in existence in alternative Canadian and International jurisdictions.

5) The project has selected a number of mitigations aimed at reducing inflation. It's unclear how this mitigations effect inflation. Please provide a discussion on the efficacy of these measures.

6) The project has selected a number of mitigations aimed at 'School Capacity' (under Education and Training)). It's unclear how this mitigations effect inflation. Please provide a discussion on the efficacy of these measures.

Response:

The pathway through which a development could potentially affect school capacity is the in-migration of families to communities, and the subsequent increased demand for educational services in the community.

1), 2)

The construction phase is not expected to attract a large number of Northwest Territories (NWT) resident labour because there is more security and a greater variety of jobs available in the operations of the existing diamond mines. The typical range of Northern participation in construction has been between 20% to 30%. This range was used in the NWT Economic Impact Model to calculate future participation in the development work associated with the Jay Project and A21 at the Diavik Mine[1] (Appendix A).

It is true that the development work at the Ekati and Diavik Mines and the construction of the Gahcho Kué Project will bring about a period of increased demand for labour that the NWT resident labour market cannot meet; however, this period will be short lived, from 2016 to 2018 (Appendix A). The labour demand during this period will be similar to what was experienced from 2005 to 2008. That period was marked by major development work at the Ekati and Diavik mines and the construction of the Snap Lake Mine. During that timeframe, the NWT's population declined from 43,401 in 2005 to 43,350 in 2008 (GNWTBS 2015).

Note that the NWT population is projected to rise in the Base Case (referred to as the "Baseline Scenario" in Appendix A) from 43,623 in 2014 to 44,230 in 2019. A small portion of this growth (20%) is attributable to the development work at the Ekati and Diavik mines and the opening of the Gahcho Kué Mine, with the majority attributable to the natural growth rate exceeding the underlying negative net migration that is assumed to range between 300 and 350 during this period. The addition of the Jay Project construction to the NWT economy does not have a measurable effect on migration beyond what is in the Base Case.

3a,b,c)

This response is based on the assumption that the question is aimed at comparing the concepts of Gross Domestic Product (GDP), and caribou harvesting. To discuss these concepts, relative to one another, the two must be brought into comparable terms. GDP is a measure of value-added, not gross output (i.e., it is not, exclusively, the value of a product, such as harvested meat). To determine the "Value-added", we must subtract the cost of intermediate goods and services that goes into the process. In the case of caribou harvesting, "value-added" would consider a number of different economic factors (e.g., the level of effort, the hourly rate of the hunter, the depreciation of equipment used to hunt). Whatever the economic value of caribou harvesting, it must be compared to the economic value of GDP and, in this case, the contribution of the mining sector to territorial GDP.

[1] At the time of writing of the Developer's Assessment Report (DAR) for the Jay Project, economic details of the A21 dike and pit at the Diavik Mine were not included in the mine plans for these operations. As a result, assumptions were made regarding the economic details of A21 in the socio-economic assessment (Section 14 of the DAR). Economic modelling with inputs into the socio-economic assessment has been revised to reflect the more advanced mine plan information for A21.

When directly comparing the economic value of the mining industry's contributions to territorial GDP (a figure in the order of $ billions) to that of caribou harvesting, there is an issue of scale. GDP contributions will appear large compared to caribou harvesting. While this approach would allow for the comparison of GDP and caribou harvesting, it does not take into account non-economic aspects of caribou, such as the importance of caribou to Aboriginal culture and heritage, or as an income substitute for the purchase of food. As a result, it may not be appropriate to compare the concept of GDP to caribou harvesting, in this context.

An alternative is to compare the Gross Output of caribou harvesting to the Gross Output of the Diamond Mining Industry. This would assign a value to caribou meat and compare the total to the total value of diamonds mined. In 2013, the latest year that data are available, the value of diamond production in the NWT was $1.56 billion. Since 1999, diamond production is valued at $22.3 billion. Again, this methodology has a problem with scale that hides the value of caribou in terms of its non-economic role and as an income substitute.

3d) As suggested in the question, alternative measures of assessment, such as the assessment of happiness, can provide an interesting foil to the discussion of GDP. For example, the assessment of Gross National Happiness (GNH) is aimed at describing the quality of life of a nations residents as defined by the following indicators: economic wellness; environmental awareness; physical wellness; mental wellness; workplace wellness; social wellness; and political wellness. Economic wellness is only one aspect of this approach. The United Nations Development Program's Multidimensional Poverty Index is a similar method of assessing the quality of life of a population, but uses different indicators than the GNH – namely quality of work, empowerment, physical safety, the ability to go out in public without shame, and psychological well-being. However, these forms of assessment are typically administered at a larger scale (e.g., national level), as opposed to on a community-by-community basis.

There are also other scales and surveys aimed at assessing happiness that have stemmed from these two programs (particularly the GNH), some of which can be administered at a community level. While these tools may shed some light on baseline conditions of happiness, it is not clear if they could be effectively transferred to an assessment of the effects of a single Project on community happiness. Assessments of community happiness, and the transferability of national-level analyses to local contexts, are typically the purview of government, or other bodies with a primary mandate to assess topics such as community happiness.

4) Project taxation is not subject to tax and royalty revenue guidelines from alternative jurisdictions (e.g., other countries). Individual developers do not establish taxation rates. Rather, the Project's taxation rate is subject to the NWT *Mining Act*. The portion of this rate distributed to the NWT, and to communities therein, is a function of the Devolution Agreement and spending decisions made by the Government of the Northwest Territories.

5) Regarding the question of inflation, the Jay Project will not, by itself, have an effect on inflation.

Historical data have shown inflation in Yellowknife has followed a path very similar to that of Canada as a whole. This was true during the period from 2000 to 2005 when the population of the territory grew by 3,000 residents, and has continued to be true in the past five years, where population has remained steady (GNWTBS 2015). Thus, there is no evidence that the mining industry has been the cause of

inflation. It is also important to recognize that the Jay Project represents an extension of an existing mine, and so it would not be expected to create a new inflationary effect.

The NWT is a price taker (i.e., a buyer whose purchases and sales are not substantial enough to influence the market for a good or service) for the majority of consumer goods and services. Any changes in price NWT residents pay for food, energy, transportation, and clothing are imported into the territory because the cost of producing these goods or services has changed or because of upward pressure on prices due to a disequilibrium between worldwide supply and demand. This is as true in Tłı̨chǫ communities as it is in Yellowknife.

The added cost of goods and services experienced in small, isolated, or remote communities when compared to costs in Yellowknife are a function of the increased transportation and storage costs, and the small markets that exist in these communities. None of these factors (transportation, storage, or market conditions related to providing goods and services in these communities) will be affected by the extended operation of the Ekati Mine through the Jay Project.

The population of the NWT is not predicted to increase as a result of the Jay Project. This eliminates the possibility that prices will rise because of a larger consumer base. Note again, that population has not been shown by historical data to be a factor in inflation in Yellowknife for the past 15 years.

The Economic Impact Report (Appendix A) describes the potential for deflation in an economic scenario whereby the existing mines all close with no economic activity replacing the lost production or lost jobs. The possible deflation would not occur where the NWT is a price taker, however. For example, the price of gasoline will not change as a result, nor would the price of food. However, the example given in the Economic Impact Report (Appendix A) was that of housing prices. The price of private-market housing would likely decline in the event that there was a significant decline in population. The price effect on housing would be experienced in Yellowknife more than elsewhere in the Local Study Area because it has one of the more active private markets in the territory, meaning there are many buyers and sellers. The price of private homes in Tłı̨chǫ communities might also decline where residents of these communities relocate and must sell their homes at a time when there is little or no demand for that home.

It is predicted that the Jay Project will help to maintain the territory's population base and therefore it will also have a positive effect in preventing deflation in the areas where NWT consumers have some influence over prices. However, this does not imply that the Project would be causing price movements in excess of what would be experienced otherwise, or inflation.

6) In-migration of families can increase pressure on schools, and influence school capacity by adding more students to a classroom. The Project, however, is not expected to result in substantial in-migration to the territory, as discussed in the response to 1), 2), and 5) above. The mitigations listed in Table 14.1-4 in Section 14.1.4.2 of the DAR reflect measure taken by the Project to avoid in-migration and associated pressure on school capacity.

References:

GNWTBS (Northwest Territories, Bureau of Statistics). 2015. Population Estimates. Available at: http://www.statsnwt.ca/population/population-estimates/ Accessed March 15, 2015.

DOMINION DIAMOND

Information Request Number: DAR-YKDFN-IR-11

Source: Yellowknives Dene First Nation: Todd Slack

Subject: Community Well Being and Culture

DAR Section(s): 14

Preamble (YKDFN):

The project provides a number of paragraphs outlining the most recent statistics available for community well-being and culture. However, they do not provide any sense of the change that has been experienced in smaller communities or any assessment associated with the downward indicators that seem to exist.

Request (YKDFN):

1) Please provide an assessment of the 'perceived sense of community' over the period since Ekati first opened

2) Please provide an assessment on yearly rate of volunteerism in the smaller communities.

3) Given the decline of desired game, please provide a discussion on the amount of harvesting that has taken place in communities. For instance, GNWT recently banned all caribou harvesting in the Chief Drygeese Territory.

4) Please provide the source for the harvesting rates that are provided (GNWT 2013b references Ground Highway and Rescue Services)

5) The harvesting rate values provided on page 14-89 are much lower than YKDFN has seen in other references. For these communities please provide rates of harvesting for this over the years since Ekati opening.

6) The project discusses income disparity, vulnerability and crime, but these are not included in any assessment of effects since the opening of Ekati. Please include a discussion on suicide rates and include his information as part of the assessment.

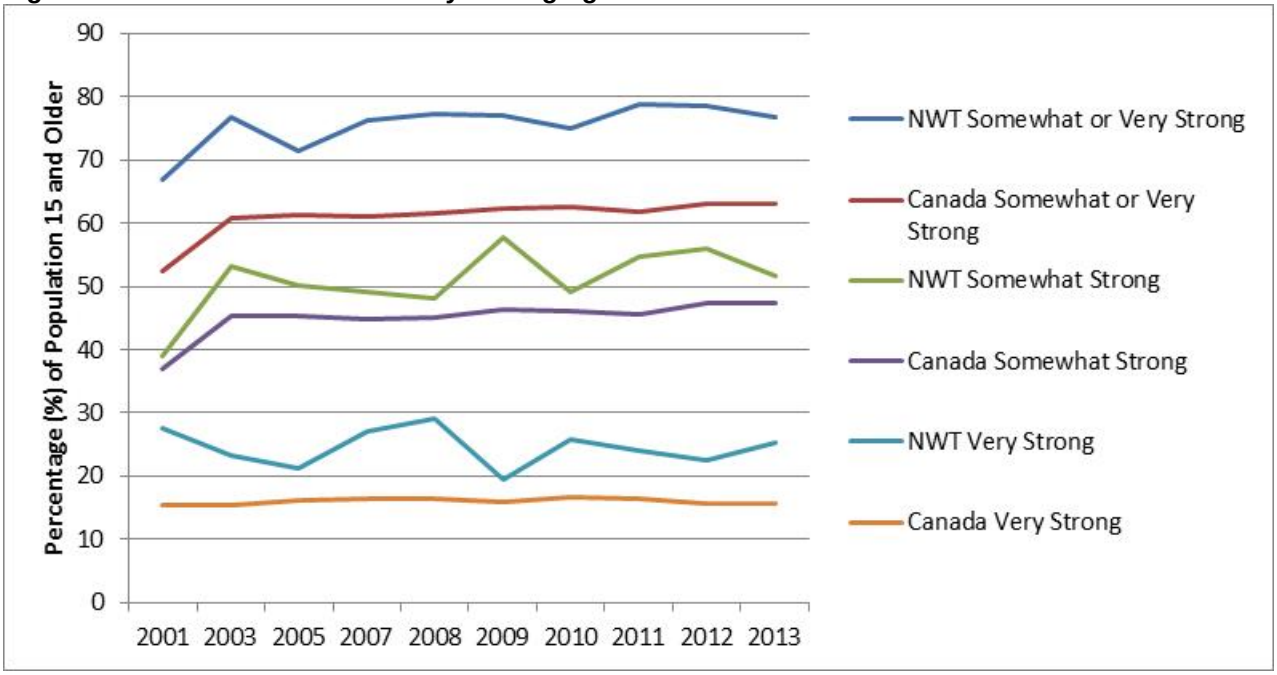
7) Please explain why increasing amounts of Crime, decreasing use of aboriginal language, likely declining Harvesting Rates, undiscussed Life Challenges/Mental Health/addictions, community vulnerability and community structure were not part of the projects consideration and assessment of the impacts to communities.

Response:

1) Statistics Canada collects statistics regarding perceived sense of community belonging as part of the Canadian Community Health Survey (Statistics Canada 2014a). Since 2007, Statistics Canada has conducted the survey annually by telephone or personal interviews. Responses are voluntary. A sample of approximately 130,000 respondents was interviewed during the reference periods of 2001, 2003, and 2005; the sample size was changed to 65,000 respondents each year starting in 2007. In

the Northwest Territories (NWT), the Yukon, and Nunavut, the survey frame coverage was 71% of the targeted population as the survey covers only the 10 largest communities (Statistics Canada 2014b). The survey asks respondents the following question: “How would you describe your sense of belonging to your local community? Would you say it is (very strong, somewhat strong, somewhat weak, or very weak)? The NWT Bureau of Statistics has compiled responses to this question for the territory and Canada as a whole, specifically the percentage of residents 15 years of age and older that rate their sense of community belonging as somewhat or very strong (GNWTBS 2014). The figure below presents data for the NWT and Canada for the years 2001 to 2013 (Figure 11-1). Data are not available for the pre-mining period.

Figure 11-1: Sense of Community Belonging in the Northwest Territories and Canada



Source: GNWTBS (2014).

Overall, residents of the NWT rate their sense of community belonging higher than Canadians as a whole. The percentage of the population reporting either a somewhat strong or very strong sense of community in 2013 (77%) is higher than it was in 2001 (67%). This is due primarily to an increase in the proportion of the population reporting a somewhat strong sense of community (from under 40% in 2001 to over 50% in 2013). The proportion of NWT residents who report a very strong sense of community belonging has remained between 20 and 30%. The Canadian rates have remained even more stable at around 15% for those reporting a very strong sense of community and around 60% for those reporting a somewhat strong sense of community. The data do not suggest a relationship between sense of community belonging and mining activity in the NWT. The data also cover the most populous areas of the NWT, so it is not possible to compare communities affected by mining activity (i.e., LSA communities) to other communities.

2) Table 11-1 shows the percent of the population in the LSA communities that volunteered in 2008. Information from the 2009 NWT Community Survey is the most up to date regarding the rate of volunteerism in the smaller communities. Historical data on the yearly rate of volunteerism in the smaller communities are not available.

Table 11-1: Percent of Population Who Volunteered in 2008

Community	Percentage
Behchokǫ̀	25.6
Dettah	38.5
Fort Resolution	16.4
Gamètì	25.2
Lutsel K'e	39.5
Wekweètì	28.0
Whatì	20.6
Yellowknife	39.1
Northwest Territories	37.7

Source: GNWTBS (2013).

In 2008, volunteer rates in the majority of LSA communities were below the territorial average of 37.7%, with the communities of Behchokǫ̀, Fort Resolution, Gamètì, Wekweètì, and Whatì having lower rates. Volunteerism in the communities of Lutsel K'e, Yellowknife, and Dettah exceeded the territorial average rate, with Lutsel K'e having the highest volunteer rate among the LSA communities, with 39.5%, followed by Yellowknife at 39.1%.

3) Historical harvest estimates of Bathurst caribou (to 1995) are presented in Table 12.2-5 of the DAR, including harvest estimates from General Hunting Licence holders, resident hunters, and non-resident/non-resident alien hunters. It is not possible to provide a full discussion on the amount of harvesting that has taken place in communities as General Hunting Licence holders were not required to report their harvest. Harvest restrictions as recommended by the Wek'èezhìi Renewable Resources Board were in effect for the 2010 to 2014 harvest seasons. This restriction included 150 hunting tags for the Tłı̨chǫ people and 150 for the Yellowknives Dene First Nation (GNWT 2012).

   Recent hunting bans and restrictions imposed by the GNWT have been put in place in response to the decline in caribou populations. A mobile conservation zone has been put in place by the GNWT. The concept includes a moving conservation zone where no harvesting of Bathurst caribou is permitted around collared cows from the Bathurst herd (GNWT 2014).

4) The references in the DAR are updated to (GNWTBS 2013c-k):

GNWTBS. (Government of Northwest Territories Bureau of Statistics). 2013c. Community at a Glance – Behchoko 2009 Community Survey Results. Available at: http://www.statsnwt.ca/community-data/Pamphlets/Behchoko.pdf. Accessed: December 10, 2013.

GNWTBS. 2013d. Community at a Glance – Dettah 2009 Community Survey Results. Available at: http://www.statsnwt.ca/community-data/Pamphlets/Detah.pdf. Accessed: December 10, 2013.

GNWTBS. 2013e. Community at a Glance – Fort Resolution 2009 Community Survey Results. Available at: http://www.statsnwt.ca/community-data/Pamphlets/Fort%20Resolution.pdf. Accessed: December 10, 2013.

GNWTBS. 2013f. Community at a Glance – Gameti 2009 Community Survey Results. Available at: http://www.statsnwt.ca/community-data/Pamphlets/Gameti.pdf. Accessed: December 10, 2013.

GNWTBS. 2013g. Community at a Glance – Lutsel K'e 2009 Community Survey Results. Available at: http://www.statsnwt.ca/community-data/Pamphlets/Lutselk'e.pdf. Accessed: December 10, 2013.

GNWTBS. 2013h. Community at a Glance – Wekweeti 2009 Community Survey Results. Available at: http://www.statsnwt.ca/community-data/Pamphlets/Wekweeti.pdff. Accessed: December 10, 2013.

GNWTBS. 2013i. Community at a Glance – Whati 2009 Community Survey Results. Available at: http://www.statsnwt.ca/community-data/Pamphlets/Whati.pdf. Accessed: December 10, 2013.

GNWTBS. 2013j. Community at a Glance – Yellowknife 2009 Community Survey Results. Available at: http://www.statsnwt.ca/community-data/Pamphlets/Yellowknife.pdf. Accessed: December 10, 2013.

GNWTBS. 2013k. Aboriginal Hunting or Fishing – 2008. Available at: http://www.statsnwt.ca/Traditional%20Activities/. Accessed December 10, 2013.

5) Table 11-2 and Figure 11-2 below show the percent of population 15 and older in the LSA communities engaged in hunting or fishing in 1998 (just before the Ekati Mine opened in 1999), 2003, and 2008. Data prior to 1998 and more recent data are not available. The original sources of the data are the 1999, 2004, and 2009 Community surveys conducted by the NWT Bureau of Statistics and are consistent with community level data available on the NWT Bureau of Statistics website (GNWTBS 2010) and in the 2013 Communities and Diamonds Report (GNWT-ITI 2014). The data presented in the DAR on page 14-89 and in Annex XV Table 3.6-5 show the percentage of hunting and fishing amongst Aboriginal people in the LSA communities, which is generally consistent with the data provided by the NWT Bureau of Statistic's Community at a Glance Pamphlets. Data for Fort Resolution are, however, incorrect in the DAR. While no exact percentage was provided by the NWT Bureau of Statistics, the percentage should be closer to 40% instead of 50% based on the Community at a Glance pamphlet for Fort Resolution.

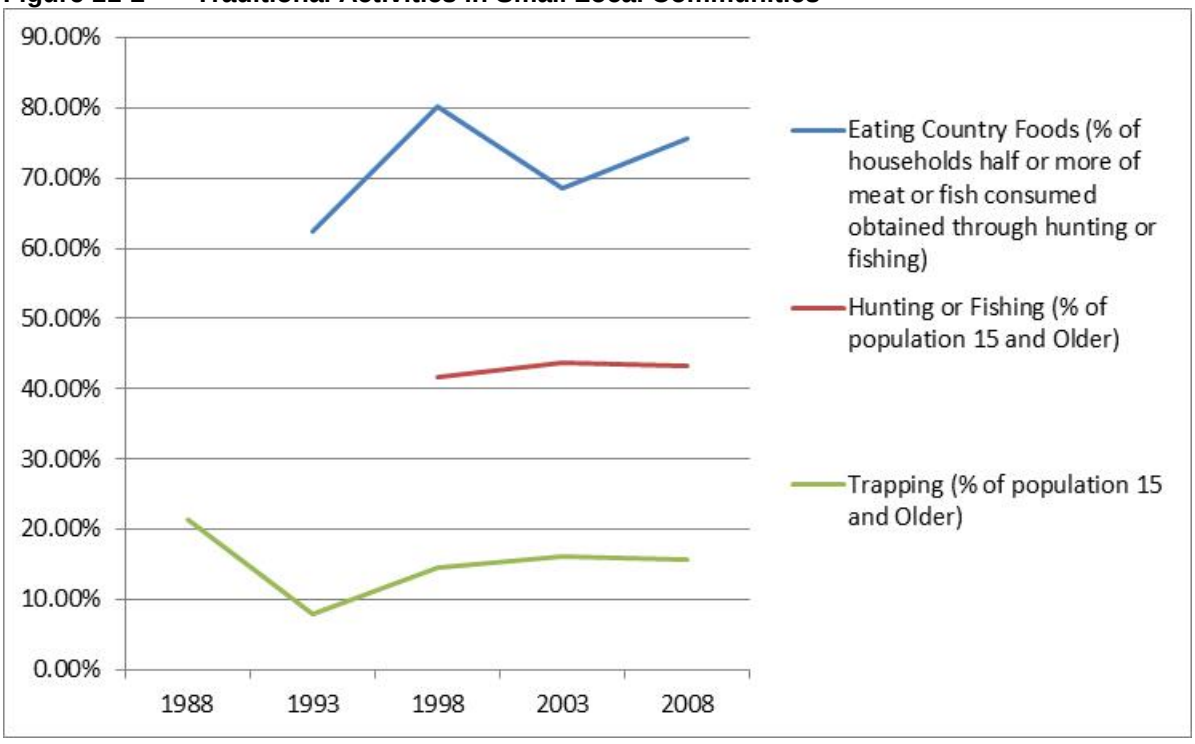
   The two data sets (Annex XV, Table 3.6-5 and Table 11-2 of this response) differ slightly as the data provided in the Community at a Glance Pamphlets refer to hunting and fishing engagement by the Aboriginal population, while Table 11-2 provides data for hunting and fishing for the entire population of each community, including any potential non-Aboriginal residents.

Table 11-2 Percent of Population 15 and Older Engaged in Hunting or Fishing in 1998, 2003, and 2008

Community	Year		
	1998	2003	2008
Behchokǫ̀	24.7	35.3	37.5
Dettah	49.3	43.3	38.5
Fort Resolution	40.1	53.3	42.6
Gamètì	42.9	41.6	37.9
Lutsel K'e	73.8	73.6	73.3
Wekweètì	71.2	64.2	55.6
Whatì	65.8	42.9	47.2
Yellowknife	40.4	32.3	34.5
Northwest Territories	42.0	36.7	39.4

Source: GNWTBS (2010).

Figure 11-2 Traditional Activities in Small Local Communities



Source: GNWT-ITI (2014).

Small Local Communities – includes the communities of Behchokǫ̀, Dettah, Gamètì, Whatì, and Wekweètì.

