Government of Northwest Territories

CONNECTING TO OPPORTUNITIES

Mackenzie Valley Highway

Developer's Assessment Report

Supplemental Filing: Consideration of Accelerated Construction Alternative

Supplement to Chapter 7: Assessment of Alternatives

September 2024

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1 Introduction

The Terms of Reference (ToR) for the Developer's Assessment Report (DAR) for the Mackenzie Valley Highway Project (the "Project") requires the Government of the Northwest Territories (GNWT) to describe alternate highway routes considered and evaluation of the environmental effects of these alternative routes (Mackenzie Valley Environmental Impact Review Board [MVEIRB], 2015 [Public Registry {PR}#66]). The ToR also requires a description and evaluation of alternative methods for highway design, construction, and operation that are technically and economically feasible, and the environmental effects of these alternative methods (MVEIRB, 2015 [PR#66]).

Chapter 7 of the DAR compared two highway routes, and two construction methods. The purpose of this Supplemental Filing is to describe and compare an additional construction method, namely an accelerated construction alternative, to the Project construction approach, in response to public input.

1.1 Identification of Additional Alternative Method

Two construction methods are compared:

1. Project construction approach: three long highway segments constructed sequentially under two to three separate contracts, as described in Chapter 5 of the DAR (GNWT, 2023)
2. Accelerated construction alternative: three highway segments constructed concurrently under one contract

A short segment construction alternative, whereby the highway is constructed in short highway segments (20 kilometres [km] or less) constructed under separate contracts, was also previously compared to the Project construction method (DAR, Section 7.3).

1.2 Influence of Engagement

Project engagement with Indigenous Governments, Indigenous Organizations, and other affected parties has been ongoing since 2010. The purpose and methods of engagement are described in Chapter 2. The selection of an additional alternative is based on feedback received during the GNWT's engagement program, as well as comments received in and outside of the MVEIRB's public review process.

In June 2024, barging services were canceled for the 2024 season due to low water levels on the Mackenzie River, precluding the delivery of fuel, materials and goods to Sahtu Region communities. The situation has highlighted the importance of the Mackenzie Valley Highway as climate resilient infrastructure, and the vulnerability of existing transportation systems. Directly affected communities, and parties in the Sahtu Region, have called on the GNWT to accelerate its construction. In response to MVEIRB Information Request #1C (PR#233), the GNWT indicated that the construction of the highway could be completed in as little as three to four years, though this is

subject to significant assumptions that are described in the GNWT's response. Accordingly, an expedited construction – an "all-at-once" construction alternative – was previously not included as a viable alternative (Section 7.1.1.2 of the DAR). The GNWT's response to engagement feedback is to now re-introduce and evaluate it here as a viable alternative to the Project construction approach as assessed in the DAR.

2 Description of Construction Methods Compared

Two approaches (methods) to constructing the Project have been evaluated. The comparison of the two construction approaches considers factors that could influence, or be influenced by, the different construction schedules and approaches, such as equipment requirements, camp requirements, workforce, cost, and availability of local infrastructure.

The Mackenzie Valley Highway requires construction of approximately 281 km of new all–season gravel highway embankment, with 102 km in the Dehcho Region and 179 km in the Sahtu Region. In the Sahtu Region it is split into two segments by the Great Bear River Bridge project and associated access roads. The segment from the Dehcho/Sahtu border to Four Mile Creek is approximately 134 km, and the segment from Tulita to Prohibition Creek is approximately 45 km (GNWT, 2023).

The two construction approaches differ in the methods and duration of the construction, and the material sources used for construction. The Project construction approach is described in detail in Section 5.4 of the DAR (GNWT, 2023) – a summary is provided below.

2.1 The Project Construction Approach

The conceptual schedule for the Project construction approach assumes the highway will be constructed in three consecutive segments under two to three separate contracts:

- Segment 1: Wrigley to the Dehcho–Sahtu border (102 km)
- Segment 2: Tulita south to the Dehcho–Sahtu border (134 km)
- Segment 3: Tulita north to the Prohibition Creek Access Road (45 km)

The Project will take approximately 10 years to construct, over a timeframe of up to 20 years, beginning in approximately 2026. It reflects a phased approach to construction, whereby construction funding and regulatory approvals are obtained prior to construction of each segment, over a period of 0–2 years. This conceptual schedule assumes the Project would be fully constructed and provide all–season connection to Norman Wells sometime between 2041 and 2046. Details of this (Project) construction approach are provided in the following sections of the DAR (GNWT, 2023):

- Section 5.4.2: mobilization, staging and resupply
- Section 5.4.3: construction camps and temporary maintenance yards
- Section 5.4.4: clearing and access
- Section 5.4.5: quarrying
- Section 5.4.6: embankment construction
- Section 5.4.7: watercourse crossings

- Section 5.4.8 demobilization
- Section 5.4.9: closure and reclamation
- Section 5.4.10: equipment and fuel use
- Section 5.4.11: water use
- Section 5.4.12: wastes
- Section 5.4.13: access and site security
- Section 5.4.14: construction employment and contracting
- Section 5.4.15: roles and responsibilities of communities

2.2 The Accelerated Construction Alternative

The accelerated construction alternative assumes that the three highway segments (per Section 2.1) are constructed concurrently under a single contract, beginning in approximately late 2027/early 2028, which allows time after an environmental assessment decision to complete the design and permitting of the entire highway (as opposed to a single segment). This conceptual alternative schedule assumes construction would be completed, and the highway open for use by 2032.

Compared to the Project construction approach, there is no difference to the material requirements, seasonal construction schedule, water sources, general camp operations, embankment construction, closure and reclamation, or access and site security.

For the purpose of the evaluation, conceptually it is anticipated that construction of the highway would advance simultaneously from two locations (construction headings) for each of Segment 1 and Segment 2, and from one construction heading for Segment 3, for a total of five concurrent construction spreads advanced from these headings. This could include start points at either end of each segment, or mid–points. The start points would be based on the need to develop material sources (quarry or borrow) and the availability and location of construction camps and staging areas. To complete the initial mobilization of equipment, fuel and materials to staging areas, 20–30 barges and/or 1,500 trucks could be required. Resupply to all construction spreads could require 15–30 barges and/or 150 to 300 trucks annually.

It is assumed that three to four dedicated construction camps of approximately 100 person capacity each would be established at locations such as existing camp facilities within Norman Wells, or, at locations outside of municipal boundaries such as at one or more borrow sources or quarries to be accessed from the Mackenzie Valley Winter Road (MVWR). Wastewater generation could be approximately 100 cubic metres (m^3) per day from all camps during maximum occupancy, which would require disposal to municipal facilities, unless other methods are approved. It is estimated that 1,200 m^3 of solid waste could be generated annually. The GNWT would be required to obtain approval and agreement from the Town of Norman Wells, the Hamlet of Tulita and Wrigley to use their community water supplies, their sewage lagoon and their solid waste disposal facility. Should

capacity be a concern at any one of these facilities, the GNWT would seek alternative options for the disposal of waste.

Multiple quarry and borrow sources (assume 5–6) would be developed concurrently, to support each construction spread. In addition to the 15 primary material sources listed in Table 5.4 of the DAR, it may be beneficial to additionally develop some of the alternate sources identified in Table 5.5 of the DAR, to reduce haul distances, including Source 9.010, 9.037, 10.001, 20.086P, Dhu2, and therefore, these are conservatively added to the scope of the project under this alternative. While the equipment to be used for construction is the same as listed in Section 5.4.10 of the DAR, there may be three to five times the number of each type of equipment. Non–potable water use for camps, compaction, winter travel lane construction, and dust control is estimated at 120,000 m^3 per year, to be sourced from the same sources as for the Project construction approach (Table 5.7 and 5.8 of the DAR).

The estimated construction workforce for the accelerated construction alternative includes:

- 400–700 contractor's construction personnel (40–70 persons per crew at four work camps per cross–shift)
- 50 contractor's camp services personnel (includes 4–5 per camp per cross–shift)
- 10 environmental/wildlife monitors (5 per cross–shift)
- 12–16 contractor's supervisors (includes 6–8 supervisory personnel per cross–shift)

The workforce arrangements are assumed to be as presented for the Project construction approach (Section 5.4.14.2 of the DAR).

2.3 Comparison of Construction Activities and Timing

A summary of the construction activities and conceptual timing for the Project construction approach and accelerated construction alternative are presented in Table 2.1. A comparison of the requirements associated with each activity is provided in Table 2.2, except where, as previously noted, there is no difference between the Project construction approach and accelerated construction alternative.

Table 2.1 Summary of Construction Activities and Timing of Project Construction Approach and Accelerated Construction Alternative

Activity per Segment (3 Segments Total)	Assumed Timing for Project Construction (per DAR Table 5.9)	Assumed Timing for Accelerated Construction Alternative
Mobilization of equipment, materials, and fuel by barges or on MVWR	Summer and/or winter, prior to the first year of construction of each segment	Summer and/or winter, prior to the first year of construction
Resupply by barges or MVWR	Annually in summer and winter for each construction segment	Annually in summer and winter (approximately 3–4 years)

Activity per Segment (3 Segments Total)	**Assumed Timing for Project Construction (per DAR Table 5.9)**	**Assumed Timing for Accelerated Construction Alternative**
	(approximately 3–4 years each), with 2 years between of no activity	
Establishment and operation of camps and maintenance yards	Annually, year–round for each construction segment (approximately 3–4 years each), with 2 years between of no activity	Annually, year–round at four camps along five construction spreads for approximately 3–4 years
Site preparation of ROW, project winter travel lanes, and maintenance areas	Winter for each construction segment (approximately 3–4 years each), with 2 years between of no activity	Winter along each construction spread for approximately 3–4 years
Borrow source and quarry development and operations, including blasting, crushing, sorting, and stockpiling	Year–round for each construction segment (approximately 3–4 years each), with 2 years between of no activity	Year–round for approximately 3–4 years
Material haul	Year–round for each construction segment (approximately 3–4 years each), with 2 years between of no activity	Year–round supporting five construction spreads for approximately 3–4 years
Embankment and quarry access road construction, including road cuts	Winter, during first 1–2 years of construction of each segment; blasting/excavation of road cuts may occur in summer or winter	Winter, during first 1–2 years of construction of each construction spread; blasting/excavation of road cuts may occur in summer or winter
Culvert installation	Summer or winter	Summer or winter
Road base placement, compaction, and surfacing	Summer, during last 2 years of construction of each segment	Summer, during last 1–2 years of construction
Water withdrawal	Winter and summer as required to support construction activities	Winter and summer as required to support construction activities
Closure and reclamation of MVWR and temporary borrow sources/quarries, camps, and workspaces	Summer, during final year of construction of each segment	Summer, during final year of construction
Demobilization	Summer and/or winter following the completion of construction of each segment	Summer and/or winter following the completion of highway construction

Table 2.2 Comparison of Specific Activities and Requirements

Project Activity	Assumed Requirements for Project Construction (per DAR Sections 5.4.1 to 5.4.14))	Assumed Requirements for Accelerated Construction Alternative
Construction duration	10 years, over a timeframe of up to 20 years	4 years
Number of construction headings	2	5
Initial mobilization	10 barges and/or 500 trucks per mobilization (x3)	20–30 barges and/or 500–1,500 trucks
Annual resupply	5–10 barges and /or 50–100 trucks	5–10 barges and /or 50–100 trucks
Clearing of right-of-way (ROW) and workspaces	Per segment	All at once
Number of camps	2 per construction segment	3–4 total
Camp capacity	80	100
Contractor's workforce	200–330 per segment	450–775
Water use (potable)	3,000 m^3 annually	30,000 m^3 annually
Water use (non-potable)	26,000 m^3 annually	120,000 m^3 annually
Wastewater	20 m^3 per day	100 m^3 per day
Solid waste	600 m^3 annually	1,200 m^3 annually
Material sources	15, per Table 5.4 of the DAR	15–20, per Table 5.4 and 5.5 of the DAR
Equipment and fuel use	As required to construct one segment	3 – 5 times more, per year
Demobilization	At end of construction of each segment	At end of construction

3 Evaluation of Construction Approaches

The evaluation of construction approaches uses criteria relevant to the assessment of effects on the biophysical and socio-economic environment to compare the options. These are presented in the subsections that follow.

3.1 Evaluation Criteria

The criteria used to compare the construction approaches are provided below:

Technical

- Rate of construction progress: refers to the number of kilometres that can be constructed annually based on equipment and workforce availability affecting overall project duration. Shorter project duration is preferred.
- Granular resources and maintenance: refers to the availability of suitable material sources to construct the option and the relative effort to maintain constructed sections of road during ongoing construction. Less granular material requirement and fewer material sources is preferred.
- Construction camp size and location: refers to the size and location of worker camps needed for the option. Smaller construction camps are preferred.

Economic

- Construction cost: refers to the relative total cost to construct the option, and the sourcing of construction funding. Lower cost is preferred.
- Procurement: refers to the ability to conclude an appropriate construction contract. The GNWT prefers successful bid from a contractor with the capacity to undertake the work in the period requested at an acceptable cost.

