SENES Consultants Limited

MEMORANDUM

121 Granton Drive, Unit 12
Richmond Hill, Ontario
Canada L4B 3N4
Tel: (905) 764-9380
Fax: (905) 764-9386
E-mail: senes@senes.ca
Web Site: http://www.senes.ca

TO:	Ginger Gibson, Kwe Beh Working Group	400081
FROM:	Stacey Fernandes and Bruce Halbert	27 May 2012
COPIED TO:	Gerd Wiatzka, Randy Knapp, Sarah Baines and Tony Pearse	
SUBJECT:	SSWQOs Developed for the Nico Project	

---

1. BACKGROUND

As part of the *Fortune Minerals Limited Developer's Assessment Report* (DAR), Site-specific Water Quality Objectives (SSWQOs) were developed for contaminants of potential concern (COPC). The documentation to support the SSWQOs was provided in Appendix 7.VII (Golder 2011):

> Golder Associates (Golder) 2011. *Fortune Minerals Limited Developer's Assessment Report Appendix 7.VII - Site-specific Water Quality Objectives.* May 2011

As requested, the rationale for the setting of the SSWQOs was reviewed and comments were provided by SENES Consultants Limited (memo dated 9 April 2012) on the appropriateness of the value for each of the COPC and the justification presented.

Fortune Minerals provided responses to these comments in the document entitled:

> Golder Associates (Golder) 2012. *Fortune Minerals Limited Nico Developer's Assessment Report Second Round Information Request Responses*. May 2012

This memo summarizes the review of the responses to the SSWQOs and the proposed revisions to these values.

2. REVIEW COMMENTS ON INDIVIDUAL PARAMETERS

Specific review comments on each of the proposed SWQO parameters are provided in the following sub-sections.

2.1 Aluminum

Aluminum	CCME (µg/L)	SSWQO (µg/L)
Nico Lake	100	420 - dissolved
Peanut Lake		410 - dissolved

Although there are still some concerns with using the BC MELP equation for deriving the SSWQO, the additional context and discussion relative to the presence of DOC and dissolved aluminosilicates provides the necessary support for the proposed SSWQO. It is noted that the measured under ice pH measurements were lower than during the open periods. Considering aluminum sensitivity to pH changes and that fish are a sensitive species it should be evaluated whether the proposed SSWQO are protective of species that would overwinter in the lakes.

Action item: Fortune should discuss whether the aluminum SSWQO is appropriate for the conditions expected throughout the year.

2.2 Ammonia

SSWQO no longer proposed.

2.3 Antimony

No response required by Fortune.

2.4 Arsenic

Arsenic	**CCME (µg/L)**	**SSWQO (µg/L)**
Nico Lake	5	50
Peanut Lake		

It is agreed that the selected toxicity value of 50 µg/L, which corresponds to the EC_{50} for a 14-day test on the green algae *Scenedesmus obliquus*, is an appropriate basis for setting an SSWQO. However, it has not been demonstrated that the EC50 provides an appropriate level of protection for these lakes.

Action item: Fortune should discuss whether an EC_{50} is an appropriate basis for setting the SSWQO.

2.5 Cadmium

SSWQO no longer proposed.

2.6 Chloride

No response required by Fortune.

2.7 Cobalt

No response required by Fortune.

2.8 Copper

Proposed SSWQO	Copper - dissolved (µg/L)
Nico Lake	25
Peanut Lake	22

The use of the BLM to develop a value for copper appears to be appropriate. The information provided in the responses is appreciated. As indicated in the original comment, the results of the BLM model are very sensitive to pH. The information provided in Table 1 shows that the BLM was run for Nico Lake for pH in the range of 7.06 to 7.67. The information in Table 7.3-3 shows that pH in Nico Lake is expected to range between 6.06 and 7.6 (median 7.2) in open water and 5.23 to 6.14 (median 5.59) under ice cover. The information provided in Table 2 shows that the BLM was run for Peanut Lake for pH in the range of 7.32 to 7.77. The information in Table 7.3-3 shows that pH in Peanut Lake is expected to range between 6.53 and 7.6 (median 7.06) in open water and 4.27 to 5.77 (median 5.08) under ice cover. The lowest pH used in the BLM model is higher than the median of the measured data during the open water season.

Action item: Either additional justification should be provided for the appropriateness of the derived copper SSWQO or the parameters used in the BLM should better reflect the conditions in the waterbodies.

2.9 Iron

Iron	CCME (µg/L)	SSWQO (µg/L)
Nico Lake	300	1500
Peanut Lake		

The much stronger justification for setting the SSWQO has been provided and appears to be appropriate.

2.10 Lead

SSWQO no longer proposed.

2.11 Nitrate

Nitrate	CCME (mg NO_3^-/L)	Previous SSWQO (mg NO_3^-/L)	Revised SSWQO (mg NO_3^-/L)
Nico Lake	13	133	27
Peanut Lake			

The revised SSWQO for nitrate of 27 mg NO_3^-/L appears to be appropriate.

2.12 Selenium

Selenium	CCME (µg/L)	Previous SSWQO (µg/L)	Revised SSWQO (µg/L)
Nico Lake	1	5	3.5
Peanut Lake			

The revised approach to setting the SSWQO appears to be appropriate and includes consideration of site-specific information on fish uptake. However, the selenium in water, shown in Table 2 of the response, shows the data are largely below detection (only 5 of 44 samples were detected). In this case the assumption that selenium is at the detection limit in water has a large influence on the estimated BAF. If an alternative assumption is applied, for example when the result is below detection selenium is present and half the detection limit (another common approach in risk assessments), the resultant SSWQO would be much lower.

Action item: The assumptions used in the derivation of the selenium SSWQO need to be re-examined.

2.13 Sulphate

No response required by Fortune.

2.14 Uranium

SSWQO no longer proposed.

2.15 Zinc

SSWQO no longer proposed.

3. CONCLUSIONS

A review of the proposed SSWQOs was conducted along with consideration of the responses and revisions to these values. Although many of the issues that were previously identified have been resolved, there are some remaining concerns. Specific action items have been identified for aluminum, arsenic, copper and selenium.