DE BEERS CANADA INC.
VICTOR MINE

MERCURY PERFORMANCE MONITORING
2013 ANNUAL REPORT

AS PER CONDITIONS 7(5) and 7(6) OF CERTIFICATE OF APPROVAL #3960-7Q4K2G

Submitted to:

Ministry of the Environment
Timmins District Office
Ontario Government Complex, Highway 101E
P.O. Bag 3080
South Porcupine, Ontario, P0N 1H0

and

Chief of Attawapiskat First Nation
First Nation Office
Attawapiskat, Ontario, P0L 1A0

Submitted by:

AMEC Environment & Infrastructure
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June 2014
TC140504

June 30, 2014
TC121511

Mr. Denis Durocher, District Manager
Ministry of the Environment
Ontario Government Complex
Highway 101E
South Porcupine, Ontario, P0N 1H0

Chief Theresa Spence
Attawapiskat First Nation
First Nation Office
Box 248
Attawapiskat, Ontario, P0L 1A0

Dear Mr. Durocher / Chief Spence:

Re: Mercury Performance Monitoring 2013 Annual Report, Certificate of Approval #3960-7Q4K2G, Conditions 7(5) and 7(6)

Please find enclosed the Annual Mercury Performance Monitoring Report which is being submitted on behalf of the De Beers Canada Inc. Victor Mine, for the 2013 reporting period. The report addresses Conditions 7(5) and 7(6) of Certificate of Approval #3960-7Q4K2G, and summarizes monitoring data relating to peat pore water, surface water systems, groundwater (well field) discharge and fish.

All monitoring results to date are consistent with permit application expectations relating to mine dewatering activities, showing no adverse effects of mine dewatering on area mercury levels in peatlands, surface waters, or fish flesh for the 2013 monitoring period. It has been observed, however, that localized sulphate release unrelated to mine dewatering may be contributing to mercury methylation effects, particularly in the Northeast Fen, resulting in slightly elevated methyl mercury levels within the lower reaches of Granny Creek. This effect does not extend to either of the Nayshkootayaow or Attawapiskat Rivers, and is still under study.

A discussion of comments and responses related to De Beers' application to renew the mine dewatering permit to take water, as these relate specifically to mercury, is also included.

We would be pleased to discuss any aspect of the above with the MOE or with the Attawapiskat First Nation. Should you have any questions please do not hesitate to contact the undersigned at (905) 568-2929, or Stephen Monninger at De Beers at 416-645-3888 ext. 5125.

Regards,

AMEC Environment & Infrastructure
a Division of AMEC Americas Limited
On behalf of De Beers Canada Inc.

Prepared by:

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cc: John. B. Nakogee – Attawapiskat FN
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TABLE OF CONTENTS

PAGE

LIST OF APPENDICES

LIST OF TABLES

PAGE

LIST OF TABLES (CONT'D)

PAGE

LIST OF TABLES (CONT'D)

PAGE

LIST OF FIGURES

PAGE

LIST OF FIGURES

LIST OF ABBREVIATIONS

Abbreviation	Meaning
ATT	Attawapiskat River
CEQG	Canadian Environmental Quality Guidelines
COM	Community
CONF	Confluence
CPUE	Catch Per Unit Effort
DS	Downstream
DSNAY	Downstream Nayshkootayaow
F-Value	Analysis of Variance from Sample Statistics
FF	Far Field
HgCON	Mercury Control Station / Northwest Control
MC	Monument Channel
MDL	Method Detection Limit
MeHg	Methyl mercury
NAY or NAYSH	Nayshkootayaow River
NAY-MOUTH	Mouth of Nayshkootayaow
NEF/F	Northeast Fen Final
NGC	North Granny Creek
ng/L	Nanograms per Litre
NF	Near Field
PPM	Parts Per Million
P-Value	Tabled Probability Threshold
SEF/F	Southeast Fen Final
RPD	Relative Percent Difference
SGC	South Granny Creek
ST	Station
SWF/F	Southwest Fen Final
T	Tributary
µg/g	Micrograms Per Gram
THg	Total mercury
US	Upstream

1.0 INTRODUCTION

This report was prepared by AMEC Environment & Infrastructure Limited (AMEC) on behalf of De Beers Canada Inc. (De Beers), pursuant to the requirements of Conditions 7(5) and 7(6) of Certificate of Approval (C. of A.) #3960-7Q4K2G. The report is the sixth in a series of annual mercury monitoring reports that have been and will be prepared for the Victor Mine. This sixth annual report summarizes all Victor Mine site mercury monitoring data collected for the year 2013, and also provides summaries of earlier data and trends where appropriate. For consistency and readability from year to year, this report keeps the same format, and much of the same wording as the previous annual reports, with updates in data interpretation where warranted.

A broad-based, rigorous mercury monitoring program was established for the De Beers Victor Mine because of concerns raised during the provincial permitting process, regarding the possible influences of mine dewatering activities on muskeg system hydrodynamics and associated mercury chemodynamics. In particular, concerns have been expressed that should mine dewatering lead to extensive “drying out” of the local muskeg ecosystem, then there could be a potential for the release of increased quantities of mercury to area receiving waters above those that occur naturally. Mercury is present in area peatlands in the baseline condition as a result of the long-range aerial transport of emissions from natural and anthropogenic sources unrelated to activities of the Victor Mine. Volcanic activity is the primary natural source for the long-range transport of mercury. Coal-fired power plants in the United States and elsewhere are one of the primary anthropogenic sources for long-range mercury transport.

AMEC and De Beers have previously provided evidence to support the position that mine dewatering activities were not likely to result in a condition that would substantively increase mercury release rates to area receiving waters, and that if evidence of such substantive release rates was to occur, then mitigation measures would be implemented to prevent or arrest the aggravating condition. The Victor Mine mercury monitoring program is designed to test De Beers’ position that mine dewatering is not likely to substantively increase mercury release rates to area receiving waters.

Data collected up to the end of 2013 thus far continue to support the De Beers’ position that mine dewatering is unlikely to result in substantive increases in mercury release to area surface waters, as described in detail in the sections that follow.

Laboratory services for the water sample program were conducted in part by Flett Research Ltd. in Winnipeg (to approximately the end of April 2009), and by Dr. Brian Branfireun’s laboratory at the University of Toronto (from approximately May 2009 to September 2010), and subsequently from that time to the present at Biotron Analytical Services laboratory at the University of Western Ontario. Dr. Branfireun helped establish the Biotron Analytical Services laboratory at the University of Western Ontario. This laboratory facility is a CALA-accredited facility, using ISO 17025. Fish flesh analyses were conducted at Dr. Branfireun’s laboratory at the University of Toronto, and subsequently at the Biotron Analytical Services laboratory since 2008. All of the above laboratories are recognized for their specialty of ultra-trace analyses for mercury.

Water quality data reported as "less than values" (i.e., less than the detection limit values) by either laboratory are shown as being at the reported detection limit in all tables in this document, to allow statistical interpretation. Lower end values are therefore conservative. Detection limits provided by Flett Research for water samples varied with the samples being analyzed with some detection limits being shown as a low as 0.00 ng/L, measured to two decimal places. Detection limits provided by Dr. Branfireun's laboratory were set at two levels: "limit of quantification" – 0.0169 ng/L, and "method detection limit" (MDL) – 0.0054 ng/L. Values less than the MDL were reported as "non-detect" and are presented in the tables of this report as <0.01 ng/L or as stated. Values reported as "detect" are presented in the tables as 0.01 ng/L if below the limit of quantification, or as stated if above that value. The Biotron Analytical Services laboratory reported values in 2012 and 2013 as non-detected at <0.01 ng/L for total mercury and <0.02 ng/L for methyl mercury (i.e., method reporting values of 0.01 ng/L and 0.02 ng/L, respectively).

For readers unfamiliar with these units of measurement:

ng/L represents nanograms per litre of water, which can also be expressed as parts per trillion (ppt) or 1 part of material in 1,000,000,000,000 parts of water.

ug/g represents micrograms per gram of solids (e.g., fish flesh), which can also be expressed as parts per million (ppm) or 1 part of material in 1,000,000 parts of solids.

A number of peer-reviewed scientific papers have been published in the *Hydrological Processes* journal and the S*cience of the Total Environment* journal in 2012 and 2013, in relation to the operation and dewatering effects at the Victor Mine site. The relevant papers are listed below. The data presented in these research papers, where applicable, support the data and conclusions presented in this report.

- Whittington, P. and J. Price. 2012. Effect of mine dewatering on peatlands of the James Bay Lowland: the role of bioherms. Hydrological Processes. 26: 1818-1826.

- Whittington, P. and J. Price. 2013. Effect of mine dewatering on the peatlands of the James Bay Lowland: the role of marine sediments on mitigating peatland drainage. Hydrological Processes. Published online in Wiley Online Library.

- Ulanowski, T.A. and B.A. Branfireun. 2013. Small-scale variability in peatland pore-water biogeochemistry, Hudson Bay Lowland, Canada. Science of the Total Environment. 454-455: 211-218.

2.0 REQUIREMENTS

Condition 7(5) of Certificate of Approval (C. of A.) #3960-7Q4K2G states the following:

> *The Owner shall report the results from the previous calendar year for the mercury monitoring program described [in] Condition 6(8), to the District Manager and the Chief of the Attawapiskat First Nation by June 30 of each year.*

The referenced Condition 6(8) states:

> *The Owner shall carryout a mercury monitoring program that includes, but [is] not necessarily limited to the following:*
>
> *(a) A onetime assessment of peat solids to determine mercury content (completed in 2007);*
>
> *(b) An analysis of peat, mineral soil, and bedrock pore water on an ongoing annual basis at the locations identified in Table 2;*
>
> *(c) Monitoring of surface water systems on a monthly or quarterly basis depending on station at the locations identified in Table 3;*
>
> *(d) Monitoring of the well field discharge on a monthly basis and quarterly basis and quarterly sampling of individual wells;*
>
> *(e) Sampling of sportfish at 3 year intervals and small fish sampling on an annual basis at locations identified in Table 4.*

Condition 7(6) states the following:

> *The Owner shall report the results from the previous calendar year for the mercury assessments described [in] Condition 6(9), to the District Manager and the Chief of the Attawapiskat First Nation by June 30 of each year.*

The referenced Condition 6(9) states:

> *In conjunction with the mercury management and monitoring program required in Section 6(8), the Owner shall also carryout data analyses, enhanced sampling programs, modelling, risk assessments, and implement effective mitigation measures, as and when required, all in accordance with the March 31, 2008 Report prepared by AMEC and submitted to the District Manager, entitled <u>Trigger Values for Mercury Concentrations and/or Body Burdens in Fish, Condition 6(10) of Certificate of Approval #8700-783LPK, De Beers Canada Inc., Victor Mine.</u> This program may be amended from time to time when approved in writing by the District Manager. As well, water quality*

data collected as part of the groundwater well field recovery system shall be analyzed statistically to determine the variability and trending over time. Should significant variation occur over time within individual wells or group of wells then a potential concern will be deemed to exist, requiring further investigation.

3.0 REPORTING – CONDITION 6(8) DATA

3.1 Condition 6(8) (a) – One Time Assessment of Peat Solids

Requirements of this condition were fulfilled in Section 3.1 of the first annual mercury report (2008 Annual Report), and are not repeated here.

3.2 Condition 6(8) (b) – Annual Analysis of Peat, Mineral Soil and Bedrock Pore Water

Condition 6(8) of Amended C. of A. #4111-7DXKQW, dated October 3, 2008, and Condition 6(8) of the Amended version referred to as C. of A. #3960-7Q4K2G, dated March 13, 2009, both provide for the annual collection of peat pore water samples from muskeg monitoring program stations identified in Table 2 of the C. of A. The two C. of A.'s also provide for the annual collection of water samples from muskeg monitoring program mineral soil and bedrock monitoring wells / piezometers identified in Table 2 of the C. of A. Samples are to be analyzed for total and methyl mercury.

C. of A. #4111-7DXKQW was preceded by C. of A. #8700-783LPK, dated December 11, 2007. Condition 6(9) of C. of A. 8700-783LPK provided for the development and approval of a mercury monitoring plan. The mercury monitoring plan had been developed previously through consultation with the MOE and was submitted to the MOE on November 13, 2007. The November 13, 2007 monitoring plan provided for the annual collection of peat pore water samples from the same muskeg monitoring program stations identified in Table 2 of C. of A. #3960-7Q4K2G; as well as from mineral soil samples to be collected from three depths below surface from each of the MSV(1)-D, MSV(2)-D and MSV(3)-D stations.

As a precautionary measure to better document baseline conditions, filtered samples for total and methyl mercury analysis were collected from all of the monitoring stations identified in Table 2 of C. of A. #3960-7Q4K2G during 2007. However, due to confusion over the small changes to the sampling program introduced in October 2008 in C. of A. #4111-7DXKQW, from those defined in the earlier November 2007 AMEC submission, the mineral soil pore water samples for the muskeg monitoring program stations were not collected in 2008 prior to freeze-up. Hence, there were no mineral soil or bedrock pore water mercury samples for the late summer / fall of 2008.