Environmental and Regulatory

- Regulatory approvals: refers to the process and timing of regulatory approvals and of obtaining land tenure. Both must be concluded prior to construction.
- Environmental and socio-economic effects: refers to a qualitative comparison of effects on the biophysical and socio-economic environment. Reduced environmental effects and enhanced positive effects are preferred.

3.2 Comparative Evaluation of Options

3.2.1 Rate of Construction Progress

The rate of progress for the Project construction approach, and the accelerated construction alternative could be 30–40 km/year. The longer segments (Segments 1 and 2) would each take three to four years to construct, and Segment 3 would take 2 two years to construct. The Project construction approach assumes that the segments would be constructed sequentially in approximately 10 years, over a timeframe of 15–20 years. It is assumed that the accelerated construction alternative could be constructed in its entirety in as few as four years, as each segment would be constructed concurrently.

3.2.2 Material Sources and Maintenance

The Project construction approach proposes to use 15 rock and granular material sources for construction. The amount of material needed to build the highway does not differ for the two construction approaches; however, owing to the relatively long haul between primary material sources, it may be beneficial to use up to five additional material sources during construction to reduce haul distance and potentially improve construction efficiency. Reducing haul distance can also reduce wear and tear on the portions of the embankment being constructed.

The Project construction approach and accelerated construction use the same amount of rock/granular material, but the accelerated construction alternative may require that more material sources (quarries and borrow sources) are developed for construction.

3.2.3 Construction Camp Size and Location

The Project construction alternative assumes that two construction camps will be used for each segment. At least one camp used to support construction of Segment 1 and Segment 2 will be located away from communities. For the accelerated construction alternative, the camps are assumed to be larger to support a larger workforce, and the camps will be operated concurrently. This is a consideration in the siting of the camps, transport of personnel and supplies to and from the camps, and management of wastes.

The accelerated construction alternative will use more, and larger camps than the Project construction approach.

3.2.4 Construction Cost

Information is not sufficiently developed to reliably compare costs between the Project construction approach and the accelerated construction alternative. However, it may be more difficult to obtain the full amount of capital funding for an accelerated construction alternative, because it will be greater than the incremental funding needed to construct each of the three segments separately. The accelerated construction alternative *could* be less expensive to construct, if only on the basis of reduced annual inflation over the shorter timeframe of the construction.

The construction costs are considered comparable for the purpose of the evaluation, but the funding for an accelerated construction alternative is considered more difficult to obtain.

3.2.5 Procurement

The Project construction approach assumes that construction of each segment would be procured separately, resulting in potentially different contractors constructing each of the segments. To construct the Project per the accelerated construction alternative, the GNWT would look to procure construction of the entire alignment under a single contract. Both construction approaches would require a successful bid from a contractor with the capacity to undertake the work in the period requested at an acceptable cost.

The GNWT anticipates that procurement of smaller contracts, several years apart could provide greater opportunities for local contractor involvement, but this is not necessarily precluded in a larger contract. It may take longer to conclude a larger contract.

3.2.6 Regulatory Approvals

To obtain the necessary regulatory approvals to construct the Project, additional site-specific environmental, geotechnical, and hydrotechnical studies will need to be completed to inform the detailed design. For the Project construction approach, detailed design and regulatory approvals will be obtained for each segment of the Project, sequentially. To obtain regulatory approvals for the accelerated construction alternative, studies and design will need to be completed for the entire Project prior to obtaining regulatory approvals to construct. Comparatively, it may take longer to complete the design and obtain regulatory approvals for the entirety of the Project, than for one (e.g., the first) segment to be constructed.

Similarly, as the Project crosses Sahtu Settlement Lands, land tenure negotiations will need to be concluded prior to construction of the segments in the Sahtu Region. It is uncertain whether it may take longer to obtain land tenure for the entire Project alignment, than for individual segments.

The process to obtain regulatory approvals and land tenure is considered the same for both construction options; however, it may take longer to obtain such approvals and agreements for the accelerated construction alternative.

3.2.7 Environmental and Socio-Economic Effects

Residual effects on the biophysical environment and socio-economic environment are evaluated and compared below for the two construction options for each valued component (VC) assessed in the DAR. The DAR, in Volume 2 and Volume 3, has provided a comprehensive assessment of the potential effects of the Project on VCs by describing the existing conditions for each VC, identifying how the VC could change (be affected by) the Project, proposing mitigation measures to reduce effects, and then characterizing adverse residual effects by their likelihood, magnitude, geographic extent, timing, duration, frequency and reversibility. The comparison of the accelerated construction alternative to the Project construction approach is based on applying the same

mitigation measures to the same potential effects as assessed in the DAR, and then comparing the anticipated residual effects relatively, by characterization, as being more than, less than or the same as those in the DAR. Effect characterizations are defined as in the DAR, except for "duration", for which a numeric value is also provided for some VCs. The comparative evaluation is based on available information only. In most cases, this comparison is qualitative, rather than quantitative, reflecting the requirements of the ToR and that the alternative has not been assessed to the same level of detail as the Project.

The discussion of the residual effects for the socio-economic VCs provides details on those characterizations that are anticipated to change under the accelerated construction schedule alternative. Those characterizations that were determined not to change are not discussed in detail for each effect. In the case of potential Project effects on socio-economic VCs, the Project is also anticipated to have potential positive effects. In order to provide full and balanced information, these positive effects are included in the comparison of effects of the accelerated construction schedule alternative for each socio-economic VC.

3.2.7.1 Air Quality

The relative comparison of residual effects on air quality from changes to criteria air contaminants (CAC) and greenhouse gases (GHG) emissions between the construction approaches is presented below. The comparison applies to the construction phase only.

Direction: The direction of change in CAC and GHG emissions is expected to be relatively the same for both construction approaches (≈) – *adverse* – because both construction approaches result in a predicted increase of ambient CAC concentrations and GHG emissions compared to baseline conditions.

Likelihood: The likelihood for change in CAC and GHG emissions is expected to be relatively the same for both construction approaches (≈) because activities of both result in CAC and GHG emissions.

Magnitude: The magnitude for change in CAC and GHG emissions per year is expected to be greater for the accelerated construction alternative (+) because the amount of construction activities and emission sources per year ("intensity") are greater, and the measurement criteria are on a yearly basis.

Geographic Extent: The geographic extent for change in CAC emissions is expected to be greater for the accelerated construction alternative (+) because if additional quarry and borrow sources are developed, this would result in an increase in the spatial extent of the project footprint and area of direct effects. The geographic extent for change in GHG emissions is expected to be relatively the same (≈) because for both construction methods, the geographic extent is not applicable for changes in GHG emissions.

Timing: The seasonality change to CAC emissions is expected to be relatively the same (≈) for both construction approaches because even though the duration of the construction is different, the seasonality of activities is the same for both methods. The seasonality change in GHG emissions is expected to be relatively the same (≈) because for both construction approaches, the seasonality is not applicable for effects in GHG emissions.

Duration: The duration for the change in CAC emissions is expected to be relatively the same (≈) for both construction approaches because the residual effects are expected to be short-term (i.e. last 5 years or less) for each respective highway segment for both construction methods. That noted, overall CAC-emitting activities will be shorter duration for the accelerated construction alternative because the construction phase will be shorter in duration. The duration for the change in GHG emissions is expected to be relatively the same (≈) because, for both construction approaches, GHG emissions will contribute to climate change for the long-term.

Frequency: The frequency for the change in CAC and GHG emissions is expected to be relatively the same for both construction approaches (≈) because the CAC and GHG emissions from the construction activities are both scheduled at the same times, which is during the daytime only.

Reversibility: The reversibility for the change in CAC and GHG emissions is expected to be relatively the same (≈) because the predicted increase in CAC emissions due to the construction activities would be able to return to baseline conditions at the end of construction for both construction approaches (to be replaced by operations and maintenance emissions); GHG emissions for both approaches will not return to baseline conditions.

The relative comparison of residual effects on air quality of the accelerated construction alternative compared to the Project construction approach is summarized in Table 3.1.

Table 3.1 Residual Effects on Air Quality of the Accelerated Construction Alternative Compared to the Project Construction Approach

Residual Effect	Direction	Likelihood	Magnitude	Geographic Extent	Timing	Duration	Frequency	Reversibility
Change in CAC	≈	≈	+	+	≈	≈	≈	≈
Change in GHG	≈	≈	+	≈	≈	≈	≈	≈

Key:

+: more adverse/more positive, more likely, more than, greater than, more extensive, or, more frequent

≈: relatively the same

–: less adverse, less likely, less than, smaller than, less extensive, or, less frequent

3.2.7.2 Noise

The relative comparison of residual effects from changes to noise between the construction approaches is presented below. The comparison applies to the construction phase only. The construction phase is divided into the mobilization and demobilization activities, and the road construction activities, because these activities generally occur at different times and their noise effects differ.

Direction: The direction of change in noise levels is expected to be relatively the same (≈) – *adverse* – for both the mobilization and demobilization activities, and road construction activities of both construction approaches because both result in a predicted increase in noise levels compared to baseline conditions.

Likelihood: The likelihood for change in noise levels is expected to be relatively the same (≈) for both the mobilization and demobilization activities, and the road construction activities of both construction approaches because activities from both result in noise emissions.

Magnitude: The magnitude for change in noise levels is expected to be greater (+) for the mobilization and demobilization activities of the accelerated construction alternative because there are additional initial mobilization requirements. The magnitude for change in noise levels could be greater (+) for the road construction activities of the accelerated construction alternative because additional equipment may be operating, and additional borrow sources may be developed near the noise receptors (within 5 km).

Geographic Extent: The geographic extent for change in noise levels is expected to potentially be greater (+) for both the mobilization and demobilization activities, and the road construction activities of the accelerated construction alternative because if additional borrow sources are developed, then this would result in an increase in the spatial extent of the project footprint and the area of direct effects.

Timing: The timing change to the noise levels is expected to be relatively the same (≈) for both the mobilization and demobilization activities, and the road construction activities of both construction approaches because the construction activities are expected to occur during the daytime only for both.

Duration: The duration for change in noise levels is expected to be relatively the same (≈) for both the mobilization and demobilization activities, and the road construction activities of both construction approaches because the residual effects are expected to be short-term (i.e., less than one year at any particular location) for both; however, noting that overall, noise effect from construction activities will be shorter duration for the accelerated construction alternative.

Frequency: The frequency for change in noise levels is expected to be relatively the same (≈) for both the mobilization and demobilization activities, and the road construction activities of both construction approaches because the noise emitting activities are expected to occur at regular intervals during the daytime only for both.

Reversibility: The reversibility of change in noise levels is expected to be relatively the same (≈) for both the mobilization and demobilization activities, and the road construction activities of both construction approaches because the predicted increase in noise levels due to Project activities would return to baseline conditions after the end of the activity for both (to be replaced by change in noise levels due to operations and maintenance activities).

The relative comparison of residual effects on noise of the accelerated construction alternative compared to the Project construction approach is summarized in Table 3.2.

Table 3.2 Residual Effects on Noise of the Accelerated Construction Alternative Compared to the Project Construction Approach

Residual Effect	Direction	Likelihood	Magnitude	Geographic Extent	Timing	Duration	Frequency	Reversibility
Change In Noise – Mobilization and Demobilization Activities	≈	≈	+	+	≈	≈	≈	≈
Change In Noise – Road Construction Activities	≈	≈	+	+	≈	≈	≈	≈

Key:

+: more adverse, more likely, more than, greater than, more extensive, or, more frequent

≈: relatively the same

–: less adverse, less likely, less than, smaller than, less extensive, or less frequent

3.2.7.3 Terrain, Soils and Permafrost

The relative comparison of residual effects on terrain, soils and permafrost between the construction approaches is presented below. The comparison applies to the construction phase only.

Effects on terrain, soils and permafrost can occur through pathways such as vegetation clearing and ground disturbance. While the accelerated construction alternative differs in the methods and duration of the construction, there is no difference to overall material requirements, seasonal construction schedule and/or proposed embankment construction technique.

The potential development of up to five additional material sources (see Table 5.5 of the DAR); however, would translate into an increase disturbance. Although this increase will be relatively minor with respect to the overall Project footprint, it will generate additional residual effects on terrain, soils, and permafrost.

Direction: The direction of change in terrain, soils, and permafrost conditions are expected to be relatively the same (≈) – *adverse* – for both construction approaches since both are expected to have adverse residual effects when compared to baseline conditions.

Likelihood: Changes in terrain, soils, and permafrost conditions are equally likely to occur (i.e., the same [≈]) for both construction approaches since both involve vegetation clearing and ground disturbance.

Magnitude: The magnitude of changes in terrain, soils, and permafrost conditions is expected to be relatively the same (≈) for both construction approaches, because a similar level of ground disturbance are expected to occur for both approaches.

Geographic Extent: The geographic extent for changes in terrain, soils and permafrost conditions is likely to be greater (+) for the accelerated construction alternative because if additional quarry and borrow sources are developed, this would result in an increase in the spatial boundary extent of the project footprint and the area of direct effects.

