Appendix 34

Meadowbank Addendum to EEM Cycle 3 Interpretative Report

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ADDENDUM TO MEADOWBANK EEM CYCLE 3 INTERPRETATIVE REPORT

The following are Agnico Eagle's responses to comments and recommendations provided by the Technical Advisory Panel (TAP) in the letter entitled '*Meadowbank Mine 3rd EEM Interpretive Report – action items identified*' regarding the '*Environmental Effects Monitoring: Cycle 3, Meadowbank Mine Interpretive Report*", submitted June 29, 2018

Action items

1. p. 26, Table 9 (NWB): The specific conductance of Wally Lake is considerably higher than that of reference lakes, and the report attributes this to effluent discharge. It is clear that specific conductance levels are well below levels that would cause toxic effects to organisms; however, the input of specific compounds (phosphate, nitrate, etc.) accompanied with a higher specific conductance can also impact aquatic ecosystems. Provide discussion on the chemical characteristics of the effluent (i.e. which ions are driving the higher specific conductance in Wally Lake), and how it could potentially be affecting the ecosystem.

Response:
Water chemistry, the phytoplankton community, and the benthic invertebrate community are monitored annually by the Meadowbank Mine Core Receiving Environment Monitoring Program (CREMP) in Meadowbank lakes that are affected by mining operations and in reference lakes. The 2017 CREMP results (Azimuth Consulting Group Partnership, 2018) showed that total alkalinity, conductivity, total dissolved solids, hardness, major cations (calcium, magnesium, potassium, sodium), and total Kjeldahl nitrogen were elevated in Wally Lake in 2017 relative the period 2006 – 2013, prior to effluent being discharged there.

The major cations are thought to be the largest contributors to higher specific conductance. Concentrations of those in the effluent on August 29, 2017, for example, were as follows:

- calcium – 42 mg/l;
- magnesium – 11.4 mg/l;
- potassium – 4.5 mg/l;
- sodium – 6.7 mg/l.

Regarding ecosystem impacts, the 2017 CREMP report states that, relative to base line. There is no evidence to suggest mining operations are increasing primary productivity and that no mine-related effects to the benthic invertebrate communities in the Meadowbank project lakes were observed in 2017. The CREMP continues to monitor and report annually on the Meadowbank project lakes and reference lakes.

2. p. 30, Table 16 (ECCC): The MMER require that the data collected during the fish population survey shall be used to calculate the mean, median, standard deviation, standard error and minimum and maximum values in the sampling areas (Schedule 5, subparagraph 16(a)(i)). Table 16 of the interpretive report, which presents lake trout summary statistics, does not include the median values. Please provide the median values for the fish survey endpoints. In future studies please provide separate

descriptive statistics for required measurements in male and female fish, as recommended in the EEM technical guidance document (p. 8-6, EC 2012).

Response:

The omission of the medians was an oversight. A revised Table 16 is provided below. During preparation of this revised table it was realized that the otolith ages were incorrectly reported as fin-ray ages. This has also been corrected in the revised table below. Agnico did not provide descriptive statistics separately for male and female fish because, consistent with the approved study design, statistical analyses were not conducted separately for males and females.

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Table 16. Lake Trout summary statistics (revised).

Lake	statistic	fork length (mm)	weight (g)	liver weight (g)	gonad weight (g)	condition	LSI	GSI	otolith age (years)
WAL	N	22	22	22	22	22	22	22	22
	Minimum	207	87.7	0.98	0.08	0.86	0.62	0.03	5
	Maximum	839	6315.7	69.71	499.4	1.22	1.29	9.21	48
	Mean	549	2592.45	20.74	75.87	1.06	0.83	1.83	23
	Median	548	1561.2	12.48	31.90	1.04	0.81	1.56	20
	Standard error	46.4	499.74	4.207	24.093	0.022	0.038	0.436	3.1
	Standard deviation	217.5	2344.00	19.730	113.007	0.102	0.178	2.044	14.7
PDL	N	27	27	27	26	27	27	27	27
	Minimum	136	27.8	0.22	0.03	0.87	0.61	0.00	2
	Maximum	1010	13410.0	257.70	2359.8	1.50	1.92	17.60	44
	Mean	492	2293.96	26.22	131.50	1.09	0.94	1.94	19
	Median	486	1656.40	12.40	16.83	1.07	0.89	0.70	17
	Standard error	42.8	603.56	9.982	90.053	0.028	0.051	0.714	2.3
	Standard deviation	222.4	3136.18	51.867	459.183	0.143	0.267	3.710	11.7
INUG	N	21	21	21	20	21	21	21	21
	Minimum	130	21.4	0.27	0.02	0.84	0.63	0.00	2
	Maximum	806	5196.9	117.57	656.3	1.67	2.26	12.63	33
	Mean	454	1362.31	15.53	48.63	1.05	0.98	1.51	17
	Median	486	1194.00	10.98	9.99	1.01	0.93	0.72	17
	Standard error	38.0	277.80	5.368	32.347	0.038	0.073	0.598	2.0
	Standard deviation	174.3	1273.04	24.601	144.661	0.173	0.336	2.742	9.1

3. p. 30, Table 16 (ECCC): The interpretive report is required to include descriptive statistics for egg size and fecundity for sexually mature fish, where practicable (Schedule 5, subparagraph 16(a)(i)). The reported indicated that a few mature females were sampled; please provide information on egg size and fecundity or describe why it was not practicable to collect this information.