Sample collection as per C. of A. #3960-7Q4K2G Table 2 requirements was resumed in August / September of 2009; with the omission of a few samples due to monitoring wells with too little water to sample – particularly in deep clay overburden wells; sample breakage in transit; sampling errors, etc.

Muskeg monitoring program pore water sample results for total and methyl mercury filtered samples are provided in Table 1 from 2007 to 2013 and sampling station locations are shown in Figure 1.

More detailed data presentations for the various muskeg (peat) types and underlying marine sediment and bedrock zones are presented in Table 2. Table 2 is divided into a series of sub-tables from 2a to 2g, with associated graphical data presentations for ease of data interpretation. It should be noted that the vertical scales on these graphs vary depending on the range of results observed. Statistical analyses using all data sets are presented in Section 4. With minor and possibly anomalous results for a few samples, total and methyl mercury values observed in 2013 were within the range of values observed in previous years for the various stations. Occasional spikes in data were observed for some of the stations for both total and methyl mercury in 2013, but there is no temporal or spatial pattern to the data, and such spikes were equally likely to be observed in stations remote from the area under-drained by Victor Mine dewatering (e.g., Station Clusters S-9(1), S-9(2), S-13 and S-15), as at areas closer to the mine (Station Clusters S-1, S-2, S-7 and S-8, as well as the S-V1, S-V2 and S-V3 Clusters). Year to year variations therefore appear to be a regional phenomenon that is not linked to mine dewatering effects on muskeg mercury chemodynamics.

All of the observed values for total mercury and methyl mercury are well below their respective Canadian Environmental Quality Guideline (CEQG) values of 26 ng/L for total mercury and 4 ng/L for methyl mercury.

3.3 Condition 6(8) (c) – Analysis of Surface Water Systems

Surface water systems considered in this section include the following:

- Passive fen treatment systems;
- Ribbed fen systems;
- Granny Creek; and
- Nayshkootayaow and Attawapiskat Rivers.

Passive Fen Treatment Systems

The Southwest Fen (SWF) was used as a passive wetland treatment system for the removal of residual total suspended solids and nutrients from the Central Quarry waste water discharge during 2006. The Northeast Fen (NEF) provides, or provided, a similar function for effluents derived from the following sources:

- Plant site excavation area (completed 2006);
- Crusher excavation area (completed 2006 and 2007);
- Attawapiskat River intake excavation and construction (completed 2007).
- Open Pit mine Phase 1 Mine Water Settling Pond (started 2007 and ongoing);
- Dry waste landfill runoff and leachate (started autumn of 2008 and ongoing);
- Fully treated sewage treatment plant effluent (started 2006 and completed August 2011); and
- Mine rock stockpile runoff (started in 2010 and continuing).

The Southeast Fen (SEF) and the Northwest Control Fen (HgCON) were set up as control fens for the SWF and the NEF. The SEF previously received minor discharges from the shallow south quarry during parts of 2004 and 2005, but was not materially affected by these discharges, and is therefore regarded as being not impacted by mine site discharges or runoff. The HgCON has never received effluent discharge from any source.

Sampling from the SWF was discontinued in June 2009 as the C. of A. for this fen treatment system (C. of A. 3374-6G7J2Y – dated December 13, 2005) was revoked on March 3, 2009. Much of the SWF has since been overlaid by stockpiles of mine waste (overburden, low grade kimberlite and processed kimberlite). There are consequently no data for the SWF beyond May 2009.

The Phase 1 Mine Water Settling Pond has only discharged surface runoff collected from the pit perimeter area, and not open pit sump water, since 2008.

Total mercury data (unfiltered and filtered) for the passive fen treatment and control system fens are presented in Tables 3 and 4. Methyl mercury data (unfiltered and filtered) for these same systems are presented in Tables 5 and 6. All results are within applicable federal (and provincial) guidelines for the protection of aquatic life with the exception of methyl mercury samples taken from the NEF in January 2012 and again in April / May 2013. All filtered methyl mercury values have been below the federal guideline value of 4 ng/L except for the January 2012 value. Winter samples collected from under the ice can show concentrated ion strength due to ice crystallization effects. In very shallow stagnant water, as the water freezes, ions tend to be extruded from the ice crystal matrix and concentrated in the remaining water below the ice. In extreme cases where the water freezes to near bottom, severe parameter concentration distortions can occur.

Total mercury concentrations in 2013, as in previous years, were generally comparable between the effluent treatment fen station (NEF), and the two control fen stations (SEF and HgCON) for unfiltered and filtered samples (Tables 3 and 4).

Results for methyl mercury in 2013 were similar to those of previous years (Tables 5 and 6), and while still meeting federal and provincial guidelines for the protection of aquatic life, with the exception of under-ice methyl mercury samples collected in January 2012 and April / May 2013 in the NEF, concentrations of methyl mercury in the NEF continued to be decidedly higher in the NEF compared with either of the two control fens.

Methyl mercury concentrations in the NEF are believed to be elevated as a result of increased sulphate levels, as described in the 2008 Mercury Performance Monitoring report. Sulphate reducing bacteria utilize sulphate as an electron acceptor, and hence higher sulphate levels tend to promote increased rates of conversion from total mercury to methyl mercury (Ullrich et al. 2001; Jeremiason et al. 2006). Sulphate concentrations in the NEF during 2013 averaged 74.5 mg/L. This value compares with average sulphate concentrations of 47.9, 32.2, 30.5, 60.0 and 84.5 for the years of 2008 through 2012, consecutively. The optimal sulphate range for mercury methylation is 20 to 50 mg/L (Ullrich et al. 2001). Ongoing elevated sulphate values observed for the NEF indicate that sulphate containing waters are still draining to the NEF, most likely mainly from the mine rock stockpile, as sulphates discharged to the NEF in previous years should have been reduced by this point in time, as was observed previously for sulphates contained in quarry water discharged to the SWF in 2006. The one noted exception to this is sulphate containing waters that have been discharged to the open pit Phase 1 Mine Water Settling pond during development of new dewatering wells, as per Section 5. This practice was discontinued in 2014. Any well development water is now discharged to the open pit where it seeps through the pit walls and is picked up by the well field dewatering system. This water does not contact the local muskeg terrain.

Samples from control fen sites typically contain <0.1 mg/L of sulphate. The increased mercury methylation rate observed for the NEF is therefore a localized phenomenon, and is not believed to be related to muskeg drying effects. As per Sections 5 and 8 of this report, De Beers is currently investigating methods that would better control the release of sulphates to localized muskeg environments including to the NEF.

Ribbed Fen Systems

The water quality of general site area drainage is monitored on a quarterly basis at three ribbed fen stations located on or near the Victor Mine site (Stations MS-V1-R, MS-V2-R, and MS-V3-R), as well as at several more remote sites (Figures 1 and 2). Ribbed fen sites were selected for surface water quarterly monitoring because ribbed fens, more than other muskeg types, tend to collect water from surrounding drainages and therefore provide the most representative data on overall site drainage.

Quarterly water sample collection from the suite of ribbed fen sites was initiated in mid-2007, and has been carried out since, except where prevented by frozen ground conditions (Table 7). However, due to confusion at the Mine site over the need to collect both peat pore water and surface water samples from ribbed fens, only peat pore water samples were collected in 2007 and 2008. C. of A. #3960-7Q4K2G provides for collecting peat pore water samples from all muskeg monitoring stations, including ribbed fens, on an annual basis; and collecting surface water samples from ribbed fen stations, only, on a quarterly basis. Sample collection protocols were remedied in 2009 in accordance with C. of A. requirements.

In addition, to assist with data interpretation De Beers collects samples from these same ribbed fen stations for the analysis of chloride, conductivity, nitrate, dissolved organic carbon, pH, sulphate, total phosphorus, calcium, iron, magnesium and sodium (Table 8). The most striking aspect of Table 8 is the variable results which are observed for chloride, sodium and sulphate for MS-8R. The data for these three parameters for 2007 and 2008 suggested that there were likely natural groundwater upwellings in this area in the predevelopment condition, but that groundwater upwelling gradients were reversed in 2009 as a result of mine dewatering. However, since 2011 there have been variable increases in these three parameters, with inconsistent year to year results for the three parameters. Hydrogeological data confirm that the

Upper Attawapiskat Formation underlying Station MS-8R has remained under-drained (Figure 2); but the fen track which drains to MS-8R originates well to the west of MS-8R in an area which is outside of the well field drawdown cone (Figure 2). It is therefore possible that year to year variations in hydrological conditions outside of the well field zone of influence could be contributing to periodic groundwater upwellings in the upstream portion of the MS-8R fen track. There are no site drainages that would drain to this fen track. If this were the case, the occasionally elevated chloride, sodium and sulphate levels observed for this station would be naturally occurring. Upstream fen track samples will be collected in 2014 to test this hypothesis.

The other aspect of interest that was noted in the previous annual mercury report with respect to ribbed fen general chemistry was the observed reduction in both pH and calcium that was noted for Station MS-13R beginning in 2009. This trend reversed itself in 2013. Sulphate levels at this station, however, remained low during all years.

Other stations showed generally consistent general chemistry values from year to year, with the exception of Station MS-1V-R which showed a single elevated sulphate value in 2011 and a single elevated chloride value in 2013.

Total and methyl mercury sample results for the ribbed fen stations are shown in Tables 7a and 7b for 2007 through 2013. The data show low concentrations of both total and methyl mercury, with no obvious increasing or decreasing trends. Samples collected from under the ice should be viewed with caution, as per discussions above regarding ice crystallization concentration effects.

Granny Creek System

Upstream and downstream total and methyl mercury concentration data for the Granny Creek system are provided in Tables 9 through 12. Sampling locations are shown in Figure 3. Average total mercury concentrations for the four stations for 2013 varied from 1.89 to 2.37 ng/L for unfiltered samples, and from 1.18 to 1.40 ng/L for filtered samples (Tables 9 and 10). These values are well within the 26 ng/L CEQG value for the protection of aquatic life. Filtered sample results for total mercury, averaged over 2013, are similar for upstream and downstream samples from both creek branches (Table 10). The graphs attached to Tables 9 and 10 also show that while total mercury concentrations can vary substantively throughout the year, due to seasonal and hydrological effects, there are no evident long-term trends in the comparison of stations for either North or South Granny Creeks, for stations upstream or downstream of the developed areas of the mine site.

Methyl mercury concentrations for unfiltered and filtered samples, from upstream and downstream South and North Granny Creek stations, are shown in Tables 11 and 12. The values are again variable, depending on seasonal and hydrologic influences. However, unlike total mercury where there is no evident trend between upstream and downstream stations, the developing trend observed for elevated downstream methyl mercury concentrations, particularly in North Granny Creek, in 2011 and 2012, has continued into 2013, and appears to have stabilized (Tables 11 and 12), While elevated methyl mercury concentrations are noted in downstream Granny Creek waters, these elevated values are still well below the CEQG value of 4 ng/L.

Downstream increases in Granny Creek methyl mercury appear to be related to sulphate drainages associated with the mine site area. These drainages occur in association with the NEF, the mine rock stockpile, the coarse PK stockpile, and other stockpiles around the site; and are not believed to be linked to muskeg dewatering effects, as all available evidence shows that the peat horizons in the general mine site area continue to be saturated (AMEC 2012). Sulphate drainage effects are localized.

Nayshkootayaow and Attawapiskat Rivers

Total and methyl mercury results for the Nayshkootayaow and Attawapiskat Rivers are shown in Tables 13 and 14. Sample locations are shown in Figure 3. Graphical data are presented in Figure 4. All values are generally low, consistent across the stations, and well within CEQG values. Filtered results for all stations on the Nayshkootayaow and Attawapiskat Rivers were generally comparable and well within the range of historical data for the respective stations. A fifth station (A-5) was added to the Attawapiskat River sampling network at a location 500 m downstream of the well field discharge, as per commitments to the MOE deriving from review of the 2012 annual mercury performance report. Data collected for the 500 m downstream station showed total and methyl mercury values that were comparable to or lower than other Attawapiskat River stations for 2013 (Tables 13 and 14).

Reviewers of the VDM well field PTTW renewal application commented that methyl (and total) mercury values for these two rivers while being well below the federal guideline values for the protection of aquatic life, were in fact above values recommended by the United States (US) Environmental Protection Agency (EPA) for the protection of fish-eating wildlife species such as Bald Eagle and River Otter.

Methyl mercury concentrations in the Attawapiskat and Nayshkootayaow Rivers are in fact at or below the bioaccumulation threshold of 0.05 ng/L for filtered methyl mercury samples cited by the US EPA (1987).