Timing: The timing of changes to terrain, soils and permafrost conditions is expected to be relatively the same (≈) for both construction approaches because both approaches involve the execution of activities during similar seasons (e.g., mobilization to occur during the summer and /or winter).

Duration: The duration of changes to terrain, soils, and permafrost conditions is expected to be relatively the same (≈) for both construction approaches. Residual effects on terrain, soils, and permafrost are expected to extend beyond 20 years following construction.

Frequency: The frequency of changes to terrain, soils, and permafrost conditions will be relatively the same (≈), for both construction approaches, as there is no change to the methods or timing of vegetation clearing and ground disturbance for both.

Reversibility: The reversibility for residual effects on terrain, soils, and permafrost will be relatively the same (≈) for both construction approaches due to the indefinite duration of the disturbances and presence of the highway.

The relative comparison of residual effects on terrain, soils and permafrost of the accelerated construction alternative compared to the Project construction approach is summarized in Table 3.3.

Table 3.3 Residual Effects on Terrain, Soils and Permafrost of the Accelerated Construction Alternative Compared to the Project Construction Approach

Residual Effect	Direction	Likelihood	Magnitude	Geographic Extent	Timing	Duration	Frequency	Reversibility
Change in terrain conditions	≈	≈	≈	+	≈	≈	≈	≈
Change in soils conditions (physical, chemical and biological properties)	≈	≈	≈	+	≈	≈	≈	≈
Change in permafrost conditions (physical and thermal properties)	≈	≈	≈	+	≈	≈	≈	≈

Key:

+: more adverse, more likely, more than, greater than, more extensive, or, more frequent

≈: relatively the same

–: less adverse, less likely, less than, smaller than, less extensive, or, less frequent

3.2.7.4 Water Quantity

3.2.7.4.1 Surface Water Quantity

The relative comparison of residual effects on water quantity from changes to streamflows and changes to lake volumes between the construction approaches is presented below. The comparison applies to the construction phase only.

Based on using the same water sources for both approaches, and if mitigation measures summarized in Table 15.8 of the DAR are in place, residual effects on streamflows and lake volumes are expected to be relatively the same between the two construction approaches.

Direction: Potential effects, pathways, and mitigation measures are the same between the two construction approaches. Therefore, the direction of change for residual effects on streamflows and lake volumes will be relatively the same (≈), – *adverse* – for both construction approaches.

Likelihood: Potential effects, pathways, and mitigation measures are the same between the two construction approaches. Therefore, the likelihood for residual effects on streamflows and lake volumes will be relatively the same (≈) for both construction approaches.

Magnitude: For both construction methods, mitigation measures will bound water withdrawal within the limits of water licences and in accordance with the DFO measures to protect fish and fish habitat (e.g., DFO, 2010; 2013). Thus, the magnitude for change for residual effects on streamflows and lake volumes will be relatively the same (≈), for both construction approaches.

Geographic Extent: No additional water sources are proposed, therefore spatial boundaries, potential effects, pathways, and mitigation measures are the same between the two construction approaches. The geographic extent for residual effects on streamflows and lake volumes will be relatively the same (≈), for both construction approaches.

Timing: The timing of water withdrawals and their potential effect on streamflows and lake volumes can be sensitive for both construction approaches. Thus, sensitivity for residual effects on streamflows and lake volumes will be relatively the same (≈) for both construction approaches.

Duration: Residual effects on streamflows and lake volumes are expected occur throughout construction; however, since the accelerated construction alternative will be completed earlier than the Project construction alternative, the duration of residual effects is relatively less (–) for the accelerated construction alternative for all water sources, though the effects on individual water sources is relatively the same.

Frequency: The frequency for change in residual effects on streamflows and lake volumes will be relatively the same (≈), (mostly depending on the timing of water withdrawals), for both construction approaches.

Reversibility: The reversibility of residual effects on streamflows and lake volumes will be relatively the same (≈), following cessation of water withdrawals, for both construction approaches.

The relative comparison of residual effects on surface water quantity of the accelerated construction alternative compared to the Project construction approach is summarized in Table 3.4.

3.2.7.4.2 Groundwater Quantity

The relative comparison of residual effects on groundwater quantity between the construction approaches is presented below. The comparison applies to the construction phase only.

Direction: Potential effects, pathways, and mitigation measures are the same between the two construction approaches. Therefore, the direction of change for residual effects on groundwater quantity will be relatively the same (≈) – *adverse* – for both construction approaches.

Likelihood: Potential effects, pathways, and mitigation measures are the same between the two construction approaches. Therefore, the likelihood for residual effects on groundwater quantity will be relatively the same (≈) for both construction approaches.

Magnitude: The magnitude for change for residual effects on groundwater quantity is anticipated to be relatively the same (≈), for both construction approaches, because although there are additional material sources to be developed, the development approach and effectiveness of mitigation measures are anticipated to be the same for both construction approaches.

Geographic Extent: The geographic extent of residual effects on groundwater quantity is anticipated to be relatively greater (+) for the accelerated construction alternative if additional quarry and borrow sources are developed. In that case, there is likely to be an increase in the spatial boundary extent of direct effects.

Timing: The timing of residual effects on groundwater quantity will be relatively the same (≈) for both construction approaches. Changes to groundwater are not sensitive to timing.

Duration: Residual effects on groundwater quantity are expected to be relatively the same (≈) for both construction approaches because changes to groundwater quantity from excavation and permafrost degradation will persist into the operations and maintenance phase.

Frequency: The frequency for change in residual effects on groundwater quantity will be relatively the same (≈) for both construction approaches, as both include construction activities involving ground disturbance and excavation throughout the year.

Reversibility: The reversibility of residual effects on groundwater quantity will be relatively the same (≈) for both construction approaches because changes to groundwater quantity from excavation and permafrost degradation will persist into the operations and maintenance phase.

The relative comparison of residual effects on groundwater quantity of the accelerated construction alternative compared to the Project construction approach is summarized in Table 3.4.

Table 3.4 Residual Effects on Water Quantity of the Accelerated Construction Alternative Compared to the Project Construction Approach

Residual Effect	Direction	Likelihood	Magnitude	Geographic Extent	Timing	Duration	Frequency	Reversibility
Changes in streamflows	≈	≈	≈	≈	≈	–	≈	≈
Changes in lake volumes	≈	≈	≈	≈	≈	–	≈	≈
Change in groundwater quantity	≈	≈	≈	+	≈	≈	≈	≈

Key:

+: more adverse, more likely, more than, greater than, more extensive, or, more frequent

≈: relatively the same

–: less adverse, less likely, less than, smaller than, less extensive, shorter duration, or, less frequent

3.2.7.5 Water Quality

Surface Water and Sediment Quality

The relative comparison of residual effects on surface water and sediment quality between the construction approaches is presented below. The comparison applies to the construction phase only.

Direction: The direction of changes to surface water and sediment quality are expected to be relatively the same (≈) for both construction approaches, meaning that there will be no measurable long-term trend in surface water and sediment quality parameters relative to existing conditions. Both approaches involve the same construction activities, effects pathways, measurable parameters, and mitigations at the same watercourse crossings.

Likelihood: Potential effects, pathways, measurable parameters, and mitigation measures are the same between the two construction approaches. Therefore, the likelihood for residual effects on surface water and sediment quality will be relatively the same (≈) for both construction approaches.

Magnitude: The magnitude of changes to surface water and sediment quality is expected to be relatively the same (≈) for both construction approaches. While some additional material sources (quarries) may be required in the accelerated approach, the scale and type of construction activities, key effect pathways, and mitigations at individual watercourses are anticipated to be relatively the same in both construction scenarios. While an accelerated construction approach may increase the potential for greater CAC emissions (and greater overall dust deposition) occurring at any given time over the entire length of the Project, individual watercourses are not anticipated to experience substantially greater dust deposition under an accelerated construction scenario due to the spatial separation of construction areas. With an accelerated construction approach, increased construction-related traffic at water crossings may be a source of additional dust deposition than what was originally assessed in the DAR; however, because the dominant pathways for potential residual effects to surface water and sediment quality are instream works (e.g., culvert installations and potential streambank erosion) and potential leaching from source materials, the overall residual effect is considered to be relatively the same.

Additional wastewater generated from an increased number of workers staying at construction camps in the accelerated program does not change the magnitude of effects because it is anticipated that wastewater will be disposed at approved municipal facilities (as with the Project construction approach). As such, residual effects from the discharge of municipal wastewater are excluded from the assessment of potential changes to surface water and sediment quality.

Geographic Extent: The overall geographic extent of potential changes to surface water and sediment quality may be relatively greater (+) for the accelerated construction alternative, because additional temporary watercourse crossings may be needed to access additional borrow/ quarry sources needed for this alternative.

Timing: The timing of project activities does not differ between construction approaches, and therefore the sensitivity of timing of effects is relatively the same (≈) for both construction approaches.

Duration: The duration of changes to surface water and sediment quality is expected to be relatively the same (≈) for both construction approaches, as the duration of construction of each segment is the same.

Frequency: The frequency for change to surface water and sediment quality is predicted to be relatively the same (≈) for both construction approaches. In both scenarios, the frequency for potential residual effects will be multiple irregular events (corresponding with construction at water crossings.

Reversibility: The reversibility for potential residual effects in surface water and sediment quality is predicted to be relatively the same (≈) for both construction approaches. Under both scenarios, residual effects are anticipated to be reversible because changes in surface water and sediment quality will be influenced by construction activities that are finite in duration. Land disturbances associated with the construction of the Project are well understood and will be managed to eliminate or reduce the potential for long-term effects that extend beyond the construction phase using best practices and mitigation measures as proposed in the DAR.

The relative comparison of residual effects on surface water and sediment quality of the accelerated construction alternative compared to the Project construction approach is summarized in Table 3.5.

Groundwater Quality

The relative comparison of residual effects on groundwater quality between the construction approaches is presented below. The comparison applies to the construction phase only.

Direction: The direction of changes to groundwater quality are expected to be relatively the same (≈) for both construction approaches. Both approaches involve the same construction activities, effects pathways, and mitigation measures.

Likelihood: The likelihood for residual effects on groundwater quality is relatively the same (≈) for both construction approaches because potential effects, pathways, measurable parameters, and mitigation measures are the same between the two construction approaches.

Magnitude: The magnitude of changes to groundwater quality is expected to be relatively the same (≈) for both construction approaches because both involve the same construction activities, effects pathways, and mitigation measures.

Geographic Extent: The geographic extent for changes in groundwater quality possibly greater (+) for the accelerated construction alternative because there are additional potential pathways associated with development of additional borrow/quarry sources; however, the potential for additional groundwater interaction is uncertain.

Timing: The timing of project activities does not differ between construction approaches, and therefore the sensitivity of timing of residual effects on groundwater quality is relatively the same (≈) for both construction approaches.

Duration: The duration of changes to groundwater quality is expected to be less (–) for the accelerated construction alternative, as the use of temporary borrow/quarry sources may be of shorter duration.

Frequency: The frequency of changes to groundwater quality is expected to be relatively the same (≈) for both construction approaches because both involve the same construction activities, effects pathways, and mitigation measures.

Reversibility: The reversibility of residual effects on groundwater quality is anticipated to be relatively the same (≈) for both construction approaches because the construction activities, effects pathways, and mitigation measures that influence reversibility are common to both.

The relative comparison of residual effects on groundwater quality of the accelerated construction alternative compared to the Project construction approach is summarized in Table 3.5.

Table 3.5 Residual Effects on Water Quality of the Accelerated Construction Alternative Compared to the Project Construction Approach

Residual Effect	Direction	Likelihood	Magnitude	Geographic Extent	Timing	Duration	Frequency	Reversibility
Surface water and sediment quality	≈	≈	≈	+	≈	≈	≈	≈
Groundwater quality	≈	≈	≈	+	≈	–	≈	≈

Key:

+: more adverse, more likely, more than, greater than, more extensive, or, more frequent

≈: relatively the same

–: less adverse, less likely, less than, smaller than, less extensive, or less frequent

3.2.7.6 Fish and Fish Habitat

The relative comparison of residual effects on fish and fish habitat from changes to fish habitat, and fish health between the construction approaches is presented below. The comparison applies to the construction phase only.

Residual effects resulting from construction, with the implementation of mitigation measures in Section 17.4.4.3 of the DAR, are likely to result in changes to fish habitat through instream construction and changes to riparian vegetation as well as changes to fish health as it pertains to the health of fish population, which may result from increased fishing pressure at watercourses crossed by the Project. Potential effects, pathways, and mitigation measures are the same between the two construction approaches, therefore, residual effects are expected to be relatively the same between both construction approaches.

Direction: The direction of changes to fish habitat and fish health are expected to be the same (≈) – *adverse* – for both construction approaches. Both approaches employ the same construction activities and mitigation at the same watercourse crossings.

Likelihood: Potential effects, pathways, and mitigation measures are the same between the two construction approaches, therefore changes in fish habitat and fish health are relatively equally likely to occur (≈) for both construction approaches.