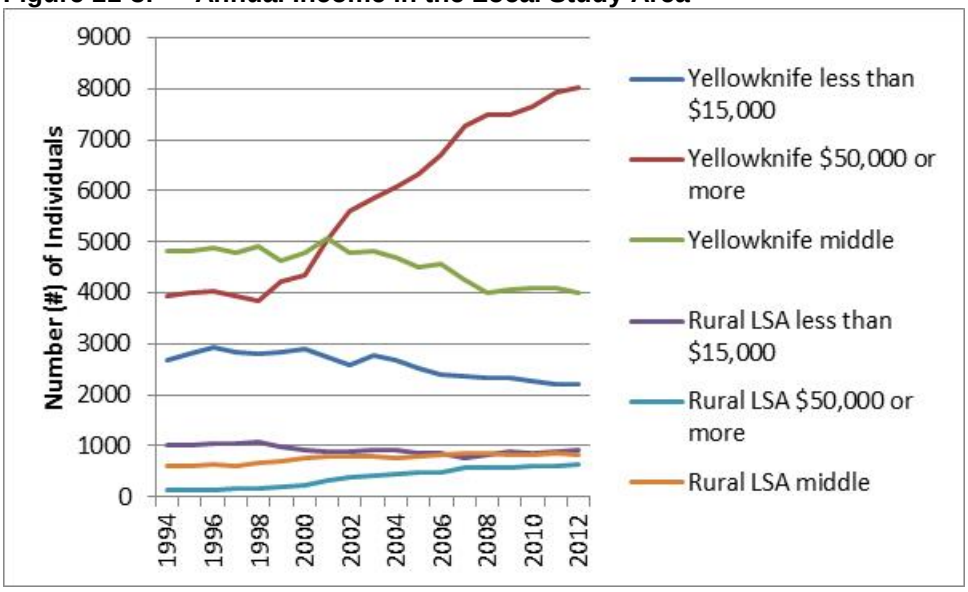
6)

Income Disparity

Overall LSA-Level Trend

The gap in the number of lower, middle and higher income tax filers in the rural LSA communities is narrowing and the number of middle and higher income tax filers is increasing (Figure 11-3). The number of lower income earners in rural LSA communities is also decreasing but at a slower rate. In Yellowknife, the rate at which the number of higher income earners is increasing is much higher than the rate for middle and lower income earners. The number of higher income earners has been higher than the number of middle and low income earners since 2002.

Figure 11-3: Annual Income in the Local Study Area

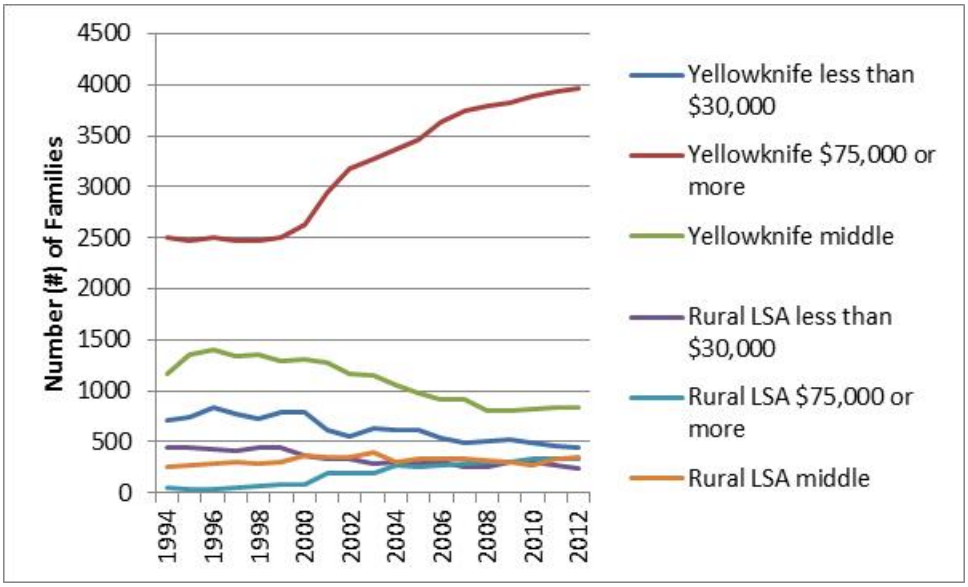


Source:GNWTBS (2015).

The income gap between families in the small LSA communities has closed over the past two decades (Figure 11-4). Overall, there were fewer families with incomes below $30,000 in 2011 than in 1994. In 1994, in rural LSA communities, 55% to 73% of families had incomes under $30,000. By 2012, this number had decreased to 13% to 31%. The same pattern occurred in Yellowknife, where the number of families living with less than a $30,000 annual income decreased from 16% to 8%.

More families earned over $75,000 per year in all LSA communities in 2012 than in 1994. This increase has been most pronounced in rural LSA communities, where the number of families with over $75,000 in annual income increased from less than 20% in the 1990s to over 30 and 40% in 2012.

Figure 11-4: Annual Family Income in the Local Study Area

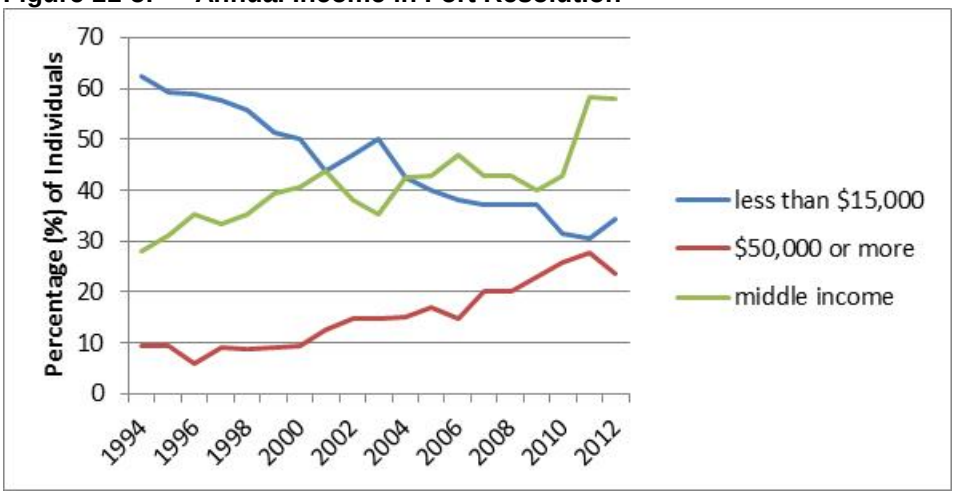


Source: GNWTBS (2015).

Income Disparity between Individuals in the Local Study Area

Graphic representations of the trend in individual incomes are presented below by community for the years 1994-2012 (Figures 11-5 to 11-10).

Figure 11-5: Annual Income in Fort Resolution

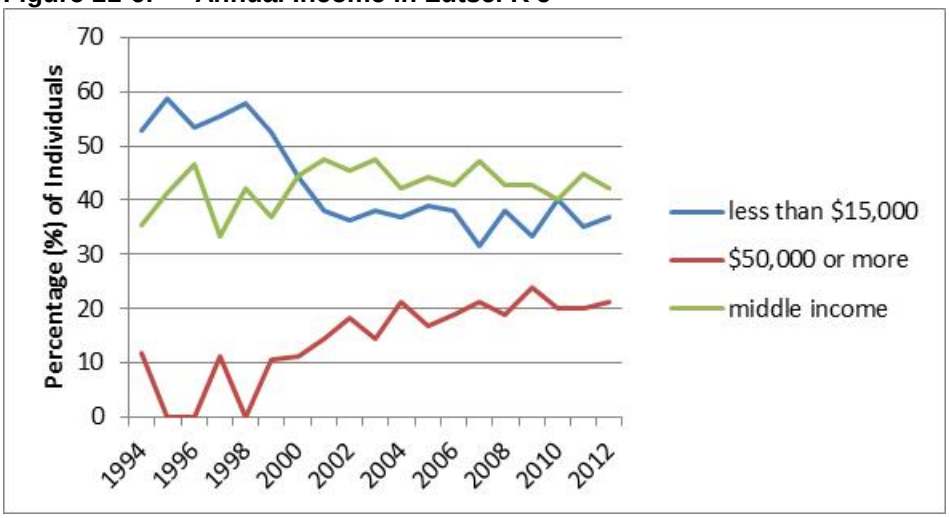


Source: GNWTBS (2015).

Fort Resolution: The gap in the proportion of higher income and lower income tax filers in Fort Resolution is narrowing and there has been a decrease in the proportion of lower income earners since 1994. There has also been an increase in the proportion of higher income earners since 2001. Lower income earners

(34% or 130 tax filers) still represent a higher proportion of the population than higher income earners (23% or 90 tax filers). The proportion of middle income earners has also increased over this period and has been higher than lower income earners since 2005.

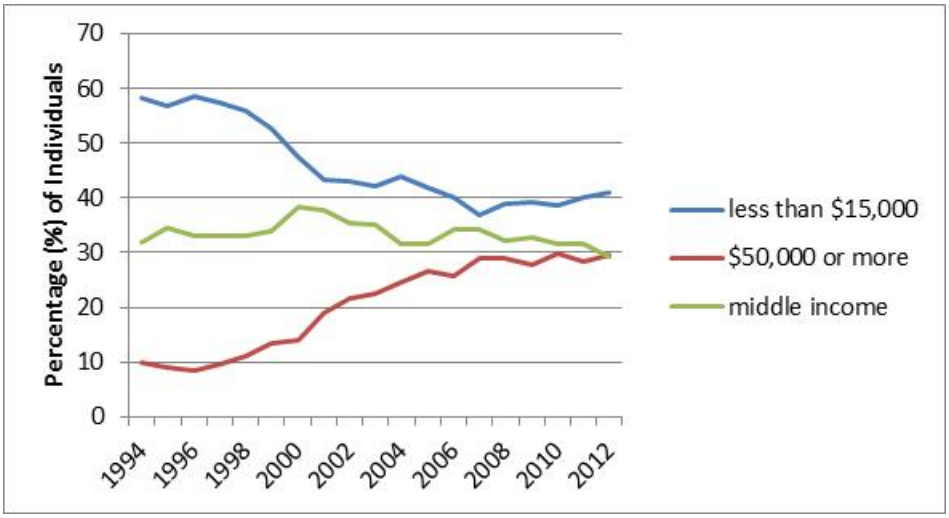
Figure 11-6: Annual Income in Lutsel K'e



Source: GNWTBS (2015).

Lutsel K'e: The gap in the proportion of higher income and lower income tax filers in Lutsel K'e is narrowing and there has been a decrease in lower income earners since 1999 and an increase in higher income earners since 2001. Lower income earners (37% or 70 tax filers) still represent a higher proportion of the population than higher income earners (21% or 40 tax filers). The proportion of middle income earners has also increased over this period and has been higher than lower income earners since 2000.

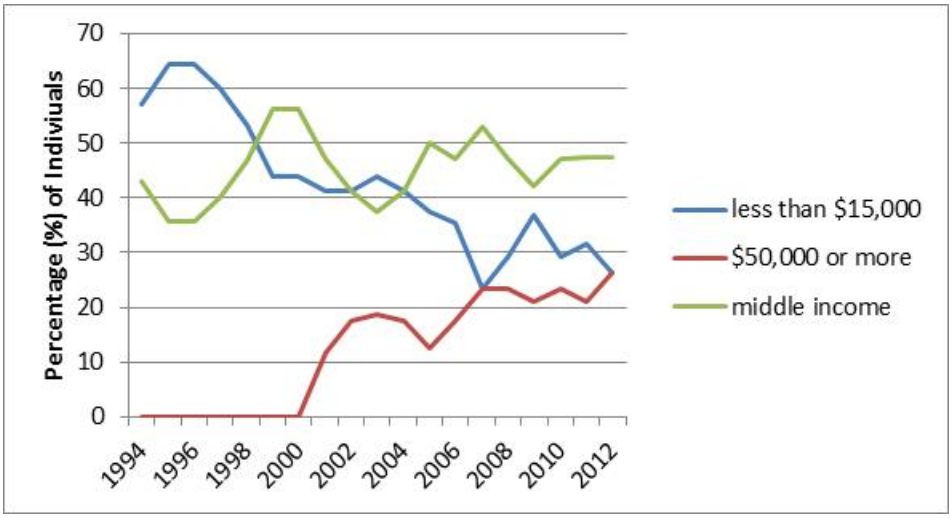
Figure 11-7: Annual Income in Behchokǫ̀



Source: GNWTBS 2015.

Behchokǫ̀: The gap in the proportion of higher income and lower income tax filers in Behchokǫ̀ is narrowing and there has been a decrease in lower income earners since 1996 and an increase in higher income earners since 2001. Lower income earners (41% or 530 tax filers) still represent a higher proportion of the population than higher income earners (30% or 380 tax filers). The proportion of middle income earners has remained stable compared to lower and higher income earners and is now equal to higher income earners.

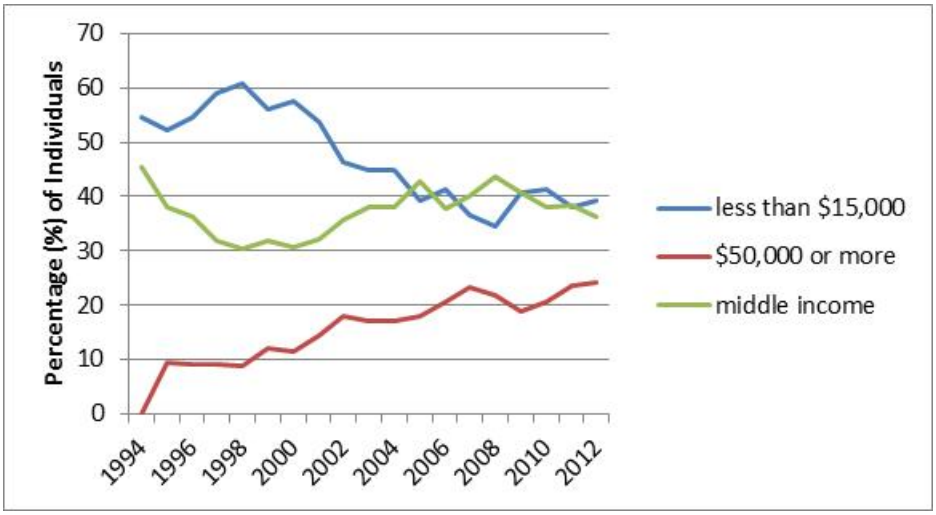
Figure 11-8: Annual Income in Gamètì



Source: GNWTBS 2015.

Gamètì: The gap in the proportion of higher income and lower income tax filers in Gamètì is narrowing and there has been a decrease in lower income earners since 1997 and an increase in higher income earners since 2001. Lower income earners and higher income earners represent the same proportion of the population (26% or 50 tax filers for each category). The proportion of middle income earners has fluctuated but has remained stable overall compared to lower and higher income earners. Middle income earners have, proportionally been above the proportion of lower income earners since 2005.

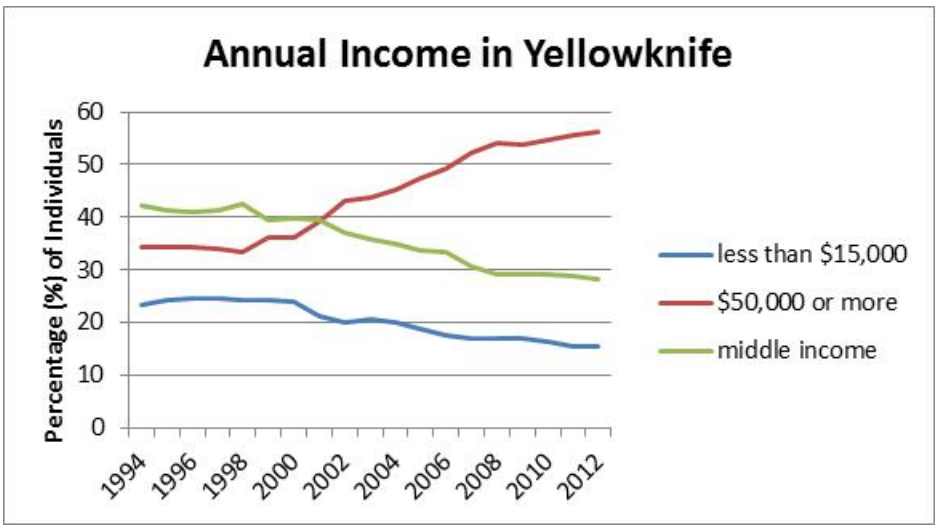
Figure 11-9: Annual Income in Whatì



Source: GNWTBS (2015).

Whatì: The gap in the proportion of higher income and lower income tax filers in Whatì is narrowing and there has been a decrease in lower income earners and an increase in higher income earners since 1994. Lower income earners (39% or 130 tax filers) still represent a higher proportion of the population than higher income earners (24% or 80 tax filers). The proportion of middle income earners has decreased overall and has closely matched the proportion of lower income earners since 2005.

Figure 11-10: Annual Income in Yellowknife



Source: GNWTBS (2015).

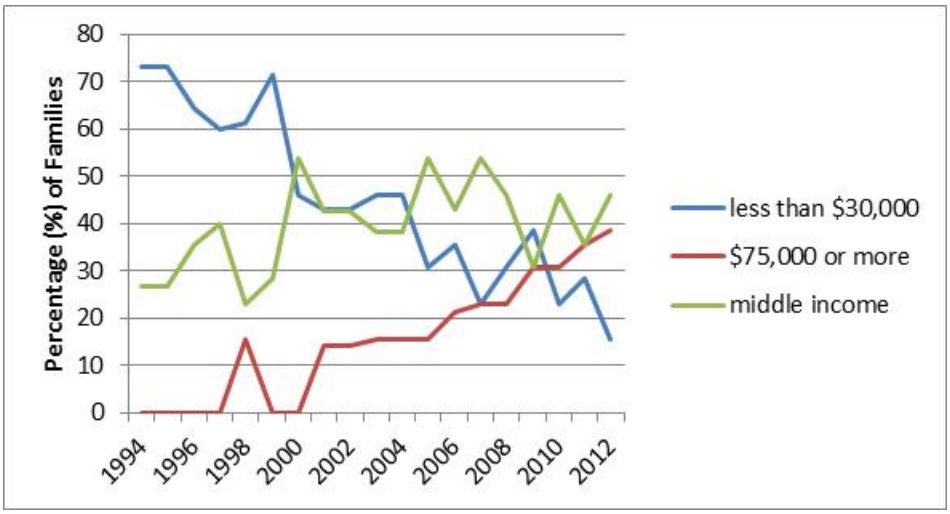
Yellowknife: The gap in the proportion of higher income and lower income tax filers in Yellowknife is widening and there has been a decrease in lower income earners and an increase in higher income

earners since 2001. Higher income earners have represented a higher proportion of the population than lower and middle income earners since 2002. The proportion of middle income earners has decreased and has closely matched the trend for lower income earners.

Income Disparity between Families in the Local Study Area

Trends in family incomes are presented below in graphs by community for the years 1994-2012 (Figure 11-11 to 11-16).

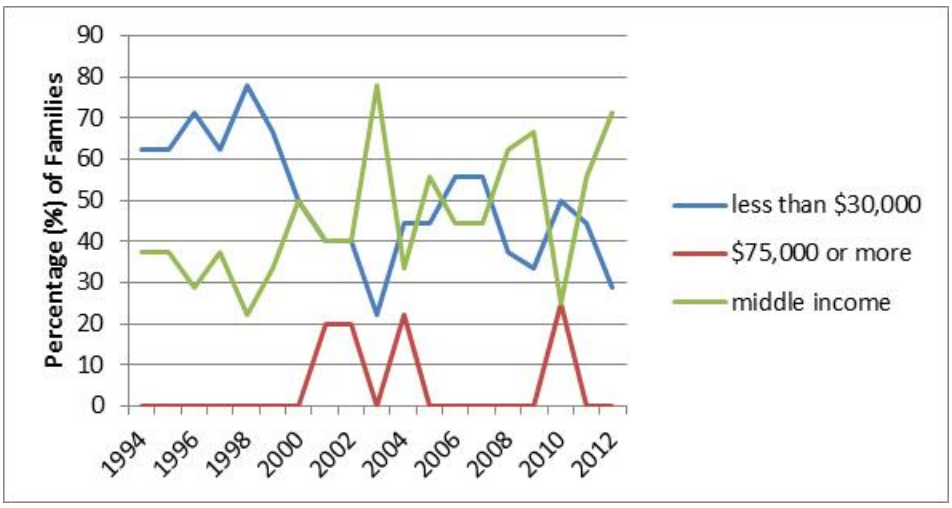
Figure 11-11: Annual Family Income in Fort Resolution



Source: GNWTBS (2015).

Fort Resolution: The gap in the proportion of higher income and lower income families in Fort Resolution is narrowing and there has been a decrease in lower income families since 2000 and an increase in higher income families since 2001. Higher and middle income families have represented a higher proportion of the population than lower income families since 2010.

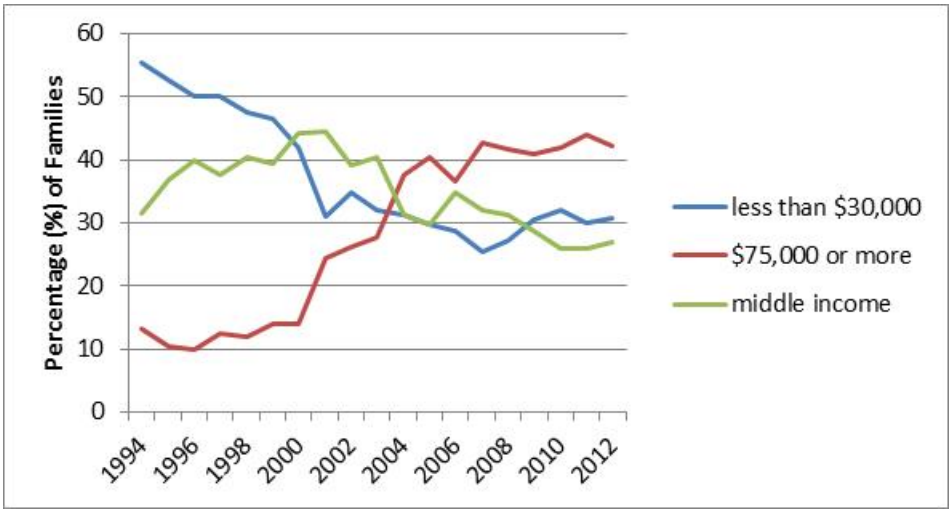
Figure 11-12: Annual Family Income in Lutsel K'e



Source: GNWTBS (2015).

Lutsel K'e: There are no evident trends in the gap between family income categories or in the proportion of higher income families. Overall, compared to the 1990s, there has been a higher proportion of middle income families than lower income families in the 2000s and 2010s.

Figure 11-13: Annual Family Income in Behchokǫ̀

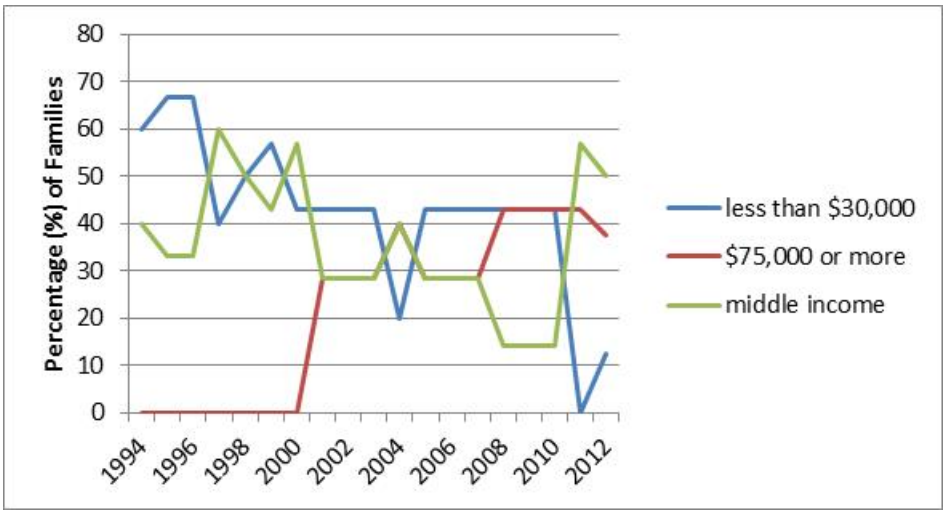


Source: GNWTBS (2015).

Behchokǫ̀: The gap in the proportion of higher income and lower income families in Behchokǫ̀ is narrowing and there has been a decrease in lower income families since 1994 and an increase in higher income families since 2001. Higher income families have represented a higher proportion of the population than lower and middle income families since 2004. The proportion of middle income families

has remained stable compared to lower and higher income families and has more recently dropped below lower income families (27% or 140 families compared to 31% or 160 families).