NB - This comparison is not noted for Granny Creeks

3.4 Condition 6(8) (d) – Annual Analysis of Well Field Discharge

Starting in November 2007, in accordance with Condition 6(3) of C. of A. #8700-783LPK, dated December 11, 2007, and Condition 6(3) of Amended C. of A. #4111-7DXKQW, dated October 3, 2008, as well as Condition 6(3) of Amended C. of A. 3960-7Q4K2G, dated March 13, 2009, De Beers initiated monthly monitoring of total and methyl mercury concentrations in the well field discharge. Sampling was initiated proactively in advance of the December 2007 C. of A. issue date. All values for the period of November 2007 to December 2013 have remained low (below CCME guidelines) for both total and methyl mercury, as shown in Table 15. Filtered total and methyl mercury concentrations in the well field discharge have thus far, on average, been below background concentrations measured in the Attawapiskat River as shown in Tables 13 and 14, and there are no evident temporal trends in the data with the possible exception of a weakly expressed, slight decline in total mercury values (Table 15). However, if the data for total mercury are viewed from 2010 onwards, the curve is essentially flat. It is also important to stress that the average annualized well field discharge of approximately 85,000 m^3/d represents only 0.24% of the 36,000,000 m^3/d mean annual flow for the river.

Quarterly total and methyl mercury sampling results for operating individual wells are shown in Tables 16 and 17, respectively. Wells VDW-11, 12 and 22, and especially VDW-11, continue to show the highest total mercury concentrations.

Methyl mercury concentrations were all low in the individual wells, ranging from <0.01 ng/L to 0.19 ng/L for the unfiltered samples and <0.01 ng/L to 0.02 ng/L for the filtered samples.

3.5 Condition 6(8)(e) – Sport and Small Fish Mercury Body Burdens

As per Condition 6(8) fish mercury body burdens were investigated in both small-bodied and large-bodied fish in 2013. Fish were captured between September 11 and 29, 2013 under MNR licence No.1075264 by minnow trapping, backpack electroshocking, boat electroshocking, angling and gill netting. Sampling techniques were used specific to the size category of fish targeted. It should be noted that Lake Sturgeon (*Acipenser fulvescens*) were captured incidentally during the 2013 sampling program, however, all individuals were returned alive to their place of capture. Species specific catch per unit effort (CPUE) information with respect 2013 is provided in Tables 18, 19, 20 and 21. Fish were collected following accepted industry methods and techniques at the required sampling sites in 2013. Sampling locations are represented in Figure 5. Sampling areas as depicted in Figure 5 represent the areas of study which include multiple sampling efforts (e.g. gill net sets, electrofishing transects).

3.5.1 Comparative Study of Tissue Collection and Analytical Protocols

The memo issued by the MOE, dated February 28, 2013, in response to the submission of the De Beers Canada Inc., Victor Diamond Mine Mercury Performance Monitoring Report (June 2012), included Comment #4.0 (additional comments/questions laboratory changed action required #17) which requested a study of the variance between laboratories used for the analysis of tested media specific to the mercury monitoring program.

De Beers undertook a comparative study of analysis protocols as conducted by specified laboratories of past and current use, as well as a third party laboratory in response to this request. Large-bodied fish collected in 2013 were sampled for this comparative study.

The purpose of the comparative study was to investigate the following:

1) Variability associated tissue plugs versus whole fillet sample collection and analysis results for total mercury (as analyzed by one lab only, Biotron Experimental Climate Change Research Centre, The University of Western Ontario [UWO], so as to negate between lab bias).

2) Variability of analysis results for the same fish between analytical protocols / methods. Specifically the difference between results obtained from the following:

   a) Flett Research Ltd. (Flett Lab) in Winnipeg, Manitoba which used a modification of US EPA's Method 1631(e) for the determination of total mercury in aqueous samples including acid digestion, BrCl oxidation, $SnCl^2$ reduction, purge and gold amalgam trapping, thermal desorption, and cold-vapor atomic fluorescence spectrometry (CVAFS) detection. The MDL was 0.003 mg/kg. This protocol is consistent with the analysis conducted by this laboratory on large-bodied fish samples collected in 2007, 2008 and for comparative study in 2013.

   b) Biotron Experimental Climate Change Research Centre, The University of Western Ontario (UWO Lab), in London, Ontario which analyzed for total mercury on a Milestone Direct Mercury Analyzer (DMA-80). The DMA-80 instrument used thermal decomposition, catalytic conversion, gold amalgamation, and atomic absorption spectrophotometry following US EPA 7473 and required no sample pre-treatment. The MDL was 0.005 mg/kg. This protocol is consistent with the analysis conducted by this laboratory (at its current UWO and previous University of Toronto, Mississauga Campus locations) for large-bodied fish samples collected in 2010 and for comparative study in 2013. This laboratory has undertaken analysis for small-bodied fish collected from 2008 to 2013.

   c) A third laboratory was included for comparison; the Ministry of Environment, Environmental Monitoring and Reporting Branch, Biomonitoring Section Laboratory (MOE Lab). A sub-sample of large-bodied fish collected at the near-field exposure area through the assistance of the Ministry of Natural Resources Cooperative Freshwater Ecology Unit / Vale Living with Lakes Centre Laurentian University were analyzed. Samples were analyzed by the MOE Lab for total mercury by cold vapour-flameless atomic absorption spectroscopy (CV-FAAS) which differs from CVAFS in that adsorbed light versus fluorescence light is measured and is proportional to mercury concentration. This laboratory analyzed a subsample of large-bodied fish from one sampling location (ATT-NF) in 2013. The MDL was 0.01 mg/kg. As such, comparisons were possible and shown in Table 22.

Of particular interest is the degree of difference between results obtained between the Flett Lab and the UWO lab as these represent the initial and subsequent providers, respectively, of analytical services to the De Beers Victor Mine.

To meet the requirements of the intended repeated measures statistical design, epaxial muscle tissue was lethally sampled from large-bodied target species. Fish were captured from the Attawapiskat River (including Monument Channel) and Nayshkootayaow River from both reference (control) and exposure (impact) locations. Control and impact sampling locations are further discussed in Sections 3.5.2 and 3.5.3. Figure 5 indicates the location of capture for 2013.

Large-bodied fish including Northern Pike (*Esox lucius*), Walleye (*Sander vitreus*), White Sucker (*Catostomus commersonii*), Lake Whitefish (*Coregonus clupeaformis*) and Cisco (*Coregonus artedi*) were lethally sampled and the left epaxial muscle fillets were collected from each fish. This fillet was then biopsied using a cylindrical punch apparatus to retrieve approximately 0.5 to 1.0 g of dorsal fish musculature. A subsample of punch biopsies were collected specifically to test the variability associated with non-lethal tissue punch techniques with lethal whole fillet analysis. A subsample (specific to Northern Pike and Walleye) were also divided to provide a sample for delivery to Flett Laboratories Inc. Right and left side epaxial muscle samples were taken from the previously listed species from one location (ATT-NF) with right side samples being provided to the MOE Lab and the left side treated as previously described. All samples were kept frozen between extraction and analysis. Fillets were further sub-sampled within the lab environment under sterile conditions to provide adequate tissue weights for analysis for each protocol. Care was taken to subsample fillets within an area of adequate thickness and sample integrity.

Two approaches were used to assess differences in labs/methods. First, the relative percent difference (RPD) between lab/method total mercury concentrations was calculated (where values were greater than 5 times the MDL (EPA 2000)). RPD was calculated as:

$$(| (V1 - V2) | / ((V1 + V2)/2)) * 100$$

Where V1 is the first value of interest and V2 is the second value of interest.

Secondly, a mixed effects analysis was implemented to determine if there were significant differences in the total mercury concentrations between laboratories/methods. The mixed effect design included a random effect for sample individual, which controlled for natural variation in total mercury amongst individuals and improved the statistical power of the analysis. Furthermore, as total mercury is known to increase with fish size, total length (mm) was included as a covariate.

Total mercury (natural log (ln)) and total length (log base 10) were transformed to meet the assumptions of normality (Cizdel et al. 2003; Sacket et al. 2013).

Where applicable, a Bonferroni correction was applied to account for an increased risk of Type 1 errors caused by multiple comparisons (between tissue mercury and at total length between laboratories/methods) applied to each species (overall alpha = 0.05).

Tissue Plug versus Fillet Comparison

All values received from the laboratory were verified to meet laboratory QA/QC standards for duplicates, and matrix spikes.

No significant differences were found between total mercury values collected from tissue plugs and fillets for any species analyzed (repeated measures mixed-effects model; $\alpha=0.008$) (Table 23 and Figure 6). Of these species, only Walleye had a p-value below the uncorrected alpha value of 0.05 ($P=0.019$).

In general, total mercury concentrations as analyzed from plugs had a mean RPD of less than 20%. Collectively, 65% of large-bodied species analyzed had RPD between fillets and plugs of less than 20% (ranging from 0 to 19%) as indicated in Table 24. Only 11% (34) of fish showed greater than 35% RPD and patterns associated with species were not apparent.

Previous studies conducted by Blanchfield et al. (2004) indicated that sampling fish tissue using a dermal punch (as in this study) was similar to benchmark concentrations in fillet samples when adequate tissue was provided by dermal punch methods using CVAFS analysis. Furthermore, survival of sampled individuals was not greatly affected.

The results of this study indicate that although some variability exists it is typically within accepted levels (RPD <20%) and therefore provides comparable results to lethal sampling methods for epaxial muscle samples. Punch sampling allows for non-lethal sampling of large-bodied fish which reduces the environmental impact on the population of large fish in this slow-growing population, by killing fewer fish.

Analysis Method Comparison

Repeated measures mixed effect model results (Bonferroni corrected for multiple comparisons) showed no significant differences between UWO versus MOE, or MOE versus Flett Labs (Tables 23 and 24; Figures 7 and 8). However, for both Northern Pike and Walleye the UWO Lab (DMA-80, US EPA 7473) analysis showed a significant difference to the Flett Lab (US EPA's Method 1631(e) (CVAFS) method of detection for total mercury in fillets. Context to these statistically significant differences is provided by the RPD values, which were typically (66% of samples) less than 20% (Table 25). The mean value of total mercury for both Northern Pike and Walleye was consistently, yet marginally greater, for UWO than Flett (mean difference ranging from 0.05 to 0.11 mg/kg; Figure 9; Table 24).

If over-estimation of total mercury by DMA-80 (UWO) analysis is consistent in comparison to CVFAS (Flett), then it is possible that values reported for large-bodied fish from the vicinity of the Victor Mine starting in 2010 (DMA-80) may be elevated compared to those which were analyzed by CVFAS.

However, this trend if applicable between years is likely negligible within the context of environmental, annual and site-specific variability.

Previous comparison of DMA-80 and CVFAS repeated measures results has indicated good comparability at a low RPD (<10%) for most samples when treated within the same lab environment (personal communication D. Gilbert, Flett Laboratories Inc.). This validates the comparability of both tissue sampling methods (plug vs fillet) and data obtained from the three laboratories (UWO, MOE, Flett).

3.5.2 Condition 6(8) (e) – Sport Fish Mercury Body Burdens

As per C of A #3960-7Q4K2G, large-bodied sport fish are to be sampled from the Attawapiskat River, Nayshkootayaow River and Monument Channel at three-year intervals to investigate mercury body burden concentrations. The C of A requires that a minimum of 30 Northern Pike be captured from each of four sampling areas. These areas include a reference area located approximately 9 km upstream of the mine site on the Attawapiskat River (ATT-US); a near-field receiving water area (ATT-NF) located within 500 m downstream of the Victor Mine well-field discharge; the mainstem Nayshkootayaow River (NAY), and Monument Channel (MC). The locations of these sampling areas are shown in Figure 5. Incidentally captured species are also included in the study with the target of 10 of each of Walleye, White Sucker and Lake Whitefish. A summary of water bodies, control and impact systems and species targeted is provided in Table 26.

Species specific total mercury body burden levels were compared using Before-After-Control-Impact (BACI) design as commonly used to monitor for potential environmental impacts. Temporal changes in total mercury body burdens may be confounded by environmental variables and between site differences may be unrelated to anthropogenic (human) influences. The BACI design allows for a comparison of the temporal differences in total mercury concentration within the context of site effects.

For this study an Analysis of Covariance (ANCOVA) was used within the BACI design using the following model:

$$\text{Ln(THg)} = \text{constant} + \text{Log (Total Length)} + \text{period} + \text{site} + \text{period*site}$$

Both period (baseline or after) and site (control or impact) are considered main effects. A significant p-value for the BACI interaction effect (period*site) indicates a difference between periods while accounting for site effects. Due to tendency of mercury body burden to increase as fish grow, and the difficulty in obtaining similar length fish across all years, fish length (also log transformed) was added to the model. Total mercury concentration was natural log (ln) transformed to meet the assumptions of normality (Cizdel et al. 2003; Sacket et al. 2013). Following comparisons with significant differences (overall alpha = 0.05) a post-hoc comparison test of the treatment groups was performed to understand the nature of the differences. Where applicable, a Bonferroni correction was applied to adjust for multiple comparisons for each species.

The period of 2007/08 (baseline condition) was compared to the present dataset 2013 to understand the potential impacts of the Victor Mine on total mercury body burdens in fish. This analysis was repeated to compare 2010 data to 2013 as they were successive cycles of fish collection. Results of these analyses are provided in Tables 27 and 28 and Figures 10 to 17).

In assessments of the Attawapiskat River, Lake Whitefish and Walleye did not exhibit significant differences in total mercury body burden (i.e. no significant interaction) between the 2007/08 period to 2013 (Table 27; Figures 10, 11, 14 and 15).