Magnitude: The magnitude of changes to fish habitat and fish health is expected to be relatively the same (≈) for both construction approaches because both involve the same construction activities, effects pathways, and mitigation measures.

Geographic Extent: The geographic extent of changes to fish habitat and fish health may be greater for the accelerated construction alternative, if additional temporary watercourse crossings are needed to access additional borrow sources needed for this alternative. Therefore, the geographic extent of changes to fish habitat is relatively more (+) for the accelerated construction alternative.

Timing: The timing of project activities does not differ between construction approaches, and therefore the sensitivity of timing of effects is relatively the same (≈) for both construction approaches.

Duration: The duration of changes to fish habitat and fish health is expected to be relatively the same (≈) for both construction approaches, as the duration of construction of each segment (and at each crossing) is the same. Potential residual effects to fish health from water withdrawals may be relatively shorter in duration for the accelerated construction alternative.

Frequency: The frequency for change to fish habitat and change in fish health is predicted to be relatively the same (≈) for both construction approaches because both involve the same construction activities and methods, effects pathways, and mitigation measures.

Reversibility: The reversibility for change in fish habitat and change in fish health is predicted to be relatively the same (≈) for both construction approaches because changes to fish habitat will persist into the operations and maintenance phase.

The relative comparison of residual effects on fish and fish habitat of the accelerated construction alternative compared to the Project construction approach is summarized in Table 3.6.

Table 3.6 Residual Effects on Fish and Fish Habitat of the Accelerated Construction Alternative Compared to the Project Construction Approach

Residual Effect	Direction	Likelihood	Magnitude	Geographic Extent	Timing	Duration	Frequency	Reversibility
Change in Fish Habitat	≈	≈	≈	+	≈	≈	≈	≈
Change in Fish Health	≈	≈	≈	≈	≈	≈	≈	≈

Key:

+: more adverse, more likely, more than, greater than, more extensive, or, more frequent

≈: relatively the same

–: less adverse, less likely, less than, smaller than, less extensive, or less frequent

3.2.7.7 Vegetation and Wetlands

The relative comparison of residual effects on vegetation and wetlands from changes to landscape diversity, changes to community diversity, changes to species diversity, and changes to wetland function between the construction approaches is presented below. The comparison applies to the construction phase only.

There is no change in the seasonal construction schedule, or closure and reclamation activities between the two Project approaches; however, the footprint of the accelerated construction alternative is larger, as there are more quarry/borrow sources potentially to be used. The accelerated construction approach may result in the generation of a larger volume of dust during construction in certain areas because of the increased number of construction vehicles compared to the Project construction approach (Table 2.2). This larger volume of dust could cause greater indirect effects on vegetation during construction.

Direction: The direction of change for all residual effects on vegetation and wetlands is expected to be the same (≈) – *adverse* – for both construction approaches because both approaches will require the removal of vegetation, may alter wetland hydrology and introduce or spread alien or alien invasive plant species, and potentially alter plant health and abundance from dust.

Likelihood: Potential effects, pathways, and mitigation measures are the same between the two construction approaches, therefore the likelihood for residual effects on vegetation and wetlands are relatively the same (≈) for both construction approaches.

Magnitude: The magnitude of residual effects on vegetation and wetlands is expected to be greater (+) for changes to landscape diversity, community diversity, species diversity, and wetland function because the footprint of the accelerated construction alternative is larger, as there are more quarry/borrow sources potentially to be used. Although indirect effects due to dust may be greater during construction under the accelerated construction approach, dust effects from construction will occur over a shorter time period; therefore, the total magnitude of indirect effects from dust are expected to be similar (≈) for both Project approaches.

Geographic Extent: The geographic extent of residual effects on vegetation and wetlands is greater (+) for the accelerated construction alternative because there are additional borrow sources / quarries which may be developed for the accelerated construction alternative, increasing the area of direct and indirect changes to landscape diversity, community diversity, and wetland function.

Timing: The timing of effects is expected to be relatively the same (≈) for both construction approaches because both approaches will have year round effects on vegetation and wetlands.

Duration: The duration for change vegetation and wetlands residual effects is expected to be relatively the same (≈) for both construction approaches. All four residual effects on vegetation and wetlands will be long-term for both construction approaches because vegetation and wetlands altered during construction will remain affected after construction during the indefinite duration of operation and maintenance of the highway.

Frequency: The frequency for change in residual effects on vegetation wetlands will be relatively the same (≈) for both construction approaches, due to ongoing effect of clearing of vegetation and wetlands associated with construction of the road.

Reversibility: The reversibility for residual effects on vegetation and wetlands will be the same (≈) for both construction approaches due to the indefinite duration of operation and maintenance of the road following completion of construction.

The relative comparison of residual effects on vegetation and wetlands of the accelerated construction alternative compared to the Project construction approach is summarized in Table 3.7.

Table 3.7 Residual Effects on Vegetation and Wetlands of the Accelerated Construction Alternative Compared to the Project Construction Approach

Residual Effect	Direction	Likelihood	Magnitude	Geographic Extent	Timing	Duration	Frequency	Reversibility
Change in Landscape Diversity	≈	≈	+	+	≈	≈	≈	≈
Change in Community Diversity	≈	≈	+	+	≈	≈	≈	≈
Change in Species Diversity	≈	≈	+	+	≈	≈	≈	≈
Change in Wetland Function	≈	≈	+	+	≈	≈	≈	≈

Key:

+: more adverse, more likely, more than, greater than, more extensive, or, more frequent

≈: relatively the same

–: less adverse, less likely, less than, smaller than, less extensive, or less frequent

3.2.7.8 Caribou and Moose

The relative comparison of residual effects on caribou and moose from changes in habitat, movement, mortality risk and health between the construction approaches is presented below. The comparison applies to the construction phase only.

Direction: The direction of the residual effects on change in caribou and moose habitat, movement, mortality risk and health are expected to be relatively the same (≈) — *adverse* — because both will result in direct and indirect loss or alteration of caribou and moose habitat, alter movement and increase mortality and health risk compared to baseline conditions.

Likelihood: The likelihood of residual effects on change in caribou and moose habitat, movement, mortality risk and health are expected to be relatively the same (≈) for both construction approaches because both employ the same construction activities and mitigation measures.

Magnitude: The magnitude of the residual effect on change in caribou and moose habitat (direct loss) is expected to be relatively greater (+) for the accelerated construction alternative because the footprint would increase to accommodate the additional material (quarry/borrow) sources. In addition, the accelerated construction alternative would result in relatively more (+) indirect habitat loss due to sensory disturbance (e.g., noise, lights) compared to the Project because construction activities would require additional equipment resulting in an increase in construction traffic and human disturbance that would occur simultaneously along the entire ROW (i.e., not in discrete segments with potential intermittent reductions in noise due to the staggered approach over several years).

The magnitude of the residual effect on change in movement is expected to be relatively greater (+) for the accelerated construction alternative because it would result in a single continuous physical and sensory barrier that occurs simultaneously along the entire ROW.

The magnitude of the residual effect on change in mortality risk is expected to be relatively greater (+) because the accelerated construction alternative might result in increased interactions between individual caribou and moose and construction equipment, construction traffic (mobilization and demobilization) and the increased number of workers on site and camps operating concurrently.

The magnitude of the residual effect on change in caribou and moose health is expected to be relatively greater (+) because the accelerated construction alternative will result in increased exposure to contaminants (e.g., emissions) as well as increased sensory disturbance and change in movement, which could alter physical (body) condition due to increased stress and energy expenditure resulting in a reduction in caribou and moose health.

Geographic Extent: The geographic extent of the residual effects on change in habitat, movement, mortality risk and health is expected to slightly increase (+) for the accelerated construction alternative because additional quarry and borrow sources are required, which would result in a larger area of direct and indirect habitat loss, potential barriers to movement as well as increased mortality risk and health risk.

Timing: The timing of the residual effect on change in habitat, movement, mortality risk and health would remain the same (≈) because, the accelerated construction alternative would also occur throughout the year, including during sensitive periods for caribou and moose (e.g., calving).

Duration: The duration of the residual effects on change in habitat is expected to be the same (≈) for both construction approaches because although the direct loss of habitat will occur over a shorter time frame, the residual effects of direct habitat loss from construction will persist over the long-term.

The duration of the residual effect on movement, mortality risk and health is expected to be relatively less (–) (up to 4 years) compared to the Project construction approach (up to 20 years).

Frequency: The frequency of the residual effect on change in habitat, movement, mortality risk and health is expected to be relatively the same (≈) for both construction approaches because residual effects will occur throughout the construction phase regardless of construction schedule.

Reversibility: The reversibility of the residual effect on change in habitat, movement, mortality risk and health are anticipated to be relatively the same (≈) for both construction approaches because residual effects associated with direct and indirect habitat loss or alteration will persist throughout the life of the Project.

The relative comparison of residual effects on caribou and moose of the accelerated construction alternative compared to the Project construction approach is summarized in Table 3.8.

Table 3.8 Residual Effects on Caribou and Moose of the Accelerated Construction Alternative Compared to the Project Construction Approach

Residual Effect	Direction	Likelihood	Magnitude	Geographic Extent	Timing	Duration	Frequency	Reversibility
Change in Habitat	≈	≈	+	+	≈	≈	≈	≈
Change in Movement	≈	≈	+	+	≈	–	≈	≈
Change in Mortality Risk	≈	≈	+	+	≈	–	≈	≈
Change in Health	≈	≈	+	+	≈	–	≈	≈

Key:

+: more adverse, more likely, more than, greater than, more extensive, or, more frequent

≈: relatively the same

–: less adverse, less likely, less than, smaller than, less extensive, or less frequent

3.2.7.9 Wildlife and Wildlife Habitat

The relative comparison of residual effects on wildlife and wildlife habitat from changes in habitat, movement, mortality risk and wildlife health between the construction approaches is presented below. The comparison applies to the construction phase only.

Direction: The direction of the residual effects on change in habitat, movement, mortality risk and wildlife health is expected to be relatively the same (≈) – *adverse* – because the accelerated construction alternative will result in direct and indirect loss or alteration of wildlife habitat, alter wildlife movement and increase mortality and health risk compared to baseline conditions.

Likelihood: The likelihood of residual effects on change in habitat, movement, mortality risk and wildlife health is expected to be relatively the same (≈) for both construction approaches because both approaches employ the same construction activities and mitigation measures.

Magnitude: The magnitude of the residual effect on change in habitat (direct loss) is expected to be relatively greater (+) for the accelerated construction alternative because the footprint (area of affected habitat) would increase to accommodate the additional material (quarry/borrow) sources. In addition, the accelerated construction alternative is expected to result in relatively more (+) indirect habitat loss due to sensory disturbance (e.g., noise, lights) compared to the Project construction approach because construction activities would require additional equipment resulting in an increase in construction traffic and human disturbance that would occur simultaneously along the entire ROW (i.e., not in discrete segments with potential intermittent reductions in noise due to the staggered approach over several years).

The magnitude of the residual effect on change in movement is expected to increase (+) because the accelerated construction alternative would result in a single continuous physical and sensory barrier that occurs simultaneously along the entire ROW.

The magnitude of the residual effect on change in mortality risk is expected to be relatively greater (+) for the accelerated construction alternative because it might result in increased interactions between animals and construction equipment, construction traffic (mobilization and demobilization) as well as increased human-wildlife conflicts due to the increased number of workers on site and camps operating concurrently.

The magnitude of the residual effect on change in wildlife health is expected to be relatively greater (+) for the accelerated construction alternative because it will result in increased exposure to contaminants (over a shorter time frame) as well as increased sensory disturbance and change in movement, which could alter physical (body) condition due to increased stress and energy expenditure resulting in a reduction in wildlife health.

Geographic Extent: The geographic extent of the residual effects on change in habitat, movement, mortality risk and wildlife health is expected to slightly increase (+) for the accelerated construction alternative because additional quarry and borrow sources are required, which would result in a larger area of direct and indirect habitat loss, potential barriers to movement as well as increased mortality risk and health risk.

Timing: The timing of the residual effect on change in habitat, movement, mortality risk and wildlife health would remain the same (≈) because, the accelerated construction alternative would also occur throughout the year, including during sensitive periods for wildlife (e.g., breeding).

Duration: The duration of the residual effects on change in habitat will remain the same (≈) because although the direct loss of habitat will occur over a shorter time frame, the residual effects of direct habitat loss, edge effects and fragmentation will persist over the long-term.

The duration of the residual effect on movement, mortality risk and wildlife health will be less (−) (i.e., short-term, up to 4 years) compared to the Project construction approach (i.e., medium-term, up to 20 years).

Frequency: The frequency of the residual effect on change in habitat, movement, mortality risk and wildlife health will remain continuous (i.e., the same [≈]) because residual effects will occur throughout the construction phase regardless of construction schedule.

Reversibility: The reversibility of the residual effect on change in habitat, movement, mortality risk and wildlife health remain irreversible (i.e., the same [≈]) because residual effects associated with direct and indirect habitat loss or alteration will persist throughout the life of the Project.