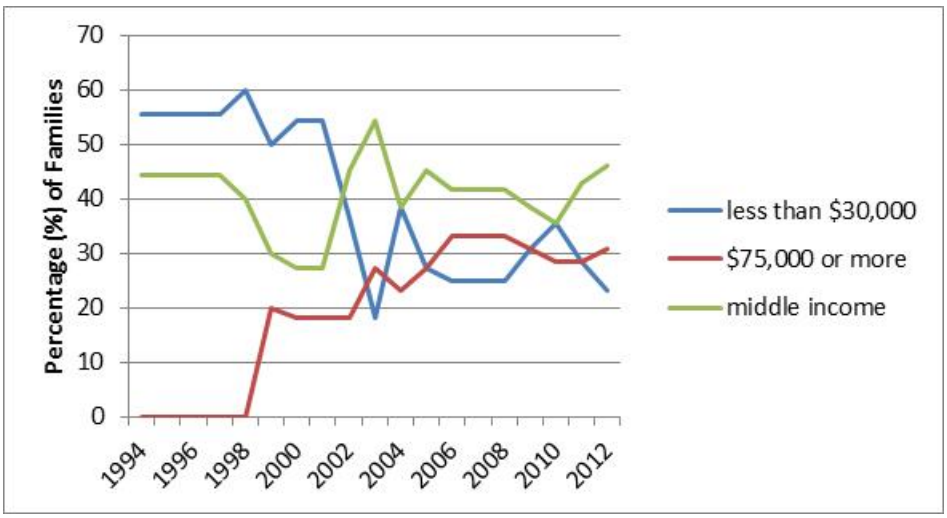
Figure 11-14: Annual Family Income in Gamètì



Source: GNWTBS (2015).

Gamètì: There are no evident trends in the gap between family income categories. The proportion of higher income families has been increasing since 2001 and the proportion of lower income families has decreased since 1999. Middle (50% or 40 families) and higher income families (38% or 30 families) now represent a larger proportion of the population than lower income families (13% or 10 families).

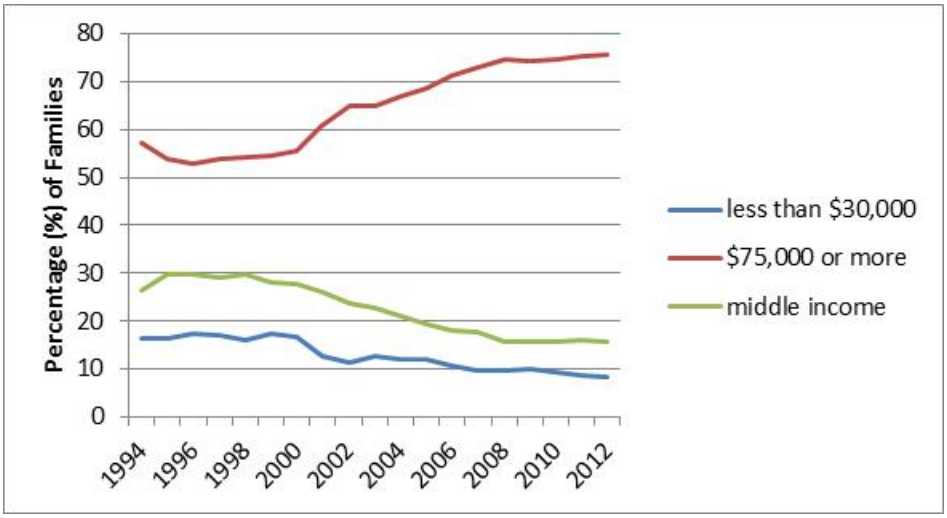
Figure 11-15: Annual Family Income in Whatì



Source: GNWTBS (2015).

Whatì: The gap in the proportion of higher income and lower income families in Whatì is narrowing and there has been a decrease in lower income families since 2001 and an increase in higher income families since 2003. Higher and middle income families (77% or 100 families) represented a higher proportion of families in 2012, reversing the trend between 1994 and the early 2000s.

Figure 11-16: Annual Family Income in Yellowknife



Source: GNWTBS (2015).

Yellowknife: The gap in the proportion of higher income and lower income families in Yellowknife is widening and there has been a decrease in lower income families and an increase in higher income families since 2001. The proportion of middle income families has also decreased and has closely matched the trend for lower income families.

Vulnerability

Vulnerability is oftentimes defined within a particular context; in this case it is considered in the context of developing the Jay Project (Project) and in terms of employment opportunities and vulnerability to poverty. Poverty disproportionately affects vulnerable members of society, including single-parent families, people with low education levels, elderly people, people with disabilities and those with addictions or mental health issues (GNWT 2013). Children of families in these groups may be especially vulnerable if their basic needs are not met (GNWT 2013). These groups are vulnerable to poverty because they are less likely or able to participate in the economy or mining employment opportunities. Also, because they are often on fixed incomes, they are vulnerable to poverty if consumer prices increase. Rural LSA communities are also vulnerable to the downside of economic development. For instance, increased incomes create new markets, some of which are negative (e.g., illegal drugs or alcohol) which pose health and safety risks to vulnerable groups in communities, for example, as the victims of drug and alcohol-related crimes. Crime is discussed further in the next section.

The unemployment rate in the territory dropped noticeably from 14.8% in 1994 (pre-diamond mining) to 9.5% in 2001 (post-diamond mining). Rates rose again during the recession in the late 2000s, but not to

the levels seen in the years before diamond mining development (Statistics Canada 2011; Annex XV Table 3.4-2). With the exception of Fort Resolution, all of the small LSA communities experienced increased labour force participation after the diamond mining industry developed in the NWT. The communities also saw variable reductions in unemployment rates during this period. However, the recession of the late 2000s had lasting negative effects on participation and unemployment rates in the small LSA communities; by 2011, conditions in most communities were nearing pre-recession levels (Statistics Canada 2011: Annex XV Table 3.4-2). Incomes are also increasing and income disparity within smaller communities is decreasing (DAR Section 14.6.1.4; Table 14.6-1). These trends indicate that the Project may actually be beneficial to reducing poverty rates in the region because it is an additional avenue for people to earn a living. The improvement in the employment rate has been linked to both diamond mine construction and operations and exploration activity in the natural gas sector. Lower unemployment, and the availability of higher incomes and year-round permanent employment will most likely translate into reduced levels of poverty. Dominion Diamond has committed to preferential hiring of women and Aboriginal people to build capacity among these groups and provide employment, thereby reducing their vulnerability to poverty.

Dominion Diamond acknowledges that there are barriers to employment of more vulnerable groups including women with children, and people with criminal records, addictions and lower levels of education. In response to barriers to employment for these groups, Dominion Diamond has committed to several actions. Please refer to the response to DAR-YKDFN-IR-14 for a breakdown of the barriers to employment of Northerners and Dominion Diamond's response.

The GNWT's Strategic Framework Toward the Elimination of Poverty also lists the roles and responsibilities of the business community in the elimination of poverty (GNWT 2013):

- Provide Northerners with opportunities for success in employment, training, and life-long learning.
- Ensure employees are productive by promoting health and well-being in the workplace.
- Contribute to economic prosperity and the quality of life of NWT residents.
- Respond to the changing demands of the economy.

Policies and programs put in place or supported by Dominion Diamond are consistent with these roles and responsibilities.

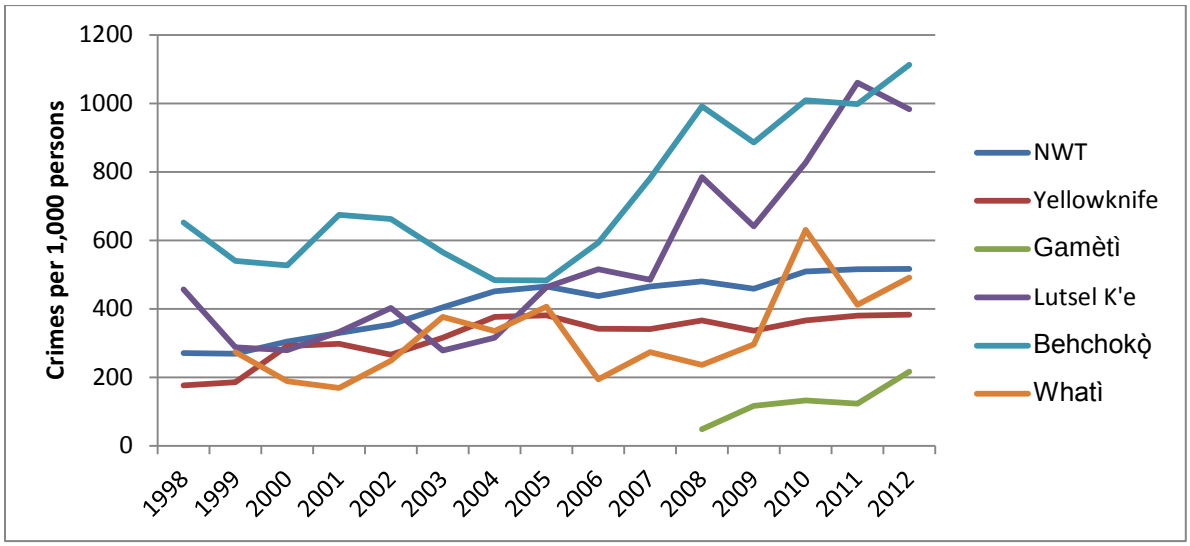
Crime

Overall crime rates have been increasing in small rural communities and Yellowknife. The figures below provide data on crime as reported in the 2013 Communities and Diamonds report (Figures 11-17 to 11-22). These increases are driven by property crimes and other criminal code offences including mischief and disturbing the peace. Alcohol use is often linked to these types of crimes, which is considered a criminal code offence in small rural communities. Before 1999 in Yellowknife and before 2002 in the rest of the NWT, territorial *Liquor Act* offences were reclassified as criminal code offences (under the Other crimes category). Mining activity may indirectly contribute to crime rates in communities. LSA communities have raised concerns during consultations that higher disposable incomes are related

to increased alcohol and drug use, which is associated with violent, property, and traffic crimes and other criminal code offences.

A recent CBC article that examined the high crime rate in the NWT reported that the RCMP point to several factors that contribute to the high levels of violent crime in the NWT. Low educational attainment, addictions issues, housing issues, and employment issues "all factor into people's ability to keep themselves productive and out of trouble". The RCMP also acknowledged that the majority of crimes committed while under the influence of alcohol, and to a lesser extent, drug use, and that victims and perpetrators often know each other; very few crimes in the territory are random acts of crime (CBC 2012).

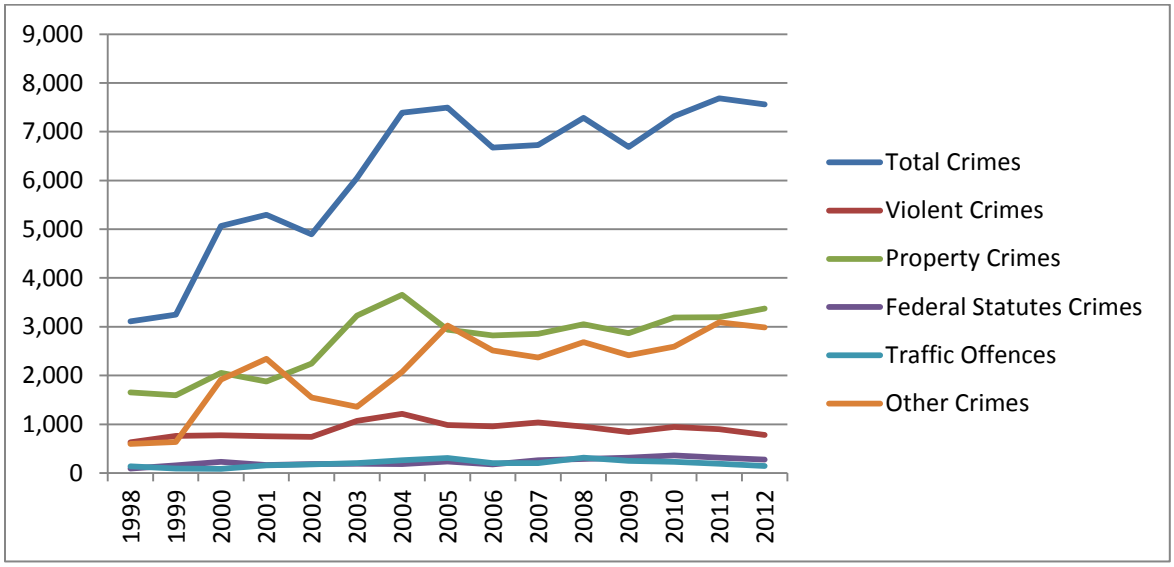
Figure 11-17: Total Police Reported Crime, per 1,000 Persons



Source: GNWT-ITI (2014).

Police-reported crime rates are highest in Behchokǫ̀ and Lutsel K'e and most of the increase in these two communities has been since 2005. In general, crime rates were higher in 2012 in the LSA communities than they were in the late 1990s. The most noticeable increase in crime rates has occurred in rural LSA communities where, since 2004, crime rates have more than doubled (DAR Section 14.6.1.5, Figure 14.6-3).

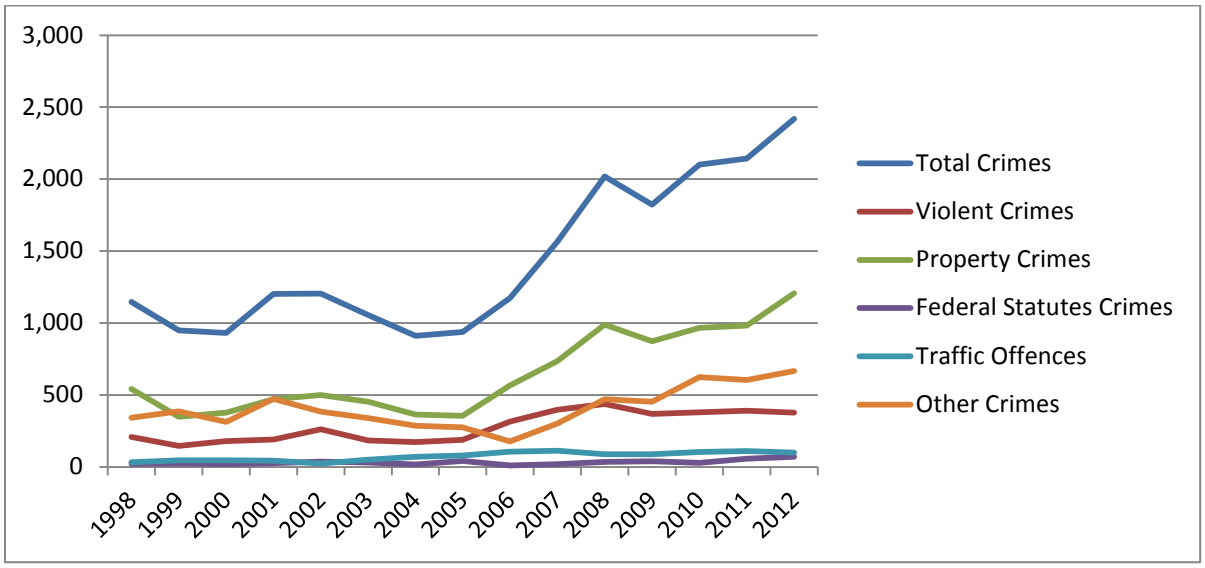
Figure 11-18: Number of Police-Reported Crimes in Yellowknife



Source: GNWT-ITI (2014).

Although 46% of the population of the NWT lives in Yellowknife, total crime in Yellowknife was only 23% of the territorial total in 2012 (GNWTBS 2013). The increase in total reported crime in Yellowknife between 1998 and 2012 has been due primarily to property crimes and other criminal code offences (e.g., mischief and disturbing the peace). The number of police reported violent crimes in Yellowknife has not increased and traffic and federal statutes (drug) crimes have remained low and stable.

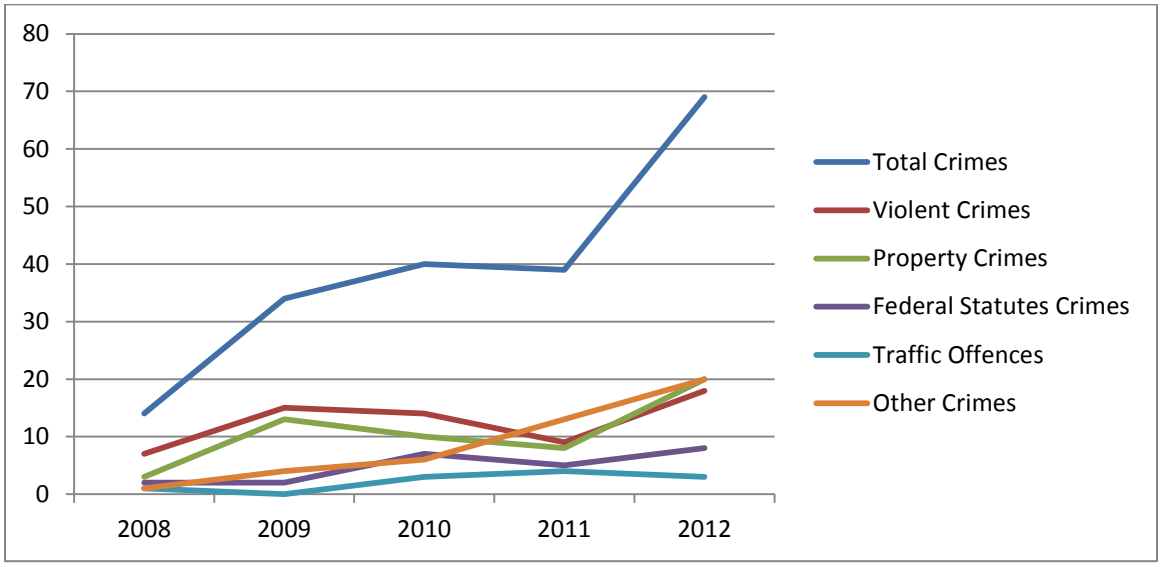
Figure 11-19: Number of Police-Reported Crimes in Behchokǫ̀



Source: GNWT-ITI (2014).

The trend in Behchokǫ̀ is similar to the trend in Yellowknife with property and other criminal code crimes representing most of the increase in police-reported crimes. The number of violent crimes increased between 2005 and 2008 but declined slightly and remained stable in more recent years. The trend lines for traffic offences and federal statutes (drugs) crimes have remained low and flat over the years.

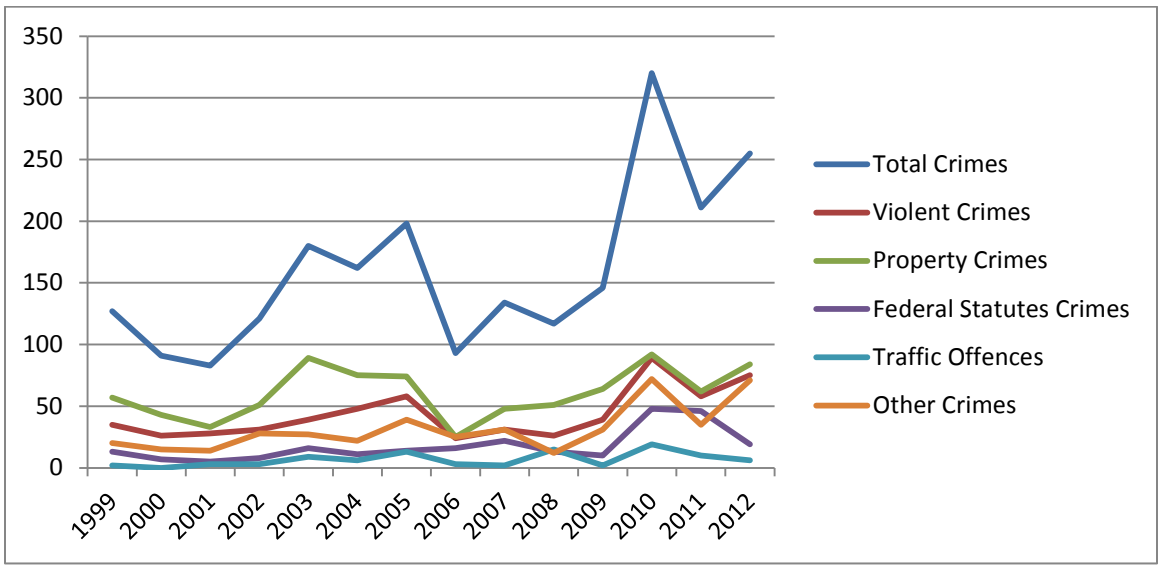
Figure 11-20: Number of Police-Reported Crimes in Gamètì



Source: GNWT-ITI (2014).

Crime data for Gamètì is not available prior to 2008 as these are captured in crimes reported by the Behchokǫ̀ RCMP Detachment. Increases in the number of crimes have been due to the number of violent crimes and property crimes and more recently other crimes.

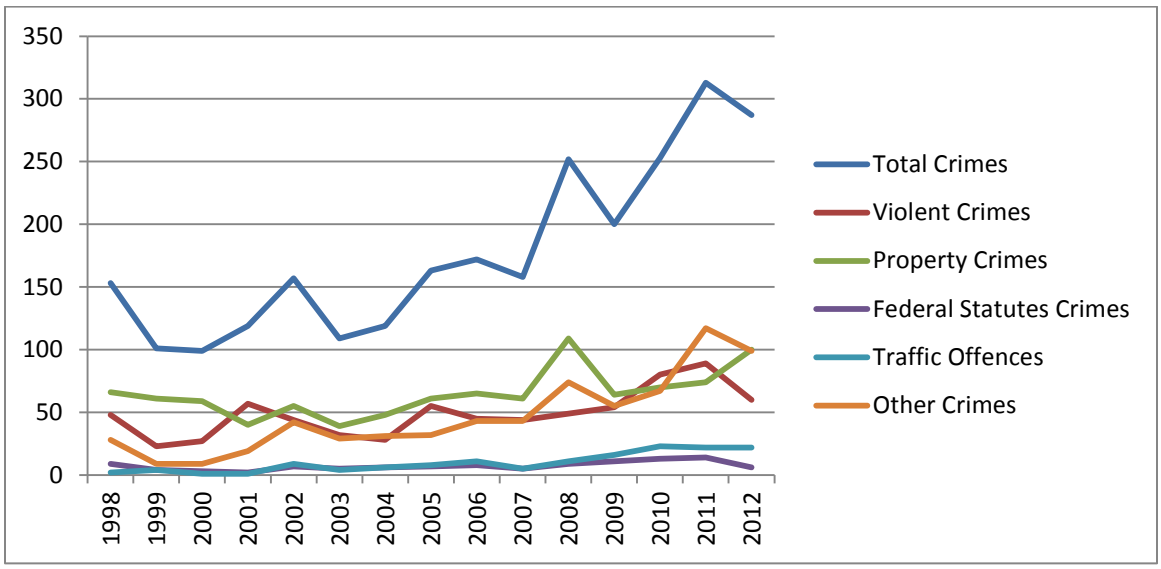
Figure 11-21: Number of Police-Reported Crimes in Whatì



Source: GNWT-ITI (2014).

The number of violent, property, and other crimes tend to follow a similar pattern in Whatì and are the main influence on the trends in the overall number of crimes. Federal statutes (drug) crime increased steeply in 2010 and 2011, but declined in 2012. This increase coincided with a decrease in all other types of crime so the number of crimes decreased overall between 2010 and 2011.

Figure 11-22: Number of Police-Reported Crimes in Lutsel K'e



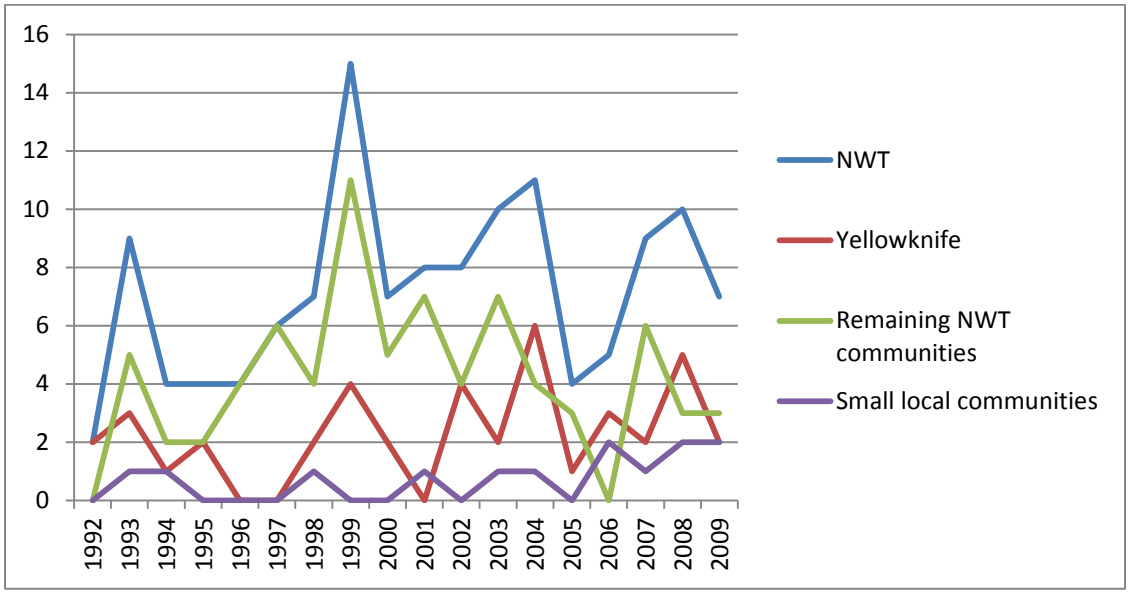
Source: GNWT-ITI (2014).