Response:
The Environment Canada approved study design (Environmental Effects Monitoring, Agnico Eagle Mines LTD – Meadowbank Division: Cycle 3 Study Design, C. Portt and Associates and Kilgour and Associates, February 2017) did not include the collection of egg size or fecundity data. It would only be practical and accurate to collect those data for female Lake Trout that were going to spawn in the current year. It was apparent, from the previous EEM studies, that there would not be enough individuals with mature ova captured to make meaningful comparisons. As the interpretive report indicates, there was one female captured that would have spawned in the current year from each of Wally and Inuggugayualik Lakes and two from Pipedream Lake, confirming that no meaningful comparisons would have been possible.

4. p. 33 (ECCC): The MMER require an analysis of survival based on fish age (Schedule 5, paragraphs 16(a) and (c)). The report assessed age frequency distribution but did not include a comparison of mean fish age between exposure and reference areas. Despite the effect indicators listed in Table 3-3 of the technical guidance, the recommended indicator for survival is age (see Table 8-2, EC 2012). Please provide the results of an analysis of fish age in accordance with MMER Schedule 5, paragraph 16(c). Note that the Metal and Diamond Mining Effluent Regulations (MDMER) have defined a critical effect size of 25% for age as an effect indicator for fish survival (MDMER Schedule 5, subsection 1(2)). Use of critical effect sizes to determine future monitoring requirements is contingent on analysis of effect indicators and calculation of effect sizes as specified in the MDMER.

Response:
The results of Levene's test for homogeneity of variances and three tests of normality, as well as the results of the ANOVA with age as the dependent variable and lake as the category are provided below. Based on the Levene's test result, the variances are not equal among lakes. Based on all three tests of normality, the data are not normally distributed. These results lead Agnico to conclude that analysis using ANCOVA to compare age distributions for these data is not appropriate and that using a non-parametric method to compare age distributions, as reported in the interpretive report, is appropriate. That analysis indicated that there was no significant difference in the age distribution among lakes. The ANOVA results are provided below, for reference. The result indicates that there is no significant difference in age among lakes.

Levene's Test for Homogeneity of Variances		
	Test Statistic	p-Value
Based on Mean	4.6812	0.0125
Based on Median	4.1660	0.0197

Test for Normality		
	Test Statistic	p-Value
K-S Test (Lilliefors)	0.1188	0.0158
Shapiro-Wilk Test	0.9510	0.0082

Test for Normality		
	Test Statistic	p-Value
Anderson-Darling Test	0.8894	0.0216

Analysis of Variance

Source	Type III SS	df	Mean Squares	F-Ratio	p-Value
LAKE$	435.6101	2	217.8050	1.4946	0.2317
Error	9,763.6614	67	145.7263		

5. p. 33 (ECCC): The report did not include an assessment of the effect indicator for reproduction, as required by the MMER (Schedule 5, paragraph 16(c)). Although fish gonad weights were reported, you indicated that there were too few mature fish with developed gonads to provide a meaningful assessment of relative gonad weight. Previous phases also did not include an assessment of the effect indicator for reproduction; what steps could you take in the next study to ensure that fish reproduction is assessed in accordance with the MDMER?

Response:
Based on the first three cycle of EEM studies, there does not appear to be any practical and acceptable method to conduct a study that captures a sufficient number of female Lake Trout that would spawn in the current year to assess fish reproduction. That is why the study design that was used in the Cycle 3 study was proposed in the Cycle 2 interpretive report. In their comments and recommendations provided in the review of the Cycle 2 interpretive report, the Technical Advisory Panel, consisting of representative from the Nunavut Water Board, Indigenous and Northern Affairs Canada, and Environment and Climate Change Canada stated "*A fish study is required for the next EEM biological field work. TAP members are supportive of a lethal study on 20 lake trout.*" This review accompanied a letter to Agnico (Stephane Robert) from ECCC (Suzanne Forbrich) dated January 20, 2017. It's Agnico's opinion that the rationale for this decision remains valid.

6. p. 46 (ECCC): The study design originally proposed a Mantel test to compare Bray-Curtis distances between exposure and reference areas, pre- and post-exposure. You subsequently changed the analysis to a comparison of NMDS axis scores based on the Bray-Curtis distance matrix because the Mantel test was not suitable for the proposed reference condition approach. Instead, you compared residuals from the multiple regression of NMDS axis 1 and 2 scores on sediment particle size and total organic carbon (TOC) to assess for an effluent effect on the similarity index.

The MMER require an analysis of the results of similarity index calculations to determine if there is a statistical difference between sampling areas (Schedule 5, section 16). It is acknowledged that you calculated NMDS scores based on Bray-Curtis distances to improve the overall analysis by adjusting for habitat differences; however, the statistical analysis to compare exposure and reference areas was not conducted directly on similarity index values. Please provide the results of an analysis of the Bray-Curtis distances for the 2017 data (HO5) based on a method recommended by EEM (e.g., Mantel or distance-based redundancy analysis) as originally proposed in the study design.

Response:
The requested Mantel test has been conducted. The resulting p value is 0.14.

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7. p. 49 (ECCC): Please clarify how you calculated effect sizes for HO1, HO2 and HO4. For example, was the effect size for the BACI hypotheses based on the overall exposure means (WAL 2013-2017) vs. mean of the baseline WAL (2006-2012) and reference means (2006-2012)? Further, given that you assessed for effect indicators by comparing residuals from multiple regression models, it is unclear if the unadjusted indicator values used to calculate effect sizes would reflect the differences in residuals detected by ANOVA.