The relative comparison of residual effects on wildlife and wildlife habitat of the accelerated construction alternative compared to Project construction approach is summarized in Table 3.9.

Table 3.9 Residual Effects on Wildlife and Wildlife Habitat of the Accelerated Construction Alternative Compared to the Project Construction Approach

Residual Effect	Direction	Likelihood	Magnitude	Geographic Extent	Timing	Duration	Frequency	Reversibility
Change in Habitat[1]	≈	≈	+	+	≈	≈	≈	≈
Change in Movement	≈	≈	+	+	≈	–	≈	≈
Change in Mortality Risk	≈	≈	+	+	≈	–	≈	≈
Change in Wildlife Health	≈	≈	+	+	≈	–	≈	≈

Key:

+: more adverse, more likely, more than, greater than, more extensive, or, more frequent

≈: relatively the same

–: less adverse, less likely, less than, smaller than, less extensive, or less frequent

[1] Change in habitat includes general wildlife habitat (for all species) as per the DAR as well as species at risk assessed in the DAR for change in habitat included: little brown myotis (*Myotis lucifugus*), grizzly bear (*Ursus arctos*), wolverine (*Gulo gulo*) and invertebrates (Gypsy cuckoo bumble bee [*Bombus bohemicus]*, Suckley's cuckoo bumble bee [*Bombus suckleyi*], Yellow-banded bumble bee [*Bombus terricola*], Transverse lady beetle [*Coccinella transversoguttata*]).

3.2.7.10 Birds and Bird Habitat

The relative comparison of residual effects from changes to birds and bird habitat between the construction approaches is presented below. The comparison applies to the construction phase only.

Direction: The direction of the residual effects on change in bird habitat, mortality risk and bird health is expected to be relatively the same (≈) – adverse – for both construction approaches because both will result in direct and indirect loss or alteration of bird habitat, and increased mortality and bird health risk compared to baseline conditions.

Likelihood: The likelihood of residual effects on change in habitat, mortality risk and bird health is expected to remain the same (≈) for both construction approaches because both approaches employ the same construction activities and mitigation measures.

Magnitude: The magnitude of the residual effect on change in bird habitat (direct loss) is expected to be relatively greater (+) for the accelerated construction alternative because the footprint would increase to accommodate the additional quarry/borrow sources. In addition, the accelerated construction alternative would result in relatively more (+) indirect habitat loss due to sensory

disturbance (e.g., noise, lights) compared to the Project because construction activities would require additional equipment resulting in an increase in construction traffic and human disturbance that would occur simultaneously along the entire ROW (i.e., not in discrete segments with potential intermittent reductions in noise due to the staggered approach [time lags] over several years).

The magnitude of the residual effect on change in bird mortality risk is expected to be relatively greater (+) because the accelerated construction alternative might result in increased interactions between birds and additional construction equipment as well as construction traffic (mobilization and demobilization) and human-bird conflicts at additional camps.

The magnitude of the residual effect on change in bird health is expected to be relatively greater (+) because the accelerated construction alternative will result in increased exposure to contaminants (over a shorter time frame) as well as sensory disturbance, which could alter physical (body) condition due to increased stress and energy expenditure resulting in a reduction in bird health

Geographic Extent: The geographic extent of the residual effects on change in bird habitat, and mortality risk and bird health is expected to be slightly greater (+) for the accelerated construction alternative because additional quarry and borrow sources are required, which would result in an increase in the spatial extent of the project footprint and the area of direct and indirect habitat loss, and increased mortality risk.

Timing: The timing of the residual effect on change in bird habitat, mortality risk and bird health would remain the same (≈) because, the accelerated construction alternative would also occur throughout the year, including during sensitive periods for birds (e.g., breeding).

Duration: The duration of the residual effects on change in habitat, mortality risk and bird health will be less (–) (up to 4 years) for the accelerated construction alternative compared to the Project construction approach (up to 20 years). However, edge effects and fragmentation will persist into the operations and maintenance phase (i.e., long-term) regardless of construction schedule.

Frequency: The frequency of the residual effect on change in habitat, mortality risk and bird health are anticipated to be relatively the same (≈) for both approaches because residual effects will occur throughout the construction phase regardless of construction schedule.

Reversibility: The reversibility of the residual effect on change in bird habitat, mortality risk and bird health are anticipated to be relatively the same (≈) for both construction approaches because residual effects associated with direct and indirect habitat loss or alteration will persist throughout the life of the Project.

The relative comparison of residual effects on birds and bird habitat of the accelerated construction alternative compared to the Project construction approach is summarized in Table 3.10.

Table 3.10 Residual Effects on Birds and Bird Habitat of the Accelerated Construction Alternative Compared to the Project Construction Approach

Residual Effect	Direction	Likelihood	Magnitude	Geographic Extent	Timing	Duration	Frequency	Reversibility
Change in Habitat[1]	≈	≈	+	+	≈	–	≈	≈
Change in Mortality Risk	≈	≈	+	+	≈	–	≈	≈
Change in Bird Health	≈	≈	+	+	≈	–	≈	≈

Key:

+: more adverse, more likely, more than, greater than, more extensive, or, more frequent

≈: relatively the same

–: less adverse, less likely, less than, smaller than, less extensive, or, less frequent

1: Change in habitat includes general bird habitat (all species) as per the DAR as well as waterbirds, upland gamebirds, birds of prey, landbirds, and species at risk: peregrine falcon*, yellow rail, lesser yellowlegs, red-necked phalarope, short-eared owl, common nighthawk, olive-sided flycatcher, rusty blackbird and horned grebe.

*Peregrine falcon – no longer listed on Schedule 1 of *Species at Risk Act* (GOC 2024).

3.2.7.11 Biodiversity

3.2.7.11.1 Ecosystem and Habitat Loss

The magnitude and geographic extent of the residual effect on change in wildlife and bird habitat (direct loss) is expected to be relatively greater for the accelerated construction alternative (+) because the construction footprint will be larger to accommodate the additional quarry/borrow sources. The magnitude and geographic extent of indirect habitat loss due to dust deposition, edge effects, and fragmentation are also expected to be relatively more (+) for the accelerated construction alternative. In addition, the accelerated construction alternative might result in increased sensory disturbance for some species as discussed in Section 3.2.7.9.

3.2.7.11.2 Habitat Fragmentation/Barrier to Movement and Gene Flow

Fragmentation will be relatively more (+) for the accelerated construction alternative because the construction footprint will be larger (i.e., more vegetation removal) to accommodate additional quarry/borrow sources. Although the accelerated construction alternative might result in reduced permeability for some species (i.e., the project may be more difficult to cross due to simultaneously construction activities), the potential effects will occur over a shorter time frame and are not expected to result in changes to gene flow.

3.2.7.11.3 Ability for Habitat to Recover

The recovery of vegetation communities is expected to be relatively the same (≈) for both approaches because closure and reclamation activities are not expected to change under the accelerated construction alternative (see Section 3.2.7.7).

3.2.7.11.4 Response to Edge Effects

Although the accelerated construction alternative would result in relatively more edge due to vegetation removal required to accommodate the additional quarry/borrow sources, the accelerated construction alternative is not expected to result in a different response to edge effects because the pathways related to indirect effects (e.g., edge effects) on vegetation and wetlands as well as wildlife remains the same.

3.2.7.11.5 Species Distribution and Abundance

Species distribution and abundance is expected to be relatively the same (≈) for both construction approaches, primarily because the additional quarry/ borrow sources are not expected to substantially alter species distribution and abundance and because proposed mitigation to reduce potential effects on change in habitat, movement and mortality risk does not change under the accelerated construction alternative. However, as mentioned below, it is not possible to provide a comparison of the potential effects of the accelerated construction alternative on species of management concern because the locations of the additional quarry/borrow sources are not known at this time.

3.2.7.11.6 Alien and Invasive Alien Species

The potential effects of alien and invasive alien species on biodiversity are expected to be relatively the same (≈) for both construction approaches, because the mechanisms of dispersal (e.g., fragmentation) and mitigation measures proposed to reduce the introduction and spread of alien and invasive alien species do not change under the accelerated construction alternative.

3.2.7.11.7 Changes to Special Management Areas and Species of Special Management Concern

It is not possible to provide a comparison of the potential effects of the accelerated construction alternative on special management areas, including Important Wildlife Areas, Important Bird Areas (IBA), Conservation Zones and species of special management concern (e.g., species at risk) because the locations of the additional quarry/borrow sources are not known at this time.

3.2.7.12 Heritage Resources

The potential effect on heritage resources is loss of site contents and contexts, due to surface ground disturbance (e.g., vegetation removal and off-road travel) and subsurface ground disturbance (e.g., stripping, grading, blasting, and excavation). Proposed mitigation of these effects is initiated through submission of the results of project-specific assessments and the DAR to the GNWT Culture and Heritage Division of the Department of Education, Culture, and Employment.

The expectation is that the Territorial regulators for heritage resources will review Project information and issue requirements intended to initiate a staged process of mitigating effects. These requirements are expected to include completion of a desktop Archaeological Overview Assessment (AOA) to identify data gaps and a field-based Archaeological Impact Assessment (AIA) prior to construction in areas of known or suspected high archaeological site potential. The Territorial regulators may issue additional requirements for specific sites and high archaeological site potential areas, such as archaeological excavation, controlled surface collection of cultural materials, and/or construction monitoring. As discussed in Section 22.1.5 of the DAR, with implementation of mitigation measures issued by the Culture and Heritage Division, ECE, there are no residual effects from a scientific perspective. After implementation of these and other mitigation measures as may be provided by Indigenous Governments, Indigenous Organizations, and other affected parties, there should be no residual effects from the Project on heritage resources from the perspective of Indigenous Governments, Indigenous Organizations, and other affected parties.

From this perspective, the accelerated construction does not change the residual effects assessment. The anticipated increase in the extent of surface and subsurface disturbance through, for example, development of additional material sources with associated access and additional and larger camps, increases the likelihood of possible interaction with known and/or unknown heritage resources. In addition, the accelerated schedule will provide less time to complete seasonally constrained field-based AIA and other regulator-issued mitigation requirements (e.g. archaeological excavation). Based on the discussion above, however, these effects can be mitigated, with no relative change in residual effects.

3.2.7.13 Human Health and Community Wellness

The Human Health and Community Wellness (HHCW) VC includes the physical, mental and social health of residents and the support systems and programs available to address human health and community wellness in communities along the Project alignment. The DAR (GNWT, 2023) indicated that the Project is anticipated to affect human health and community wellness during both the construction and operations and maintenance phases. Community engagement identified potential Project benefits (e.g., increased population health levels associated with increased access to health services) and adverse effects (e.g., increased social pressures as a result of increased access to drugs and alcohol facilitated by non-resident construction workers) associated with human health and community wellness. The accelerated construction schedule is also anticipated to have both potential positive and adverse effects on human health and community wellness, as described below.

3.2.7.13.1 Potential Positive Effects

The Project is anticipated to have several potential positive effects on human health and community wellness provided that measures are put in place to maximize benefits and assist in community readiness. The majority of potential positive effects are expected to occur during the operations and maintenance phase of the Project. The accelerated construction schedule may result in: the potential positive effect occurring sooner; a reduction in the level or amount of potential positive effects; or no change in the potential positive effects of some pathways.

Population Composition – It is possible, but not anticipated that the accelerated construction schedule would lead to changes in the Project's effect on population composition during the construction phase. It may reduce the number of community members that can return to their home community for work on the Project, as there may be fewer local employment opportunities (see Section 3.2.7.15), but this is anticipated to only have small changes in the overall neutral/positive effects. However, it is not anticipated that the accelerated schedule would lead to changes in population composition related to non-resident construction workers as they are anticipated to remain residing in construction camps and not considered residents of communities while working on the Project.

Population Composition –The potential positive effects associated with reduced out-migration due to increased employment opportunities and/or increased access to services or education opportunities within the communities may be somewhat lessened for the accelerated construction schedule during the operations and maintenance phase. Community(s) members will have less time to take advantage of potential employment opportunities in advance of the operations and maintenance phase that may reduce the likelihood that they will stay resident in communities, and in turn this may reduce the positive population composition effects of the Project.

Population Health – The potential positive effects associated with the increase in overall population health (preventable and chronic diseases and mental health) should remain the same for the accelerated construction schedule because of easier and lower-cost access to medical and dental care and social services during the operations and maintenance phase of the Project and the positive effects will also occur more quickly because the Project will be operational sooner.

Community/Family and Social Ties – The potential positive effects associated with increased community participation in regional social, recreational, and cultural events and the reduced sense of isolation and increased connection to family and friends during the operations and maintenance phase of the Project should remain the same for the accelerated construction schedule. The positive effects will occur more quickly because the Project will be operational sooner and allow community members easier access to events and family and friends located elsewhere.

Food Security – The potential positive effects associated with improved food security during the operations and maintenance phase of the Project should remain the same for the accelerated construction schedule because the Project would provide all-season access to a greater variety of groceries and improved food security due to increased access to traditional food sources/harvesting areas and the positive effects will also occur more quickly because the Project will be operational sooner.