The total number of crimes in Lutsel K'e is made up primarily of violent and property crimes and other criminal code offences. Federal statutes (drug) crimes and traffic offences are comparatively low and do not indicate a trend.

Suicide

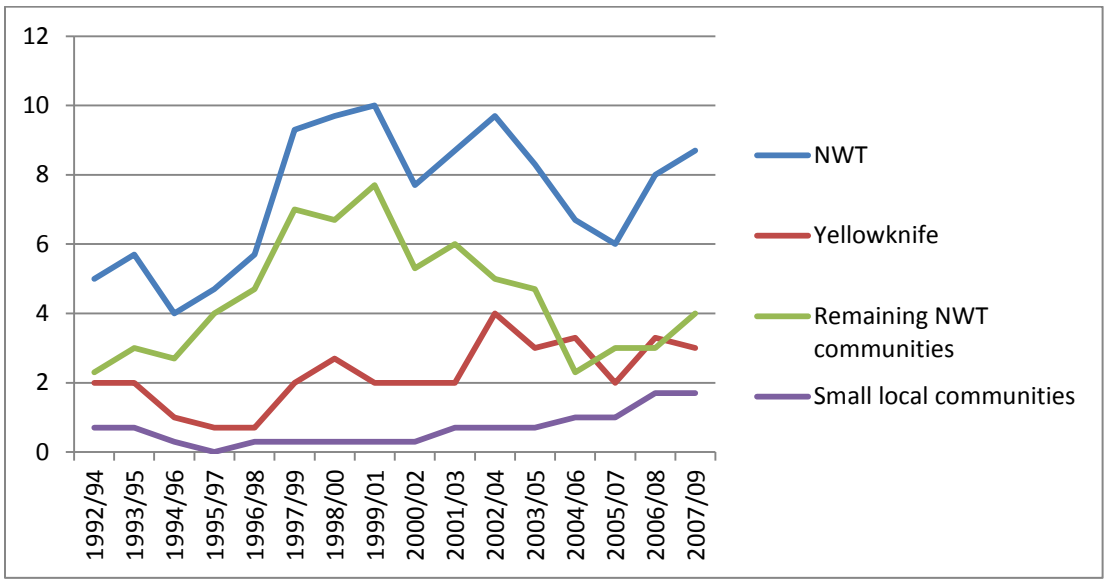
The graphs below provide data on suicide as reported in the 2013 Communities and Diamonds report (Figures 11-23 to 11-25). Small local communities are defined in the Communities and Diamonds report and include Behchokǫ̀, Dettah, Gamètì, Lutsel K'e, Wekweètì, and Whatì. Statistics for N'dilo are included with Yellowknife. The remaining NWT communities are all other communities in the NWT.

Figure 11-23: Number of Suicides



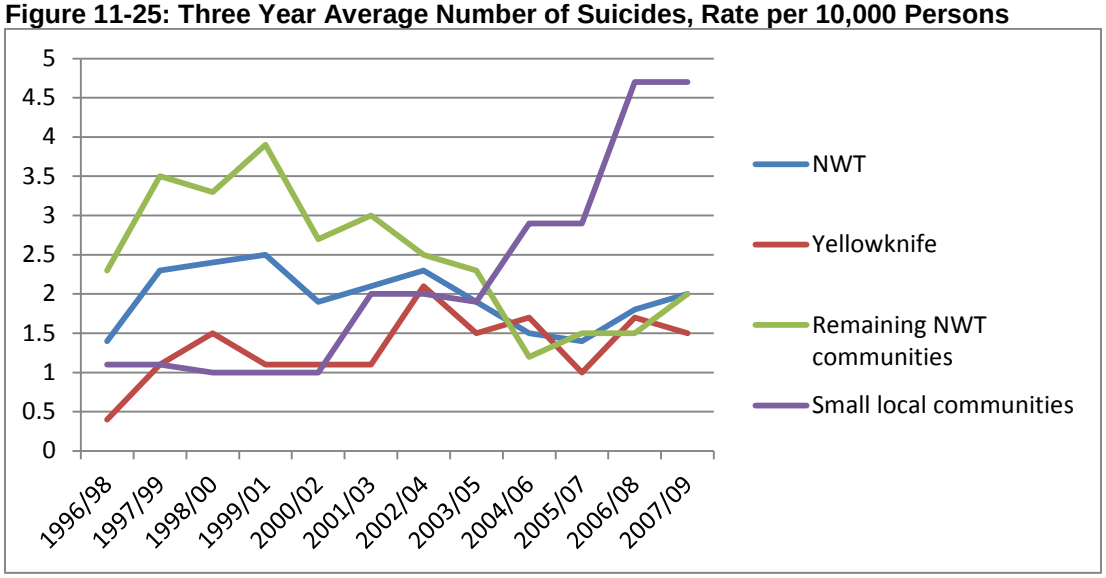
Source: GNWT-ITI (2014).

Figure 11-24: Three Year Average Number of Suicides



Source: GNWT-ITI (2014).

Figure 11-25: Three Year Average Number of Suicides, Rate per 10,000 Persons



Source: GNWT-ITI (2014).

The suicide rate in the NWT varies by region. The rate in Yellowknife and small local communities has been increasing since the mid-1990s, and especially in the small local communities (Behchokǫ̀, Dettah, Gamètì, Lutsel K'e, Wekweètì, and Whatì) since 2000. This increase is in contrast to the declines seen in communities in the remaining NWT communities. The GNWT has put in place the Applied Suicide Intervention Skills Training program, which is aimed at building the capacity for suicide prevention amongst community members and health care workers (Northern News Service 2012).

These rates should be interpreted with caution. For example, the number of suicides in Behchokǫ̀, Dettah, Gamètì, Lutsel K'e, Wekweètì, and Whatì. fluctuated between 0 to 2 per year between 1992 and 2009. This makes it difficult to identify any trends from the data or to infer a relationship between suicides and mining in the NWT.

Addictions and associated mental health problems have been linked to increases in suicide (Northern News Service 2012). Higher incomes from jobs in the mining industry have made alcohol and drugs more accessible; there is more money in communities. Abuse of alcohol and drugs can lead to people engaging in riskier activities such as crime (including domestic violence), unprotected sexual intercourse, child neglect, and further substance abuse, and can lead to depression and, in some cases, suicide (GNWT-ITI 2013).

The National Aboriginal Youth Suicide Prevention Strategy is meant to address high rates of youth suicide and its risk factors, among Aboriginal youth. The program provides opportunities for Aboriginal communities to design, develop, and participate in projects to reduce suicide within their communities (GNWT-HSS 2014).

7) Annex XV and Section 14 of the DAR consider crime, Aboriginal language, traditional activities, and community health and well-being, including mortality and disease, substance abuse and gambling, vulnerability and inequality, and health, social and protective services. All of the information presented in the DAR provides context that supports the assessment of effects of the Jay Project.

In an assessment of effects of a project on community health and well-being, the approach is to examine the existing trends, and consider Project components or activities that may indirectly or directly affect indicators. Benefit enhancement and mitigation measures are then proposed, and the relationships between the project and health and well-being in northern communities are discussed in the DAR.

The DAR examines health and wellbeing trends that have developed in communities to date, from the beginning of diamond mining and as mining activity increased in the NWT. The DAR does not, however, draw conclusions about the causal relationship between mining activity and existing health and well-being trends. Rather, it seeks to describe how the Jay Project could potentially influence these trends and what Dominion Diamond can do in response to community concerns.

Dominion Diamond acknowledges that mining projects have the potential to affect health and well-being in communities. Dominion Diamond is committed to maintaining a healthy, safe and supportive work environment for employees and contractors, and supporting community initiatives that are intended to address local needs. Potential initiatives related to community health and well-being include the following:

- Community partnership programs to provide sport, recreation, and outdoor traditional activities.
- Community and school partnerships to develop youth mentorship and leadership programs.
- Community partnerships to define Traditional Knowledge projects and to preserve oral histories and genealogical archives.
- Support for traditional activities (e.g., fall hunt) and training in traditional skills (e.g., moccasin, dreamcatcher, and drum making).

- Funding or partnership for community-building activities.
- Community and government partnership to develop facilities for sport and other recreation activities.

In the development of mitigation measures, Dominion Diamond also considers life challenges that may be barriers to employment (see Table 11-3 above).

References:

CBC (Canadian Broadcast Corporation). 2012. Crime rates in Canada still higher than national average: N.W.T. and Nunavut rates about 4 times higher than rest of Canada. Published: July 24, 2012. Available at: http://www.cbc.ca/news/canada/north/crime-rates-in-north-still-higher-than-in-rest-ofcanada- 1.1221263. Accessed: November 19, 2013.

GNWT (Government of the Northwest Territories). 2012. Update on NWT barren-ground caribou. News release from November 6, 2012. http://news.exec.gov.nt.ca/update-on-nwt-barren-ground-caribou/

GNWT. 2013. Building on the Strength of Northerners: A Strategic Framework toward the elimination of poverty in the NWT. Available at: http://www.hss.gov.nt.ca/sites/default/files/anti-poverty_report.pdf. Accessed March 2015.

GNWT. 2014. Temporary harvest measure for Bathurst and Bluenose-East caribou herds announced. Government of the Northwest Territories media release. December 19, 2014. Yellowknife, NT.

GNWTBS. 2010. Traditional Activities. Available at: http://www.statsnwt.ca/Traditional%20Activities/. Accessed March 2015.

GNWTBS. 2013. NWT Community Data. Available at: http://www.statsnwt.ca/community-data/#. Accessed: December 10, 2013.

GNWTBS. 2014. General Health Indicators. Available at: http://www.statsnwt.ca/health/health-conditions/. Accessed March 2015.

GNWTBS. 2015. Income Statistics. Available at: http://www.statsnwt.ca/labour-income/income/index.html. Accessed March 2015.

GNWT-HSS. 2014. Pathway to Wellness . Available at: http://www.hss.gov.nt.ca/sites/default/files/pathway-to-wellness.pdf. Accessed: March 16, 2014.

GNWT-ITI. 2013. 2012 Annual Report: Communities and Diamonds. Available at: http://www.iti.gov.nt.ca/publications/2012-communities-and-diamonds-annual-report. Accessed: July 29, 2014.

GNWT-ITI. 2014. Communities and Diamonds: 2013 Annual Report. Available at: http://www.iti.gov.nt.ca/sites/default/files/td_-_2013_communities_and_diamonds_annual_report_-_final_web.pdf. Accessed: March 2015.

Statistics Canada. 2011. National Household Survey. Available at: http://www12.statcan.gc.ca/nhs-enm/index-eng.cfm. Accessed: March 2014.

Statistics Canada. 2014a. Canadian Community Health Survey (CCHS) – 2014. Available at: http://www23.statcan.gc.ca/imdb/p3Instr.pl?Function=assembleInstr&lang=en&Item_Id=214314#qb215576. Accessed March 2015.

Statistics Canada. 2014b. Canadian Community Health Survey – Annual Component. Available at: http://www23.statcan.gc.ca/imdb/p2SV.pl?Function=getSurvey&SDDS=3226&lang=en&db=imdb&adm=8&dis=2. Accessed March 2015.

DOMINION DIAMOND

Information Request Number: DAR-YKDFN-IR-12

Source: Yellowknives Dene First Nation: Todd Slack

Subject: Socio-Ec

DAR Section(s): 14

Preamble (YKDFN):

The project notes a significant increase in the number of residents moving from small communities to Yellowknife, but provides almost no discussion on the impact to the smaller communities. Secondly, the project notes that aboriginal language is declining, but this information is not incorporated into any kind of assessment.

Request (YKDFN):

1) Please provide an assessment on the impact of small communities when sizable proportions of their educated and strong members leave to reside in Yellowknife.

2) The project has concluded that the impacts associated with project induced out migration from rural LSA communities is significant, yet fails to provide any mitigations or discussions on the efficacy of the existing efforts. If the impacts are significant, how can this project proceed?

3) Please provide a discussion on the impact of communities losing 20 to 53% of their aboriginal language speakers over a period similar to that of the operation of Ekati.

4) Please provide a discussion on the level of federal and GNWT funding for mining related geo-science versus funding provided to support language programs (for the 9 official languages that the project chooses not to recognize).

Response:

1) In most of the rural local study area (LSA) communities, population decline has been pronounced since 2001. Lutsel K'e, Gamètì, and Fort Resolution all experienced population declines of over 10 percent (%) between 2001 and 2011. Wekweètì, Whatì, and Dettah had little or no population growth during the same period. Behchokǫ̀ and Yellowknife were the only two communities to see population increases above 5%. Much of this increase can be attributed to the current migration trend of rural to urban, and north to south movement. In a 2009 survey, mining employees living in the Northwest Territories (NWT) that were considering leaving the NWT cited the cost of living (64%), time for a change (46%), being tired of the weather (25%), wanting to be closer to family (16%), or the availability of direct flights to the mine site (10%) as reasons for considering a move (NWT Bureau of Statistics 2009). Similar reasons were also cited by mining employees that had already left the NWT.

   Mining employees from smaller communities of 4,000 persons or less were less likely to consider leaving the NWT, at 32%, compared to 52% of those living in communities of 5,000 to 24,000 persons (GNWTBS 2009). The move south, therefore, seems to be more likely when mining employees live in Yellowknife.

Between 2006 and 2011, 720 people had moved to Yellowknife from other locations in the NWT. While only amounting to 4.1% of the population of the city, this number is important considering the low populations in the smaller communities in the NWT, including the LSA communities, from which people would have moved. Others still, including people in Yellowknife, migrate south is search of warmer climates and lower cost of living.

While the rural to urban migration trend is already occurring, and is not wholly attributable to mining employment, it is expected that as people take up positions with the Jay Project (Project) made available by attrition, some will choose to move from rural LSA communities to Yellowknife to be closer to amenities and for other reasons.

Project employment provides incomes needed for successful relocation and participation in the private housing market. Furthermore, the inclusion of Yellowknife as a point of hire community removes the barrier associated with transportation to and from the Project. Dominion Diamond includes all rural LSA communities as fly points so living in one of these communities will not be a barrier to employment on the Project.

Intra-territorial migration from rural LSA communities to Yellowknife will be low, given that few new jobs will be created by the Project, and that not all people from rural LSA communities who fill these jobs will choose to migrate to Yellowknife. It is expected that the small amount of in-migration over the five year construction and 10 year operational phase of the Project would not be discernable from natural population change in the city, in terms of demand on existing health, social, and protective services.

The Project's residual effect on intra-territorial migration from rural LSA communities to Yellowknife is considered to be of low magnitude. Project operation is expected to maintain the existing Ekati Mine workforce, and so the uptake of employment by those currently not employed by the mine and living in rural LSA communities is limited to opportunities created by attrition. Furthermore, not all those who take up employment at the mine will decide to migrate from rural LSA communities to Yellowknife; these are individual choices.

The effect may be negative for some communities where population decline threatens the demographic composition of the community, or the provision of services based on population linked funding from the territorial and federal governments. Conversely, the effect may be positive for those who choose to move to Yellowknife in terms of their access to amenities and services. The effect will persist throughout Project operations and closure, and so is considered long term in duration. It is unlikely that, following closure of the Project, skilled workers employed at the mine would return to rural LSA communities, and so this effect is considered irreversible. The combined effect of the Project on out-migration from rural and LSA communities to Yellowknife and on the population of the NWT is considered significant (see Developer's Assessment Report [DAR] Section 14, Table 14.2-2).

2) A mitigation for out-migration from rural to urban communities that is within the scope of a developer is to remove the barrier to employment in rural communities. Dominion Diamond flies out employees (by charter) from all LSA communities and preferentially hires Northern workers, including those from LSA communities (Table 14.1-4 of the DAR). Dominion Diamond has also cancelled its southern charter between Edmonton and Yellowknife effective May 31, 2015. Employees are provided with allowances to get to the nearest pick up point, but will not be paid for their time to do so. Dominion

Diamond acquired the Ekati Mine less than two years ago, and only recently changed its policy regarding Edmonton as a fly point, and so has not yet had the opportunity to monitor the efficacy of this mitigation.

It is not the purview of Dominion Diamond to state whether or not the Project proceeds. This determination will be made through the regulatory review process.

3) Language is the way in which all human beings understand and communicate about the world (Wallace and Wolf 1999). As such, language is one of the ways in which a person learns about their culture. Culture is expressed in behaviour patterns and the products of human action which may be passed on from generation to generation (Parsons 1958). Aboriginal culture and traditional knowledge is passed on through language and experience (e.g., time on the land); therefore, as the number of Aboriginal language speakers in a community declines, it follows that the potential for transmission of Aboriginal cultural knowledge to future generations would also decline. As noted in the DAR, this is a scenario faced by the rural LSA communities, where the number of people with knowledge of, or who use an Aboriginal language, has declined.

   In recognition that use of Aboriginal language is in decline, Dominion Diamond is in the process of developing community development plans for each of its Impact Benefit Agreement (IBA) communities. During the development of these plans, consideration will be given to the IBA community priorities based on conversations held with community leaders and Elders, and feedback from employees. Cultural priorities may include the following:

   - fostering community pride in youth;
   - youth participating in Traditional Knowledge, country food supply, and environmental plans and programs; and,
   - community facilities and cultural activities and celebrations.

   Potential initiatives or options for future social programming supported by Dominion Diamond in response to these priorities could include the following:

   - community partnerships to define Traditional Knowledge projects and to preserve oral histories and genealogical archives;
   - support for traditional activities (e.g., fall hunt) and training in traditional skills (e.g., moccasin, dreamcatcher, and drum making); and,
   - funding or partnerships for community-building activities.

   In addition to these community development strategies, Dominion Diamond has continued the Ekati Plus program, which provides scholarships for post-secondary education to students from LSA communities and invests in schools, Elder Centres, Out on the Land programs, the Trail Series films, a Heritage centre, youth programs, and community initiatives aimed at preserving and teaching traditional knowledge and language.

4) Please note, the summary below may not include comprehensive details on all federal and Government of Northwest Territories (GNWT) funding for geoscience funding and language program funding, and is based on publicly available information.

The NWT Mineral Development Strategy was released in the fall of 2013. The Strategy's Implementation Plan identified actions that would begin during the 2014-2015 fiscal year (GNWT-ITI 2014). Within the implementation plan is a commitment from the GNWT to allocate $655,000 in 2014-2015 and $650,000 in 2015-2016 to increase human resource capacity in the Northwest Territories Geoscience Office (NTGO) by hiring a Surficial Geologist and Geophysicist, and to increase funding for key program areas within the NTGO including web-based delivery of geoscience information. A new and easier to use web portal for discovery and dissemination of geoscience information will also be developed.

The 2014-2015 GNWT Budget includes $1.9 million for initiatives recommended by the Mineral Development Strategy, including a Mining Incentive Program and marketing, improvements in geoscience information and research, mining workforce development and training, and a Slave Geologic Province Corridor Access Study (the $655,000 mentioned in the previous paragraph is included in this $1.9 million (GNWT 2014).

The 2015-2016 GNWT Budget provides $1.7 million in funds for the Mineral Development Strategy, including $300,000 for the Geoscience Field Assistant Training Program and a geoscience career liaison coordinator and over $1.4 million to hire a geophysicist, a surficial geologist, and a northern mining business development officer and provide support for incentive programs for exploration, scientific resource deficits, and coordination between industrial market segments (the $650,000 mentioned in the former paragraph is included in this $1.7 million; GNWT 2015).

The level of GNWT funding for initiatives under the Mineral Development Strategy including mining related geoscience is summarized in Table 12-1.

Table 12-1 GNWT Budget for Initiatives under the Mineral Development Strategy

MDS Initiative	2012-2013	2013-2014	2014-2015	2015-2016	Total
Mineral Development Strategy and Action Plan	$643,000				$643,000
Geoscience career training				$300,00	$300,000
Support for Aboriginal engagement and participation			$100,000	$100,000	$200,000
NWT business supply opportunities			$152,000	$149,000	$301,000
Promotion of NWT mineral exploration and development			$200,000	$140,000	$340,000
Improved geoscience information and research			$655,000	$650,000	$1,305,000
Creation of NWT Mining Incentive Program			$400,000	$400,000	$800,000
Mining workforce development and training			$162,000		$162,000
Slave Geologic Province Corridor Access Study			$200,000		$200,000
Maximizing Northern residency from mining	$100,000				$100,000
Total	**$743,000**	**$0**	**$1,869,000**	**$1,739,000**	**$4,351,000**

The 2013-2014 Annual Report on Official Languages describes language programs funded by the GNWT including Aboriginal Language Nests (GNWT-ECE 2015). In February 2014, GNWT Education, Culture and Employment Department (ECE) had consultation meetings with Regional Aboriginal Governments to discuss taking responsibility for Aboriginal languages revitalization including management and operations of the Aboriginal Language Nest program. As of April 2014, Regional Aboriginal Governments or their designates are now responsible for the Aboriginal Language Nest program. As part of the agreement the Aboriginal Language Nest funding recipients now apply to their own Aboriginal governments or organizations.

In the GNWT funding is provision for the Aboriginal Language and Cultural Instructor Program (ALCIP) through ECE's Strategy for Teacher Education in the Northwest Territories: 2007-2015, with additional funding for part-time delivery coming from contributions from ECE's Aboriginal Languages Secretariat, and the Government of Canada. ECE also funds an Aurora College ALCIP Coordinator position. The ALCIP Coordinator updates student files, communicates with Language Coordinators in each of the regions, and supports student needs (GNWT-ECE 2015).

For the past several years, the GNWT has entered into annual contribution agreements with regional Aboriginal organizations, or their designate, that represents an official Aboriginal language group to fund the Aboriginal Languages Communities Program. Funding is allocated based on the development, implementation and review of their strategic language plans, and on language proposals received from member communities (GNWT-ECE 2015)

The Aboriginal Languages Literacy Program also receives funding from the GNWT (GNWT-ECE 2015). The focus of this initiative is on community and family literacy and on developing Aboriginal language resources that can be used by others.

Contributions are provided to Aboriginal broadcasting organizations to ensure production and distribution of radio and television programming and press releases in the NWT Aboriginal languages. Funding is based on the demonstrated need of the organization and the availability of resources as approved by the Legislative Assembly. The maximum amounts for the contribution are based on the amounts secured through the Canada-NWT Cooperation Agreement for French and Aboriginal Languages in the NWT. (GNWT-ECE 2015). For example, the Community Broadcasting Grant Program provides a maximum of $6,000 a year to community radio stations (GNWT-ECE 2015).

The level of federal and GNWT funding provided to GNWT language programs for Aboriginal languages in 2013-2014, the most recent year of available funding data (GNWT-ECE 2015) is summarized in Table 12-2.