Response:

The effect size formulas provided in Section 4.2.3.5 were meant to be generalizable. Agnico realize in hindsight that they were insufficient. The formulae used to calculate the effect sizes are provided here.

The first null hypothesis (HO1) was: no change in differences between exposure and reference areas in mean responses from the before (2006 – 2012) to after (2013 – 2017) periods. This HO was tested using data only from Wally and INUG which both had data back to 2006.

The effect size for HO1 was

$$ES_{HO1} = \frac{(\overline{x_{W2006\ to\ 2012}} - \overline{x_{I2006\ to\ 2012}}) - (\overline{x_{W2013\ to\ 2017}} - \overline{x_{I2013\ to\ 2017}})}{SD_{pooled}}$$

Where;

- $\overline{x_{W2006\ to\ 2012}}$ is the grand mean of the Wally Lake data from the before (2006 – 2012) period;
- $x_{I2006\ to\ 2012}$ is the grand mean of the INUG Lake data from the before (2006 - 2012) period;
- $x_{W2013\ to\ 2017}$ is the grand mean of the Wally Lake data from the after (2013 – 2017) period;
- $\overline{x_{I2013\ to\ 2017}}$ is the grand mean of the INUG Lake data from the after (2013 – 2017) period; and,
- SD_{pooled} is the pooled standard deviation, estimated from the square root of the mean-squared error term from the omnibus ANOVA.

The second null hypothesis (HO2) was: no change in differences between exposure and reference areas in mean responses from the before (2010 – 2012) to after (2013 – 2017) periods. This HO was tested using data from Wally, INUG and PDL which all had data back to 2010.

The effect size for HO2 was

$$ES_{HO2} = \frac{(\overline{x_{W2010\ to\ 2012}} - \overline{x_{R2010\ to\ 2012}}) - (\overline{x_{W2013\ to\ 2017}} - \overline{x_{R2013\ to\ 2017}})}{SD_{pooled}}$$

Where;

- $\overline{x_{W2010\ to\ 2012}}$ is the grand mean of the Wally Lake data from the before (2010 – 2012) period;
- $\overline{x_{R2010\ to\ 2012}}$is the grand mean of the INUG Lake and PDL Lake data from the before (2010 - 2012) period;
- $\overline{x_{W2013\ to\ 2017}}$is the grand mean of the Wally Lake data from the after (2013 – 2017) period;
- $\overline{x_{R2013\ to\ 2017}}$ is the grand mean of the INUG Lake data from the after (2013 – 2017) period; and,
- SD_{pooled} is the pooled standard deviation, estimated from the square root of the mean-squared error term from the omnibus ANOVA.

The third null hypothesis (HO3) was: no change in the linear time trend between exposure and reference areas in mean responses during the after (2013 – 2017) period. This HO was tested using data from Wally, INUG and PDL which all had data during the after period. The effect size was computed by estimating the change in difference from 2013 to 2017.

The effect size for HO3 was

$$ES_{HO3} = \frac{(\overline{x_{W2013}} - \overline{x_{R2013}}) - (\overline{x_{W2017}} - \overline{x_{R2017}})}{SD_{pooled}}$$

Where;

- $\overline{x_{W2013}}$ is the grand mean of the Wally Lake data from 2013;
- $\overline{x_{R2013}}$is the grand mean of the INUG Lake and PDL Lake data from 2013;
- $\overline{x_{W2017}}$is the grand mean of the Wally Lake data from 2017;
- $\overline{x_{R2017}}$ is the grand mean of the INUG Lake data from 2017; and,
- SD_{pooled} is the pooled standard deviation, estimated from the square root of the mean-squared error term from the omnibus ANOVA.

The fourth null hypothesis (HO4) was: no change in the exposure-reference difference in the last year of the after period, i.e., comparing the exposure-reference difference in 2017, to the average exposure-reference difference from 2013 to 2016. This HO was tested using data from Wally, INUG and PDL which all had data during the after period.

The effect size for HO4 was

$$ES_{HO3} = \frac{(\overline{x_{W2013\ to\ 2016}} - \overline{x_{R2013\ to\ 2016}}) - (\overline{x_{W2017}} - \overline{x_{R2017}})}{SD_{pooled}}$$

Where;

- $\overline{x_{W2013\ to\ 2016}}$ is the grand mean of the Wally Lake data from 2013;
- $\overline{x_{R2013\ to\ 2016}}$is the grand mean of the INUG Lake and PDL Lake data from 2013;
- $\overline{x_{W2017}}$is the grand mean of the Wally Lake data from 2017;
- $\overline{x_{R2017}}$ is the grand mean of the INUG Lake data from 2017; and,
- SD_{pooled} is the pooled standard deviation, estimated from the square root of the mean-squared error term from the omnibus ANOVA.

8. p. 50 (ECCC): Statistical power for the BACI and time trend hypotheses (HO1-HO4) was sufficient to detect effect sizes of 0.9 and 1.1 standard deviations, respectively, at α=β=0.05. What was the power and significance level for the HO5 (2017) test?

<u>*Response:*</u>

The fifth hypothesis, HO5, is the conventional test requested in the guidance document (Environment Canada, 2012). For that test (ANOVA), and with alpha = beta = 0.1 (per the guidance document), the probability of obtaining a significant result is 90%.