However, Northern Pike had a significant interaction; with an increase in body burden levels occurring at ATT-NF (impact) from 2007/08 to 2013 (impact-after group) and ATT-US (control) having a general reduction in total mercury concentration for this species (Table 27; Figure 13. It should be noted that this trend of decreasing body burden level within the Attawapiskat River control area (ATT-US) was not observed for other species analyzed (Figures 11 and 15). In other water bodies (Nayshkootayaow River and Monument Channel), Northern Pike showed an increase in total mercury body burden (Figure 13) and Walleye, another piscivorous top predator, showed an increase in body burden level at both control and impact sites for the Attawapiskat River from 2007/08 to 2013 (Figure 15). As such the trend for ATT-US Northern Pike does not reflect the overall trend for the fish community of similar increases in body burden level for control and impact sites between the these periods.

Similarly, when comparing the 2007/08 period to 2013 for the Nayshkootayaow River (NAY, impact) and Monument Channel (MC, control), no significant change in total mercury body burden was found for any species, excepting Northern Pike which once again showed a marked increases in body burden levels as a function of total length at both the control and impact sites. However, a more steep increase was indicated for MC (Figures 12 and 13) which a reference site not influenced by the Mine operation.

When comparing the 2010 period with 2013 between control and impact sites for all species, no significant change was indicated by the analysis. This was inclusive of all species including White Sucker. These results indicate no significant impact to fish body burdens by the Victor Mine through the last cycle period. However, a general trend of increase was observed for the majority of large-bodied species at both control and impact sites from 2007/08 to 2013 and as well from 2010 to 2013.

Larger Northern Pike and Walleye individuals continue to show mercury concentrations within the consumption advisory range for women of child-bearing age and children under 15 years (start of advisory = 0.26 ppm to total restriction = 0.52 ppm) (MOE 2013), as well as the general population (start of advisory = 0.60) specifically in the Attawapiskat River both upstream (control site) and downstream of the Victor Mine (Figures 12 and 14). Walleye individuals from each of the Attawapiskat River (ATT-US), the Nayshkootayaow River and Monument Channel had mercury body burden concentrations (2.20, 1.72, 1.87, respectively), which approached or exceeded the total restriction level for the general population (1.84 ppm). These individuals were all female and some of the largest and oldest individuals captured (685, 583, and 661 mm total length, and 25, 15, and 15 years of age, respectively).

3.5.3 Condition 6(8) (e) – Small Fish Mercury Body Burdens

Small-bodied fish species are to be collected annually from North Granny Creek, South Granny Creek, Tributary 5A, the Nayshkootayaow River (upstream of Tributary 3 and downstream of the Granny Creek confluence) and the Attawapiskat River (upstream of the mine site, approximately 500 m downstream of the well-field discharge and approximately 2 km downstream of the well-field discharge point). Sampling areas in the Attawapiskat River upstream of the mine site, in the Nayshkootayaow River upstream of Tributary 3, as well as Tributary 5A serve as reference areas to near-field and far-field areas located downstream of the mine site and discharge locations (Table 26).

The sample locations for small-bodied fish from 2008 to 2012 are shown in Figure 5. Small-bodied fish were collected from these locations using the techniques of backpack and boat electroshocking and minnow trapping (where applicable). The presence of Pearl Dace (*Margariscus margarita*) was adequate to allow for comparisons between North Granny Creek, South Granny Creek and Tributary 5A. A second species, Trout-Perch (*Percopsis omiscomaycus*), was used to compare upstream and downstream Attawapiskat and Nayshkootayaow River locations. Total species-specific catch data for each location are summarized in Tables 18 and 19 for minnow trapping and electroshocking, respectively.

All small bodied fish were analyzed at the UWO laboratory. Individual samples were thawed and sub-sampled for dorsal muscle on which total mercury analysis was completed. A small mass was retained for oven-drying, and a minimum of two wet samples (<0.5 g wet weight each) was used for analyses. Remaining tissue, if any, was kept frozen for replicate analyses if required. Samples were analyzed and reported as wet weight as per standard methods. Analysis was by thermal decomposition and atomic absorption detection using a Milestone DMA-80 as per the requirements of US EPA Method 7473. Calibration and instrument performance were verified through the analysis of various fish tissue standard reference materials.

To compare the total mercury body burden levels between site and year a BACI design was used with an ANCOVA incorporating total length as the covariate. Total mercury and total length were natural log and log base 10 transformed to approximate normality. As previously described interactions between period (year) and site (control impact) were analyzed for significance to determine if an effect due to the mine was evident (as indicated by a significant interaction term).

The period of 2008 (baseline condition) was compared to the present dataset 2013 to understand the potential impacts of the Victor Mine on total mercury body burdens in fish. This analysis was repeated to compare 2012 data to 2013 to understand recent changes since the latest year of sampling. Results of these analyses are provided in Tables 27 and 28 and Figures 18 to 21.

Pearl Dace compared between 2008 and 2013 (baseline versus present) between SGC (impact), NGC (impact) and ST5A (control) were not significantly different for total mercury body burden level (Table 27; Figure 18). In general mercury levels in Pearl Dace increased between 2008 and 2013 when corrected for length with NGC showing a less pronounced increase yet an elevated starting point at baseline condition (Figure 19). Pearl Dace body burden levels compared between 2012 and 2013 had a significant interaction. Post-hoc comparison showed significant increase between 2012 and 2013 at SGC. NGC had moderately significant decrease (Table 28; Figures 18 and 19). Control station 5A showed a marginal increase which was not statistically significantly different between 2012 and 2013. Total mercury body burdens continued to increase at all sites except NGC in 2013 from 2012 yet, body burden levels in Pearl Dace from NGC may still reflect the continued bioavailability of sulphates to reducing bacteria, which may not be reflected in water quality results for 2013.

Attawapiskat River Trout-Perch had significant interactions for both period analyses (i.e., 2008 to 2013 and 2012 to 2013). However, in both cases a reduction in total mercury body burden levels for Trout-Perch from ATT-NF (near field impact) was observed in comparison to an increase at ATT-US (control), implying little effect by the mine discharge to this species (Tables 27 and 28; Figures 20 and 21).

Nayshkootayaow River Trout-Perch showed no effect when compared under the BACI design by ANOVA between the 2009 and 2013 or 2012 to 2013 periods (Table 28; Figures 20 and 21) indicating no specific mine influence on body burden levels. Total mercury body burden levels corrected for total length (mm) were shown to be increasing from 2012 to 2013 at both Nayshkootayaow River sites (control and impact).

To compliment previously described analyses, trends in mercury levels over time were assessed using a Generalized Additive Model (GAM) (Zuur et al. 2009) for small-bodied fish. The Generalized Additive Model is a useful approach that can deal with non-linear data and provide statistical tests to determine if change over time has occurred. In this case a cubic regression spline smoother (with three nodes) was applied to log-transformed values of total mercury and year of collection. Due to tendency of mercury body burden to increase as fish grow, and the difficulty in obtaining similar length fish across all years, fish length (also log transformed) was also added to the model. A separate trend analysis was created for each species and each site. Presentation of time series data are provided assuming a constant size of fish (60 mm for Pearl Dace and 50 mm for Trout-Perch as previously discussed in AMEC 2013) and include 95% confidence intervals. GAM plots are provided in Figures 22 to 24 (note vertical scales vary between graphs). It should be noted that within these figures the GAM trends lines represent total mercury for the standard size of fish as previously mentioned for each species. The specific data points provided represent the raw total mercury concentration distribution for a given year, uncorrected for size.

The GAM model for Pearl Dace (Figure 22) was highly significant when including both year and total length and explained 39.4%, 17.1% and 52.2% (NGC, SGC and ST5A, respectively) of the deviance in total mercury. The trend analysis indicates a trend of increase at NGC since 2008 specific to a fish of 60 mm, with a peak reached in 2011 and subsequent gradual reduction through 2012 and 2013. The trends at SGC and ST5A have some similarity with a gradual decrease in total mercury between 2008 and 2010, but a gradual increase since 2011 to 2013 for a standard length (Figure 22).

Results for Attawapiskat River Trout-Perch (Figure 23) of 50 mm are similar between ATT-US and ATT-FF with a decline in total mercury body burdens through 2008 to 2011, but an increasing trend since 2011 to 2013. ATT-NF shows a less dramatic increase (Figure 23) Deviance explained by the model were 25.6%, 29.5% and 10%, respectively.

Nayshkootayaow River Trout-Perch (Figure 24) of 50 mm had a decreasing trend at both the control and impact sites (NAY-US3 and NAY-DS6) from 2008/09 to 2012, with a slight increase moving forward to 2013 at NAY-DS6 (Figure 24).

4.0 REPORTING – CONDITION 6(9) DATA

4.1 Annual Analysis of Peat Pore Water

As described in Section 3.2, and as a general observation, concentrations of total and methyl mercury in the 2013 peat horizon water samples were not markedly higher or lower than the range of data for previous years. Statistical analyses of total and methyl mercury peat pore water concentrations are presented in Table 29 for the: S-1 stations (Table 29a), the S-2 stations (Table 29b), the S-7 stations (Table 29c), the S-8 stations (Table 29d), the S-9(1) stations (Table 29e), the S-9(2) stations (Table 29f), and the S-V stations (Table 29g). Unlike data for previous years where none of the results for total or methyl mercury concentrations were significantly different for location effect compared with the S-13 / S-15 background control stations using Two-Way Analysis of Variance at $\alpha = 0.05$, there was one station which did show a statistically significant difference, namely the S-2 (MS-2) cluster for methyl mercury.

The MS-2 peat horizon cluster consists of three stations (MS-2-D, MS-2-F and MS-2-R) and is located to the east of the DM in an undisturbed area of muskeg. There is no horizontal fen environment within the bounds of this cluster. One of the cluster points (MS-2-R) is located within the existing mine dewatering drawdown cone. The other two cluster points (MS-2-D and MS-2-F) are located outside of the drawdown cone. There are no site discharges to any of the cluster points that would cause sulphate to be elevated, and in the instance where sulphate was measured (at MS-2-R) the sulphate level was at background (<1.0 mg/L). There is no evident reason why the 2013 result for the MS-2 cluster should be significantly different compared with the control stations for methyl mercury. It is important to note that the 0.05 probability level for statistic significance means that one would expect 5% of the tests to yield a statistically significant result due to random chance alone, when the samples are in fact not statistically different. Out of 63 Two-Way Analysis of Variance tests performed on peat horizon methyl mercury concentrations for the years 2008 through 2013 combined, only this single test has showed a significant difference in methyl mercury concentrations for the experimental cluster versus the control cluster average. Given the above circumstances this particular result is regarded as most likely being the result of random chance and not a biogeochemical effect.

General site inspections and flyovers, showed no overt evidence of any meaningful peatland “drying out”, in the area of well field induced depressurization of the underlying upper bedrock aquifer for the 2013. However, despite continued saturation of peatlands within the major portion of the area near to the open pit, an analysis of muskeg pond area expression between 2006 and 2012, using satellite imagery, showed an approximate 14% reduction in muskeg pond area for the nearfield zone (i.e., the zone contained by the approximate 2 m upper bedrock drawdown contour shown in Figure 2), and an approximate 7.5% reduction in pond surface area for the midfield zone (i.e., that area between the 2013, 2 m drawdown contour and the original 2008 modeled end of mine life 2 m drawdown contour) (AMEC 2013). Muskeg pond reduction values of 14% and 7.5% for the two zones were corrected against pond area changes observed during the same period for a far-field control site, to correct for regional changes due to weather or climate effects. Localized areas of mine-related muskeg dewatering in association bioherms and bedrock subcrop zones were predicted in the federal EA conducted for the VDM (Federal Authorities 2005).

The MS-8 muskeg monitoring cluster, MS-V1 through MS-V3 sites, and part of the MS-2 muskeg monitoring cluster (station MS-2-R) are located within the nearfield area defined above. The midfield zone includes the MS-7 cluster and the remainder of the MS-2 cluster stations. All other muskeg monitoring clusters (i.e., MS-1, MS-9(1), MS-9(2), MS-13 and MS-15) are located outside the mine dewatering zone of influence.

4.2 Annual Analysis of Mineral Soil Pore Water

Total and methyl mercury results from shallow and deep clay pore water samples have continued to show low values, with no defining trends (Table 2f). Total mercury values have generally been <1 ng/L, and methyl mercury values have generally been <0.1 ng/L, with the exception of the S-8(CL-3) shallow clay station where a 0.63 ng/L methyl mercury value was recorded for 2013. This value is not consistent with the remainder of the data set and appears to be anomalous . Sampling consistency for a number of the clay stations has been poor, in large part because the very slow recovery times after well purging, often make it impractical to collect samples from these sites. Also, the term “clay” is not quite appropriate, as further more detailed studies carried out as part of the NSERC research program determined that the fine grained materials at site are not really clay minerals, but instead rock flour, a portion of which consists of clay-sized grains, with the bulk of the material being silt. This overburden material is predominantly derived from carbonate rock (limestone), and is more appropriately termed fined-grained marine sediments.

Total and methyl mercury results from shallow bedrock water samples also showed no real trends.