Table 12-2 GNWT Language Program Expenditures – Aboriginal Languages, 2013 to 2014

	Federal Funding		GNWT Funding	
	Budget	**Actual**	**Budget**	**Actual**
Aboriginal Terminology	$110,000	$109,999		
Teaching and Learning	$450,000	$450,000		
Aboriginal Language Broadcast	$200,000	$200,000	$222,000	$212,000

Table 12-2 GNWT Language Program Expenditures – Aboriginal Languages, 2013 to 2014

	Federal Funding		GNWT Funding	
	Budget	**Actual**	**Budget**	**Actual**
PWNHC Geographic Place Names	$15,000	$15,000		
Aboriginal Language and Culture	$200,000	$200,000		
Community Contributions	$925,000	$911,700	$443,000	$930,805
Aboriginal Language Projects			$338,000	$350,000
Language Acquisition Initiative			$143,000	
Language Nest-Early Childhood			$972,000	$971,575
Aboriginal Language Literacy			$300,000	$300,000
Language Services Division Admin			$372,000	$406,878
Culture and Heritage			$157,000	$17,000
Official Languages Board			$125,000	$26,855
Aboriginal Languages Strategic Initiatives			$778,000	$359,989
Aboriginal Language Culture Based Contributions - School Contributions			$8,850,000	$8,392,584
Total	**$1,900,000**	**$1,886,699**	**$12,700,000**	**$11,967,686**

Budgets for language programs are included in the total budget allocated to the ECE. To address the risk of losing Aboriginal languages, ECE has funded the development of five-year regional Aboriginal language plans and is funding Aboriginal governments to build their capacity to guide the implementation of those plans as part of their 2015-2016 Business Plan (GNWT-ECE 2014). Specifically, ECE has provided $1,953 million in new funding, for a total of $3.4 million per year, to Aboriginal governments so that they can develop and deliver Aboriginal language programs based on their language plans.

The ECE's Operations Expense Summary for Aboriginal language related programs and initiatives (GNWT-ECE 2014) is presented in Table 12-3.

Table 12-3 ECE Operations Expense Summary – Aboriginal Language

	2014-2015 Estimates	2015-2016 Business Plan
Aboriginal Language and Culture Based Education	$8,237,000	$8,400,000
Aboriginal Languages Secretariat	$6,727,000	$6,755,000
Total	$14,964,000	$15,155,000

The estimated transfer payments from the federal government for 2014-2015 for the Canada NWT Cooperation Agreement for French and Aboriginal Languages totals $3.8 million (GNWT-ECE 2014).

References:

GNWT (Government of the Northwest Territories). 2014. Budget 2014-2015 Highlights. Available at: http://www.fin.gov.nt.ca/address/archive/documents/2014-15%20Budget%20Highlights.pdf. Accessed March 2015.

GNWT. 2015. Budget Address 2015-2016. Available at http://www.fin.gov.nt.ca/address/archive/documents/2015-16BudgetAddressandPapers.pdf. Accessed March 2015.

GNWTBS (Government of the Northwest Territories, Bureau of Statistics. 2009. 2009 NWT Survey of Mining Employees Report. Government of the Northwest Territories. August 2009. Available at: http://www.iti.gov.nt.ca/sites/default/files/MESReportGNWT.pdf. Accessed March 2015.

GNWT-ECE (Government of the Northwest Territories - Education, Culture and Employment). 2014. Education, Culture and Employment 2015-2015 Business Plan. Available at: http://www.fin.gov.nt.ca/budget-documents/business-plans/documents/ECE_BP2015-16Final.pdf. Accessed March 2015.

GNWT-ECE. 2015. 2013-2014 Annual Report on Official Languages. Available at: http://www.ece.gov.nt.ca/files/pages/608/eceofficiallanguagesar141024webready.pdf. Accessed March 2015.

GNWT-ITI (Government of the Northwest Territories - Industry, Tourism and Investment). 2014. NWT Mineral Development Strategy GNWT Implementation Plan 2014-2015. Available at: http://www.iti.gov.nt.ca/sites/default/files/mineral_development_strategy_implementationplan.pdf. Accessed March 2015.

Parsons T. 1958. Essays in Sociological Theory. Free Press: The University of California. 459 pp.

Wallace RA, Wolf A. 1999. Contemporary Sociological Theory: Expanding the Classical Tradition. Fifth edition. Prentice Hall. ISBN 0-13-787656-4

DOMINION DIAMOND

Information Request Number: DAR-YKDFN-IR-13

Source: Yellowknives Dene First Nation: Todd Slack

Subject: Socio-Ec

DAR Section(s): 14

Preamble (YKDFN):

Many members of the YKDFN are concerned that the benefits associated with the diamond mines have not been witnessed by those most impacted by the mine.

Request (YKDFN):

1) For the period found in table 14.3-2 please provide a metric that compares the amount of paved roads in Ndilo (km) versus the value of production ($B).

2) For Yellowknife, Ndilo and Dettah Please provide a chart that provides absolute value per capita income (not rate of increase), government spending, and mineral valuation for the period since Ekati opened.

3) Please provide a discussion on why the number of businesses has declined so steeply during the operation of the mines – particularly when the discussion provided notes the many new businesses that were started to service the project.

Response:

1) The two metrics, referenced in this information request (i.e., paved roads in N'dilo, by kilometre, and the value of production of diamonds at the mines in the Northwest Territories [NWT]) are not directly comparable. While royalties associated with the total value of production of a mine can be determined relative to total annual production, these royalties are not directly associated with any one community or spending priority. The allocation of funding based on spending priority is the purview of governments, as opposed to individual developers.

2) Individual income levels are discussed in further detail in the responses to DAR-MVEIRB-IR-72 and DAR-Tłı̨chǫ-IR-15. Individual income levels are not reported by Statistics Canada for the communities of Dettah or N'dilo given their small populations, and the requirement to maintain anonymity.

   Historical data on clearly attributable and comprehensive total government (i.e., federal, territorial, and municipal) spending in the individual communities referenced in this information request were not publicly available at the time that this response was drafted.

   Mineral valuation at a mine is not associated with the population of exclusive communities.

3) Section 14.3.1.6 of the Developer's Assessment Report (DAR) discusses local business capacity, including a breakdown of local business in general, as well as mining-related businesses. While the DAR does note an overall decline in the number of registered businesses in the NWT, it does not

suggest that there has been a decline in the number of businesses that specifically service the mining industry. Mining companies in the NWT have targets for Northern procurement, and contract and procure from Northern businesses wherever possible and practical. As a result, demand for the goods and services offered by Northern businesses specifically related to the mining industry is high. The response to DAR-YKDFN-IR-08 provides a detailed breakdown of the types of goods and services procured from Northern businesses.

DOMINION DIAMOND

Information Request Number: DAR-YKDFN-IR-14

Source: MVEIRB Information Requests from Chuck Hubert

Subject: Projected Employment Effects

DAR Section(s): 14

Preamble (MVEIRB):

Figure 14.4-4 contains projections of employment. It's unclear what assumptions went into this graph.

Request (MVEIRB):

1) Please provide a description of the presumed northern participation rate that was used in this graph (including that for Gahcho Kue)

2) Please provide a graph that contains projections based on current northern rates including Gahcho Kue (now that it's in construction). Additionally, please include graphs that outline what the projections would be if the projects met their commitments as well as if they had 100% northern hiring rates.

3) Anecdotal experience has suggested that the degree of aboriginal participation in the mining force has begun to plateau. Please provide a discussion which:

   a. Explains the level of certainty that the promises of future developments (GK and Jay) will be able to achieve the economic commitments, given the evidence of history.

   b. What are the primary obstacles keeping the underutilized part of the potential workforce from becoming employed as part of the mineral industry's workforce?

   c. What actions has the company undertaken to expand the accessible workforce and how effective have they been.

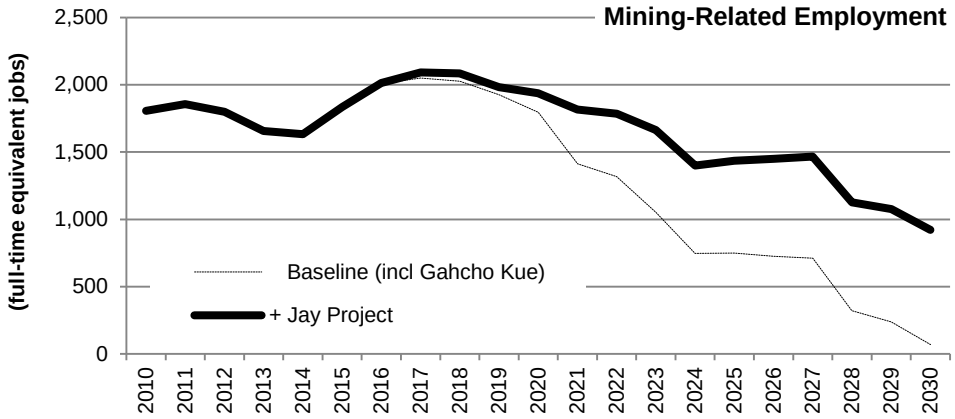
4) On page 14-75, the project suggests that the Northern Participation rate in 2021 will be 55%. However, they have a commitment of 60% today. Please provide an explanation? Secondly, please explain why the project is already accepting and acknowledging that it cannot meet their hiring targets until some point after Diavik has closed.

Response:

1, 2 and 4) The recent announcement from the Diavik Mine that the A21 pipe was being developed necessitated a revision to the Economic Impact Report; a revised Economic Impact Report was completed that includes this development (Appendix A, Economic Impact Report [Revised]). Please see the response to DAR-MVEIRB-IR-71 for a description of the effects of A21 on the Northwest Territories (NWT) labour market.

The employment figure (Developer's Assessment Report [DAR] Figure 14-4-4) referenced in this Information Request has been updated and is provided below as Figure 14-1.

Figure 14-1 Base Case Employment Effect from Northwest Territories Mining, 2010 to 2030



There is no presumed participation rate used in estimating the potential number of NWT residents employed either directly or indirectly as a result of the mining industry; that is, the relative number of NWT workers is derived after calculating the absolute number.

The NWT Economic Impact Model incorporates several variables in determining the participation of NWT residents in mining-related employment. Included with these variables is the historical trend, the size of the source population and labour force, and a modelled response by the NWT labour force to changes in the NWT labour market.

In this last case, it is assumed that a large increase in labour demand combined with a decreasing number of unemployed will result in an increase in the number of NWT residents working but at a decreasing rate. The absolute number of employed NWT residents goes up, but the relative number goes down. The model is also built to respond in the opposite direction when jobs are being lost and unemployment rates are climbing. Both of these effects can be seen in the results. As described in the response to DAR-MVEIRB-IR-71, the new Base Case Scenario creates a short-term situation from 2016 to 2018 where the increasing labour demand puts pressure on the existing NWT labour market. Beyond that period, a number of the development projects that caused the upward pressure will be completed, with the result being a decrease in labour demand. Beyond 2023 and the closure of the Diavik Mine, the combined effects of lost jobs and growing unemployment result in a decrease in the number of NWT residents employed, but an increase in the relative number.

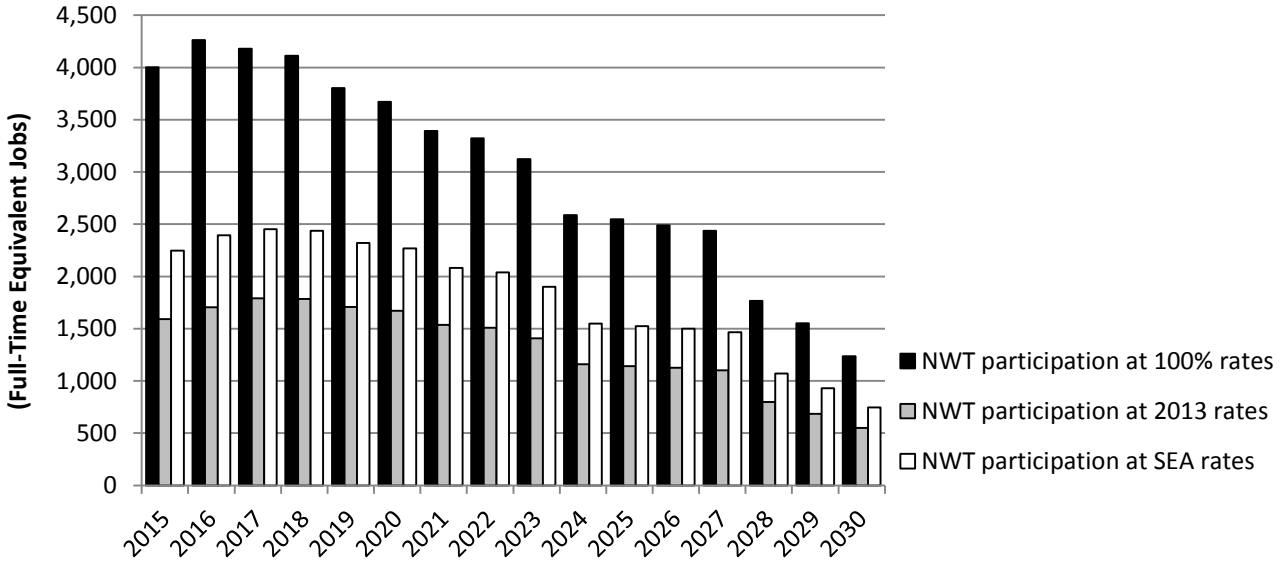
In addition to this, bounds are placed on the NWT populations propensity to participate in the labour force. These bounds are based on historical data. Participation rates are not allowed to exceed 80% or fall below 66 percent (%) in the model. This component creates an additional dynamic response in the model because it affects the size of the labour force, and thus the number and rate of unemployed.

The absolute and relative number of NWT residents working in the jobs created by the Jay Project is provided below:

- The number of NWT residents working in the direct and indirect jobs created during the construction phase of the Jay Project was estimated to equal 152 (given in terms of full-time equivalent [FTE] jobs). This represents 26% of the total direct and indirect employment.
- The absolute and relative participation of NWT resident labour will change over the life of the Jay Project. The starting point in estimating this participation was the number of NWT residents currently employed at the Ekati Mine.
- Starting in the first full year of production (2021), it is estimated that NWT residents will fill 540 of the 1,075 operation jobs associated with the Jay Project. In relative terms, this represents 50% of the workforce. Note that in 2021, there will be other work at the mine site related to the final activities related to the existing Ekati Mine, which includes some reclamation work that will employ NWT residents.
- By the final full year of operations (2030), the NWT resident workforce will have grown based on the modelled response explained earlier. At that time, total direct and indirect employment related to the Jay Project will equal 1,150 FTE jobs. NWT residents will fill 728 of these jobs. In relative terms, this is equal to 63%.
- The number of induced jobs created during the operations phase was estimated to average 110 annually. NWT residents are assumed to fill all of these jobs.
- When taken together, the operations phase of the Jay Project is expected to create an average of 1,245 FTE jobs (direct, indirect, and induced). NWT residents are estimated to fill 748 of them, for a relative participation rate equal to 60% over the operational life of the Project.

The 2013 Socio-economic Monitoring Agreement reports were used in creating the figure requested in question 2 of this Information Request (Figure 14-2). The participation of NWT residents in the direct and indirect jobs in 2013 was reported to equal 1,465 from a total of 3,258, representing 45% in relative terms (23.5% for development work and 46% for operations work).

Figure 14-2 Northwest Territories Participation



3a) The results presented in the DAR represent a prudent estimation of the economic effects of the Project. They are based on sound economic principles and historical evidence. With specific reference to the labour estimates, it is a brief period (2015 to 2018) where the NWT labour market will face real pressure. Labour demand from the mining industry will average 4,100 FTEs. In those years, it is true that the relative participation of NWT residents will decline, but the absolute number of participants will go up.

In looking at this time period and the changing labour market, the estimates show NWT residents will fill 1,745 of the FTE jobs available in 2018, causing the unemployment rate to reach 6.9% that year, which will be the first year since 2009 that it will have dropped below 7%. However, this rate is not without precedence. In 2005, the NWT unemployment rate was 5%. At that time (2005), the number of NWT residents working directly or indirectly with the diamond mines was 1,614. Also at that time, the territory's source population was 33,045 and the labour force participation rate was 76.6%. By 2018, the source population will be larger (34,441) and the labour force participation rate will be lower (76%). So, the labour estimates during this period seem reasonable, and are well within historic norms.

Otherwise, the estimates are based on reasonable and prudent assumptions regarding the future economy and labour market in the NWT.

3b,c) The Socio-Economic Supplemental Report to Adequacy Items 11.1 to 11.5 (Dominion Diamond 2015) discusses barriers to the employment of Northerners. A summary of barriers is provided in Table 14-1 below. As noted in the DAR, and in the Socio-Economic Supplemental Report response to Adequacy Review items 11.1 to 11.5, low levels of educational attainment present a significant barrier to the success of people in rural communities, and the NWT Aboriginal population overall, in obtaining employment in the mining industry. While concessions are made by some proponents, such as Dominion Diamond, in terms of flexible educational requirements for some entry level positions, not

possessing the necessary training and skill set for semi-skilled and skilled positions prevents many from participating in these areas of employment.

Table 14-1 Barriers to Employment and Dominion Diamond Responses

Indicator	Barrier	Dominion Diamond Response	Additional Comments
Employment	In the small rural communities, women with children do not tend to apply for rotational positions. Most of Dominion Diamond's employment is rotational, except in Yellowknife, where Dominion Diamond's corporate head office is situated.	On a case-by-case basis Dominion Diamond evaluates alternative shift options for women such as 3 on, 4 off.	Women with children are more likely to apply for positions that become open in Dominion Diamond's offices in Yellowknife. There are, however, fewer openings there and these positions require the employee to reside in Yellowknife, or be willing to move.
Employment	Criminal records can prevent potential workers from passing security clearance.	Dominion Diamond conducts case-by-case security assessments. If an applicant self-declares a criminal record, security investigators consider when the offence was committed, and the severity of the crime before making a recommendation as to the hiring of the individual.	Through this process, some candidates with criminal records can be considered for employment opportunities. There are still problems associated with getting an official pardon, including the cost of the pardon, and the lengthy processing time. Dominion Diamond would prefer that the Community Development Officer from the applicant's home community pursue the pardon. This would occur during pre-employment, before the candidate applies for a position.
	Drug and alcohol abuse can prevent potential workers from passing pre-employment medical clearance. Failure to pass the medical clearance is the most common barrier to employment.	Drug testing is conducted prior to employment at the mine and while employed, if there is suspected drug and alcohol use. If an applicant fails the drug test, this does not prejudice them, and they are able to immediately apply for other employment opportunities with Dominion Diamond in the future. In the past, the applicant would have to wait for months before they were permitted to re-apply. Dominion Diamond contributes to projects and initiatives to address health and wellness issues, including substance abuse problems in communities. Dominion Diamond will pay for drug and alcohol treatment which may include residential treatment, out- patient services and/or educational counselling. This is in addition to the Employee and Family Assistance Program, which is part of the employee benefits package.	Workers will be reinstated after the alcohol/drug issue has been addressed. Drug testing is booked in advance and is required for all positions with Dominion Diamond. People over 40 have to have an Electrocardiogram; however, failure to achieve medical clearance is mainly related to the presence of drugs or alcohol. The test reveals recent drug and alcohol use, in the last 48 hours.
	Low levels of literacy can prevent employees from going through the application process.	Community liaison or Community Development Officer identify gaps in education and literacy of potential applicants in their community. Dominion Diamond provides support for initiatives aimed at improving literacy pre-employment through Impact Benefit Agreements (IBAs).	It has been observed that pre-employment readiness has been improving, particularly amongst the young.

Table 14-1 Barriers to Employment and Dominion Diamond Responses

Indicator	Barrier	Dominion Diamond Response	Additional Comments
Employment	People living in remote communities or those who are unfamiliar with the online application process may not be able to access employment opportunities and need other options.	The Dominion Diamond Aboriginal employment coordinator recruits the majority (approximately 90%) of entry level positions directly from Aboriginal communities. Community Development Officers have a listing of all candidates interested in employment in their community, and provides this list to the Aboriginal Employment Coordinator. Dominion Diamond maintains a database of candidates from IBA communities, including their resumes. Dominion Diamond also accepts unsolicited resumes from communities sent by fax or mail. These options are only open to communities in the Northwest Territories, and are not available to southern applicants, who must use the online system. Further, southern applicants will not be short listed for entry level positions.	Employment opportunities are advertised, and made available to interested community members.
Retention	Drug and alcohol abuse can result in termination of employment.	Dominion Diamond conducts “for cause” drug and alcohol testing after an incident where it is suspected that drugs or alcohol was a contributing factor, or if there is unusual behaviour exhibited by an employee. Dominion Diamond pays for addictions counselling for workers, including both out-patient and residential treatment programs.	Some employees are able to successfully deal with their addiction following counselling and treatment, allowing them to return to work.
	In the event that an individual with low literacy levels passes through the application process, and their literacy problems begin to pose a risk to safety (e.g., not being able to pass the online safety programs), employment may necessarily be terminated.	Dominion Diamond is reinstating the Workplace Learning Program, and is introducing an adult educator position, with the goal of improving the education and literacy of employees. Where a gap in education is identified, the adult educator will work with the employee to close said gap. If an employee is unable to improve their literacy to an acceptable level through the Workplace Learning Program, or with the help of the adult educator, they may be terminated. If this occurs, Dominion Diamond is open to reinstating the employee, should they bring their literacy up to an acceptable level. Dominion Diamond has also hired an Aboriginal workplace advisor who will work with the adult educator. This role involves coaching and mentoring employees.	There may be issues associated with English as a Second Language; however, literacy issues dominate, even among the young.
	Competition from other resource sectors in other parts of Canada (e.g., the oil sands in northern Alberta) has affected retention, particularly of workers in senior positions.	Dominion Diamond offers competitive wages and benefit packages, and transportation allowances to pick up points and many communities are designated as pick up points.	
	Stress and bereavement can lead employees to feel that they cannot continue employment at the mine.	Dominion Diamond takes a flexible approach to stress and bereavement leave, and evaluates, on a case-by-case basis, the appropriate length of leave to meet the needs of the employee, as reasonable.	Allowing for flexible leaves of absence, where reasonable, can provide employees with an option other than resignation, improving retention.

Table 14-1 Barriers to Employment and Dominion Diamond Responses

Indicator	Barrier	Dominion Diamond Response	Additional Comments
Retention	Increased incomes associated with mining can enhance access to drugs and alcohol, and can result in poor spending habits that threaten household stability. This in turn can affect employment and the retention of employees.	Dominion Diamond is instituting a financial literacy program conducted in communities. Course material can be provided to the community for delivery to interested members, or can be delivered by the Dominion Diamond adult educator. There are many modules to the program, including budgeting, loans, and home ownership.	To date, the program has been rolled out in Behchokǫ̀ , where ten people attended. Chiefs are in support of the program, and are recommending it to community members. It may take time to achieve momentum and positive word of mouth recommendations.
	Some employees may feel that, in order to take part in cultural activities, they cannot continue to work at the mine due to schedule conflicts.	Most positions with the mine are on a 2:2 rotation. Dominion Diamond also offers up to one week unpaid cultural leave to participate in activities such as organized community hunts. Further, communities try to schedule these events in a manner that does not conflict with the schedule of those employed at the mine.	There is also a cultural room at camp, and cultural celebrations
Advancement	Low levels of literacy can prevent employees from advancing their careers at the mine.	Dominion Diamond is reinstating the Workplace Learning Program, and is introducing an adult educator position, with the goal of improving the education and literacy of employees. Where a gap in education is identified, the adult educator will work with the employee to close said gap.	Employees are self–referred or are referred to the Workplace Learning Program through their Team Leader.
	Low levels of literacy and numeracy can prevent pre-apprentices from successfully pursuing apprenticeships or writing the exam. Costs associated with travelling to write the exam and costs to take the exam are paid by the student, and can be prohibitive.	The adult educator meets with pre-apprentices to identify education gaps, and recommend areas for improvement (e.g., maths, sciences, literacy) prior to writing apprenticeship exams. Dominion Diamond allows pre-apprentices one failed attempt at the test, without impunity. A second successful writing is accepted as a pass.	Improving education prior to writing apprenticeship exams improves the chance of an employee's success. This allows for career advancement.
	Aboriginal employees may not feel able to advance into managerial or leadership roles that have, in the past, been filled primarily by non-Aboriginal candidates.	Dominion Diamond has introduced an Aboriginal Workplace Advisor position. This position works with Aboriginal employees and provides coaching and mentoring, in conjunction with skills development provided by the adult educator. There is also a Supervisor Training Program aimed at building the capacity of people in supervisory roles, including Aboriginal employees.	Aboriginal employees have a support system in place to encourage their development and advancement, including advancement into leadership positions.
Transportation	Transportation from non-fly-point communities to the mine site can deter residents from those communities from applying for employment at the mine.	Dominion Diamond is committed to providing transportation allowances for workers living in communities that are neither fly points, nor points of hire, to facilitate transportation to and from the mine.	Geographic location has been removed as a barrier for communities in the Slave region.