9. p. 57, Table 30 (ECCC): If the benthic invertebrate community survey is conducted in an area where it is possible to sample sediment, the MMER require the calculation of the mean, median, standard deviation, standard error and minimum and maximum values for total organic carbon content and the particle size distribution of sediment (Schedule 5, subparagraph16(a)(iii)). Table 30 of the interpretive report presents data on total organic content and particle size distribution by station. However, the

interpretive report does not include the summary statistics by the sampling area. Please provide the mean, median, standard deviation, standard error and minimum and maximum values in the sampling areas for total organic carbon content and the particle size distribution of sediment.

Response:
A revised Table 30 is presented below, with the average, median, minimum, maximum, standard deviation, standard error provided.

Table 30. Variations in sample depth, TOC, sand, silt and clay, 2017. (Revised)

Area	Station / statistic	Depth (m)	TOC (%)	Sand (%)	Silt (%)	Clay (%)
INUG	1	7.0	6.02	4.0	74.1	22
	2	7.3	6.34	6.9	68.6	24.5
	3	7.5	6.08	4.3	69.8	25.9
	4	7.9	5.93	3.5	67.8	28.8
	5	8.1	5.7	2.8	68.5	28.7
	mean	7.6	6.0	4.3	69.8	26.0
	median	7.5	6.02	4.0	68.6	25.9
	minimum	7	5.7	2.8	67.8	22
	maximum	8.1	6.34	6.9	74.1	28.8
	standard deviation	0.44	0.23	1.56	2.53	2.89
	standard error	0.20	0.10	0.70	1.13	1.29
PDL	1	8	6.21	2.8	77.2	20
	2	6.9	5.94	9.0	72.3	18.8
	3	6.9	5.62	7.7	74	18.3
	4	8	6.21	6.6	73.4	20
	5	7.5	6.29	7.1	75.1	17.7
	mean	7.5	6.1	6.6	74.4	19.0
	median	7.5	6.21	7.1	74	18.8
	minimum	6.9	5.62	2.8	72.3	17.7
	maximum	8	6.29	9.0	77.2	20
	standard deviation	0.55	0.28	2.33	1.86	1.03
	standard error	0.25	0.12	1.04	0.83	0.46
Wally	1	8	7.48	4.7	78.5	16.8
	2	8.3	7.52	<1.0	79.3	19.8
	3	7.9	8.1	1.1	76.6	22.3
	4	7.9	7.15	2.1	76.1	21.8
	5	7.5	7.86	3.2	80.8	16.1
	mean	7.9	7.6	2.8	78.3	19.4
	median	7.9	7.52	2.65	78.5	19.8
	minimum	7.5	7.15	1.1	76.1	16.1
	maximum	8.3	8.1	4.7	80.8	22.3

Area	Station / statistic	Depth (m)	TOC (%)	Sand (%)	Silt (%)	Clay (%)
	standard deviation	0.29	0.37	1.54	1.94	2.83
	standard error	0.13	0.16	0.69	0.87	1.26

10. p. 69 (ECCC): Stepwise linear regression showed associations between benthic effect indicators and sediment characteristics. Residuals from these models were compared to assess for effluent effects on benthic indicators. It was noted that the models were not statistically significant for the NMDS axis 1 and axis 2 scores, and that the models explained 26%, 8% and 4% of the variability in density, evenness and richness, respectively. Did adjustment of effect indicators for habitat factors change the outcome of effect assessments?

Response:
No, in the end there were no differences in conclusions between using residuals or the original data; in hindsight, Agnico could have presented the results for the original data instead or additionally, for clarity.

11. p. 82 (ECCC): The MMER require the interpretive report to contain a summary of the results of annual effluent characterization, sublethal toxicity testing and water quality monitoring reported since the date on which the previous interpretive report was required to be submitted (Schedule 5, paragraph 21(1)(a.1)). The report included summaries of effluent characterization and sublethal toxicity testing results but did not include a summary of water quality monitoring results. Please provide a summary of annual water quality monitoring results since the previous interpretive report was submitted.

Response:
Agnico apologize for this omission. The requested data are provided in the table below.

Water chemistry results for the Wally Lake Exposure Area for the period June 26, 2015 – June 20, 2018.

	2015		2016			2017	
Parameter	**27-Jul**	**2-Sep**	**19-Jul**	**22-Aug**	**27-Sep**	**23-Jul**	**17-Aug**
WAL (Exposure Area)							
Alkalinity (mg CaCO3/L)	15	21	14	14	14	42	16
Aluminum-Total (mg/L)[1]	<0.006	<0.006	0.015	0.009	0.024	0.008	<0.06
Ammonia-Total (mg N/L)[1,2]	<0.01	0.03	0.01	0.02	0.07	0.04	<0.01
Arsenic-Total (mg/L)	<0.005	<0.0005	<0.0005	0.002	<0.0005	<0.0005	<0.0005
Cadmium-Total (mg/L)[3]	<0.00002	<0.00002	<0.00002	<0.00002	<0.00002	<0.00002	<0.00002
Copper-Total (mg/L)[3]	0.0009	0.0007	0.0007	0.0013	0.0007	0.0011	0.0006
Cyanide-Total (mg/L)	<0.005	0.009	<0.001	<0.001	<0.001	<0.001	0.002
Dissolved oxygen-Field (mg/L)	8.62	14.63	-	-	-	9.56	10.27
Hardness (mg CaCO3/L)	17	20	15	21	21	18	23
Iron-Total (mg/L)	0.01	0.02	0.02	0.02	0.02	0.02	<0.01
Lead-Total (mg/L)[3]	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	0.0018	<0.0003
Mercury-Total (mg/L)	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	0.00003
Molybdenum-Total (mg/L)	<0.0005	0.0009	<0.0005	<0.0005	0.0006	<0.0005	0.001
Nickel-Total (mg/L)[3]	<0.0005	0.0006	<0.0005	0.0005	0.0007	0.0005	<0.0005
Nitrate-Total (mg N/L)	0.14	0.44	0.12	0.18	0.17	0.12	0.29
pH-Field	7.27	6.84	7.58	7.62	7.42	7.39	6.55
Radium-226 (Bq/L)	<0.002	<0.002	<0.002	-	-	-	-
Selenium-Total (mg/L)	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Temperature-Field (°C)	12.6	9.8	13.3	16.1	-	10.95	11.2
Total suspended solid (mg/L)[4]	2	5	2	6	3	1	<1
Zinc-Total (mg/L)	<0.001	<0.001	<0.001	<0.001	0.001	<0.001	<0.001
Conductivity (µs/cm)	41	85	34	49	102	59	57