Social Determinants of Health (SDOH) – In the DAR (GNWT, 2023), the potential effects of the Project on the broad range of SDOH (health behaviours, physical environments, employment and income, education and education systems, food security and community infrastructure, resources and capacity) were assessed as part of other effects pathways, with the exception of some limited discussion on effects related to the need for social assistance. That being said, the accelerated construction schedule will result in a shorter period of time for vulnerable or underserved populations to participate in training and other educational supports necessary to prepare them for

employment and for them to participate in employment opportunities that would increase their income (i.e., a 4-year window as opposed to a 20-year window). This would potentially lead to a reduction in the potential positive effect associated with Project employment on income assistance levels.

3.2.7.13.2 Potential Adverse Effects

Most potential adverse effects of the Project on the HHCW VC are anticipated to be associated with the presence of non-resident workers and worker camps. Historically, worker camps have been linked to adverse health and social impacts such as increased substance use (drugs and alcohol), increased demand for sex work and higher risks of sexual exploitation, increased food insecurity, and decreased ability to carry out traditional practices such as hunting, fishing, berry picking, etc. (Gibson et al., 2017) At this time, camp locations have not yet been determined, but locations currently being considered include existing camp facilities within Norman Wells, or locations outside of municipal boundaries such as at one or more borrow sources and quarries to be accessed from the MVWR. If camps are located within municipal boundaries, which some communities have expressed strong opposition to, the effects will need to be reassessed, as the proximity of the camps to communities may influence the presence of non-resident workers.

It is possible that the accelerated construction schedule may increase potential adverse effects on human health and community wellness. Specifically, an increase in the number of non-resident workers present during the construction phase (i.e., from 200–330 per segment for the 20-year Project schedule to 450–775 in total for the 4-year accelerated schedule) is anticipated to increase the magnitude, likelihood and/or frequency of some potential adverse effects and result in some potential adverse effects occurring sooner. This is described in more detail below.

3.2.7.13.3 Adverse Effects Anticipated to be Increased

The relative change in the potential adverse effects as a result of the accelerated construction schedule are described below:

- **Population Health** – The magnitude and frequency of potential adverse effects associated with population health (i.e., communicable diseases) during the construction phase may increase as a result of the greater number of construction workers in or near communities that can contribute to the transmission of communicable diseases during the accelerated construction schedule.
- **Change in Community/Family and Social Ties** – The magnitude, likelihood and frequency of potential adverse effects associated with reduced 'sense of community'/community cohesion during construction may increase as a result of the greater number of construction workers in or near communities during the accelerated construction schedule. This increased number of non-resident workers required to complete the project in 4 years may also result in an increase in the number of residents reporting a reduced sense of community belonging.
- **Food Security** – The magnitude of potential adverse effects associated with reduced food security may increase during the construction phase as a result of a decreased ability to access some harvesting areas or reduced access to traditional food with the accelerated construction schedule. The evaluation of the accelerated construction schedule alternative for wildlife-related

effects anticipates a greater magnitude and geographic extent of adverse effects related to loss of habitat and mortality as a result of increased intensity of construction activity which in turn may decrease ability to access traditional foods.

- **Social Pressures** –The magnitude and likelihood of potential adverse effects associated with increased drug and alcohol use and abuse in the communities, increased rates of sexually transmitted infections (STI)s and teen pregnancies and increased crime during the construction phase of the Project may be greater as a result of the increased number of non-resident workers in or near communities during the accelerated construction schedule.
- **Nuisance –** The magnitude of the adverse effects associated with an increase in potential nuisance effects (noise, dust, combustion emissions) during the construction phase may be greater. The evaluation of the accelerated construction schedule alternative anticipates a greater magnitude and larger geographic extent for air emissions and noise levels as a result of the increased intensity of construction activity, which in turn would lead to an increase in magnitude of adverse effects related to nuisance. It is not anticipated that there would be an increase in geographic extent of nuisance effects beyond the Local Assessment Area communities (i.e., Norman Wells, Tulita, Wrigley), even though the geographic extent for changes in noise levels and air emissions may expand.
- **Public Safety** –The magnitude, likelihood and frequency of potential adverse effects associated with reduced feelings of personal safety and security during the construction phase may be greater as a result of the increased number of non-resident workers in or near communities during the accelerated construction schedule, which may expose residents to more situations that make them feel unsafe.

3.2.7.13.4 Adverse Effects Anticipated to Remain Unchanged

The following HHCW VC effects pathways are largely (but not exclusively) associated with the operations and maintenance phase of the Project; the accelerated construction schedule is unlikely to increase the intensity of potential adverse effects of the following pathways, although some potential adverse effects may occur sooner:

- **Population Health –** It is anticipated that the potential adverse effects associated with a decrease in population health (communicable diseases) during the Operations and Maintenance phase of the Project will remain the same for the accelerated construction schedule.
- **Community/Family and Social Ties –** It is anticipated that the potential adverse effects associated with a reduced sense of community/community cohesion during the operations and maintenance phase of the Project will remain the same for the accelerated construction schedule.
- **Food Security –** It is anticipated that the potential adverse effects associated with a decrease in food security related to reduced access to traditional foods during the operations and maintenance phase of the Project will remain the same for the accelerated construction schedule.
- **Social Pressures –** It is anticipated that the potential adverse effects associated with increased drug and alcohol use and abuse in the communities, increased rates of STIs, teen pregnancies and increased crime during the operations and maintenance phase of the Project will remain the same for the accelerated construction schedule, although the adverse effects may occur sooner.

- **Nuisance –** It is anticipated that the potential adverse effects associated with nuisance effects during the operations and maintenance phase of the Project will remain the same for the accelerated construction schedule, although the adverse effects may occur sooner.
- **Drinking and recreational water quality –** It is anticipated that the potential adverse effects associated with decreased drinking and recreational water quality during both the construction and operations and maintenance phases of the Project will remain the same for the accelerated construction schedule. The evaluation of the Project effects on surface water quality and groundwater quality under the accelerated construction schedule during the construction phase anticipates that the Project effects will be relatively the same, and therefore the effects on drinking and recreational water quality are also anticipated to remain unchanged. The potential adverse effects during the operational phase may occur sooner.
- **Public Safety –** It is anticipated that the potential adverse effects associated with reduced feelings of personal safety and security and increased risk of traffic accidents during the operations and maintenance phase of the Project will remain the same for the accelerated construction schedule, although the adverse effects may occur sooner.

Table 3.11 provides a comparative summary of the anticipated residual effects of the Project for the accelerated construction alternative. Consistent with the assessment methodology used in the DAR, only potential adverse effects are characterized as having residual effects; as such the table below only includes adverse effects. Potential positive effects associated with the accelerated construction schedule are described in the text above.

Table 3.11 Residual Effects on Human Health and Community Wellness of the Accelerated Construction Alternative Compared to the Project Construction Approach

Residual Effect	Direction	Likelihood	Magnitude	Geographic Extent	Timing	Duration	Frequency	Reversibility
Change in population health – construction	≈	+	+	≈	≈	≈	+	≈
Change in population health – operations and maintenance	≈	≈	≈	≈	≈	≈	≈	≈
Change in community/family and social ties – construction	≈	+	+	≈	≈	≈	+	≈
Change in community/family and social ties – operations and maintenance	≈	≈	≈	≈	≈	≈	≈	≈
Change in food security: traditional foods – construction	≈	≈	+	≈	≈	≈	≈	≈
Change in food security: traditional foods – operations and maintenance	≈	≈	≈	≈	≈	≈	≈	≈
Change in social pressures – construction	≈	+	+	≈	≈	≈	≈	≈

Residual Effect	**Direction**	**Likelihood**	**Magnitude**	**Geographic Extent**	**Timing**	**Duration**	**Frequency**	**Reversibility**
Change in social pressures – operations and maintenance	≈	≈	≈	≈	≈	≈	≈	≈
Change in nuisance (air quality, noise) – construction	≈	≈	+	≈	≈	≈	≈	≈
Change in nuisance (air quality, noise) – operations and maintenance	≈	≈	≈	≈	≈	≈	≈	≈
Change in drinking and recreational water quality – construction	≈	≈	≈	≈	≈	≈	≈	≈
Change in drinking and recreational water quality – operations and maintenance	≈	≈	≈	≈	≈	≈	≈	≈
Change in public safety – construction	≈	+	+	≈	≈	≈	+	≈
Change in public safety – operations and maintenance	≈	≈	≈	≈	≈	≈	≈	≈

Key:

+: more adverse, more likely, more than, greater than, more extensive, or, more frequent

≈: relatively the same

–: less adverse, less likely, less than, smaller than, less extensive, or, less frequent

3.2.7.14 Education, Training, and Skills

The Education, Training and Skills VC reflects how changes in demand for education and training programs and the operation of the Project itself can affect educational attainment rates as well as the existing services and supports available to the local and regional communities. The DAR (GNWT, 2023) indicated that the Project is anticipated to affect education capacity, demand and attainment during both the construction and operations and maintenance phases. Community engagement identified potential Project benefits (e.g., increased education levels for local residents) and adverse effects (e.g., decreased capacity of education and training providers due to demand that stems from residents seeking out education/training to obtain employment with the Project) associated with education, training and skills development. The accelerated construction schedule is also anticipated to have both potential positive and adverse effects on education, training and skills, which are described below.

3.2.7.14.1 Potential Positive Effects

The Project is anticipated to have several potential positive effects in the areas of education, training and skills provided that measures are put in place to maximize benefits and support community readiness. Positive effects are anticipated to occur during both the construction and the operations and maintenance phases of the Project. The accelerated construction schedule may result in: the positive effects occurring sooner; a reduction in the level or amount of positive effects; or no change in impact on the positive effects for of some pathways.

3.2.7.14.2 Positive Effects Anticipated to Decrease

Change in Level of Education, Certification/Training and Skills Development – It is anticipated that there will still be potential positive changes in the level of education, certification/training and skills development during the construction phase of the Project under the accelerated construction schedule. However, the level of positive effects may be reduced as a result of the shorter amount of time available for people to seek out and obtain needed education and training to qualify them for Project-related jobs associated with either the construction or operations and maintenance phases.

3.2.7.14.3 Positive Effects Anticipated to Remain Unchanged

As these pathways are largely associated with the operations and maintenance phase of the Project, the accelerated construction schedule is unlikely to increase potential adverse effects of the following pathways, although some effects may occur sooner:

- **Change in Access to Education, Certification/Training and Skills Development Programs –** The ability for residents to access education, training or skills development opportunities is not anticipated to change under the accelerated construction schedule, but may occur sooner.
- **Change in Capacity to Meet Demand for Education, Certification and Training Programs –** The capacity to meet demand for education, certification and training once the Project reaches operations is unlikely to change and will remain a relatively neutral effect under the accelerated construction schedule as it is not affected by a shorter construction period.

3.2.7.14.4 Potential Adverse Effects

The following Education, Training and Skills VC effects pathway was assessed as experiencing potential adverse residual effects during the construction phase and neutral effects during operations and maintenance phase in the DAR (GNWT, 2023). The accelerated construction schedule may increase the magnitude of the following adverse effect:

- **Change in Capacity to Meet Demand for Education, Certification and Training Programs –** The magnitude and frequency of the potential adverse effects associated with reduced capacity to meet demand for education and training under the accelerated construction schedule may increase as a result of more residents seeking education and training opportunities over a shorter/compressed period of time to try and prepare for construction employment opportunities associated with both the construction and operations and maintenance phases of the Project.

Table 3.12 provides a comparative summary of the anticipated residual effects of the Project for the accelerated construction alternative. Consistent with the assessment methodology used in the DAR, only adverse effects are characterized as having residual effects; as such the table below only includes adverse effects. Potential positive effects associated with the accelerated construction schedule are described in the text above.

Table 3.12 Residual Effects on Education, Training, and Skills of the Accelerated Construction Alternative Compared to the Project Construction Approach

Residual Effect	Direction	Likelihood	Magnitude	Geographic Extent	Timing	Duration	Frequency	Reversibility
Change in capacity to meet demand for education, certification and training programs – construction	≈	≈	+	≈	≈	≈	+	≈
Change in capacity to meet demand for education, certification and training programs – operations and maintenance	≈	≈	≈	≈	≈	≈	≈	≈

Key:

+: more adverse, more likely, more than, greater than, more extensive, or, more frequent

≈: relatively the same

–: less adverse, less likely, less than, smaller than, less extensive, or, less frequent

3.2.7.15 Employment and Economy

The Employment and Economy VC includes and reflects changes in local, regional and the GNWT employment levels, as well as local business activity and other economic activity including connections to the traditional economy that are present in many communities and which may be affected by the Project. The DAR (GNWT, 2023) indicated that the Project is anticipated to affect employment and business levels and opportunities and economic activity during both the construction, and operations and maintenance phases. Many of these potential effects were assessed to be positive. Community engagement identified potential Project benefits (e.g., increased levels of local employment associated with construction jobs) and adverse effects (e.g., decreased time for local residents employed by the Project to participate in the traditional economy) associated with employment, business activity and economic activity. The accelerated construction schedule is also anticipated to have both potential positive and adverse effects on employment and economy, which are described below.