4.3 Annual Analysis of Surface Waters

Statistical analyses of total and methyl mercury concentrations in surface water samples are presented in Table 30. Monthly analyses of total mercury concentrations for North and South Granny Creeks for upstream and downstream samples showed no statistical differences (Table 30a).

Methyl mercury concentrations in upstream, mid-stream and downstream reaches for both North and South Granny Creeks were not statistically different from one another, but as in previous years there was a trend to higher downstream methyl mercury concentrations in both creek branches (Table 30b). In 2012 the differences in methyl mercury concentrations between upstream and downstream stations was statistically significant for methyl mercury. As per Section 3.3, it is likely that methyl mercury dynamics in peatlands around the mine site are being influenced by elevated sulphate levels, which increase the activity of methylating bacteria. Any such increases in methyl mercury concentrations in downstream Granny Creek waters are not believed to be related to mine dewatering. Also, while methyl mercury values are elevated in

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downstream Granny Creek waters for both creek branches, all values are well below the CEQG value of 4 mg/L.

Data for the Nayshkootayaow and Attawapiskat Rivers show no upstream or downstream trends, and none of the results are statistically significant for either total or methyl mercury (Tables 30c and 30d).

4.4 Trend Analysis of Well Field Water Discharge

Monthly well field discharge data are presented in Table 15. Similar to previous years from 2009 to present both total and methyl mercury remain on average, lower than for comparable Attawapiskat River background water concentrations (Tables 13 and 14), and there are no evident trends in the data other than a possible slight decrease in total mercury concentrations with time (Table 15).

4.5 Annual Analysis of Fish Mercury Body Burdens

For discussions regarding comparisons of fish mercury body burdens between geographical locations in 2013 please refer to Section 3.5. Overall mercury levels in fish tissues are increasing in both large-bodied and small-bodied groups, yet this trend is consistent at both control and impact areas alike. This trend is not true in 2013 for impact sites (ATT-NF, NGC) previously exhibiting higher levels than control sites as they have exhibited a trend of reduction over the short-term.

5.0 NORTHEAST FEN SULPHATE SOURCE INVESTIGATION

In the 2012 annual mercury report, De Beers committed to undertaking a study of sulphate loadings to mine site area muskeg systems, with the objective of assessing alternatives to better limit such loadings, as a means of reducing mercury methylation rates in affected muskeg systems. Following from this commitment De Beers undertook a site investigation to characterize the relationship between sulphate levels and methyl mercury in relation to the NEF. This investigation yielded the following results:

- Sulphate concentrations in the NEF final compliance point gradually increased from 2010 to 2012, with annual average values increasing from approximately 30 mg/L in 2010, to 60 mg/L in 2011 and to 105 mg/L in 2012;

- Sulphate concentrations were highest in the proximal end of the NEF (i.e., in the ditch that receives runoff and seepage from the mine rock stockpile and the landfill), with annual average values increasing from approximately 50 mg/L in 2010, to 105 mg/L in 2011 and to 150 mg/L in 2012;

- Sulphate contributions to the NEF are currently deriving from the following areas: mine rock stockpile, the open pit phase 1 mine water pond, and possibly from the landfill;

- Five muskeg ponds bordering the west and south perimeters of the mine rock stockpile were samples for sulphate, with three of five ponds showing values of < 1mg/L, and the remaining two ponds showing values of 56.6 mg/l and 81.1 mg/L;

- Twenty-four samples collected during the spring, summer and fall of 2010 through 2012 showed sulphate concentrations within the open pit Phase 1 Mine Water Settling Pond ranging from approximately 10 mg/L to 120 mg/L, with a general trend to increasing values over the period, and with highest values observed in the fall of each year; and

- Shallow groundwater samples collected from the perimeter of the landfill ranged from near zero to as high as 250 mg/L of sulphate, with only one of six perimeter stations consistently showing values above 50 mg/L.

Sulphate concentrations in ponds surrounding the mine rock stockpile are highly variable as described above. This variability likely reflects micro-drainage paths associated with the stockpile, as well as the length of time that rock proximal to the stockpile has been in place. To better characterize sulphate release potentials from mine rock, samples of mine rock were collected from different bench levels within the open pit, and mixed (allowed to stand in buckets) with distilled water. After mixing with distilled water, samples of the water were analyzed after 1 day and 6 days. Observed sulphate levels in the aged samples ranged from 24.3 to 460 mg/L, with higher sulphate concentrations being associated with deeper rock formations. For five of the six samples, the 6-day samples showed an average sulphate content that was approximately 25 percent higher than for the 1-day sample. Mine rock samples do not contain sulphides, and the sulphate release from the mine rock is believed to originate from groundwater that infuses the rock formations. This associated sulphate-rich groundwater would be expected to wash / drain from the stockpiles in response to precipitation infiltrating into the stockpile.

The open pit Phase 1 Mine Water Settling Pond borders the open pit perimeter on its north side, and was originally constructed to receive sump water from the open pit. However, sump water has not been discharged to the Phase 1 Mine Water Settling Pond since 2008, as all such water from the open pit diffuses through the bedrock to the perimeter well field. This Phase 1 Mine Water Settling Pond therefore normally only receives surface runoff from the area bordering the open pit. This surface water would be expected to be low in sulphate. The source of sulphate in the Phase 1 Mine Water Settling Pond is believed to derive from well development water. When new wells are being developed for the perimeter well field, water from the developing wells has in the past been discharged to the Phase 1 Mine Water Settling Pond. This practice was discontinued in 2014. Well development water is now discharged to the open pit where it seeps through the pit walls and is picked up by the well field dewatering system. Some drainage into the Phase 1 Pond may also originate from the use of water from the dewatering wells for dust control on the mine roads.

Leachate contributions from the landfill are more difficult to assess because the landfill is positioned immediately adjacent to the southeast corner of the mine rock stockpile and a main haul road. Sulphate concentrations associated with shallow groundwater samples (in the peat) from the landfill perimeter zone are variably elevated, as described above, but the source volume of the material is very small compared with the mine rock stockpile, such that sulphate loadings from the landfill can be essentially lumped in with those from the mine rock stockpile.

The above investigation into sulphate sources has focused on the NEF because that was the primary area of interest. The other area that remains to be investigated is the coarse processed kimberlite stockpile. Methyl mercury levels in South Granny Creek continue to be less than those observed for North Granny Creek, but some increase is evident within downstream Granny Creek and this requires investigation. This may be in part an artifact of historic discharges of quarry water through the SW Fen, but further influenced by drainage from the stockpiles of rock.

6.0 RESPONSE TO COMMENTS RECEIVED FROM REVIEWERS OF THE PTTW RENEWAL APPLICATION

Comments relating to mercury were received from multiple reviewers in relation to De Beers' application to the MOE to renew well field dewatering PTTW #5521-8CZSNK. These included comments received in relation to Environmental Bill of Rights (EBR) postings, and comments received from Malroz Engineering Inc., on behalf of the AttFN.

Comments received from the EBR reviewers, and to a much lesser extent, from Malroz, can be broadly summarized as follows:

1. Walleye and northern pike in Attawapiskat and Nayshkootayaow Rivers already exceed recommended consumption guidelines for vulnerable segments of the local population (e.g., women of child-bearing aging and persons under 15 years of age);

2. Data indicate that methyl mercury values for Granny Creek waters have increased as a result of mine dewatering and this has translated to higher body burden levels in small fish present in the Granny Creek system;

3. Federal guidelines of 26 ng/L for total mercury and 4 ng/L, used as a benchmark, for total and methyl mercury, are not sufficiently protective of the environment and the more stringent US EPA derived guidelines of 0.05 ng/L for methyl mercury and 0.641 ng/L for total mercury should be used for the long-term protection of fish-eating birds and mammals (e.g., Bald Eagle and otter);

4. Pumping well field water to the Attawapiskat River is increasing total mercury loadings to the river which will accelerate mercury uptake by fish in the Attawapiskat River;

5. De Beers is relying on dilution in the Attawapiskat River to reduce the effect of mercury loadings from well field water discharged to the river;

6. Increased sulphate concentration observed in the peat horizon are due to mine dewatering, causing de-saturation of the peat and the resulting oxidation of the underlying sediments and the associated release of sulphates, and not to the sources identified by AMEC.

7. Analysis of filtered mercury and methyl mercury values, as opposed to unfiltered values, is misleading;

8. Laboratory data used by De Beers are potentially biased because Dr. Brian Branfireun received part of the NSERC grant money from De Beers;

9. Comparisons with the Sudbury area indicate the sulphates and metals are being released for local peatlands following drought conditions in that environment, which could also be happening at the Victor Mine site;

10. Attawapiskat members are dependent on the quality of the water in the Attawapiskat River and the fish and wildlife that the river supports; and

11. 2013 mercury data were not available in the PTTW renewal request.

Responses to the above comments can be summarized as follows:

1. Mercury levels in Attawapiskat and Nayshkootayaow River Walleye and Northern Pike are a reflection of natural background conditions for the region, and this condition has not been altered by operations at the Victor Diamond Mine.

2. Methyl mercury concentrations have increased by a small amount in downstream Granny Creek waters, and in the small fish that live in these waters, as noted by the reviewer and as described in this report; but the increase is not a function of mine dewatering, but rather a localized effect related to higher sulphate levels deriving from areas of the mine site. De Beers is working on rectifying this problem.

3. De Beers acknowledges that the federal guideline values for the protection of aquatic life, may not be fully protective of bird and mammal species which depend on fish for the major part of their diet, and that the 0.05 ng/L methyl mercury value is more appropriate to such circumstances. The 0.05 ng/L methyl mercury value is met or approximately met in the Attawapiskat and Nayshkootayaow Rivers in both the background and present day conditions.

avoids mentioning Granny Crks… also continues to use other CCME reference throughout…

4. Pumping well field water to the Attawapiskat River does increase mercury loadings to the Attawapiskat River in the strict sense, but it should be noted that total and methyl mercury concentrations in the well field water are lower than those of the Attawapiskat River background condition, and that well field discharge to the river of approximately 85,000 m^3/d equates to approximately 0.24% of the 36,000,000 m^3/d average annual flow, such that there are not adverse water quality effects to the river.

5. Dilution of the well field discharge in the Attawapiskat River is not relevant to mercury concentrations since the well field discharge contains lesser mercury concentrations compared to the background river condition.

6. Increased sulphate concentrations observed in the peat horizon are not due to mine dewatering effects as the peat layer at virtually all cluster sampling points (e.g., MS-8 series peat horizon sampling stations) have remained saturated. The source of sulphates near to the mine site, and particularly those affecting the NEF are as

described in Section 5 of this document. De Beers is looking at methods to better control the release of sulphates to localized muskeg environments as described in Section 8.

7. Analysis is presented for both unfiltered and filtered samples for surface water samples. Only filtered data are presented for groundwater samples as per standard groundwater sampling protocols.

doesn't answer question…

8. The laboratory analysis is not biased. The University of Western Ontario ultra-trace mercury laboratory facility is a fully accredited facility. Inter-laboratory comparisons in 2013 between that laboratory, the MOE laboratory and Flett Laboratories, as reported above, verified that they produce similar results for fish tissue analyses. If anything, the UWO lab reads slightly higher than the other labs.

9. Comparisons between the Sudbury area and the Victor Diamond Mine area are inappropriate because of the long history of sulphide mining in the Sudbury area, including the long-term historic effects of smelter operations and associated sulphur dioxide and metals release in that environment.

10. The importance of the Attawapiskat River and its associated fish and wildlife populations is fully appreciated by De Beers, and De Beers continues to make every effort to protect this resource.

11. The 2013 mercury data were not available when the permit to take water renewal request was made by De Beers. The 2013 mercury data are included in this report.

Detailed comments and responses relating to the above are provided in Appendix A.

7.0 CONCLUSIONS

Peat Pore Waters

- Total and methyl mercury concentrations in peat pore waters remained considerably lower than the respective CEQG values of 26 ng/L for total mercury and 4 ng/L for methyl mercury, and there are no evident trends in the data.

- Statistical analysis of peat pore waters showed no significant differences, for total or methyl mercury, between peat complexes located near to and at mid-distances from the mine site, compared with more remote control stations, with the exception of the MS-2 peat horizon cluster where a statistically significant result was observed for 2013. There is no obvious explanation for this result, and the result is believed to be an effect of random variation in relation to the large number of statistical tests carried out over several years, as described in Section 4.1.

Surface Waters

- Total mercury concentrations measured in proximal area fen systems (NEF, SEF and HgCON) showed no evident overall trends. Data collection from the SWF was discontinued partway through 2009 so no conclusions could be drawn regarding this fen.

- Methyl mercury concentrations in the NEF, which receives (or received) various site effluents, showed elevated methyl mercury concentrations compared with the control fens (SEF and HgCON). Elevated methyl mercury concentrations in the NEF are most likely attributed to sulphate-rich effluent waters which stimulate the mercury methylation process, and are not a function of well field dewatering effects.