Notes: [1] CCME Guideline is pH dependent; [2] CCME Guideline is temperature dependent; [3] CCME Guideline is hardness dependent; [4] CCME Guideline is relative to background levels; Shaded values (if any) exceed the CCME guideline.

Other items

12. p. 10 (NWB): Table 5 includes a column for rainbow trout LC50, but rainbow trout are not mentioned anywhere else in the report. The value of this data would be improved if accompanied by some explanation.

Response:
A 96-hr Rainbow Trout lethality test is a required laboratory bioassay. All tests resulted in the effluent LC50 being estimated as > 100% effluent on samples in 2016 through 2017. This is interpreted to indicate that the effluent is not lethal to Rainbow Trout.

13. p. 13 (NWB): The report states that the effluent plume will "attach to the shoreline for all cases." However, the monitoring program focuses on the pelagic and benthic zones of the lake, and less so on the littoral zones. It would be beneficial to include sampling efforts in the littoral zone for future studies.

Response:
As indicated in Figure 15, effluent was mixed to bottom. The benthos sampling stations in Wally Lake were, therefore, exposed to effluent. All of the benthic invertebrate monitoring that has been conducted for the Meadowbank project since 2006 has been conducted in deeper (7 to 9 m depth) water. Moving benthos sampling to the littoral zone would eliminate the ability to utilize the historical data in a before-after-control-impact design. Agnico therefore disagrees with the recommendation to move future sampling to shore.

14. p. 15-16 and 19, Figures 3-5 (NWB): Gill net sets in Wally Lake were all north of the Effluent Diffuser, yet the effluent plume appears to expand out southerly more than northerly, and it would be expected to have fish caught in the southern region of the lake more impacted by effluent discharge. A recommendation would be to set gill nets in an area that better represents the plume distribution and captures areas most affected by effluent discharge, i.e. the southern arm of Wally Lake.

Response:
The gill net locations were all well within the 1% effluent plume. The selection of gill net locations is influenced by several factors, including the ability to safely lift the nets if adverse wind conditions develop.

15. p. 24 (ECCC): The report indicates that differences in ANCOVA slopes and intercepts were considered significant at $p<0.05$. The EEM technical guidance recommends assessment of effect indicators at a significance level equal to the Type 2 error rate – i.e. $\alpha=\beta$ (Section 8.6.1, EC 2012). Given the results of the power analysis, which was conducted at $\beta=0.1$ (p. 41), intercepts should be compared at $\alpha=0.1$. The guidance recommends $\alpha=0.05$ for comparison of slopes in ANCOVA.

Response:
If intercepts are considered significant at $p<0.1$, the ANCOVA results (Table 18 in the interpretive report) indicate there are no significant differences among lakes except for the relationship between log of body weight versus log of fork length with three outliers removed ($p=0.0981$). The differences between the exposed area and the two reference areas are 3.5% and -2.4% for INUG and PDL, respectively. In other words, the exposed area, Wally Lake, is intermediate between the two reference areas. Agnico

investigated this relationship further, performing post-hoc pairwise comparisons based on the reduced ANCOVA with the three outliers removed. The results of both Tukey's Honestly-Significant-Difference Test and Bonferroni Test (see output below) indicate that there is no significant difference between Wally Lake and either of the reference lakes. There is a significant difference (p<0.1) between the two reference lakes. The conclusion of the Cycle 3 interpretive report that for the relationships examined no effects were observed on the Lake Trout in Wally Lake remains valid when the intercepts are compared at p<0.1.

Tukey's Honestly-Significant-Difference Test

LAKE$(i)	LAKE$(j)	Difference	p-Value	95% Confidence Interval	
				Lower	Upper
Innug	Pipedream	-0.0254	0.0798	-0.0532	0.0024
Innug	Wally	-0.0150	0.4381	-0.0438	0.0139
Pipedream	Wally	0.0105	0.6203	-0.0162	0.0372

Bonferroni Test

LAKE$(i)	LAKE$(j)	Difference	p-Value	95% Confidence Interval	
				Lower	Upper
Innug	Pipedream	-0.0254	0.0955	-0.0539	0.0031
Innug	Wally	-0.0150	0.6658	-0.0445	0.0146
Pipedream	Wally	0.0105	1.0000	-0.0169	0.0378

16. p. 26 (ECCC): The results for the fish survey refer to water quality data provided in the benthic survey section. Water quality samples for the exposure area were collected at WAL-1 and WAL-2 (Table 29) – do these correspond to benthic stations WAL-1 and WAL-2 (Figure 5)? Given that the fish survey was conducted on the opposite site of the effluent diffuser from the benthic survey, do you consider the water quality at the benthic stations to be representative of the fish survey area? Please clarify where the water samples were collected for each sampling area and lake.