3.2.7.15.1 Potential Positive Effects

The Project is anticipated to have several potential positive effects in the areas of employment and economy provided that measures are put in place to maximize benefits and support community readiness. Positive effects are anticipated to occur during both the construction, and the operations and maintenance phases of the Project. The accelerated construction schedule may result in: the potential positive effect occurring sooner; a reduction in the level or amount of potential positive effects; or no change in impact on the positive effects of some pathways.

3.2.7.15.2 Positive/Neutral Effects Anticipated to Remain Unchanged

As these effects include pathways that are largely associated with the operations and maintenance phase of the Project, the accelerated construction schedule is unlikely to change the potential adverse effects, although some effects may occur sooner:

- **Change in Cost of Living / Consumer Prices –** The level and types of potential changes in cost of living or consumer prices for local residents once the Project becomes operational is not anticipated to change under the accelerated construction schedule. However, effects may happen sooner.
- **Change in Traditional Economy –** The potential change in the traditional economy that results from workers being able to more easily access traditional foods as a result of the operation of the Project is anticipated to remain unchanged under the accelerated construction schedule. The time available for harvesting for residents that are employed by the Project during the operations and maintenance phase is also anticipated to remain unchanged under the accelerated construction schedule alternative.

3.2.7.15.3 Positive Effects Anticipated to Decrease in Magnitude

Change in Employment and Income – It is anticipated that there will still be potential positive changes in the level of employment and income due to the Project under the accelerated construction schedule as a result of local, regional and NWT residents obtaining jobs working on the Project during both the construction, and operations and maintenance phases. However, the level of potential positive effects may be reduced as a result of the shorter time available for people to prepare for construction and operations and maintenance jobs associated with the Project, or by a higher proportion of southern workers needing to be hired to meet the construction needs given this shorter time.

Change in Economic Development Opportunities and Capacity of Local Businesses – It is anticipated that there will still be potential positive effects related to changes in the level of economic development opportunities and capacity of local businesses due to the Project under the accelerated construction schedule. This would be as a result of local and NWT businesses obtaining contracts related to the construction, or operations and maintenance phases of the Project. However, the level of positive effects may be reduced as a result of the relatively shorter time available for businesses to prepare for Project-related contracts, or by a higher proportion of southern contractors needing to be hired to meet the construction needs given this shorter time.

The shorter construction time under the accelerated construction schedule alternative may also reduce the potential positive effects of the Project associated with the ability of existing and new businesses to take advantage of economic development opportunities (e.g., enhanced tourism, arts and crafts, etc.) during the operations and maintenance phase as they will have less time to prepare before the Project becomes operational. It may also mean for some new or existing businesses, that the potential positive effect will happen sooner.

3.2.7.15.4 Positive Effects that Cannot be Comparatively Evaluated at this time

Change in GDP and Government Revenues – It is anticipated that there may still be potential positive effects related to the contribution of the Project to government revenue and territorial GDP, as a result of employment and economic activity associated with the Project. However, detailed modelling has not been carried out on the economic effects associated with an accelerated construction schedule. This includes anticipated employment levels, and other economic activities that may affect the amount of government revenue and contribution to GDP. Therefore, it is not possible to provide an evaluation of how the effects may change under the accelerated construction schedule alternative at this time.

Change in the GNWT Operations Employment – It is anticipated that there will still be potential positive effects related to the change in GNWT operations employment during the operations and maintenance phase of the Project. However, detailed information on the changes needed in GNWT operations staff to provide project oversight for the accelerated construction schedule alternative is currently not available. Therefore, is not possible to provide an evaluation of how the effects may change under the accelerated construction schedule alternative at this time.

3.2.7.15.5 Potential Adverse Effects

The following Employment and Economy VC effects pathway was assessed to experience adverse residual effects during construction in the DAR (GNWT, 2023). The accelerated construction schedule may decrease the duration of the following potential adverse effect:

- **Change in Traditional Economy –** It is anticipated that the duration of the potential adverse effect associated with the change in traditional economy may decrease under the accelerated construction schedule, as the period of time in which workers have less time to participate in the traditional economy is reduced.

Table 3.13 provides a comparative summary of the anticipated residual effects of the Project for the accelerated construction alternative. Consistent with the assessment methodology used in the DAR, only adverse effects are characterized as having residual effects; as such the table below only includes adverse effects. Potential positive effects associated with the accelerated construction schedule are described in the text above.

Table 3.13 Residual Effects on Employment and Economy of the Accelerated Construction Alternative Compared to the Project Construction Approach

Residual Effect	Direction	Likelihood	Magnitude	Geographic Extent	Timing	Duration	Frequency	Reversibility
Change in traditional economy (harvesting and related community/ household income) – construction only	≈	≈	≈	≈	≈	–	≈	≈

Key:

+: more adverse, more likely, more than, greater than, more extensive, or, more frequent

≈: relatively the same

–: less adverse, less likely, less than, smaller than, less extensive, or, less frequent

3.2.7.16 Infrastructure, Services, and Institutional Capacity

The Infrastructure, Services and Institutional Capacity VC includes the provision of utilities, roads, and infrastructure used to provide services such as education and health, as well as the judicial system, and are essential to the quality of life in communities throughout Canada. The DAR (GNWT, 2023) indicated that the Project is anticipated to affect the provision and capacity of infrastructure, services and institutions during both the construction and operations and maintenance phases. Community engagement identified potential Project benefits (e.g., increased access to health and social services as a result of all-season access provided by the Project) and adverse effects (e.g., increased demand on emergency and protective services as a result of construction and operations of the Project) associated with infrastructure, services, and institutional capacity. The accelerated construction schedule is also anticipated to have both potential positive and potential adverse effects on infrastructure, services and institutional capacity, which are described below.

3.2.7.16.1 Potential Positive/Neutral Effects

The Project is anticipated to have several relatively positive or neutral effects in the areas of infrastructure, services, and institutional capacity related to increased access to and use of infrastructure and services by community residents. The majority of potential positive effects are expected to occur during both the construction, and operations and maintenance phases of the Project. The accelerated construction schedule may result in: the potential positive effect occurring sooner; a reduction in the level or amount of potential positive effects; or no change in impact on some effect pathways.

Change in Housing and Accommodation – The potential change in demand for housing, which was assessed to be neutral in the DAR during the construction phase as a result of the Project, is not

anticipated to change under the accelerated construction schedule. Although there will be more non-resident construction workers employed by the Project over a 4 year period under the accelerated construction schedule, it is anticipated that there will be no change in where workers will be housed, i.e., they will still be in construction camps under the accelerated construction alternative and non-resident workers will not be seeking housing in LAA communities.

Change in Social Infrastructure and Services – The potential change in access to social infrastructure facilities and services during the operations and maintenance phase of the Project is not anticipated to change under the accelerated construction schedule, although increased access may be available sooner.

Change in Public Infrastructure and Services – As public infrastructure is not planned to be used for activities associated with the operations and maintenance phase, it is anticipated that the potential effects of the Project on public infrastructure will remain unchanged under the accelerated construction schedule.

Change in Institutional Facilities and Services – The potential change in access to institutional facilities and services during the operations and maintenance phase of the Project is not anticipated to change under the accelerated construction schedule, although increased access may be available sooner.

3.2.7.16.2 Potential Adverse Effects

The Project is anticipated to have several potential adverse effects in the areas of infrastructure, services and institutional capacity, most of which are expected to occur during the construction phase of the Project.

3.2.7.16.3 Adverse Effects Anticipated to be Increased

It is possible that the accelerated construction schedule may increase adverse effects on infrastructure, services and institutional capacity during construction of the Project. Specifically, an increase in the number of non-resident workers present during the construction phase (i.e., from 200–330 per segment for the 20-year schedule to 450–775 in total for the 4 year accelerated schedule) is anticipated to increase the intensity of some adverse effects and result in some adverse effects occurring sooner. It is also possible that the accelerated construction schedule will increase some adverse effects. This is described in more detail below.

Change in Social Infrastructure and Services – The magnitude and frequency of potential adverse effects associated with increased demand for social infrastructure (e.g., emergency and protective services, health services) during the construction phase may increase as a result of the increased number of construction workers in or near communities during the accelerated construction schedule.

Change in Public Infrastructure and Services – The magnitude and frequency of potential adverse effects associated with a change in demand for, and disruption in, public infrastructure and services (e.g., waste disposal, wastewater treatment, etc.) may increase as a result of a greater

number of camps operating concurrently over a shorter period of time during the construction phase that will be needed for the accelerated construction schedule.

Change in Institutional Facilities and Services – The magnitude and frequency of potential adverse effects associated with increased demand for institutional facilities (e.g., educational, cultural, recreational) during the construction phase may increase as a result of the increased number of non-resident construction workers that may be present in communities (e.g., make use of services regardless of where they might reside) during the accelerated construction schedule that may make use of some facilities. The increase in magnitude and frequency may also be due to an increased demand for educational services by residents seeking education and training for purposes of obtaining Project employment immediately preceding and during the construction phase.

3.2.7.16.4 Adverse Effects Anticipated to Remain Unchanged

Change in Housing and Accommodation – It is anticipated that the potential change in demand for housing or short-term accommodation driven by an increase in visitors that may occur during the operations and maintenance phase of the Project will not change under the accelerated construction schedule, but the effects may happen sooner.

Change in Social Infrastructure and Services – The magnitude of potential adverse effects associated with increased demand for social infrastructure (e.g., emergency and protective services, health services) during the operations and maintenance phase is not anticipated to change as a result of the accelerated construction schedule but the effects may happen sooner.

Table 3.14 provides a comparative summary of the anticipated residual effects of the Project for the accelerated construction alternative. Consistent with the assessment methodology used in the DAR, only adverse effects are characterized as having residual effects; as such the table below only includes adverse effects. Potential positive effects associated with the accelerated construction schedule are described in the text above.

Table 3.14 Residual Effects on Infrastructure, Services, and Institutional Capacity of the Accelerated Construction Alternative Compared to the Project Construction Approach

Residual Effect	Direction	Likelihood	Magnitude	Geographic Extent	Timing	Duration	Frequency	Reversibility
Change in housing and accommodation – operations only	≈	≈	≈	≈	≈	≈	≈	≈
Change in social infrastructure and services – construction	≈	≈	+	≈	≈	≈	+	≈
Change in social infrastructure and services – operations and maintenance	≈	≈	≈	≈	≈	≈	≈	≈
Change in public infrastructure and services – construction only	≈	≈	+	≈	≈	≈	+	≈
Change in institutional facilities and services – construction only	≈	≈	+	≈	≈	≈	+	≈

Key:

+: more adverse/more positive, more likely, more than, greater than, more extensive, or, more frequent

≈: relatively the same

–: less adverse, less likely, less than, smaller than, less extensive, or, less frequent

3.2.7.17 Culture and Traditional Land Use, including Harvesting

The relative comparison of residual effects on culture and traditional land use from changes in availability of traditional resources for cultural use, access to traditional resources or areas for cultural use, and cultural and heritage use sites and areas between the construction approaches is presented below. The relative changes in culture and traditional use, including harvesting is derived from the relative comparisons made for other VCs, with a demonstrable link to culture and traditional land use, such as wildlife and wildlife habitat and traditional hunting and trapping, as well as relevant traditional knowledge shared by Indigenous Governments, Indigenous Organizations, and other affected parties. Conclusions from sections on moose and caribou, air quality, surface water quality, fish and fish habitat, vegetation and wetlands, and wildlife and wildlife habitat were considered.

Direction: The direction of the residual effects on change in availability of traditional resources for cultural use, access to cultural resources or areas for cultural use, and cultural and heritage use sites and areas is expected to be relatively the same (≈) – *adverse* – for both construction approaches because the construction activities, effects pathways, and mitigation measures are the same for both approaches.

Likelihood: The likelihood of residual effects on change in availability of traditional resources for cultural use, access to cultural resources or areas for cultural use, and cultural and heritage use sites and areas are expected to be relatively the same (≈) for both construction approaches, because construction activities, effects pathways, and mitigation measures are the same for both construction approaches.

Magnitude: The magnitude of the residual effect on change in availability of traditional resources for cultural use is expected to be relatively greater (+) for the accelerated construction alternative, because the construction approach would result in continuous physical and sensory effects on wildlife simultaneously along the entire ROW, and because the accelerated construction alternative might result in increased interactions between animals and construction equipment, construction traffic (mobilization and demobilization) as well as increased mortality risk due to the increased number of workers on site and camps operating concurrently.

The magnitude of the residual effect change in access to traditional resources or areas for cultural use is expected to be relatively greater (+) for the accelerated construction alternative because construction will occur simultaneously along the entire ROW, potentially restricting access to Indigenous users for traditional use or cultural activities.