- Total and methyl mercury concentrations measured in area surface waters (Granny Creek, the Nayshkootayaow River and the Attawapiskat River) show mercury concentrations well below the applicable CEQG values of 26 ng/L and 4 ng/L, respectively. The Nayshkootayaow and Attawapiskat River show essentially background concentrations of total and methyl mercury both upstream and downstream of the VDM, with no evident trends to the data. North and South Granny Creek continue to show trends to elevated methyl mercury concentrations in downstream waters, compared with the Tributary 5A control site. These observed increases in methyl mercury are believed to be attributable to sulphate-rich effluent waters which stimulate the mercury methylation process, as per the above, and not a function of well field dewatering effects. Total mercury values in upstream and downstream Granny Creek waters are at background levels.

- Well field discharge total and methyl mercury concentrations are well below CEQG values, and are also generally below Attawapiskat River background values upstream of the mine discharge, and there are no evident long-term trends in the data.

Fish Mercury Body Burdens

- In general there has been an increase in total mercury body burden levels in fish over the period of the study for the majority of large-bodied and small-bodied species at both control and impact sites, and therefore is a phenomenon not reserved to mine effects.

- The increase in Northern Pike in total mercury body burden levels at the near-field impact area (ATT-NF) from 2008 to 2013; compared to a trend in the opposite direction for the same species at the control area (ATT-US) is not reflected in any other species including Walleye, another piscivorous top predator. As such, the trend for ATT-US Northern Pike does not reflect the overall trend for the fish community of similar increases in body burden level for control and impact sites between the these periods (2007/08 and 2013) This trend has been reversed to some degree between the 2010 and 2013 periods.

- Larger Northern Pike and Walleye individuals continue to show mercury concentrations within the range of advisory for women of child-bearing age and children under 15 years (start of advisory = 0.26 ppm to total restriction = 0.52 ppm) (MOE 2013), as well as the general population (start of advisory = 0.60) specifically in the Attawapiskat River both upstream (control site) and downstream of the Victor Mine. Large and long-lived Walleye individuals from each of Attawapiskat River, the Nayshkootayaow River and Monument Channel have mercury body burden concentrations which approach or exceed the total restriction level for the general population (1.84 ppm).

- Granny Creek system and Tributary 5A Pearl Dace are showing signs of increased total mercury body burden levels from 2012 to 2013 except at NGC where a marginal reduction at a standard size was observed, potentially indicating a stabilization of mercury loading in the NGC system.

- Attawapiskat River Trout-Perch at ATT-NF (near-field impact) showed a reduction or muted increase of total mercury body burden levels from previous periods to 2013 in comparison to ATT-US (control) and ATT-FF (far-field impact) which exhibited trends of increase.

- Comparative lab method study results were provided herein as requested. Overall, repeated measures results indicate that the majority of samples were analyzed as having similar (within 20%) concentrations for total mercury.

8.0 RECOMMENDATIONS

The mercury monitoring program is both extensive and robust, and it is recommended that the monitoring program continue to be carried out in its current form.

In addition, and in follow-up study results reported in Section 5, De Beers will evaluate and consider the implementation of site specific management practices to limit sulphate loadings to adjacent muskeg areas. Such plans will be provided to the MOE and to the AttFN for review not later than December 31, 2014. Plans will be implemented as soon as reasonably practicable following agreement with the MOE and the AttFN on the plans, and any related permit modifications. As a minimum the plans for sulphate management will address the following areas.

1. Discharge of water associated with the drilling of additional pit perimeter wells. Such water discharge was previously discharged to the Phase 1 mine water pond, which reports to the NEF, but is now discharged to the open pit (Section 5).

2. Runoff and seepage from the mine rock stockpile. Runoff and seepage from the mine rock stockpile currently reports mainly to the NEF.

3. Runoff and seepage from the landfill. Runoff and seepage from the landfill currently reports to the NEF.

4. Runoff and seepage from the coarse processed kimberlite stockpile (pending further investigation). Runoff and seepage from the coarse processed kimberlite stockpile currently reports to South Granny Creek by way of one or more fen tracks.

*** No mention of FPK facility upstream of NEF, also contributing to NGC?

Subject to further evaluation, it is anticipated that groundwater, runoff and seepage from the above sources will be managed in one or more of the following ways, as appropriate to the source and condition:

- Continue to direct drill water from perimeter well development to the open pit (where it seeps into the bedrock and report to collection wells for discharge to the Attawapiskat River), or pump such water to the fine processed kimberlite containment area.

- Construct perimeter ditching to capture runoff and seepage from the mine rock stockpile (and possibly the coarse kimberlite stockpile), before it contacts the muskeg environment, with such water to be pumped to the fine processed kimberlite containment facility for re-use in processing, or to be discharged to the Attawapiskat River along with well-field water.

- Cap completed portions of mine rock, and possibly coarse processed kimberlite, stockpiles with a layer of marine sediments to shed runoff from the stockpile, thus minimizing the leaching of sulphate from the piles.

- Develop internal drainage gradients and associated collection points within stockpiles, using wells, with collected water to be pumped to the fine processed kimberlite containment facility for re-use in processing, or discharged to the Attawapiskat River.

- Long-term management of drainage from mine rock stockpiles, after the closure of the mine, by directing drainage into the mine pit, which is expected to be a local drainage point into the underlying bedrock, with no discharge to surface waters.

is this in the amended Mine Closure Plan….?

9.0 REFERENCES

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TABLE 1
MUSKEG MONITORING PROGRAM - ANNUAL MERCURY RESULTS - 2007-2013
(late summer / fall sampling - Data in ng/L or parts per trillion)