Response:
The temperature, dissolved oxygen and specific conductance data presented in Tables 9 and 10 were taken at the gillnet locations shown in Figures 5, 6, and 7 of the interpretative report. The water sampling locations were at two locations within the benthic exposure area and are shown in the revised Figure 4 below. Given the similarity in effluent concentrations between the gill net locations and the benthic sampling locations, Agnico consider the water quality at the benthic stations to be representative of the fish survey area.

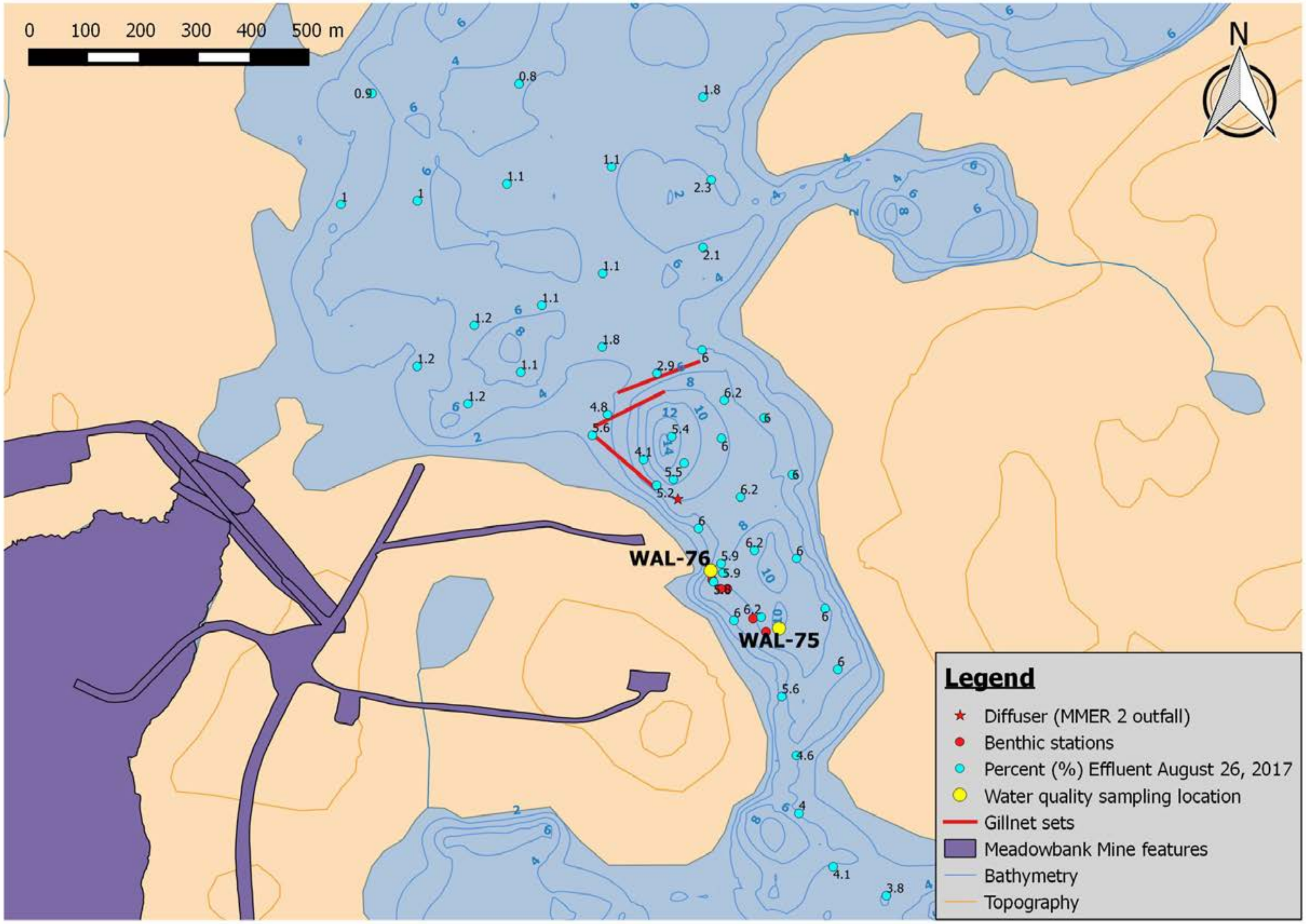

Figure 4 (revised). Effluent concentrations in Wally Lake on August 26, 2017, and Cycle 3 gillnet, benthic invertebrate, and water sampling locations.

17. p. 28 (ECCC): Assessment of fish effect indicators was conducted separately for each exposure-reference pair. For future studies, note that the recommended approach for multiple control-impact designs is to pool the reference data for comparison to the exposure, provided the reference areas have comparable habitat characteristics to the exposure area. If the reference areas differ and the data cannot be pooled, the results for the reference area that best matches the characteristics of the exposure area should be used, subject to site-specific considerations.

Response:
This recommendation has been noted.