Early Education

Educational attainment is something that is not necessarily achieved in a few short years in response to a need for a trained workforce. Enforcing the importance of school completion and further education at an

early age, and fostering an interest in education by showing the positive outcomes, is critical in the continued progression of children in the K-12 system. Efforts that support this are important, and can be influential in laying the groundwork for future educational achievement. Dominion Diamond is committed to promoting the importance of education in the pursuit of mining employment. In addition to measures discussed in the DAR, Dominion Diamond intends to continue to support early (K-12) educational programming.

Pre-Trades demonstrations will be held annually on a rotational basis with Impact Benefit Agreement (IBA) communities. Recently, demonstrations have been held in Behchokǫ̀ (2012) and Lutsel K'e (2014). Dominion Diamond intends to liaise with schools in IBA communities to determine what trades the students in the community are interested in, and what trades their facilities can accommodate. Tradespeople are selected from among Dominion Diamond staff, with a focus on highlighting local Aboriginal trades people wherever possible. The demonstration begins with a presentation on Dominion Diamond, the trades positions available at the Ekati Mine, safety and the importance of education and maintaining good grades and attendance to establish the appropriate pre-requisite education for training programs. Students are given a demonstration of the chosen trades, and have the opportunity to ask question of the tradespeople. During the demonstration, tradespeople discuss the challenges students may face and how to maintain focus on goals and objectives in order to be successful in their education. To date, the feedback from communities on the pre-trades demonstrations has been highly positive.

Dominion Diamond provides annual contributions to the schools in rural IBA communities, and has also contributed to schools in Yellowknife and Fort Resolution. Each year, the company receives proposals for various projects such as an Aboriginal Grad Coach Program, out on-the-land cultural programs, programs intended to improve student attendance, school wellness programs, initiatives to provide students with healthy snacks and meals, Information Technology (IT) equipment purchases, library updating and expansion, playground construction and literacy initiatives.

Students from IBA communities have the opportunity for a tour of the Ekati Mine site on a bi-annual basis. Dominion Diamond rotates between half of the IBA communities one year and the other half in the following year. Dominion Diamond liaises with the schools to identify jobs that students are interested in learning more about and then provides the opportunity to see firsthand what those positions entail. Students are given a tour of facilities including accommodations, offices in the truck shop, the process plant, recreation room, movie room, cafeteria, gymnasium and fitness centre. Following the tour, a presentation to support staying in school similar to the presentation provided to schools during the career fairs is delivered. The presentation includes an overview of Dominion Diamond and the Ekati Mine, the opportunities available, and how staying in school, completing an education and maintaining good attendance levels can lead to employment at the mine.

Project Training and Support for Community Education

The Project will continue to build capacity in the mining labour force through training. For employees, the Project will continue to implement Ekati workforce development programs aimed at developing job-specific progression and employee potential with the goal of advancement. The Project would continue the existing health and safety, leadership and supervision training programs including a Supervisory Development Program, the Ekati Leadership Program, and the Northern Leadership Development Program.

Dominion Diamond is reinstating the Workplace Learning Program, and is introducing an adult educator position, with the goal of improving the education and literacy of employees. Where a gap in education is identified, the adult educator will work with the employee to close said gap. The adult educator meets with pre-apprentices to identify education gaps, and recommend areas for improvement (e.g., maths, sciences, literacy) prior to writing apprenticeship exams Dominion Diamond has also hired an Aboriginal workplace advisor who will work with the adult educator to identify areas where employee education gaps can be improved upon. This role involves coaching and mentoring employees.

Through their Community Development Strategy, Dominion Diamond has identified possible initiatives to further support community education beyond their immediate workforce, including establishing a community partnership to provide pre-employment training to community members, aimed at preparing them for entry level careers at the Ekati Mine. Dominion Diamond also intends to continue educational contributions and scholarships for post-secondary studies to community members, with the goal of removing the financial barrier associated with pursuing an education beyond high school (e.g., trades, technical diplomas and university degrees).

Dominion Diamond also has a multi-year funding agreement to support the Territorial Skills Canada Competition in the NWT. The 17th annual Territorial Skills Competition will be held in Yellowknife on April 21, 2015. The competition is a one-day event that highlights trades and technology careers for students, parents, educators, and the general public. It gives young Northerners a chance to show their skills in their chosen trade or technology contest. Participation in the Territorial Skills Competition provides an opportunity for apprentices at the Ekati Mine to demonstrate their skills and for Dominion Diamond to show its support for apprenticeship positions. In past years, many apprentices from the Ekati Mine have participated in this territorial competition and some advanced to the national competition.

References:

Dominion Diamond (Dominion Diamond Ekati Corporation). 2015. Response to: Jay Project Adequacy Review Items 11.1, 11.2, 11.3, 11.4, and 11.5. Submitted to Mackenzie Valley Environmental Impact Review Board. Yellowknife, NWT, Canada. January 2015.

DOMINION DIAMOND

Information Request Number:	DAR-YKDFN-IR-21
Source:	Yellowknives Dene First Nation: Todd Slack
Subject:	Wildlife Effects Monitoring
DAR Section(s):	12, DAR-MVEIRB-13

Preamble (YKDFN):

The project has repeatedly cited the linkage between wildlife monitoring and adaptive management. However, since the start of Ekati's operations, YKDFN has observed relatively little meaningful response during the collapse of the Bathurst Caribou Herd.

Request (YKDFN):

1) Please provide examples of operational changes that have occurred during the life of the mine to date as a response to the changes in abundance and distribution of wildlife in the region.

2) Please provide examples that are directly related to changes to the caribou herd abundance.

3) The project has introduced mitigations over the years, but there is little understanding if they have been effective. Please provide an update on the efficacy of the mitigations (i.e. what evidence is there to suggest caribou crossings are effective, etc.).

Response:

Mitigation actions to reduce impacts to wildlife are provided in the Developer's Assessment Report (DAR), in Tables 12.3-1 and 13.3-1. These include actions such as closing roads when large numbers of caribou are moving through the mine site, regular inspections of all waste management facilities for wildlife attractants, communication between drivers regarding the presence of caribou and other wildlife on and near the mine site, isolation of hazardous areas, and investigation and reporting of all incidents and mortalities. Caribou monitoring programs have evolved in response to on-going data collection and feedback from regulators and communities (i.e., caribou behavioural surveys and use of remote cameras). Guidance to reduce impacts to caribou has also been provided by communities, leading to inokhoks, fences, and road crossings to direct caribou movements through the Ekati Mine area. A review of mitigation effectiveness is also provided in the DAR (Section 12.3.2.1, page 12-45 and Section 13.3.2.1, page 13-67).

The mitigation discussed in Section 12.3.2.1 and in the Pathway Screening (Section 12.3.2.2) is implemented independent of the abundance of caribou. Review of the long-term monitoring information from existing mines indicates there is no strong mine-related mechanism influencing caribou survival or fecundity. The environmental design features and traffic mitigation strategies identified in the DAR are summarized in Appendix C, Traffic Associated with the Jay Project. Mitigation strategies include modification of traffic patterns and temporary road closures to permit caribou to move through the area. The mitigation strategies are expected to be effective in permitting caribou passage through the area at all abundance levels.

Similar to other aspects in ecology, there are not always opportunities to test specific questions with regards to the efficacy of mitigation. For example, one way to test the effectiveness of mitigation implemented to facilitate caribou crossing of the Misery Road (such as crossing points, speed limits, and right of way) would be to remove the mitigation to see if caribou road crossing frequency and behaviour changes. Because such an experiment would not be acceptable, there remains uncertainty in the precise contribution of each measure to the overall effectiveness of the mitigation.

Evidence does indicate that the mitigation implemented at the Ekati Mine has been successful at avoiding and limiting caribou mortalities. For example, there have been no caribou mortalities at the Ekati Mine due to vehicle collisions and only nine caribou mortalities directly attributable to mine operations from 1998 to 2013 (Section 12.2.2.4.1; Table 12.2-6). While there appears to be a zone of influence around the mine where caribou presence is lower, the most frequent behaviour of animals within this zone is feeding, bedding, and walking. In addition, caribou that are disturbed have short reaction times to direct disturbance (35 ± 10 (standard error [SE]) seconds for male caribou and 16 ± 3 (SE) seconds for females; ERM Rescan 2014). Results from camera monitoring indicate that caribou do use the crossing locations constructed along the Misery Road (ERM Rescan 2014).

References:

ERM Rescan (ERM Rescan Environmental Services Ltd.). 2014. Ekati Diamond Mine: 2013 Wildlife Effects Monitoring Program. Prepared for Dominion Diamond Ekati Corporation. Appendix 5.1 Caribou Behaviour Direct Monitoring Program. March 2014.

DOMINION DIAMOND

Information Request Number: DAR-YKDFN-IR-23

Source: Yellowknives Dene First Nation: Todd Slack

Subject: Barren-Ground Caribou

DAR Section(s): 12

Preamble (YKDFN):

The project notes that they had an 8 year study to consider the permeability of the Misery Road. However, the DAR notes this, but then proceeds to discard the study in favour of the Camera Monitoring Program (which has results much more favourable to the project). The longer winter road program (Rescan 2012) noted that caribou were deflected 57% of the time. For example, the discussion of the monitoring program on p12-96 does not note that there was an alternative study with much different results at all. It seems that the project is not presenting a fulsome picture of the caribou response to roads, but rather the studies that they prefer.

Request (YKDFN):

1) Throughout the DAR, the project states that the camera project along the road has a detection range of 500m, such as on p12-96 where the DAR states “the effective range of the cameras is likely limited to less than 500m”. The project has previously provided YKDFN with information that the camera coverage was an arc extending approximately 30 m. While YKDFN agree that 30m is less than 500 metres, there seems to be some inconsistency in the information that has been presented. Please provide an explanation and examples of pictures where caribou were observed at ranges from 4-500m.

2) Please provide an analysis of the area covered by the camera monitoring program at any one point for each year.

3) Please provide an area if the Misery Road was buffered by 500 meters.

4) For each of the Objectives discussed in 12.2.1.1.6 please provide the results of this Camera Monitoring Study

5) Please provide an explanation as to why the camera study is believed to be more effective in explaining caribou response to the longer Rescan survey.

6) Section 12.2.2.2 states that the “it cannot be determined whether these deflections represented caribou that did not cross the road or caribou that chose a different location to cross the road”. The presentation suggests that this is not a problem with the camera system. Given the coverage requested above, please provide examples and methodology as to how the project assessed the difference.

7) If the key factor affecting crossing height appears to be berm height, what is the best practice to ensure that roads (and winter roads) do not represent barriers to movement?

8) Is Ekati committing to ensure that no new roads will be built in excess of these guidelines (i.e. implementing mitigation to minimize effects)

9) Is Ekati willing to commit that the winter road will also maintain these berm limits (believed to be approximately 1.8m)? Though YKDFN acknowledge that the Joint Venture is not simply an Ekati enterprise, they are the largest user and after 2021 will be the only user on the northern half – thus are able to set contracting terms for the construction. During the period before that, it seems that all road users would desire to limit those effects which could be mitigated through best practices.

Response:

Two studies have been undertaken to investigate caribou crossing of the Misery Road. The first involved counting caribou tracks in snow adjacent to the Misery Road, which indicated that caribou had deflected to find another location to cross the road or did not cross the road. The second used cameras to document caribou crossing of the road, July through October. The 2013 Wildlife Effects Monitoring Program Addendum describes the camera monitoring program from 2011 to 2013 in detail (ERM Rescan 2014). It is recognized by Dominion Diamond that the cameras recording caribou interaction along roads at the Ekati Mine do not reflect deflection rates that may be occurring at a broader spatial scale. However, the results from these cameras and from the snow trail surveys do indicate that these roads do not act as a complete barrier to caribou movements as assumed in the Developer's Assessment Report (DAR).

1) The cameras record both motion-triggered photographs and timed photographs. The motion trigger sensor has a range of approximately 30 metres (m) according to the manufacturer (i.e., a caribou must be 30 m or closer to trigger a photograph). In addition, timed photos are taken every 10 minutes. Regardless of whether the photo is motion-triggered or timed, caribou must be within approximately 500 m of the camera to be visible in the resulting photograph (except when topography limits the view). Examples of remote camera photos that were triggered by caribou proximity, and photos where caribou are at the maximum visible range are presented in ERM Rescan (2014).

2) The field of view for the Reconyx PC800 camera is not provided on the manufacturer's website (www.reconyx.com), so the maximum area covered by a camera cannot be calculated precisely. Assuming a 60 degree field of view and a 500 m range, the area covered by a single camera is approximately 14.4 hectares (assuming that this is not affected by local topography). Use of the trigger, which is effective to 30 m, would greatly reduce sampled coverage at any one point in time.

3) The Misery Road is approximately 28 kilometres, buffered on either side by 500 m gives an area of 28 square kilometres (km^2).

4) The objectives listed in Section 12.2.1.1.6 of the DAR are those presented in ERM Rescan (2014), and the same report addresses each of these objectives.

5) The DAR focuses on the results of the camera study because:

   - it included far more data (approximately 10 days of snow track survey per year, versus >22,000 camera days from 2011 to 2013);
   - summer caribou movements are more restricted than in winter (when the landscape is covered with ice and snow); and,

- in summer, the caribou are travelling with calves.

It should also be noted that the two studies are very different in nature and caution should be used when comparing the results.

6) It is a limitation of both the snow track survey and the camera survey that it is difficult to track and follow individual caribou. A snow track or photograph showing a caribou deflecting from the road does not mean that that the individual did not cross at some other point on the road. A possible solution to this problem is to deploy more satellite collars to provide tracking for individual caribou, and programming the collars to record locations frequently within the vicinity of the Misery Road. Dominion Diamond would consider supporting the GNWT with deployment and data acquisition from these collars.

7) ERM Rescan (2014) states, “Overall, less than 1% of road encounters resulted in a deflection event at the road interface, and some of these animals may have crossed the road elsewhere. In general, these deflection events were associated with steeper embankments composed of larger boulders. In addition, the frequency of crossing events and how caribou crossed the Misery Road were related to the presence of a berm but not the maximum road height or traffic volume, suggesting that the verge (incline) interface between the adjacent habitat and the road is a determining factor in whether caribou will attempt to cross. It appears that ease of access and escape are more important to caribou than road height.” These results indicate that caribou can and do cross the Misery Road, and that current mitigation (including the caribou crossing structures) are working. As well, snow berms are maintained at low height during routine road clearing activities for operational safety reasons (visibility, prevention of snow drifting), which also mitigates risks to caribou during the spring migration.

   Dominion Diamond’s community engagement program has consistently indicated that the area crossed by the Jay Road (between the esker and Lac du Sauvage) is of special importance for caribou movement. In response to the feedback received through community engagement, Dominion Diamond proposes to construct an increased number of caribou crossings along the main section of the Jay Road (i.e., roughly between King Pond Dam and the approach to the active operations area at Lac du Sauvage). The esker cut will specifically be built as a caribou crossing. The Jay Road will be constructed with frequent and wide caribou crossings that will respect the communities’ identification of the importance of this area for caribou movement. In areas designated as caribou crossings, the slopes of the road will be constructed at 5 horizontal : 1 vertical. The slopes will be covered with crushed gravel, 200 mm in diameter or smaller. The pipelines will also be covered with the gravel.

   Where possible, the roads constructed for the Jay Project will minimize the use of fill material. However, no caribou crossings will be constructed where raised safety berms are required for compliance with Worker’s Compensation Board of the Northwest Territories and Nunavut regulations for placement of berms (where fill thicknesses exceed 3 m, for safety (WCB NWT and NU 1995, or at locations where there are necessary joints and valves in the pipelines that require visual inspection for safe operation. The pipelines will be strategically designed to reduce the number of locations that cannot be constructed as caribou crossings due to joints and valves.

8) The Jay Road will incorporate caribou crossings as part of the initial construction of the road, which is a 'lesson-learned' from the Misery road. Community engagement has been a basis of route selection and approach to the construction of caribou crossings. Please see the response to DAR-MVEIRB-IR-90 for a description of how Dominion Diamond has adapted design of the Jay Road in response to community feedback on caribou crossings in that area.

9) The Tibbit to Contwoyto Winter Road is operated by the Tibbit to Contwoyoto Winter Road Joint Venture (Joint Venture), which includes a number of different mine operators. Final decisions related to the design or maintenance of this winter road are made by the Joint Venture.

References:

ERM Rescan (ERM Rescan Environmental Services Ltd.). 2014. Ekati Diamond Mine: 2013 WEMP Addendum — Wildlife Camera Monitoring Summary Report. Prepared for Dominion Diamond Ekati Corporation by ERM Rescan: Yellowknife, NWT.

Rescan (Rescan Environmental Services Ltd.). 2011. EKATI Diamond Mine: 2010 Wildlife Effects Monitoring Program. Prepared for BHP Billiton Canada Inc. by Rescan Environmental Services Ltd.: Yellowknife, NWT.

WCB NWT and NU (Worker's Compensation Board of the Northwest Territories and Nunavut). 1995. Consolidation of Mine Health and Safety Regulations R-125, 1995. Available at: http//www.wscc.nt.ca/YourWSCC/Resources/Documents/Mines%20Health%20and%20Safety/Regus/NUMineRegulations.pdf.

DOMINION DIAMOND

Information Request Number: DAR-YKDFN-IR-24

Source: Yellowknives Dene First Nation: Todd Slack

Subject: Barren-Ground Caribou

DAR Section(s): 12.2.2.2

Preamble (YKDFN):

Based on the behavioural monitoring, the project states that caribou are reasonably tolerant of human activity around the mines.

Request (YKDFN):

1) Please provide the sample size and a confidence discussion.

2) Please provide a listing of year on year sampling numbers.

3) Behavioural monitoring has been underway for a long time – please provide a thorough discussion on why the sample size is still 'small'.

Response:

Responses to questions (1), (2), and (3) are incorporated in the following two paragraphs.

The reference to small sample sizes of behaviour monitoring in Section 12.2.2.2 of the Developer's Assessment Report was related to focal behaviour monitoring completed at the Ekati Mine. Focal observations at the Ekati Mine have occurred since 2010 and quantify the duration of resting, feeding, and moving behaviour over a 20 to 40 minute period. The resulting number of individual caribou observed for at least 20 minutes by year include 9, 27, 69 and 25 for 2010, 2011, 2012 and 2013, respectively (Rescan 2011, 2012, 2013; ERM Rescan 2014). Except for 2012, these types of samples sizes are likely inadequate to test for gender differences or interactions with other natural factors, such as habitat type and insect harassment levels that may influence behaviour within a given year and will require pooling across years to test these types of models.

Annual results of these data indicate that caribou in close proximity to the Ekati Mine are spending greater than 60 percent (%) of their time resting or feeding and less than 5% of their time trotting or running (ERM Rescan 2014). These data are also used to assess the duration of behavioural responses to mine-related stressors such as humans, blasting, trucks, and aircraft (ERM Rescan 2014). Recent analysis of the data set indicated a statistically significant change of behaviour in response to humans and light truck traffic but not heavy trucks, blasting, or aircraft. The average duration of behavioural change was 35 ± 10 (standard error [SE]) seconds for male caribou and 16 ± 3 (SE) seconds for females before they returned to a non-stress behaviour such as feeding or resting (ERM Rescan 2014).

References:

ERM Rescan (ERM Rescan Environmental Services Ltd.). 2014. Ekati Diamond Mine: 2013 Wildlife Effects Monitoring Program. Prepared for Dominion Diamond Ekati Corporation by ERM Rescan: Yellowknife, NWT, Canada.

Rescan (Rescan Environmental Services Ltd.). 2011. Ekati Diamond Mine: 2010 Wildlife Effects Monitoring Program. Prepared for BHP Billiton Canada by Rescan: Yellowknife, NWT, Canada.

Rescan. 2012. Ekati Diamond Mine: 2011 Wildlife Effects Monitoring Program. Prepared for BHP Billiton Canada by Rescan: Yellowknife, NWT, Canada.

Rescan. 2013. Ekati Diamond Mine: 2012 Wildlife Effects Monitoring Program. Prepared for BHP Billiton Canada by Rescan: Yellowknife, NWT, Canada.

DOMINION DIAMOND

Information Request Number: DAR-YKDFN-IR-25

Source: Yellowknives Dene First Nation: Todd Slack

Subject: Barren-Ground Caribou - Migration

DAR Section(s): 12.2.2.2

Preamble (YKDFN):

Caribou crossings are a particularly important matter for migration and are not thoroughly discussed as either a part of traditional use or for caribou's utilization of the land.

Request (YKDFN):

1) Please provide a discussion on the historic importance of the crossing areas in Lac de Gras.

2) Please provide an update on the utilization of these crossings since the opening of Ekati and Diavik. As part of this discussion, please indicate the number of animals which have been observed to pass through and cross at the narrows or from the island.

3) Please provide a post closure discussion which predicts and provides closure goals for caribou use of the Ekati area.

Response:

1) Section 12.2.3 of the Developer's Assessment Report (DAR) provides a summary of reported Traditional Knowledge for seven Aboriginal groups who have a history of land use in the Lac de Gras region. The use of Lac de Gras narrows and islands in the lake for caribou movements during the southern migration are the only specific locations identified surrounding the Project. The full details of reported Traditional Knowledge including traditional land use and caribou are provided in Annex XVII of the DAR. Additionally, caribou migration routes through the Lac de Gras region identified by Traditional Knowledge, which show a number of different crossings, were explicitly considered in the energy model for the assessment of caribou (Map 12.4-3).

2) There are no specific mine monitoring programs that record use of natural crossings by caribou in the Lac de Gras region. The number of caribou that use specific crossings will depend on herd size and distribution relative to the location of crossings. Historically, Bathurst caribou would travel along the eastern and western shorelines of Lac de Gras, and also from the West Island to the East Island (location of the Diavik Mine) and cross Lac de Gras to the eastern shoreline (DDMI 1998). Use of the East Island has been reduced since the development of the Diavik Mine. A map requested by the Mackenzie Valley Environmental Impact Review Board (DAR-MVEIRB-92) includes a consolidation of satellite-collared cow movements from 1996 to 2013, the historical trails mapped in 2013 during Jay Project baseline studies, and the migration routes identified by Traditional Knowledge. The results of this compilation suggest a number of different places where caribou may be crossing during migrations through the Lac de Gras area. Note that the collar movements presented in Map 92-1 in DAR-MVEIRB-92 reflect a straight line between consecutive location fixes, which may be between 3

hours to a week or more apart depending on the year and season. These lines should not be considered as an accurate reflection of fine-scale movements.

3) The Jay Project components will be reclaimed according to the goals and general methods in the Interim Closure and Reclamation Plan. A Conceptual Closure Plan is provided in the DAR. The post-closure wildlife objective for the Ekati Mine and the Jay Project is to make the site safe for people, caribou, and other wildlife. For example, caribou ramps will be constructed as the waste rock storage area is built to provide multiple areas for caribou or other wildlife to safely egress from the pile. Also, road berms will be pushed off and all facilities removed. Caribou and other wildlife will be able to safely use the Ekati mine site after reclamation. It is anticipated that the zone of influence resulting from sensory disturbance would diminish 5 to 10 years post closure. Please see Appendix D, Temporal vs Spatial Cumulative Effects and Underestimating Incremental Effects from the Jay Project, for additional information regarding the reversibility of the zone of influence at closure.

References:

DDMI (Diavik Diamond Mines Inc.). 1998. Environmental Effects Report, Wildlife. Yellowknife, NWT, Canada.

DOMINION DIAMOND

Information Request Number:	DAR-YKDFN-IR-27
Source:	Yellowknives Dene First Nation: Todd Slack
Subject:	Barren-Ground Caribou
DAR Section(s):	12.2.2.4x

Preamble (YKDFN):

The project has provided information that don't seem to match particularly well – the text passages are different than the chart. For example, s. 12.2.2.4.4 notes that 80 caribou have been 'found dead' at the Diavik site, but the chart only lists 23. Similarly, the Ekati section seems to note an awful lot of dead animals relative to the passages.

Request (YKDFN):

1) Please provide an explanation on the seeming discrepancy between the text and the chart

2) Has DDEC or Golder undertaken any analysis to consider if the number of dead caribou is within the range of expectations – given the low probability of discovering a carcass in areas distant from the mine, the actual observed area may be quite small versus the annual range (i.e. given the relatively small area & probability of discovering a carcass, what would the expected number of animals be expected to be discovered)? If so, please provide this analysis. If not, why not?