The magnitude of the residual effect on change in sites or areas for cultural use is expected to be relatively the same (≈) for both construction approaches because the accelerated construction alternative does not increase the potential impact to sites or areas for cultural use.

Geographic Extent: The geographic extent of the residual effects on availability of traditional resources for cultural use is expected to be relatively greater (+) for the accelerated construction alternative because additional quarry and borrow sources may be developed, which would result in an increase in the spatial extent of the project footprint and the area of direct and indirect wildlife habitat loss, barriers to movement and increased wildlife mortality and health risk, which has the potential to reduce the quantity of species available for Indigenous harvesting activities.

The geographic extent of the residual effects change in access to traditional resources or areas for cultural use, and changes in sites or areas for cultural use is expected to be relatively slightly greater (+) for the accelerated construction alternative because additional quarry and borrow sources may be developed, which would result in an increase in the spatial extent of the project footprint, which has the potential to reduce access to Indigenous users for Indigenous traditional use or cultural activities, and/or permanently remove sites or areas for cultural use.

Timing: The timing of the residual effect on change availability of traditional resources for cultural use is expected to be relatively the same (≈) for both construction approaches because, the accelerated construction alternative would also occur throughout the year, including during seasonal specific harvesting activities, as identified in the DAR.

The timing of the residual effect on change in access to traditional resources or areas for cultural use, and sites and areas for cultural use is expected to be relatively the same (≈) for both construction approaches because construction activities would occur throughout the year, and potentially affect access to traditional resources or areas for cultural use in all seasons.

Duration: The duration of the residual effects on change availability of traditional resources for cultural use, and on change in sites or areas for cultural use is anticipated to be relatively the same (≈) for both construction approaches. Although the construction duration has shortened from 20 years to 4 years, direct and indirect effects on resources such as wildlife and vegetation, and effects on any sites or areas for cultural use that may be disturbed by construction will persist into the operations and maintenance phase regardless of construction schedule.

The duration of the residual effects on change in access to traditional resources or areas for cultural use is expected to be relatively less (–) for the accelerated construction alternative, as the construction duration is reduced from 20 years to 4 years.

Frequency: The frequency of the residual effect on change availability of traditional resources for cultural use, change in access to traditional resources or areas for cultural use, and change in sites or areas for cultural use will is anticipated to be relatively the same (≈) for both construction approaches because residual effects will occur throughout the construction phase regardless of construction schedule.

Reversibility: The reversibility of the residual effect on change availability of traditional resources for cultural use will be relatively the same (≈) for both construction approaches because residual effects associated with direct and indirect wildlife habitat loss or alteration that have the potential to affect species available to Indigenous harvesters will persist throughout the life of the Project.

The reversibility of the residual effect on change in access to traditional resources or areas for cultural use will be relatively the same (≈) for both construction approaches because the project will result in increased access to non-Indigenous harvesters for the life of the project.

The reversibility of the residual effect on change in any sites or areas for cultural use will be relatively the same (≈) for both construction approaches because sites or areas for cultural use may be permanently removed for both approaches.

The relative comparison of residual effects on culture and traditional land use, including harvesting of the accelerated construction alternative compared to the Project construction approach is summarized in Table 3.15.

Table 3.15 Residual Effects on Culture and Traditional Land Use, Including Harvesting of the Accelerated Construction Alternative Compared to the Project Construction Approach

Residual Effect	Direction	Likelihood	Magnitude	Geographic Extent	Timing	Duration	Frequency	Reversibility
Change in Availability of Traditional Resources for Cultural Use	≈	≈	+	+	≈	≈	≈	≈
Change in Access to Traditional Resources or Areas for Cultural Use	≈	≈	+	+	≈	−	≈	≈
Change in Cultural and Heritage Use Sites and Areas	≈	≈	+	+	≈	≈	≈	≈

Key:

+: more adverse/more positive, more likely, more than, greater than, more extensive, or, more frequent

≈: relatively the same

−: less adverse, less likely, less than, smaller than, less extensive, or, less frequent

3.2.7.18 Non-traditional Land and Resource Use

The Non-traditional Land and Resource Use VC reflects the social and economic importance that a number of non-traditional land use activities – including oil and gas, mining, commercial tourism and recreation, and use of parks and protected areas – have for communities. Having access to non-traditional land and resources is important to communities. This includes businesses which are based on the extraction, refining, and selling of non-renewable resources (e.g., minerals, oil and gas), the enjoyment of the land and natural resources (e.g., tourism), as well as residents who rely on the land and natural resources for transportation (e.g., use of roads and navigable waterways), recreation (e.g., camping, recreational hunting and fishing), and quality of life (e.g., aesthetics).

3.2.7.18.1 Potential Positive Effects

The following Non-traditional Land and Resource Use VC effects include pathways that were assessed to experience potential positive effects during operations and maintenance in the DAR (GNWT, 2023). As these pathways are associated with the operations and maintenance phase of the Project, the accelerated construction schedule is unlikely to change the potential positive effects of the following pathways, although some effects may occur sooner:

- **Change in Access to Non-traditional Land Use –** It is anticipated that the potential change in access to non-traditional land use during the operations and maintenance phase under the accelerated construction schedule will remain the same, as the capacity to transport goods, services and resources once the Project becomes operational does not change under the alternative schedule. The positive effects will occur more quickly because the Project will be operational sooner.
- **Change in Non-traditional Resource Use –** It is anticipated that the potential change in non-traditional resource use related to access to granular sources and potential mineral and gas resources during the operations and maintenance phase under the accelerated construction schedule will remain the same. The access to granular sources and potential mineral and gas resources once the Project becomes operational does not change under the alternative schedule. The positive effects will occur more quickly because the Project will be operational sooner. Please refer to the Potential Adverse Effects discussion below for characterization of how the adverse effects on the access to wildlife resources may change under the accelerated construction schedule.

3.2.7.18.2 Potential Adverse Effects

Adverse Effects Anticipated to Increase

It is possible that the accelerated construction schedule may increase potential adverse effects on non-traditional land and resource use during both the construction and operations and maintenance phases. Specifically, an increase in the number of non-resident workers present during the construction phase (i.e., from 200–330 per segment for the 20-year Project schedule to 450–775 in total for the 4 year accelerated schedule), or the increased intensity of construction activity is anticipated to increase some adverse effects. This is described in more detail below.

Change in Non-traditional Land Use – The magnitude and frequency of potential adverse effects associated with changes in non-traditional land use during construction may increase under the accelerated construction schedule as a result of the increased intensity in construction activity happening concurrently over the 4-year construction period. This will increase the physical disturbances to the physical environment that interfere with non-traditional land use (e.g., recreational or tourism uses) during the Construction phase.

Change in Access to Non-traditional Land Use – The magnitude and frequency of potential adverse effects associated with changes in access to non-traditional land use during construction may increase under the accelerated construction schedule as a result of the increased intensity in construction activity happening concurrently over the 4 -year construction schedule. This would lead to a greater number of vehicles used during the construction phase that prevents regular transportation and movement on the MVWR, especially during the mobilization period.

Change in Aesthetics – The magnitude and frequency of potential adverse effects associated with changes in aesthetics may increase under the accelerated construction schedule as a result of the increased intensity in construction activity happening concurrently over the 4 -year construction period. Changes in aesthetics are linked to some extent to air and noise emissions but also include

visual issues related to being able to see construction activities. The evaluation of the accelerated construction schedule alternative anticipates a greater magnitude and larger geographic extent for air emissions and noise levels as a result of the increased intensity of construction activity, which in turn would lead to an increase in magnitude of adverse effects related to aesthetics. It is not anticipated that there would be an increase in geographic extent of adverse aesthetic effects beyond the Local Assessment Area communities (Norman Wells, Tulita, Wrigley), even though the geographic extent for changes in noise levels and air emissions may expand.

Change in non-traditional resource use – The magnitude and frequency of potential adverse effects associated with changes in non-traditional resource use associated with wildlife resources may increase under the accelerated construction schedule as a result of the increased intensity in construction activity happening concurrently over the 4 -year construction period leading to an increased disturbance to wildlife. The evaluation of the accelerated construction schedule alternative for wildlife related effects anticipates a greater magnitude and geographic extent of adverse effects related to loss of habitat and mortality risk as a result of increased intensity of construction activity which in turn may decrease ability to access wildlife resources.

Adverse Effects Anticipated to Remain Unchanged

The following Non-traditional Land and Resource Use VC effects include pathways that were assessed to experience potential adverse effects in the DAR (GNWT, 2023). As these pathways are largely associated with the operations and maintenance phase of the Project, the accelerated construction schedule is unlikely to change adverse effects, although some adverse effects may occur sooner:

- **Change in non-traditional land use** – It is anticipated that the potential adverse effects associated with a change in non-traditional land use during operations will remain the same under the accelerated construction schedule, although the effects may happen sooner.
- **Change in access to non-traditional land use –** It is anticipated that the potential adverse effects associated with a change in access to non-traditional land use during operations will remain the same under the accelerated construction schedule, although the effects may happen sooner.
- **Change in aesthetics –** It is anticipated that the potential adverse effects associated with a change in aesthetics during operations will remain the same under the accelerated construction schedule, although the effects may happen sooner.
- **Change in non-traditional resource use –** It is anticipated that the potential adverse effects associated with a change in non-traditional resource use during operations will remain the same under the accelerated construction schedule, although the effects may happen sooner.

Table 3.16 provides a comparative summary of the anticipated residual effects of the Project for the accelerated construction alternative. Consistent with the assessment methodology used in the DAR, only adverse effects are characterized as having residual effects; as such the table below only includes adverse effects. Potential positive effects associated with the accelerated construction schedule are described in the text above.

Table 3.16 Residual Effects on Non-traditional Land and Resource Use of the Accelerated Construction Alternative Compared to the Project Construction Approach

Residual Effect	Direction	Likelihood	Magnitude	Geographic Extent	Timing	Duration	Frequency	Reversibility
Change in non-traditional land use – construction	≈	≈	+	≈	≈	≈	≈	≈
Change in non-traditional land use – operations and maintenance	≈	≈	≈	≈	≈	≈	≈	≈
Change in access to non-traditional land use – construction	≈	≈	+	≈	≈	≈	≈	≈
Change in access to non-traditional land use – operations and maintenance	≈	≈	≈	≈	≈	≈	≈	≈
Aesthetics – construction	≈	≈	+	≈	≈	≈	≈	≈
Aesthetics – operations and maintenance	≈	≈	≈	≈	≈	≈	≈	≈
Change in non-traditional resource use – construction	≈	≈	+	≈	≈	≈	≈	≈
Change in non-traditional resource use – operations and maintenance	≈	≈	≈	≈	≈	≈	≈	≈

Key:

+: more adverse/more positive, more likely, more than, greater than, more extensive, or, more frequent

≈: relatively the same

–: less adverse, less likely, less than, smaller than, less extensive, or, less frequent

3.3 The Preferred Construction Approach

The Project construction approach, accelerated construction alternative, and short-segment alternative (previously compared in Section 7.3 of the DAR) are each feasible construction methods for the GNWT. The construction method to be used will depend on a number of factors (detailed further below), with a final method possibly being a combination of the three options. For example, the GNWT could procure short construction segments closer to communities, sequential to, or concurrent with one or more longer construction segments in more remote areas. The GNWT's preferred construction approach, which has been advanced through the environmental assessment in the DAR as the Project, remains the Project construction approach.

The Project construction approach remains preferred by the GNWT as it is more realistically achievable than the accelerated construction alternative, based upon information available at this time. As noted in the GNWT's response to MVEIRB IR#1 [PR#233], there is now a more apparent urgent need for all-season access to the Sahtu Region. Unprecedented challenges associated with historic low water conditions along the Mackenzie River have resulted in serious restrictions to resupply the communities of Norman Wells and Tulita which has further amplified the need for all season access to these communities. Though 'optimal', the GNWT's ability to execute an accelerated construction schedule is limited by being able to resolve factors presented in the above evaluation criteria, and related factors, for the entire Project length versus shorter segments. The Project construction approach is favoured when considering the following factors:

- Design for construction can be concluded earlier for a single segment compared to the entire alignment
- Land tenure may be able to be concluded earlier for a single segment prior to construction than for the entire Project
- Funding required to complete regulatory authorizations and advance construction for individual segments is less and may be easier to obtain than for the entire Project at once.
- Regulatory authorizations and associated permitting needed for construction are anticipated to be simpler to obtain for each segment, specific to each geographic area, rather than for the full Project.

That said, the GNWT's comparative evaluation indicates that while many potential adverse effects of the Project construction approach are lesser in magnitude and geographic extent relative to the accelerated construction alternative, other potential adverse effects are greater in duration. There are no apparent technical, or environmental impediments precluding the advancement of the accelerated construction alternative; though more and greater potential adverse socio-economic effects could arise under the accelerated construction alternative, warranting additional consideration to mitigating these adverse effects, while enhancing the potential positive effects of this alternative.

Thus, the GNWT confirms that the Project construction schedule presented in the DAR remains the basis of the Project undergoing environmental assessment by the MVEIRB.

4 References

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