18. p. 40-41 (NWB): Is there adult fish health data from Wally Lake before effluent discharge occurred? If so, a statistical comparison could be made pre/post effluent discharge to Wally Lake.

Response:
There are not adult fish survey health data for Wally Lake prior to effluent discharge.

19. p. 40, Table 18 and Figure 10 (NWB): A major conclusion of Section 3.4 Summary and Discussion is that "no effects were observed on Lake Trout in Wally Lake." However, this conclusion leaves out the small but significant differences in liver weight vs fork length outlined in Section 3.3.3.6 and Table 18. Although discussed briefly in the text, the focus is on the non-significant relationships and seems to be a means of proving no effect. Additional discussion could be provided to focus on potential effects that could be captured by the monitoring program. Provide discussion that focuses on potential effects, which may be captured by the monitoring program.

Response:
The significant differences ($p \leq 0.05$) were in the slopes of the log of liver weight versus log of fork length relationships when one fish or three fish that were identified as outliers were removed from the analysis. As the report states (page 34) *"the r^2 value was only reduced by 0.003 (one outlier removed) or 0.002 (three outliers removed) when the interaction term was removed (Table 18). Therefore, comparison of least square means using the reduced ANCOVA was considered appropriate and the intercepts of the log of liver weight versus log of fork length relationships were not significantly different.*" This statistical approach is recommended for dealing with comparisons where there are significant differences in slope but the inclusion of the interaction (slope) term has a very small effect on the r^2. The report is a factual presentation of results.

It should be noted, however, that the liver weight versus length relationship is not an effect indicator under the Metal and Diamond Mining Effluent Regulations (MDMER). The effect indicator is the liver weight versus body weight relationship. There were no significant differences in slopes ($P>0.05$) for this relationship and no significant differences in intercepts ($p>0.1$).

It is also important to recognize that there is natural variation among sampling areas and that small significant differences do not necessarily indicate an effluent-related effect. The use of critical effect sizes for effects indicators is a means of taking this into account. The critical effect size for the liver weight versus body weight relationship is 25%. The largest difference observed in this study was -13.7%.

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20. p. 41 (ECCC): The report suggests that a sample size of 20 fish would be adequate for the next study. However, the sample size for the current study was too low to assess the required effect indicator for reproduction (relative gonad weight), did not provide adequate statistical power for the assessment of growth (weight-at-age) and did not allow for individual assessment of males and females as recommended (p. 8-5, EC 2012). The EEM guidance document recommends a minimum of 20 mature fish per sex (p. 8-14, EC 2012); future studies should be designed to ensure sufficient statistical power for assessment of all required indicators in both male and female fish.

Response:

The number of Lake Trout that would be killed in order to conduct a study that addresses all of the endpoints included in the EEM guidance is of concern and has been a topic of discussion in the past. Based on the first three cycle of EEM studies, there does not appear to be any practical and acceptable method to conduct a study that captures a sufficient number of female Lake Trout that would spawn in the current year to assess fish reproduction. That is why the study design that was used in the Cycle 3 study was proposed in the Cycle 2 interpretive report. In their comments and recommendations provided in the review of that report, the Technical Advisory Panel, consisting of representative from the Nunavut Water Board, Indigenous and Northern Affairs Canada, and Environment and Climate Change Canada stated "*A fish study is required for the next EEM biological field work. TAP members are supportive of a lethal study on 20 lake trout*." This review accompanied a letter to Agnico (Stephane Robert) from ECCC (Suzanne Forbrich) dated January 20, 2017. In Agnico's opinion, the rationale for this decision remains valid.

21. p. 46 (ECCC): Effect indicators for the benthic invertebrate survey were calculated per the EEM guidance for density, taxon richness and evenness. The report refers to density as 'abundance' and evenness as 'equitability', however it was assumed that each was equivalent to the indicators defined in the guidance document.

Response:

The assumption is correct. Agnico will ensure greater consistency with the terminology and language used in the EEM guidance document in future submissions.

22. p. 49 (ECCC): The formula for benthic effect size presented in the report used pooled reference standard deviation in the denominator. For future studies, please note that the MDMER have defined critical effect sizes for effect indicators (Schedule 5, subsection 1(2)) and specify that effect sizes for benthic effect indicators are calculated with the reference standard deviation, as indicated in subsection 12(3).

Response:

Agnico acknowledge the ECCC comments. If there is only a single year of data, the within-reference data to estimate the SD makes sense. At Meadowbank, there are multiple years of data, and they provide an opportunity to improve on the estimate of the within-reference variability. Therefore, a pooled 'among-year, within reference' SD may be more relevant than the SD computed from the most recent year of data. In the future, Agnico will compute effect sizes using both estimates of the within-reference SD.

23. p. 59 (NWB): Were streams in the area (i.e. lake outflows) considered for part of the assessment of the benthic invertebrate community? What value might including them in the assessment bring to the study?

Response:
Streams were not considered for inclusion in the assessment of the benthic community. The effluent was released into Wally Lake and the effluent concentrations are higher near the discharge point than they would be in the lake outflow.

24. p. 59, Figure 22 (NWB): The NMDS ordination analysis of benthic invertebrate communities could benefit from a more in-depth description and interpretation, specifically what information might be gained by each analysis and specifically what information each axis correlation provides. For example, Figure 22, Ostracoda abundance seems to be driven separately from the other families, but little explanation is given as to why Ostracoda abundance may function on a separate axis to other benthic invertebrate taxa.