Response:

1) The text in Section 12.2.2.4.4 of the Developer's Assessment Report (DAR) indicates that 80 caribou have been found dead at Ekati and Diavik mine sites, not at Diavik alone. Dominion Diamond Ekati Corportion (Dominion Diamond) has assumed that the chart referred to in this Information Request is Table 12.2-6 of the DAR; the table enumerates 23 dead caribou found at the Diavik Mine and 57 at the Ekati Mine for a total of 80 animals. There is no discrepancy between Table 12.2-6 and the text in Section 12.2.2.4.4.
2) Neither Dominion Diamond nor Golder Associates Ltd. (Golder) has determined if the number of dead caribou is within the (unknown) range of expectations. The observations are not part of a systematic study with a specified survey area, frequency, sampling method, and probability of detection. To define a range of expectations for the comparison requested would also require knowledge of carcass distribution and detectability through time in the survey area, information that is not known. Therefore, meaningful analyses cannot be conducted.

DOMINION DIAMOND

Information Request Number: DAR-YKDFN-IR-28

Source: Yellowknives Dene First Nation: Todd Slack

Subject: Barren-Ground Caribou

DAR Section(s): 12.3.2.2.2

Preamble (YKDFN):

The project notes that PM2.5 will return to NWT guidelines in less than a kilometer surrounding the minesite. However, there is no discussion on the measured values of PM2.5 versus the background, nor is there any discussion on how this may be one of the causal mechanisms driving the zone of influence.

Request (YKDFN):

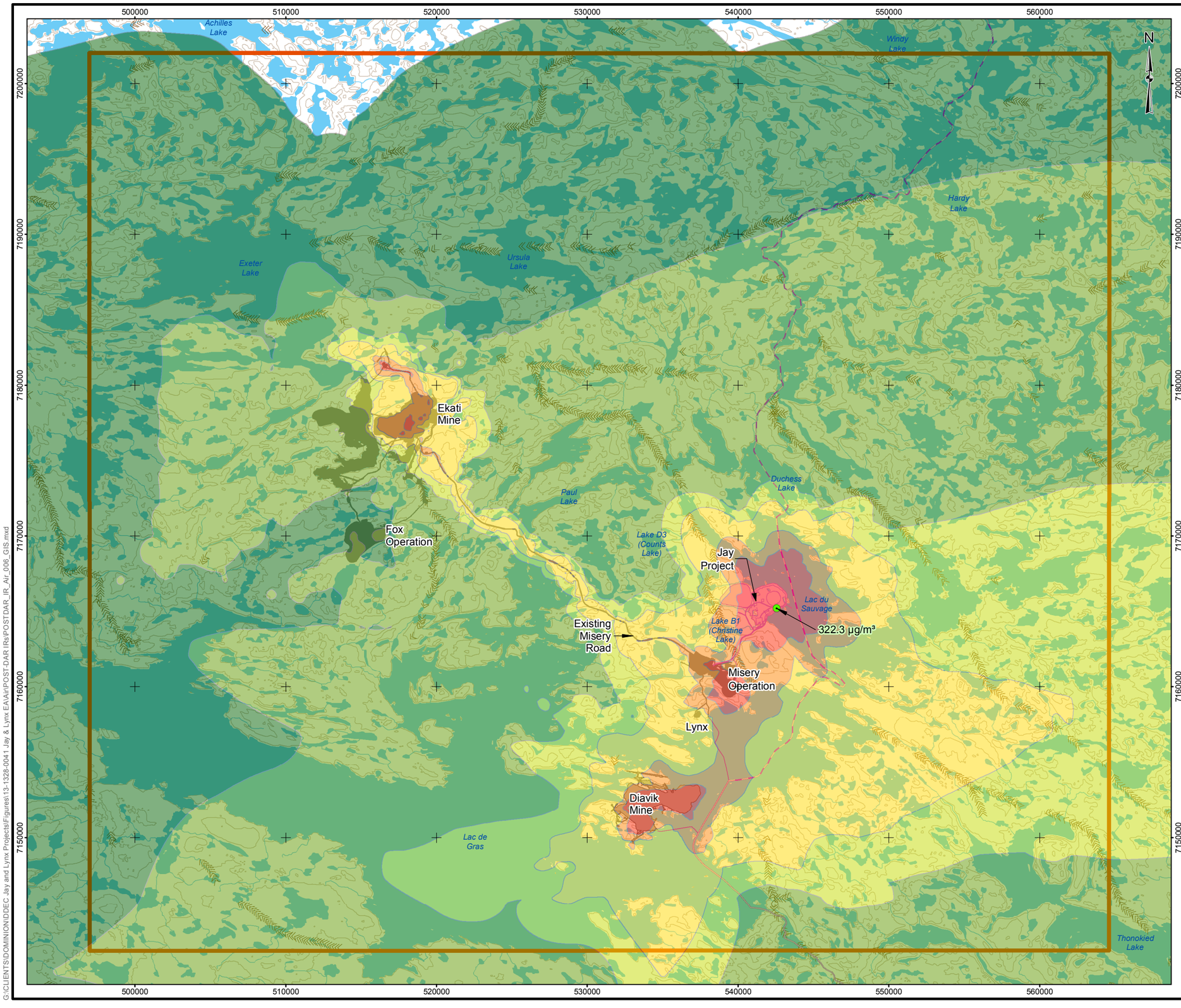
1) Please provide a discussion on the range and distribution of pm2.5 against the measured baseline.

2) PM2.5 has been theorized as one potential driver behind the zone of influence. Please provide a description on the work that the project has done to understand the causal mechanisms behind this avoidance and what the outcomes are.

3) To YKDFN, it feels that ZOI now has a general acceptance from western science. Please provide an explanation why it took the better part of two decades for something that the elders and landusers predicted to be considered ‘a fact’. As part of this explanation, why does Ekati and DDEC prioritize Golder science over the knowledge of the people who lived and trapped on this land for generations.

Response:

1) Maps 7.4-11 to 7.4-16 and Section 7.4.2.2.4 of the Developer Assessment Report (DAR) present the results of the dispersion modelling and shows the range and distribution of $PM_{2.5}$ concentrations. An updated map showing the Application Case maximum 24-hour $PM_{2.5}$ concentrations (Golder 2015) with more isopleths at lower concentration values is provided in Map 28-1 for a comparison against the measured baseline (background) values.



LEGEND

- EKATI MINE FOOTPRINT
- DIAVIK MINE FOOTPRINT
- PROPOSED JAY FOOTPRINT
- WINTER ROAD
- TIBBITT TO CONTWOYTO WINTER ROAD
- NORTHERN PORTION OF TIBBITT TO CONTWOYTO WINTER ROAD
- ELEVATION CONTOUR (20 m INTERVAL)
- ESKER
- WATERCOURSE
- WATERBODY
- LOCAL STUDY AREA
- MAXIMUM POINT OF IMPINGEMENT

CONCENTRATIONS (µg/m³)

- 0 to < 2.85
- 2.85 to < 3.8
- 3.8 to < 5.7
- 5.7 to < 7.00
- 7.00 to < 14.00
- 14.00 to < 28.00
- > 28.00

REFERENCE

NATIONAL TOPOGRAPHIC BASE DATA (NTDB) 1:250,000
CANVEC © NATURAL RESOURCES CANADA, 2012
NATURAL RESOURCES CANADA, CENTRE FOR TOPOGRAPHIC INFORMATION, 2012
DATUM: NAD83 PROJECTION: UTM ZONE 12N

DOCUMENT

DAR-YKDFN-IR-28

5 0 5
SCALE 1:250,000 KILOMETRES

PROJECT
DOMINION DIAMOND™
JAY PROJECT
NORTHWEST TERRITORIES, CANADA

TITLE
APPLICATION CASE MAXIMUM 24-HOUR $PM_{2.5}$ CONCENTRATIONS

Golder Associates

PROJECT		1419751	FILE No. POSTDAR_IR_Air_006_GIS	
DESIGN	DC	01/04/15	SCALE AS SHOWN	REV 3
GIS	SBM	01/04/15	MAP 28-1	
CHECK	DC	02/04/15		
REVIEW	CM	02/04/15		

G:\CLIENTS\DOMINION\DDEC Jay and Lynx Projects\Figures\13-1328-0041 Jay & Lynx EA\mxd\POST-DAR IRs\POSTDAR_IR_Air_006_GIS.mxd

There were two sources of background $PM_{2.5}$ measurements considered in the assessment. A short-term (July to October in 2013) monitoring program at two locations at the proposed Jay Project site showed an average 24-hour $PM_{2.5}$ concentration of 1.3 micrograms per cubic metre (µg/m³). It should be noted that of the seven measurements taken, all but one $PM_{2.5}$ measurement are in the range of 0.3 and 1 µg/m³. The second source of background $PM_{2.5}$ measurement considered is the seasonal (June to August) monitoring conducted at the Northwest Territories (NWT) Tundra Ecological Research Station located at Daring Lake between 2003 and 2008. The average 24-hour $PM_{2.5}$ concentration measured at Daring Lake is 1.9 µg/m³. Although the average $PM_{2.5}$ concentration measured at the proposed Jay Project location is lower and may be partially influenced by existing mining activities at Ekati Mine Misery Pit approximately three kilometres away, the Daring Lake measured value, which is absent of any influence from local anthropogenic emissions, was chosen to represent the background 24-hour $PM_{2.5}$ concentration in the study area due to the longer measurement period and its more conservative value.

Background $PM_{2.5}$ concentrations were included in the modelling results for the assessment cases, as they were added to the predicted concentrations from the dispersion modelling; therefore, all $PM_{2.5}$ concentration values within the study area presented in the DAR are above the background value. Map 28-1 includes additional isopleth levels at lower concentration values that represent 150% (2.85 µg/m³), 200 percent (%) (3.8 µg/m³), and 300% (5.7 µg/m³) of the background 24-hour $PM_{2.5}$ value (1.9 µg/m³) to provide more detailed comparison with the background value. $PM_{2.5}$ concentrations are predicted to be at 200% and 300% of the background value within the majority of the study area for at least one 24-hour period. As $PM_{2.5}$ represents the fine particulate matter that is more likely to stay suspended in the atmosphere and to be transported over longer distances, the $PM_{2.5}$ concentration isopleth is influenced by the westerly wind pattern observed during the summer season when fugitive dust and particulate matter emissions due to mining activities are higher.

2) As described in the response to DAR-MVEIRB-IR-01, experiments that identify cause and effect relationships with a zone of influence will be subject to practical constraints. For example, studies have detected correlative changes in caribou behaviour near mines (see Section 12.2.1.1.2 of the DAR), but it is unknown whether these behavioural changes (e.g., a zone of influence) are in response to mine-related noise, smells, dust, vibration, or other sensory disturbance. Since these potential disturbances occur at the same time during mine construction and operation, the relative contribution from the residual effect of each type to an observed behavioral change is unknown. There are several technical challenges and constraints to establishing cause and effect relationships between a type of sensory disturbance and behavioural changes. These include:

   - isolation of sensory disturbance types;
   - representative controls; and,
   - sufficient replication at the scale of development to provide confidence in conclusions.

   Such an experiment would require a significant change in how mines operate, which would affect their economics. It may also require a reduction of other types of mitigation, which may have consequences to the target wildlife species or other components of the receiving environment.

3) Section 12.2.3 of the DAR describes the reported information available on Traditional Knowledge (TK) from seven Aboriginal groups with a history in the Lac de Gras area. The available TK information from Elders includes descriptions of relationships between caribou, other wildlife, people, and mines and includes TK holders predictions of avoidance and changes in migration routes. The current lines of evidence from scientific analysis also indicate caribou avoidance of mines (Boulanger et al. 2004; Johnson et al. 2005; Rescan 2010; Golder 2011; Boulanger et al. 2012) and support these TK predictions (see Section 12.2.2.1 for review of zone of influence studies). In order to perform the analyses in the DAR, it was necessary to quantify a zone of influence around different types of active developments in order to estimate effects to caribou distribution and energetics.

   A zone of influence around the Ekati and Diavik mines of 14 km was derived from aerial survey data pooled across 1998 to 2008 (Boulanger et al. 2012). Different studies have estimated different zones of influence based on fewer (Boulanger et al. 2004) or more (Golder 2011) years of survey data. As well, estimates derived from collar data are different (Johnson et al. 2005; Boulanger et al. 2012) from those of aerial survey data. The 14 km estimate of Boulanger et al. (2012) represents a longer-term average response by caribou and captures the year-to-year variability of the aerial survey data. A more conservative 15 km zone of influence was assumed for active mining development in the DAR to maximize predicted effects.

References:

Boulanger J, Poole K, Fournier B, Wierzchowski J, Gaines T, Gunn A. 2004. Assessment of Bathurst Caribou Movements and Distribution in the Slave Geological Province. GNWT Manuscript Report 158.

Boulanger J, Poole KG, Gunn A, Wierzchowski J. 2012. Estimating the Zone of Influence of industrial Developments on Wildlife: a Migratory Caribou *Rangifer tarandus groenlandicus* and diamond mine case study. Wildlife Biol 18: 164-179.

Golder (Golder Associates Ltd.). 2011. Analysis of Environmental Effects from the Diavik Diamond Mine on Wildlife in the Lac de Gras Region. Submitted to Diavik Diamond Mines Inc., Yellowknife, NWT.

Golder 2015. Jay Project Air Quality Assessment Update. Technical memorandum submitted to Dominion Diamond. January 19, 2015. Yellowknife. NWT. Canada.

Johnson CJ, Boyce MS, Case RL, Cluff HD, Gau RJ, Gunn A, Mulders R. 2005. Cumulative Effects of Human Developments on Arctic Wildlife. Wildlife Monogr 160: 1-36.

Rescan (Rescan Environmental Services Ltd). 2010. Ekati Diamond Mine 2009 Wildlife Effects Monitoring Program. Yellowknife, NWT, Canada.

DOMINION DIAMOND

Information Request Number: DAR-YKDFN-IR-30

Source: Yellowknives Dene First Nation: Todd Slack

Subject: DAR-MVEIRB-15

DAR Section(s): 17.8

Preamble (YKDFN):

The Yellowknives Dene and other First Nations have made tremendous sacrifices to help the Bathurst Caribou herd recover while industry has effectively done nothing, and indeed, has expanded the level and range of impacts with the addition of new mine and a series of proposed new development projects in both the NWT and Nunavut.

Request (YKDFN):

1) Section 12.2.2.1 notes that the zone of influence at Diavik is 12 to 40km (from Golder), while Snap Lake may have a ZOI of 28km. Please provide a discussion why the project has chosen to discard the reports from their consultants and use a smaller ZOI.

2) Dominion Diamonds has established a 'Significance Threshold' that is only crossed when the ability of the herd to continue to exist is threatened (described as Self-sustaining or 'exceeding the predicted resilience limits and adaptive capacity of the VC'). Please explain why such the project does not see significant impacts occurring at any point prior to the complete collapse for the herd. It seems obvious that the proper threshold should be established prior to this – to ensure that conservation is inherent.

3) Is this significance threshold based on the principle that "overprotection is not overly useful", a position that Golder (the company's consultant) advanced during the Snap Lake Environmental Assessment?

4) The significance threshold also includes an aspect described as "ecologically effective". Please provide a thorough discussion on what this means and the metrics that are used to evaluate whether the residual population is effective, including an explanation that details what this population will be effective at achieving.

5) The project states that that "for cumulative effects of development to have a significant influence on self-sustaining there would have to be sufficient change that the populations would no longer be resilient or have the ability to adapt to natural selection pressures" but state elsewhere in the chapter that populations with low numbers have lowered resilience. Please provide a discussion and analysis that explains:

    a. Why the Bathurst Herd has additional resilience and adaptability to absorb new infrastructure and industrial development

b. Why industrial operations should be prioritized over aboriginal rights in the present and how they will not limit the successful exercise of those rights in the future (i.e. that this doesn't become a scenario where people have the right to hunt caribou, but they are just extirpated from the area)

6) Given that the application case predicts a herd population approximately 15% lower than the reference (or approximately two thirds the population estimated as part of the 2014 Recon Survey), and that the population is not sufficient to support Dene harvesting at present, how is it that the project has assessed the effects as not significant?

7) Why is it that the company feels that they do not need to alter their operations and can expand the level and range of activity when Yellowknives Dene are being forced to give up their constitutional rights to harvest the animal that is central to their culture and lifestyle?

Response:

1) The most current analysis of aerial survey data near the Ekati and Diavik mine sites suggests that caribou from the Bathurst herd may avoid the mine sites by 14 kilometres (km) (Boulanger et al. 2012). Analysis of satellite-collar data near the Ekati and Diavik mines suggests a similar zone of influence (ZOI) around the two mines of 11 km for caribou of the Bathurst herd (Boulanger et al. 2012). These estimates are used in the DAR because the estimates are obtained from two independent datasets (i.e., aerial surveys and satellite-collars) and the estimates from both datasets are similar (Boulanger et al. 2012). Boulanger et al. (2009) also estimated a 6.5 km ZOI around the Snap Lake mine from aerial survey data, although there is a high degree of uncertainty around this estimate. The ZOI used in the DAR is 2.3 times larger (15 km) and slightly larger than the maximum, current, predicted ZOI around the Ekati and Diavik mines.

   The ZOIs referenced in the DAR represent a range of annual estimates from aerial survey data, which depict reduced caribou occurrence. Golder (2011) was able to detect reduced caribou occurrence near the Ekati and Diavik in four of 12 years of aerial survey monitoring data. This analysis also detected higher caribou occurrence near the mines in 2 years and no detectable ZOI in the remaining six years from monitoring. In summary, the distribution of caribou occurrence has been variable through time and a 14 km ZOI is a robust estimate supported by analyses for the Bathurst herd (Boulanger et al. 2012).

2 to 7) In addition to being consistent with the engagement processes, the concept of self-sustaining and ecologically effective populations is rooted in conservation biology (Hunter and Gibbs 2007). Self-sustaining populations are healthy, robust populations capable of withstanding environmental change and accommodating random demographic processes (Reed et al. 2003). Self-sustaining and stable populations can exist across a range of animal abundances. A self-sustaining population is the goal for the recovery strategy of woodland caribou (EC 2012) and other species at risk targeted for conservation (e.g., AESRD 2012; EC 2014). Protection of ecological effectiveness is aimed at preserving a species role in an ecosystem because interactions with other species are important for maintaining ecosystem function (Soulé et al. 2003; Sabo 2008; Säterberg et al. 2013). Highly interactive species such as barren-ground caribou at lower population size can still support the stability of similarly decreased wolf populations and stimulation of plant biomass and quality through grazing pressure and fecal deposition, albeit within smaller seasonal ranges.

Local and Traditional Knowledge also pointed out the importance of caribou interaction with other species in the ecosystem, including Aboriginal people (Section 5 of the DAR). Self-sustaining and ecologically effective populations is still an appropriate management/recovery goal (assessment endpoint) even for species such as woodland caribou where over half of the local populations across Canada are currently not self-sustaining or as likely as not self-sustaining (EC 2012). Thus, the assessment endpoint used in the DAR addresses both protection of caribou populations and their interaction with other species (including people) and is an ecologically appropriate assessment endpoint for barren-ground caribou and other wildlife VCs.

Incremental and cumulative effects from human developments reduce the quantity and quality of caribou habitat available to Bathurst caribou but these effects are small. For example, the reduction of preferred caribou habitats (high and good quality) by the Project is predicted to be less than 0.2 percent (%) and cumulatively through the 2014 Base Case, to be less than 6%, for any seasonal range. This means that greater than 94% of preferred habitats in the Bathurst annual range remain intact after the Project is developed and will be available for continued use by the herd, and would likely have little limiting effect during the increasing phase of the population cycle. Density-dependent resource selection in a declining population should allow more selective use of habitat and use of smaller seasonal ranges (McLoughlin et al. 2006), which suggests habitat should be less limiting at the low phase of a population cycle.

The Bathurst herd has recently exhibited behavioural plasticity (adaptive capacity) in the use of seasonal ranges and timing of migrations. For example, the Tłı̨chǫ report a southward migration later in the year and northward migration earlier in the spring, and a greater dispersal of caribou than in the past (Jacobsen 2011). A recent analysis of collar data in response to Adequacy Review Item 8.2 (DAR-MVEIRB-9) supports this TK and detected decreasing trends in the size of post-calving and autumn seasonal ranges, and later movement into the forest from the tundra. The analysis found no changes in range fidelity, indicating that Bathurst cows are using the same general areas annually from 1996 through 2013. Russell (2014) also demonstrated a significant increasing trend in total annual cumulative biomass on the Bathurst caribou spring to autumn ranges (May 1 to November 10) for three vegetation classes (shrub, herb-shrub, and lichen). Caribou may be responding to higher quality forage areas and lower predation rates (e.g., from the decline in wolf numbers) within post-calving and autumn ranges, and subsequently spending more time on the barren-grounds while also interacting with development.

The remaining mechanism of interest to assess the resilience of the herd at low population size is the potential of developments to disrupt migration routes, reduce population connectivity, and impose added energetic costs on calf production. The additional energetic costs from changes in movement and behaviour associated with the Project and other developments are not expected to decrease population resilience and increase the risk to the Bathurst herd to be self-sustaining or ecologically effective at any phase of the population cycle. Analysis in the DAR showed that development-related effects have little influence on survival and reproduction in caribou, and the strength of these effects are predicted to be independent of population size relative to other factors, such as forage conditions on seasonal ranges, insect harassment, and harvesting (Weladji et al. 2003; Adamczewski et al. 2009; Boulanger et al. 2011; Chen et al. 2014). Monitoring of collared caribou locations, and the Misery and Jay roads, and modifying traffic volume and implementing road closures when necessary is expected to maintain population connectivity and migratory movements through the Lac de Gras

area. Migration is likely an important life history strategy (i.e., influences resilience) for barren-ground to access the best quality food and reduce predation risk (Gunn 2009; Avgar et al. 2014). By maintaining caribou migration through the Lac de Gras area, the Jay Project is not affecting the resilience of the herd. The results presented in the DAR reflect conservative assumptions designed to produce maximum effects from changes in habitat quantity and quality and behaviour, energy balance and calf production; providing ecologically relevant and confident impact predictions.

The DAR acknowledged the relationship between the resilience of caribou and population size and that resilience to cumulative effects is likely greater when the population is increasing and high. A qualitative analysis and assessment was completed as part of the response to Adequacy item 8.1 (DAR-MVEIRB-8). Furthermore, subsequent to the submission of the DAR, population modelling of cumulative effects of development was completed in response to Adequacy Item 8.8 (DAR-MVEIRB-15). The analyses examined both declining and increasing phases of the Bathurst herd using the most recent population vital rates from the Government of the Northwest Territories and included maximum cumulative effects predicted in the DAR. The results support the conclusion that cumulative effects of the Reasonably Foreseeable Development (RFD) Case will not prevent the Bathurst herd from increasing. The RFD Case represents that maximum predicted cumulative effects from development.

Management of barren-ground caribou herds and other wildlife populations, including regulating harvest, is the responsibility of the Government of the Northwest Territories and its co-management partners and the Government of Nunavut.

References:

Adamczewski JZ, Boulanger J, Croft B, Cluff D, Elkin B, Nishi J, Kelly A, D'Hont A, Nicholson C. 2009. Decline of the Bathurst Caribou Herd 2006-2009: A technical evaluation of field data and modeling. Draft technical report December 2009. GNWT.

AESRD (Alberta Environment and Sustainable Resource Development). 2012. Alberta Burrowing Owl Recovery Plan 2012-2017. Alberta Environment and Sustainable Resource Development Recovery Plan No. 21. Edmonton, AB.

Avgar T., Street, G., Fryxell, JM. 2014. On the adaptive benefits of mammal migration. Canadian Journal of Zoology 92:481-490.

Boulanger J, Poole KG, Gunn A, Wierzchowski J. 2009. Estimating the Zone of Influence of Industrial Developments on Wildlife: a Migratory Caribou and Diamond Mine Case Study. Draft technical report. Prepared by Integrated Ecological Services, Nelson, BC.

Boulanger J, Gunn A, Adamczewski J, Croft B. 2011. A Data-Driven Demographic Model to Explore the Decline of the Bathurst Caribou Herd. Journal of Wildlife Management 75:883-896.