amec

Cluster Location	Substrate/Condition	Well Name	GPS Code	Sample Code	Total Mercury (Filtered)								Methyl Mercury (Filtered)							
					2007	2008	2009	2010	2011 (Aug)	2011 (Sep/Nov)	2012	2013	2007	2008	2009	2010	2011 (Aug)	2011 (Sep/Nov)	2012	2013
S-1	Bedrock (Bioherm)	MS-1-BR	ES1-BR	ES1BDR	1.30	ns	0.27	Detect	Non-Detect	Detect	0.05	<0.1	Detect	ns	0.06	Detect	Non-Detect	Non-Detect	Non-Detect	<0.02
	Clay - Deep	MS-1-CL(1)	ES1-BR	ES1CLD	1.47	ns	0.18	Detect	Non-Detect	Detect	0.19	<0.1	ns	ns	0.03	Detect	Non-Detect	Non-Detect	Non-Detect	<0.02
	Clay - Shallow	MS-1-CL(2)	ES1-BR	ES1CLS	0.27	ns	0.16	Detect	Non-Detect	Detect	0.16	<0.1	Detect	ns	0.03	0.04	Detect	Non-Detect	Non-Detect	0.03
	Peat - Domed Bog	MS-1-D	ES1D	ES1D	2.22	1.93	0.40	0.79	0.37	0.79	0.72	0.28	0.02	0.07	0.10	0.06	0.08	0.10	0.03	0.10
	Peat - Flat Bog	MS-1-F	ES1F	ES1F	2.73	3.04	0.83	1.47	1.18	1.17	1.31	0.79	Detect	0.18	0.19	0.14	Non-Detect	0.10	0.06	0.10
	Peat - Horizontal Fen	MS-1-H	ES1H	ES1H	na	1.77	0.36	0.53	0.30	0.51	0.48	0.28	na	na	0.10	0.04	Detect	Detect	0.10	0.04
	Peat - Ribbed Fen	MS-1-R	ES1R	ES1R	1.81	2.27	0.49	1.24	0.91	ns	1.06	<0.1	0.02	0.07	0.06	0.06	0.05	ns	Non-Detect	0.05
S-2	Bedrock (Bioherm)	DAS-1	EDAS-1	EDAS-1	0.23	ns	0.24	0.45	Detect	ns	0.06	0.03	Non-Detect	ns	0.05	0.02	0.07	ns	Non-Detect	<0.1
		MS-2BR	ES2-BR	ES2BR	0.68	ns	ns	0.38	Detect	ns	0.21	0.17	Non-Detect	ns	ns	0.14	0.04	ns	0.03	0.07
	Clay - Deep	MS-2-CL(1)	ES2-BR	ES2CLD	ns	ns	0.36	Detect	Detect	Detect	0.18	ns	ns	ns	0.13	0.03	0.03	Detect	Non-Detect	ns
	Clay - Shallow	MS-2-CL(2)	ES2-BR	ES2CLS	0.98	ns	0.17	Detect	3.01	Detect	0.07	<0.1	Non-Detect	ns	0.04	0.02	Detect	Non-Detect	0.02	0.06
	Peat - Domed Bog	MS-2-D	ES2D	ES2D	1.98	2.15	0.51	1.25	4.69	0.74	1.02	1.21	Non-Detect	0.02	0.04	0.05	Detect	0.02	0.07	0.14
	Peat - Flat Bog	MS-2-F	ES2F	ES2F	3.12	3.05	2.35	2.74	5.79	1.18	1.53	2.48	Non-Detect	0.10	0.07	0.11	0.10	0.05	0.09	0.20
	Peat - Ribbed Fen	MS-2-R	ES2R	ES2R	1.56	2.02	0.38	1.43	4.6	0.64	0.67	0.3	Non-Detect	0.04	0.09	0.08	0.06	0.07	0.29	0.11
S-7	BR Shallow		NS7-BR	NS7BRS	1.02	ns	0.53	0.34	0.35	0.52	0.54	0.67	0.09	ns	0.05	0.05	0.05	0.12	0.03	Non-Detect
	BR Intermediate		NS7-BR	NS7BRI	1.93	ns	0.23	Detect	Detect	ns	0.23	0.53	0.04	ns	0.02	0.05	Detect	ns	Non-Detect	0.06
	BR Deep		NS7-BR	NS7BRD	2.34	ns	0.12	0.39	Detect	Detect	1.62	0.3	0.03	ns	0.03	0.03	0.03	0.03	Non-Detect	Non-Detect
	Clay - Deep	MS-7-CL(1)	NS7-CL	NS7-CLD	0.59	ns	0.25	Detect	Detect	Non-Detect	Non-Detect	0.22	Non-Detect	ns	0.02	0.05	Non-Detect	Non-Detect	Non-Detect	Non-Detect
	Clay - Intermediate		NS7-CL	NS7-CLI	0.41	ns	0.13	Detect	Detect	Non-Detect	0.25	0.19	0.02	ns	0.02	0.02	Detect	Detect	Non-Detect	Non-Detect
	Clay - Shallow	MS-7-CL(2)	NS7-CL	NS7-CLS	0.70	ns	0.10	Detect	0.96	Non-Detect	0.03	0.18	Detect	ns	0.02	Detect	0.03	Non-Detect	Non-Detect	Non-Detect
	Peat - Domed Bog	MS-7-D	NS-7D	NS-7D	0.72	1.04	0.29	0.62	0.74	0.58	0.58	0.72	Detect	Detect	0.04	0.02	0.04	0.03	0.02	Non-Detect
	Peat - Flat Bog	MS-7-F	NS-7F	NS-7F	1.23	1.61	0.27	0.85	1.09	0.95	0.86	1.32	Detect	Non-Detect	0.05	Detect	Detect	Non-Detect	Non-Detect	Non-Detect
	Peat - Horizontal Fen	MS-7-H	NS-7H	NS-7H	1.24	2.18	0.68	1.35	0.61	0.95	0.74	1.01	0.02	0.06	0.10	0.04	0.03	0.06	0.46	0.04
	Peat - Ribbed Fen	MS-7-R	NS-7R	NS-7R	0.62	0.52	0.12	0.44	0.36	ns	0.25	<0.1	Detect	Detect	0.03	0.02	Detect	ns	Non-Detect	<0.02
S-8	Bedrock (Bioherm)	MS-8-BR(1)	NS8BR1	NS8B1S	7.46	ns	1.56	7.14	1.37	ns	0.79	0.54	0.03	ns	0.03	0.13	0.04	ns	0.03	Non-Detect
	Bedrock (Bioherm)	MS-8-BR(2)	NS8BR1	NS8B1I	4.36	ns	ns	0.33	ns	ns	ns	ns	Non-Detect	ns	ns	0.05	ns	ns	ns	ns
			NS8BR1	NS8B1D	1.83	ns	ns	ns	ns	ns	ns	ns	Non-Detect	ns	ns	ns	ns	ns	ns	ns
	Clay - Deep	MS-8-CL(1)	NS8CL1	NS8C1D	0.31	ns	0.24	Detect	ns	ns	ns	ns	Detect	ns	0.02	Detect	ns	ns	ns	ns
	Clay - Middle	MS-8-CL(2)	NS8CL1	NS8C1I	ns	ns	0.26	ns	0.32	0.47	0.21	1.05	ns	ns	0.04	ns	0.10	0.06	0.02	Non-Detect
	Clay - Shallow	MS-8-CL(3)	NS8CL1	NS8C1S	0.89	ns	0.28	0.50	Detect	Detect	ns	1.13	0.03	ns	0.02	0.06	0.08	0.03	ns	0.63
	Clay - Deep	MS-8-CL(4)	NS8CL2	NS8C2D	0.14	ns	0.16	Non-Detect	Detect	ns	<0.1	1.37	Detect	ns	0.02	Non-Detect	Non-Detect	ns	Non-Detect	Non-Detect
	Clay - Middle	MS-8-CL(5)	NS8CL2	NS8C2I	0.49	ns	ns	ns	ns	ns	ns	ns	Non-Detect	ns	ns	ns	ns	ns	ns	ns
	Clay - Shallow	MS-8-CL(6)	NS8CL2	NS8C2S	0.33	ns	0.59	Detect	Detect	0.17	<0.1	0.17	0.08	ns	0.02	0.03	0.04	Detect	Non-Detect	Non-Detect
	Peat - Domed Bog	MS-8-D	NS8-1D	NS8-1D	1.13	1.49	0.38	1.66	1.2	ns	1.33	1.72	Non-Detect	Detect	0.06	0.29	0.11	ns	0.07	0.23
	Peat - Flat Bog	MS-8-F	NS8-1F	NS8-1F	1.91	2.85	1.46	2.76	4.34	3.24	3.08	3.31	Non-Detect	0.08	0.31	0.14	0.16	0.25	0.12	0.11
	Peat - Horizontal Fen	MS-8-H	NS8-1H	NS8-1H	0.56	0.55	0.18	Detect	Detect	ns	0.14	0.44	Detect	Detect	0.07	0.02	Non-Detect	ns	Non-Detect	Non-Detect
	Peat - Ribbed Fen	MS-8-R	NS8-1R	NS8-1R	1.00	0.98	0.27	1.60	1.18	ns	0.55	0.30	Non-Detect	Detect	0.09	Non-Detect	0.02	ns	Non-Detect	0.07
S-9(1)	Bedrock (Bioherm) *	MS-9(1)-BR			ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns
	Clay - Deep	MS-9(1)-CL(1)	SS9CL1	SS9C1D	0.66	ns	Detect	0.52	Detect	Detect	0.09	0.32	Detect	ns	Detect	Non-Detect	0.029	Non-Detect	0.037	0.039
	Clay - Shallow	MS-9(1)-CL(2)	SS9CL1	SS9C1S	1.03	ns	0.10	0.43	Detect	Detect	0.24	0.26	Detect	ns	0.07	0.02	0.03	Detect	Non-Detect	0.05
	Peat - Domed Bog	MS-9(1)-D	SS9-1D	SS9-1D	0.77	0.77	0.27	0.58	Detect	ns	0.59	0.52	Detect	Non-Detect	0.17	Detect	Detect	ns	0.04	Non-Detect
	Peat - Flat Bog	MS-9(1)-F	SS9-1F	SS9-1F	2.53	1.74	0.37	1.36	0.69	ns	1.08	1.27	Detect	0.04	0.05	0.05	Non-Detect	ns	0.05	Non-Detect
	Peat - Horizontal Fen	MS-9(1)-H	SS9-1H	SS9-1H	2.65	2.06	0.45	1.01	0.71	0.9	0.68	0.48	0.02	0.05	0.11	0.03	0.04	0.03	0.02	Non-Detect
	Peat - Ribbed Fen	MS-9(1)-R	SS9-1R	SS9-1R	0.72	1.26	0.22	0.47	0.42	ns	0.32	0.25	0.02	0.03	0.04	0.02	0.02	ns	Non-Detect	Non-Detect
S-9(2)	Bedrock (Bioherm) *	MS-9(2)-BR			ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns
	Clay - Deep	MS-9(2)-CL(1)	SS9CL2	SS9C2D	1.09	ns	0.30	0.38	Detect	Detect	0.03	0.25	0.01	ns	0.04	0.02	0.03	Non-Detect	Non-Detect	0.04
	Clay - Shallow	MS-9(2)-CL(2)	SS9CL2	SS9C2S	0.44	ns	0.13	Detect	Non-Detect	Non-Detect	0.51	0.17	Non-Detect	ns	0.02	Detect	Detect	Detect	Non-Detect	0.04
	Peat - Domed Bog	MS-9(2)-D	SS9-2D	SS9-2D	1.72	1.89	0.42	1.04	0.93	ns	0.63	1.38	Detect	0.02	0.02	Detect	Detect	ns	Non-Detect	Non-Detect
	Peat - Flat Bog	MS-9(2)-F	SS9-2F	SS9-2F	1.10	1.27	0.57	1.21	0.98	ns	1.25	1.02	Non-Detect	0.06	0.12	0.03	0.05	ns	0.04	Non-Detect
	Peat - Horizontal Fen	MS-9(2)-H	SS9-2H	SS9-2H	0.80	0.59	0.30	Detect	Detect	ns	0.11	1.37	Non-Detect	Detect	0.08	0.02	Non-Detect	ns	Non-Detect	0.06
	Peat - Ribbed Fen	MS-9(2)-R	SS9-2R	SS9-2R	1.29	0.90	0.33	0.72	5.16	Detect	0.34	<0.1	Non-Detect	0.06	0.17	0.05	0.18	0.03	0.06	0.02
S-13	Bedrock (Bioherm)	MS-13-BR	WS13BR	WS13BS	2.57	ns	0.72	0.87	ns	ns	0.56	0.92	Non-Detect	ns	Detect	Non-Detect	ns	ns	Non-Detect	0.060
			WS13BR	WS13BD	1.19	ns	ns	ns	ns	ns	ns	ns	Non-Detect	ns	ns	ns	ns	ns	ns	ns
	Clay - Deep	MS-13-CL(1)	WS13CL	WS13CD	0.42	ns	0.09	Detect	Non-Detect	Det/Non	ns	ns	0.03	ns	0.02	0.02	Detect	Det/Non	ns	ns
			WS13CL	WS13CI	1.48	ns	0.18	ns	Detect	Detect	ns	ns	0.04	ns	0.04	ns	Detect	Non-Detect	ns	ns
	Clay - Shallow	MS-13-CL(2)	WS13CL	WS13CS	0.50	ns	Detect	0.36	Detect	ns	ns	ns	0.02	ns	ns	Detect	Non-Detect	ns	ns	ns
	Peat - Domed Bog	MS-13-D	WS13-D	WS13-D	2.81	2.68	1.26	1.45	7.02	1.65	1.23	1.25	0.03	0.12	0.24	0.11	0.08	0.16	0.06	0.06
	Peat - Flat Bog	MS-13-F	WS13-F	WS13-F	1.60	2.79	0.92	1.30	1.83	ns	1.22	1.23	0.07	0.24	0.45	0.15	0.19	ns	0.28	0.18
	Peat - Horizontal Fen	MS-13-H	WS13-H	WS13-H	ns	0.57	0.35	0.42	0.31	ns	<0.1	0.11	0.02	Detect	0.29	Detect	0.02	ns	Non-Detect	0.04
	Peat - Ribbed Fen	MS-13-R	WS13-R	WS13-R	0.40	0.95	0.25	Detect	Detect	ns	0.13	<0.1	0.13	Non-Detect	0.05	Detect	0.03	ns	Non-Detect	0.03
S-15	Bedrock (Bioherm)	MS-15-BR	WS15BR	WS15BS	2.00	ns	2.34	2.74	2.46	ns	2.02	0.88	Detect	ns	0.37	0.03	0.03	ns	Non-Detect	0.61
			WS15BR	WS15BD	0.58	ns	ns	ns	ns	ns	ns	ns	Detect	ns	ns	ns	ns	ns	ns	ns
	Clay - Deep	MS-15-CL(1)	WS15CL	WS15CD	is	ns	ns	0.59	ns	ns	ns	ns	Detect	ns	ns	0.04	ns	ns	ns	ns
			WS15CL	WS15CI	1.70	ns	ns	ns	ns	ns	ns	ns	Non-Detect	ns	ns	ns	ns	ns	ns	ns
	Clay - Shallow	MS-15-CL(2)	WS15CL	WS15CS	0.69	ns	0.07	Detect	0.33	Detect	ns	ns	Detect	ns	Detect	Detect	Non-Detect	0.037	ns	ns
	Peat - Domed Bog	MS-15-D	WS15-D	WS15-D	1.35	1.89	0.93	Detect	0.34	ns	0.17	0.23	Detect	0.04	0.78	0.02	0.05	ns	Non-Detect	0.13
	Peat - Flat Bog	MS-15-F	WS15-F	WS15-F	2.66	2.55	0.30	0.35	1.92	ns	<0.1	0.63	Non-Detect	0.07	0.17	Non-Detect	0.16	ns	Non-Detect	0.04
	Peat - Horizontal Fen	MS-15-H	WS15-H	WS15-H	0.99	0.90	0.22	Detect	Detect	ns	0.10	0.13	ns	Detect	0.10	Detect	0.02	ns	Non-Detect	<0.02
	Peat - Ribbed Fen	MS-15-R	WS15-R	WS15-R	0.43	0.92	0.15	Detect	Detect	ns	<0.1	0.2	0.02	0.02	Non-Detect	0.02	Detect	ns	Non-Detect	0.03
S-V1	Peat - Domed Bog	MS-V(1)-D	-	NS-V-1D	1.96	0.60	0.18	0.53	0.49	ns	0.14	0.17	ns	Detect	0.02	0.02	0.03	ns	Non-Detect	<0.02
	Peat - Ribbed Fen	MS-V(1)-R	-	NS-V-1R	see MS-2-R	see MS-2-R	see MS-2-R	see MS-2-R	see MS-2-R	see MS-2-R	see MS-2-R	see MS-2-R	see MS-2-R	see MS-2-R	see MS-2-R	see MS-2-R	see MS-2-R	see MS-2-R	see MS-2-R	see MS-2-R
S-V2	Peat - Domed Bog	MS-V(2)-D	-	SS-V-2D	1.97	1.16	0.24	0.45	0.52	ns	1.19	0.55	ns	Detect	0.02	0.05	0.07	ns	0.03	0.05
	Peat - Ribbed Fen	MS-V(2)-R	-	SS-V(2)-R	0.59	0.60	0.13	0.85	Detect	ns	0.33	0.61	ns	Non-Detect	0.03	0.04	Detect	ns	Non-Detect	Non-Detect
S-V3	Peat - Domed Bog	MS-V(3)-D	-	SS-V-3D	0.72	0.61	0.49	0.60	5.20	1.17	0.47	0.64	ns	0.10	0.03	Detect	0.07	0.03	Non-Detect	Non-Detect
	Peat - Ribbed Fen	MS-V(3)-R	-	SS-V(3)-R	1.08	1.69	0.47	0.76	0.89	0.9	0.64	0.76	ns	0.02	0.04	0.02	Detect	0.03	Non-Detect	0.05

Notes
na: not accessible
is: insufficient sample
ns: no sample
*: bedrock samples for stations S-9(1) and S-9(2) are collected at the overburden/ bedrock inteface and are reported as deep clay samples

for 2009-2011: Non-Detect = <0.0054 ng/L
Detect = >0.0054 but ≤0.0169 ng/L

for 2012-2013: Non-detect = <0.01 ng/L for total mercury
Non-detect = <0.02 ng/L for methyl mercury

Near-field sites: S-2; S-8; S-V1; S-V2; S-V3
Mid-field sites: S-1; S-7; S-9(1); S-9(2)
Far-field sites: S-13; S-15

TABLE 2
MUSKEG MONITORING PROGRAM - ANNUAL MERCURY RESULTS (PEAT HORIZON VALUES) - 2007-2013
(late summer / fall sampling - Data in ng/L or parts per trillion)