Response:
Agnico acknowledge the NWB comment and will attempt to provide more interpretation in subsequent EEM interpretive reports. The fact that Ostracods correlated more strongly with Axis 2 than 1 suggests that relative abundances of that group varied somewhat independently of the other taxa. Further, reviewing the relative abundances in Table 31 illustrates that relative abundances of Ostracoda varied within PDL and WAL by an order of magnitude from ~ 1% to ~10% from year to year. Axis 2 scores tended to decrease (Ostracods increased) with increasing TOC and geometric mean particle size (see Table 35). Ostracoda, like other benthos, have environmental preferences. Schneider et al. (2016) describe the covariation of Arctic ostracods in relation to environmental variables, and demonstrated the potential influences of organic carbon (related to depth, and nitrogen, magnesium and calcium in sediments) and percent silt/clay in sediments (related to dissolved oxygen levels, conductivity and pH of the overlying water). Tolerances will vary depending on the specific ostracod taxa, which here were not identified below the level of Class. The data in the Meadowbank Cycle 3 interpretive report suggest that ostracods in the study lakes tended to vary in relative abundance with TOC and sediment grain size (Table 35), and did not strongly vary in relation to exposure to mine effluent (Table 36, Table 37).

25. p. 62, Table 31(NWB): Data presented in Table 31 could also be provided in graphical form to improve its interpretation.

Response:
Agnico acknowledge the NWB comment and will look into the possibility to include graphical form in future reporting. The data are currently presented in the fashion of Table 31 to address the requirement under the Regulation to provide data for the Family level.

26. p. 67 (ECCC): Figure 11 shows NMDS axis scores for benthic taxa, however the figure label indicates a scatterplot of Pearson correlation coefficients between taxa abundances and NMDS scores; please clarify.

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Response:

The figure does illustrate the Pearson correlations of taxa relative abundances with the 'axis' scores produced by the NMDS ordination. The NMDS ordination creates a set of scores for each sample; with those scores illustrated in Figure 23. In the overall analysis, there were 161 total samples, for each of which was computed scores on NMDS axes 1 and 2. The Pearson correlations were determined for the 161 samples.

27. p. 70-71, Table 32 (NWB): Effects of the effluent discharge on the benthic invertebrate community are measurable, but discussion focuses on a lack of measurable effects. For example, a lower richness and greater abundance of benthic invertebrates in Wally Lake, combined with the scatterplots of residuals and computed effect sizes showing that abundances tended to increase more in the impacted Wally Lake than in reference lakes (INUG and PDL) during the exposure period (Figure 24), could be an indication of eutrophication. Combined with the high nitrogen content and lack of effluent phosphorus data (see Table 6), this may warrant future investigation. Provide detailed discussion on differences between reference lakes and the impacted lake, including potential cause-and effect mechanisms. Include other proxies of eutrophication in the assessment, such as water column chlorophyll a, etc.

Response:

Per the discussion, when all of the years of data were included (H01), which is arguably the most robust analysis, there was no significant difference between WAL and the average of INUG for any of the indices of composition. As noted in the comment, the study considered the observed variations in abundance and richness relative to normal ranges observed in reference data, in addition to what had been observed prior to effluent discharge in Wally Lake. Referring to Figure 24, abundances in Wally Lake in 2016 were higher than reference normal ranges, and higher than previously observed in Wally Lake. In the other years during the exposure period (2013, 2014, 2015, and 2017), abundances were within the range for the baseline period. Richness in Wally Lake (see Figure 25) was within the normal range of observations for reference conditions, and within the range of values observed in Wally Lake during the baseline period.

The CREMP monitors chlorophyll a and algal biomass, as well as water chemistry and benthic invertebrate communities, annually. The 2017 CREMP report states that, relative to baseline. there is no evidence to suggest mining operations are increasing primary productivity and that no mine-related effects to the benthic invertebrate communities in the Meadowbank project lakes were observed in 2017. The CREMP continues to monitor and report annually on the Meadowbank project lakes and reference lakes.

***28*. p. 79 (ECCC): The results of the sampling precision analysis indicate that four subsamples would be required to estimate evenness within 20% of the true value at the station level in the exposure area. Please consider this information when developing the next study design, and consider increasing the number of subsamples per station for future benthic invertebrate community studies.**

Response:

Within-station sampling will consider the modestly higher variance observed in Wally Lake in the design of subsequent EEM programs.

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29. p. 82, Table 6 and Table 40 (NWB): Little discussion was given to the observed sublethal toxic effects. For example, the fathead minnow LC50 of 82% indicated in Table 6 and Table 40 is not discussed. More emphasis should be placed on the statistically measured effects rather than on the lack of statistically significant effects.

Response:
The concern regarding the lack of discussion of this one test is noted. The toxicity test report from the laboratory (AquatTox Testing & Consulting Inc.) for the July 18, 2016, fathead minnow survival test states "the usefulness of any LC50 calculated with this set of data is questionable because a concentration effect relationship has not been demonstrated over a reasonable range (e.g. <37 to >63) of percent dead".

30. p. 82, Table 6 (NWB): Aluminum concentrations in the effluent sampled for sublethal toxicity testing are above CCME guidelines for protection of freshwater aquatic life (CCME-FW-PAL) and should continue to be monitored in water and sediments as a parameter of concern.

Response:
There is ongoing monitoring of aluminum concentrations in water and sediment as part of the CREMP.