Boulanger J, Poole KG, Gunn A, Wierzchowski J. 2012. Estimating the Zone of Influence of Industrial Developments on Wildlife: a Migratory Caribou *Rangifer tarandus groenlandicus* and Diamond Mine Case Study. Wildlife Biology 18: 164-179.

Chen W, White L, Adamczewski JZ, Croft B, Garner K, Pellissey JS, Clark K, Olthof I, Latifovic R, Finstad GL. 2014. Assessing the Impacts of Summer Range on Bathurst caribou's productivity and abundance since 1985. Natural Resources 5:130-145.

EC (Environment Canada). 2012. Recovery Strategy for the Woodland Caribou (*Rangifer tarandus* caribou), Boreal population, in Canada. Species at Risk Act Recovery Strategy Series. Environment Canada, Ottawa, ON.

EC. 2014. Proposed Recovery Strategy for the Wolverine (*Gulo gulo*), Eastern population, in Canada – 2014. Environment Canada, Ottawa, ON. Available at: http://www.sararegistry.gc.ca/default.asp?lang=En&n=A18B84C4-1#_05.

Golder (Golder Associates Ltd.). 2011. Analysis of Environmental Effects from the Diavik Diamond Mine on Wildlife in the Lac de Gras Region. Prepared for the Diavik Diamond Mines Inc. March 2011.

Gunn, A. 2009. Facing a future of change: wild migratory caribou and reindeer. Arctic 62: iii-vi.

Hunter ML, Jr., Gibbs JP. 2007. Fundamentals of Conservation Biology, Third edition. Blackwell Publishing Ltd., Oxford, United Kingdom.

Jacobsen P. 2011. Tłįchǫ Elders' Knowledge of Climate Change and Forest Fires: Implications for Barren-Ground Caribou Hunting. University of Northern British Columbia, Prince George, BC, Canada.

McLoughlin PD, Boyce MS, Coulson T, Clutton-Brock T. 2006. Lifetime reproductive success and density-dependent, multi-variable resource selection. Proceedings of the Royal Society B 273:1449-1454.

Reed DH, O'Grady JJ, Ballou JD, Frankham R. 2003. The frequency and severity of catastrophic die-offs in vertebrates. Anim Conserv 6:109–114.

Russell DE. 2014. Kiggavik Project Effects: Energy-Protein and Population Modeling of the Qamanirjuaq Caribou Herd. Prepared for EDI Environmental Dynamics Inc., Whitehorse, YT.

Sabo JL. 2008. Population viability and species interactions: life outside the single-species vacuum. Biol Conserv 141:276-286.

Säterberg T, Sellman S, Ebenman B. 2013. High frequency of functional extinctions in ecological networks. Nature 499: 468–470.

Soulé ME, Estes JA, Berger J, Del Rio CM. 2003. Ecological effectiveness: conservation goals for interactive species. Conser Biol 17: 1238-1250.Weladji RD, Holand O. 2003. Global climate change and reindeer: effects of winter weather on the autumn weight and growth of calves. Oecologia 136: 317-323.

DOMINION DIAMOND

Information Request Number: DAR-YKDFN-IR-31

Source: Yellowknives Dene First Nation: Todd Slack

Subject: Residual Effects Analysis

DAR Section(s): 12.4

Preamble (YKDFN):

The discussion provided under 'general approach' does not describe the inclusion of traditional knowledge or how it is valued. It seems that the discussion provided as a part of this chapter was for no purpose (as is often the case).

Request (YKDFN):

Section 12.4.1 states that Traditional Knowledge and Community Knowledge was incorporated where available. Please provide:

1) Examples of where this was done

2) Examples of where the project identified an opportunity and went to gather traditional knowledge (similar to the other research that it did) and incorporated into the DAR.

Response:

1) Dominion Diamond submitted the Developer's Assessment Report (DAR), which rates significance per Mackenzie Valley Environmental Impact Review Board (MVEIRB) guidelines (MVEIRB 2004). Community and regulatory engagement, and local and Traditional Knowledge (TK) were a key consideration in:

   - the selection of valued components (VCs) and assessment endpoints;
   - the identification of effects pathways and mitigation;
   - providing context for residual effects analysis; and,
   - residual impact classification and determination of significance of VCs.

   Traditional knowledge and scientific information were incorporated in the overall assessment and discussion of evaluating the likelihood and significance of residual effects. It is not appropriate, however, for the developer to submit an opinion of societal values. These must be submitted to the MVEIRB by the interested communities, regulators, and public, and will be weighed by the MVEIRB in their final determination of significance (MVEIRB 2004).

Section 12 (Examples for Caribou)

Subsection 12.1.3 page 12-4, subsection 12.6.1, page 12-126: Local and TK recognizes the importance of caribou to the health of the land, predators, and people. Therefore, caribou have been

identified as an ecologically important and highly interactive species important to the overall ecosystem. A self-sustaining and ecologically effective population is, therefore, the assessment endpoint for barren-ground caribou identified in Section 12. Measurement indicators from Section 12 were also carried forward so that effects on opportunities for traditional use of resources could also be appropriately captured in the DAR (Section 15).

Subsection 12.4.2.3, pages 12-102 to 12-105: The recent decline of caribou population is recognized by both science and TK. Both knowledges identify the trend as, at least partially, due to natural factors. However, the potential influences of anthropogenic factors, such as the Jay Project, are also considered in the DAR. An example of TK integration into the quantitative assessment of the effects from the Project is evident in the caribou energetics model (subsection 12.4.2.3 [Behaviour, Energy Balance, and Calf Production]). For example, seven alternate caribou paths identified by Tłı̨chǫ Elders (DTC 2001; DAR Map 12.4-3) were applied to the energetics model to calculate the potential energetic costs from deflection around the Project, including the Misery, Jay, and Sable roads and Ekati and Diavik mine infrastructure. The results of this model are presented directly in the context of TK and traditional land use (TLU) information.

Subsection 12.2.2.3, pages 12-22 to 12-23, subsection 12.2.3, pages 12-34 to 12-39, subsection 12.4.2, pages 12-75 to 12-76, 12-98 to 12-99, subsection 12.5, pages 12-118 to 12-120, and subsection 12.6.2, page 12-131: TK was also incorporated into the DAR to qualitatively assess effects of climate change, including fire frequency and intensity, and the implications to caribou numbers and distribution (Kendrick et al. 2005). For example, the Inuit have identified the increase in freezing rains in winter as an important factor limiting caribou access to food (Banci et al. 2007), and the Tłı̨chǫ have observed that climate change has changed snow and ice conditions and has decreased lichen availability. They have also reported that caribou avoid burned areas and suggest that these factors all contribute to why caribou appear thinner now than they did in the past. The changing timing and nature of caribou migration has also been identified by TK. For example, the Tłı̨chǫ report a southward migration later in the year and northward migration earlier in the spring, and a greater dispersal of caribou than in the past (Jacobsen 2011). A recent analysis of collar data supports this TK and found a northern shift in the distribution or contraction of the core area of the Bathurst herd during the post-calving season (Golder 2014; MVEIRB-IR-9). The results of the assessment on the impacts of climate change, including fire disturbances on caribou numbers and distribution included both scientific and TK in the DAR (Sections 12 and 17). The anticipated impacts and associated significance assessment provided in the DAR are presented in the context of scientific, TK and TLU information.

In the DAR, Dominion Diamond proposed to construct caribou crossings at appropriate discrete locations along the Jay Road. After receiving input from Aboriginal communities during our engagement process and during site visits, Dominion Diamond has changed its approach to caribou crossings along the Jay Road to reflect that feedback, as described below.

Because of the importance of the esker for caribou movement as identified through community engagement, the portion of the Jay Road that cuts through the esker will be constructed as a caribou crossing. The pipelines will be covered over with crushed rock along this section of road, except where there are valves or joints that require visual inspection for safe operation. Dominion Diamond

will strategically construct the pipelines to reduce the number of joints or valves through the esker crossing.

Dominion Diamond's community engagement program has indicated that the area to be crossed by the Jay Road is important for caribou movement. In response to the feedback received through community engagement, Dominion Diamond proposes to construct an increased number of caribou crossings along the main section of the Jay Road (i.e., roughly between King Pond Dam and the approach to the active operations area at Lac du Sauvage). This main section of the Jay Road will be constructed with frequent and wide caribou crossings that will respect the communities' identification of the importance of this area for caribou movement. Caribou crossings will not be built in areas where raised safety berms are required by the Mines Inspector, or at locations where there are necessary joints and valves in the pipelines that require visual inspection for safe operation. The pipelines will be strategically designed to reduce the number of locations that cannot be constructed as caribou crossings due to joints and valves. This approach also makes beneficial use of 'lessons-learned' from the original Misery Road, where caribou crossings were only installed after construction of the road.

Section 13 (Examples for Other Wildlife VCs)

Subsection 13.1.3 pages 13-6 to 13-7, subsection 13.3, pages 13-66 to 13-92, and subsection 13.6, pages 13-143 to 13-153: Like caribou, local and TK recognizes the cultural and economic importance of other wildlife that should be protected for future human generations and as a result, a self-sustaining and ecologically effective population is the assessment endpoint for wildlife VCs identified in Section 13. The identification of VCs were determined from the outcome of the community, public, and regulatory engagement process. As a result, wildlife VCs include ecologically sensitive and threatened animals and culturally and economically important animals including grizzly bear, wolverine, waterbirds, raptors, gray wolf, and upland breeding birds (which includes ptarmigan). Measurement indicators from Section 13 were also carried forward so that effects on TLU could be appropriately captured in the DAR (Section 15).

Subsection 13.3.2, pages 13-68 to 13-73, 13-85 to 13-86, subsection 13.6, pages 13-248 to 13-149: Community concerns about potential impacts of the Project on wildlife have helped focus the wildlife monitoring and mitigation planning for the Project. For example, during the scoping and technical sessions, Elders and the communities expressed concerns about the effects of dust on the vegetation in and around the Ekati Mine. Members of the Yellowknives Dene First Nation (YKDFN), the North Slave Métis Alliance (NSMA), and Kitikmeot Inuit Association (KIA) expressed concerns about the effects of dust on wildlife, especially birds. These concerns resulted in a thorough investigation in the DAR of the likelihood and impacts resulting from:

- the ingestion of water, soil, and vegetation, or inhalation of air that has been chemically altered by air emissions or dust deposition;
- sensory disturbances (lights, smells, noise, dust, viewscape) on upland bird habitat quality and movement and behaviour; and
- air and dust emissions and subsequent deposition on the quantity or quality of plant forage, and prey abundance.

Subsection 13.2, pages 13-12 to 13-37: In addition to providing context for wildlife assessments in the DAR, opportunities to document TK are an ongoing part of monitoring and mitigation programs at Ekati (i.e., bird surveys, nest surveys, wolf den surveys, wolverine snow track and hair-snagging surveys, and grizzly bear habitat and hair snagging surveys). For example, in 2011, community participants in the Wildlife Effects Monitoring Program (WEMP) Community Engagement Program helped Ekati Mine staff identify 23 habitat locations around the mine for establishing plots for the grizzly bear DNA hair-snagging program. This program is designed to assess and monitor the distribution and occupancy of grizzly bears near the mine (Rescan 2011). The results from these surveys, including observations and recommendations from communities collected during the life of the Ekati Mine, have been integrated into the assessment of effects on wildlife in the DAR for the Jay Project.

A similar approach to that used in Sections 12 and 13 were used to assess the impacts of the Jay Project on other VCs throughout the DAR. A summary of how local and TK information has been integrated into the DAR is provided in Table 5.3-2 of the DAR.

2) Dominion Diamond funded two community-led activities to identify TK related to the Jay Project:

- The activities with the Yellowknives Dene First Nation included a site visit with an archaeologist to provide advice on locations of cultural significance around Lac du Sauvage, and to provide advice on the crossing of the esker for the Project (August 11 to 12, 2014). This program also includes funding for a workshop with Elders to provide additional TK on the Project and to enter relevant TK data for the Ekati Mine area into the Yellowknives Dene First Nation's Community Knowledge Keeper (CKK) database.
- The What'aa Project with the Tłı̨chǫ involves the study by Tłı̨chǫ Elders of varying properties of natural eskers close to Mesa Lake, NWT, to identify community-based concepts that may be useful in planning, construction, and reclamation of mine waste rock piles. Dominion Diamond's activities included arranging a site visit for Tłı̨chǫ Government representatives and Elders with an engineer to provide advice on the crossing of the esker for the Project (July 16, 2014).

The anticipated impacts and associated significance provided in the DAR are presented in the context of TK and TLU information collected to date. Traditional Knowledge programs with each community are currently under development or underway with the goal of continually collecting, documenting, recording, and verifying TK. Communities are also involved in ongoing monitoring programs, site visits, and Jay Project design and development discussions that provide opportunities to integrate TK into the Jay Project (and Ekati Mine) on a continual basis.

References:

Banci V, Hanak J, Ovilok J, Engoaloak H. 2007. Caribou and Roads: Implementing Traditional Knowledge in Wildlife Monitoring at the Ekati Diamond Mine 2006 Annual Report. Yellowknife, NWT, Canada.

DTC (Dogrib Treaty 11 Council). 2001. Caribou Migration and the State of Their Habitat. Final Report to West Kitikmeot Slave Study Society. Yellowknife, NWT, Canada.

Golder (Golder Associates Ltd.). 2014. Analysis of Environmental Effects from the Diavik Diamond Mine on Wildlife in the Lac de Gras Region. Prepared for Diavik Diamond Mines (2012) Inc. Yellowknife, NWT, Candaa.

Jacobsen P. 2011. Tłįchǫ Elders' Knowledge of Climate Change and Forest Fires: Implications for Barren-Ground Caribou Hunting. University of Northern British Columbia, Prince George, BC, Canada.

Kendrick A, Lyver POB, Łutsel K'e Dene First Nation. 2005. Denesoline (Chipewyan) Knowledge of Barren-ground Caribou (*Rangifer tarandus groenlandicus*) Movements. Arctic 58:175-191.

MVEIRB (Mackenzie Valley Environmental Impact Review Board). 2004. Environmental Impact Assessment Guidelines. MVEIRB. March 2004.

Rescan (Rescan Environmental Services Ltd.). 2011. EKATI Diamond Mine: 2011 Wildlife Effects Monitoring Program. Prepared for BHP Billiton Canada Inc. by Rescan Environmental Services Ltd.: Yellowknife, Northwest Territories.

DOMINION DIAMOND

Information Request Number: DAR-YKDFN-IR-32

Source: Yellowknives Dene First Nation: Todd Slack

Subject: Barren-Ground Caribou

DAR Section(s): 12.4

Preamble (YKDFN):

The project substantially manipulated the baseline information prior to undertaking the analysis.

Request (YKDFN):

1) Please explain what methods were used for the resampling and why this method was selected as the preferred option.

2) The text suggests that the data was resampled prior to reclassification. This can result in the loss of a significant amount of the landbase texture, with classes disappearing entirely. Please provide an explanation of the methods and why the project feel that they do no introduce (particularly type I) errors into the final product that the analysis was completed on.

3) The project has stated that computational efficiency was the base need to do this for the winter range. Given that the GNWT completed 25m RSF analyses for the entire Mackenzie Delta a decade ago, are we to understand that Dominion Diamond and Golder Associates lack the ability to do something similar for the other seasonal ranges?

4) Please provide tables 12.4-8 to 12.4-10 with change in hectares as well as adding a line which provides totals.

5) The all-weather road that was recently announced by GNWT is not included as part of the analysis. Please provide a discussion on when DDEC suggested this to government and what the habitat implications would be.

Response:

1) The details of the methods used for resampling are presented in Section 12.4.2.1.1 (page 12-76) of the Developer's Assessment Report (DAR). Land cover data resampling was used only for the Bathurst herd winter range. The unique classification for winter habitat, including the use of the Earth Observation for Sustainable Development database and the resampling step, was a consequence of the availability of winter resource selection function (RSF) coefficients and the data and processes upon which they were based. The available winter RSF for the Bathurst caribou herd winter range was completed for the NICO Project (Fortune 2011) and the process used in the assessment for the Jay Project followed that process.

2) Classification of the cells was completed at the 25-metre (m) cell layer prior to resampling. For each 25-m cell, the local scale RSF coefficients were applied to the land cover layer that included the updated burn data, while the regional scale RSF values for each 25-m cell were held constant

(Fortune 2011). The 25-m cell layer was then resampled to coarser resolution before analyses. Combining RSF values for groups of adjacent cells during resampling has the effect of reducing the occurrence of extreme values and moderating variation across the landscape. Type I statistical errors are less likely to occur in such a situation.

3) The computational procedure followed those presented in Fortune (2011). For the Jay Project, the extent of the Bathurst winter range was recalculated based on radio-collar and Global Positioning System collar data that were collected from April 1996 to October 2013 from individuals of the Bathurst caribou herd. Fire data were then updated to 2013. Following the delineation of a new winter range and the fire layer update, the approach for habitat analyses for the Jay Project matched that for the NICO Project, enabling the use of the winter RSF layer from the NICO Project. This is an efficient, consistent, and ecologically appropriate approach to evaluating the effects of development on the Bathurst winter range.

4) The Tables requested appear below as Tables 32-1 to 32-4.

5) The 'all-weather road' mentioned did not meet the Reasonably Foreseeable Development (RFD) criteria for the assessment of the Jay Project and it has not been assessed. The RFDs are defined in Section 12.4.1.2 of the DAR as projects that are as follows:

   - currently under regulatory review or have officially entered a regulatory application process;
   - have a reasonable likelihood of being initiated during the life of the Project,
   - or may be induced by the Project; and,
   - have the potential to change the Project or the effects predictions.

   It is not possible to include a potential road as an RFD unless there is sufficient information on timing, location, and construction and operational details to quantitatively and/or qualitatively assess effects to biophysical and human components of the environment; none of the required information is available for the potential 'all-weather road' mentioned in the request. The 'all-weather road' is not defined to a necessary minimal level that enables effects predictions, even at Tier 3 (i.e., qualitative assessment).

Table 32-1 Area of Habitat Types within the Bathurst Caribou Herd Spring Range during Reference Condition, Baseline Condition, Application Case, and Reasonably Foreseeable Development Case

Habitat Type	Area (ha)				Change (ha)			
	Reference	Baseline	Application	RFD	Reference to Baseline	Baseline to Application	Application to RFD	Reference to RFD
Lichen Veneer	733,650	732,806	732,806	731,644	-844	0	-1,162	-2,006
Unvegetated	4,371,638	4,360,613	4,360,100	4,358,069	-11,025	-513	-2,031	-13,569
Esker	136,888	135,819	135,788	135,606	-1,069	-31	-182	-1,282
Riparian Shrub	24,713	24,638	24,625	24,625	-75	-13	0	-88
Sedge Association	724,119	722,100	722,069	721,813	-2,019	-31	-256	-2,306
Heath Tundra / Heath Rock	8,318,456	8,297,144	8,296,431	8,283,044	-21,312	-713	-13,387	-35,412
Forest	4,514,175	4,502,200	4,502,200	4,497,225	-11,975	0	-4,975	-16,950
Rock Association	61,906	58,575	58,575	58,513	-3,331	0	-62	-3,393
Peat Bog	204,819	204,319	204,319	204,275	-500	0	-44	-544
Old Burn	48,375	48,175	48,175	48,169	-200	0	-6	-206
Young Burn	865,844	863,050	863,050	862,925	-2,794	0	-125	-2,919
Disturbance	1,713	56,856	58,156	80,388	55,143	1,300	22,232	78,675
Total Area (ha)	**20,006,296**							

ha = hectare; RFD = reasonably foreseeable development.

Table 32-2 Area of Habitat Types within the Bathurst Caribou Herd Post-calving Range during Reference Condition, Baseline Condition, Application Case, and Reasonably Foreseeable Development Case

Habitat Type	Total Area (ha)				Change (ha)			
	Reference	Baseline	Application	RFD	Reference to Baseline	Baseline to Application	Application to RFD	Reference to RFD
Lichen Veneer	530,038	529,294	529,294	527,656	-744	0	-1,638	-2,382
Unvegetated	1,730,306	1,724,850	1,724,338	1,722,669	-5,456	-512	-1,669	-7,637
Esker	72,794	71,875	71,844	71,663	-919	-31	-181	-1,131
Riparian Shrub	19,844	19,769	19,756	19,756	-75	-13	0	-88
Sedge Association	314,250	313,075	313,044	312,819	-1,175	-31	-225	-1,431
Heath Tundra / Heath Rock	6,030,963	6,012,950	6,012,238	5,998,619	-18,013	-712	-13,619	-32,344
Forest	154,313	154,188	154,188	154,188	-125	0	0	-125
Rock Association	20,881	17,775	17,775	17,694	-3,106	0	-81	-3,187
Peat Bog	26,919	26,919	26,919	26,919	0	0	0	0
Old Burn	369	369	369	369	0	0	0	0
Young Burn	188	188	188	188	0	0	0	0
Disturbance	0	29,613	30,913	48,325	29,613	1,300	17,412	48,325
Total Area (ha)	**8,900,865**							

ha = hectare; RFD = reasonably foreseeable development.

Table 32-3 Area of Habitat Types within the Bathurst Caribou Herd Autumn Migration Range during Reference Condition, Baseline Condition, Application Case, and Reasonably Foreseeable Development Case

Habitat Type	Total Area (ha)				Change (ha)			
	Reference	Baseline	Application	RFD	Reference to Baseline	Baseline to Application	Application to RFD	Reference to RFD
Lichen Veneer	318,175	317,463	317,463	316,113	-712	0	-1,350	-2,062
Unvegetated	3,204,094	3,194,563	3,194,050	3,192,644	-9,531	-513	-1,406	-11,450
Esker	117,488	116,419	116,388	116,269	-1,069	-31	-119	-1,219
Riparian Shrub	22,538	22,463	22,450	22,450	-75	-13	0	-88
Sedge Association	571,363	569,344	569,313	569,100	-2,019	-31	-213	-2,263
Heath Tundra / Heath Rock	7,402,375	7,381,056	7,380,344	7,369,069	-21,319	-712	-11,275	-33,306
Forest	1,846,856	1,839,913	1,839,913	1,839,913	-6,943	0	0	-6,943
Rock Association	21,325	18,013	18,013	18,013	-3,312	0	0	-3,312
Peat Bog	174,663	174,231	174,231	174,231	-432	0	0	-432
Old Burn	11,738	11,613	11,613	11,613	-125	0	0	-125
Young Burn	213,644	213,456	213,456	213,456	-188	0	0	-188
Disturbance	1,169	46,894	48,194	62,556	45,725	1,300	14,362	61,387
Total Area (ha)	**13,905,428**							

ha = hectare; RFD = reasonably foreseeable development.

Table 32-4 Area of Habitat Types within the Bathurst Caribou Herd Winter Range during Reference Condition, Baseline Condition, Application Case, and Reasonably Foreseeable Development (RFD) Case

Habitat Type	Total Area (ha)				Change (ha)			
	Reference	Baseline	Application	RFD	Reference to Baseline	Baseline to Application	Application to RFD	Reference to RFD
Non-productive/data deficient	92,996	92,704	92,704	92,696	-292	0	-8	-300
Exposed Land/Rock	1,029,164	1,022,668	1,022,668	1,022,288	-6,496	0	-380	-6,876
Bryoids	646,288	645,880	645,880	645,860	-408	0	-20	-428
Shrub	1,200,964	1,199,044	1,199,044	1,198,492	-1,920	0	-552	-2,472
Bog/Fen	705,380	703,664	703,664	703,232	-1,716	0	-432	-2,148
Coniferous	4,343,380	4,333,168	4,333,168	4,330,516	-10,212	0	-2,652	-12,864
Broadleaf	342,088	340,976	340,976	340,972	-1,112	0	-4	-1,116
Mixedwood	350,476	349,996	349,996	349,788	-480	0	-208	-688
Water	3,461,832	3,441,804	3,441,804	3,445,152	-20,028	0	3,348	-16,680
Burn	3,776,528	3,765,520	3,765,520	3,765,408	-11,008	0	-112	-11,120
Disturbance	1,804	55,476	55,476	56,496	53,672	0	1,020	54,692
Total Area (ha)	**15,950,900**							

ha = hectare; RFD = reasonably foreseeable development.

References:

Fortune (Fortune Minerals Ltd.). 2011. NICO Developer’s Assessment Report. Prepared by Golder Associates Ltd.