Cluster Location	Substrate/Condition	Total Mercury (Filtered)							Methyl Mercury (Filtered)						
		2007	2008	2009	2010	2011	2012	2013	2007	2008	2009	2010	2011	2012	2013
S-1	Peat - Domed Bog	2.22	1.93	0.40	0.79	0.37	0.72	0.28	0.02	0.07	0.10	0.06	0.08	0.03	0.10
	Peat - Flat Bog	2.73	3.04	0.83	1.47	1.18	1.31	0.79	Detect	0.18	0.19	0.14	Non-Detect	0.06	0.10
	Peat - Horizontal Fen	na	1.77	0.36	0.53	0.30	0.48	0.28	na	na	0.10	0.04	Detect	0.10	0.04
	Peat - Ribbed Fen	1.81	2.27	0.49	1.24	0.91	1.06	<0.1	0.02	0.07	0.06	0.06	0.05	Non-Detect	0.05
S-2	Peat - Domed Bog	1.98	2.15	0.51	1.25	4.69	1.02	1.21	Non-Detect	0.02	0.04	0.05	Detect	0.07	0.14
	Peat - Flat Bog	3.12	3.05	2.35	2.74	5.79	1.53	2.48	Non-Detect	0.10	0.07	0.11	0.10	0.09	0.20
	Peat - Ribbed Fen	1.56	2.02	0.38	1.43	4.6	0.67	0.3	Non-Detect	0.04	0.09	0.08	0.06	0.29	0.11
S-7	Peat - Domed Bog	0.72	1.04	0.29	0.62	0.74	0.58	0.72	Detect	Detect	0.04	0.02	0.04	0.02	Non-Detect
	Peat - Flat Bog	1.23	1.61	0.27	0.85	1.09	0.86	1.32	Detect	Non-Detect	0.05	Detect	Detect	Non-Detect	Non-Detect
	Peat - Horizontal Fen	1.24	2.18	0.68	1.35	0.61	0.74	1.01	0.02	0.06	0.10	0.04	0.03	0.46	0.04
	Peat - Ribbed Fen	0.62	0.52	0.12	0.44	0.36	0.25	<0.1	Detect	Detect	0.03	0.02	Detect	Non-Detect	<0.02
S-8	Peat - Domed Bog	1.13	1.49	0.38	1.66	1.2	1.33	1.72	Non-Detect	Detect	0.06	0.29	0.11	0.07	0.23
	Peat - Flat Bog	1.91	2.85	1.46	2.76	4.34	3.08	3.31	Non-Detect	0.08	0.31	0.14	0.16	0.12	0.11
	Peat - Horizontal Fen	0.56	0.55	0.18	Detect	Detect	0.14	0.44	Detect	Detect	0.07	0.02	Non-Detect	Non-Detect	Non-Detect
	Peat - Ribbed Fen	1.00	0.98	0.27	1.60	1.18	0.55	0.30	Non-Detect	Detect	0.09	Non-Detect	0.02	Non-Detect	0.07
S-9(1)	Peat - Domed Bog	0.77	0.77	0.27	0.58	Detect	0.59	0.52	Detect	Non-Detect	0.17	Detect	Detect	0.04	Non-Detect
	Peat - Flat Bog	2.53	1.74	0.37	1.36	0.69	1.08	1.27	Detect	0.04	0.05	0.05	Non-Detect	0.05	Non-Detect
	Peat - Horizontal Fen	2.65	2.06	0.45	1.01	0.71	0.68	0.48	0.02	0.05	0.11	0.03	0.04	0.02	Non-Detect
	Peat - Ribbed Fen	0.72	1.26	0.22	0.47	0.42	0.32	0.25	0.02	0.03	0.04	0.02	0.02	Non-Detect	Non-Detect
S-9(2)	Peat - Domed Bog	1.72	1.89	0.42	1.04	0.93	0.63	1.38	Detect	0.02	0.02	Detect	Detect	Non-Detect	Non-Detect
	Peat - Flat Bog	1.10	1.27	0.57	1.21	0.98	1.25	1.02	Non-Detect	0.06	0.12	0.03	0.05	0.04	Non-Detect
	Peat - Horizontal Fen	0.80	0.59	0.30	Detect	Detect	0.11	1.37	Non-Detect	Detect	0.08	0.02	Non-Detect	Non-Detect	0.06
	Peat - Ribbed Fen	1.29	0.90	0.33	0.72	5.16	0.34	<0.1	Non-Detect	0.06	0.17	0.05	0.18	0.06	0.02
S-13	Peat - Domed Bog	2.81	2.68	1.26	1.45	7.02	1.23	1.25	0.03	0.12	0.24	0.11	0.08	0.06	0.06
	Peat - Flat Bog	1.60	2.79	0.92	1.30	1.83	1.22	1.23	0.07	0.24	0.45	0.15	0.19	0.28	0.18
	Peat - Horizontal Fen	ns	0.57	0.35	0.42	0.31	<0.1	0.11	0.02	Detect	0.29	Detect	0.02	Non-Detect	0.04
	Peat - Ribbed Fen	0.40	0.95	0.25	Detect	Detect	0.13	<0.1	0.13	Non-Detect	0.05	Detect	0.03	Non-Detect	0.03
S-15	Peat - Domed Bog	1.35	1.89	0.93	Detect	0.34	0.17	0.23	Detect	0.04	0.78	0.02	0.05	Non-Detect	0.13
	Peat - Flat Bog	2.66	2.55	0.30	0.35	1.92	<0.1	0.63	Non-Detect	0.07	0.17	Non-Detect	0.16	Non-Detect	0.04
	Peat - Horizontal Fen	0.99	0.90	0.22	Detect	Detect	0.10	0.13	ns	Detect	0.10	Detect	0.02	Non-Detect	<0.02
	Peat - Ribbed Fen	0.43	0.92	0.15	Detect	Detect	<0.1	0.2	0.02	0.02	Non-Detect	0.02	Detect	Non-Detect	0.03
S-V1	Peat - Domed Bog	1.96	0.60	0.18	0.53	0.49	0.14	0.17	ns	Detect	0.02	0.02	0.03	Non-Detect	<0.02
	Peat - Ribbed Fen	see MS-2-R	see MS-2-R	see MS-2-R	see MS-2-R	see MS-2-R	see MS-2-R	see MS-2-R	see MS-2-R	see MS-2-R	see MS-2-R	see MS-2-R	see MS-2-R	see MS-2-R	see MS-2-R
S-V2	Peat - Domed Bog	1.97	1.16	0.24	0.45	0.52	1.19	0.55	ns	Detect	0.02	0.05	0.07	0.03	0.05
	Peat - Ribbed Fen	0.59	0.60	0.13	0.85	Detect	0.33	0.61	ns	Non-Detect	0.03	0.04	Detect	Non-Detect	Non-Detect
S-V3	Peat - Domed Bog	0.72	0.61	0.49	0.60	5.20	0.47	0.64	ns	0.10	0.03	Detect	0.07	Non-Detect	Non-Detect
	Peat - Ribbed Fen	1.08	1.69	0.47	0.76	0.89	0.64	0.76	ns	0.02	0.04	0.02	0.03	Non-Detect	0.05

Notes
na: not accessible
is: insufficient sample
ns: no sample
Non-Detect: <0.0054 ng/L
Detect: >0.0054 but <0.0169 ng/L

TABLE 2a
MUSKEG PORE WATER - DOMED BOG 2007-2013 (Filtered)
(concentrations in ng/L)

Cluster Location	Total Mercury							Methyl Mercury						
	2007	2008	2009	2010	2011	2012	2013	2007	2008	2009	2010	2011	2012	2013
S-1	2.22	1.93	0.40	0.79	0.37	0.72	0.28	0.02	0.07	0.10	0.06	0.08	0.03	0.10
S-2	1.98	2.15	0.51	1.25	4.69	1.02	1.21	<0.01	0.02	0.04	0.05	0.01	0.07	0.14
S-7	0.72	1.04	0.29	0.62	0.74	0.58	0.72	0.01	0.01	0.04	0.02	0.04	0.02	<0.01
S-8	1.13	1.49	0.38	1.66	1.2	1.33	1.72	<0.01	0.01	0.06	0.29	0.11	0.07	0.23
S-9(1)	0.77	0.77	0.27	0.58	0.01	0.59	0.52	0.01	<0.01	0.17	0.01	0.01	0.04	<0.01
S-9(2)	1.72	1.89	0.42	1.04	0.93	0.63	1.38	0.01	0.02	0.02	0.01	0.01	<0.01	<0.01
S-13	2.81	2.68	1.26	1.45	7.02	1.23	1.25	0.03	0.12	0.24	0.11	0.08	0.06	0.06
S-15	1.35	1.89	0.93	0.01	0.34	0.17	0.23	0.01	0.04	0.78	0.02	0.05	<0.01	0.13
S-V1	1.96	0.6	0.18	0.53	0.49	0.14	0.17		0.01	0.02	0.02	0.03	<0.01	<0.02
S-V2	1.97	1.16	0.24	0.45	0.52	1.19	0.55		0.01	0.02	0.05	0.07	0.03	0.05
S-V3	0.72	0.61	0.49	0.60	5.20	0.47	0.64		0.10	0.03	0.01	0.07	<0.01	<0.01

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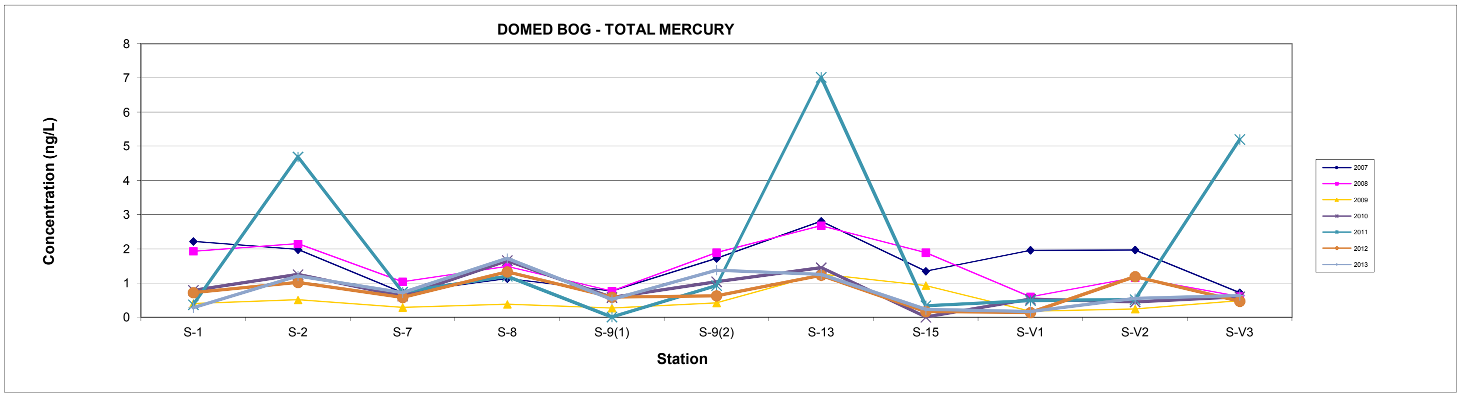
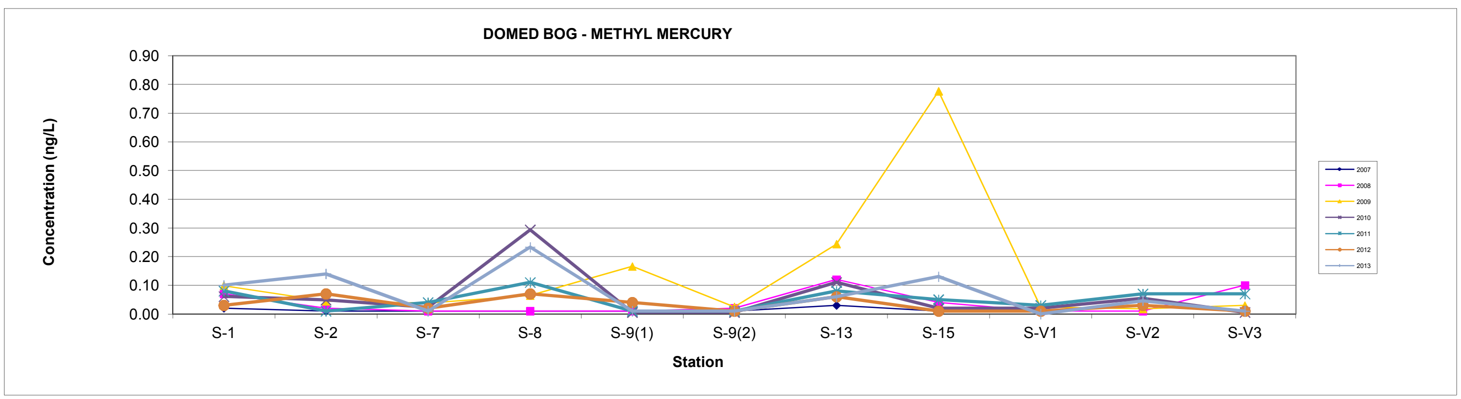
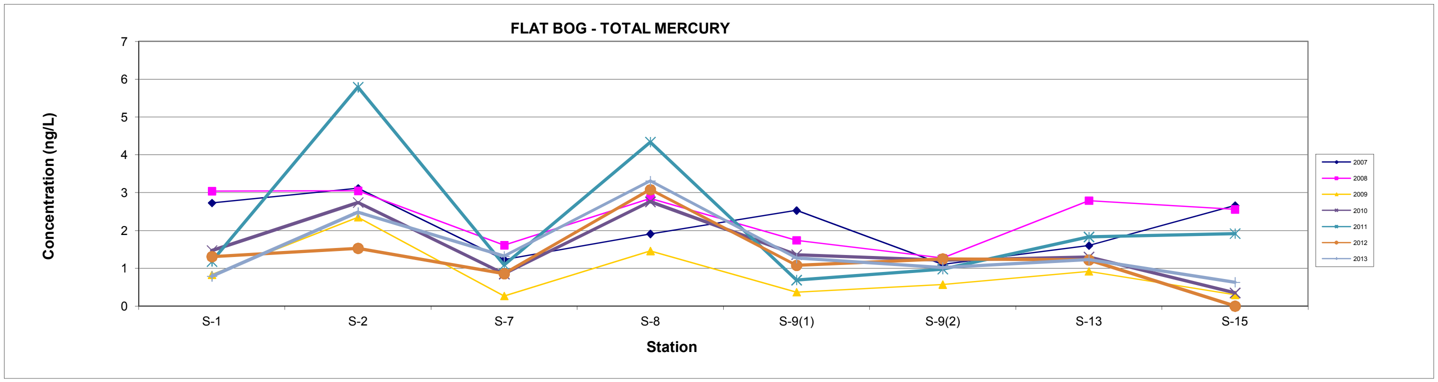


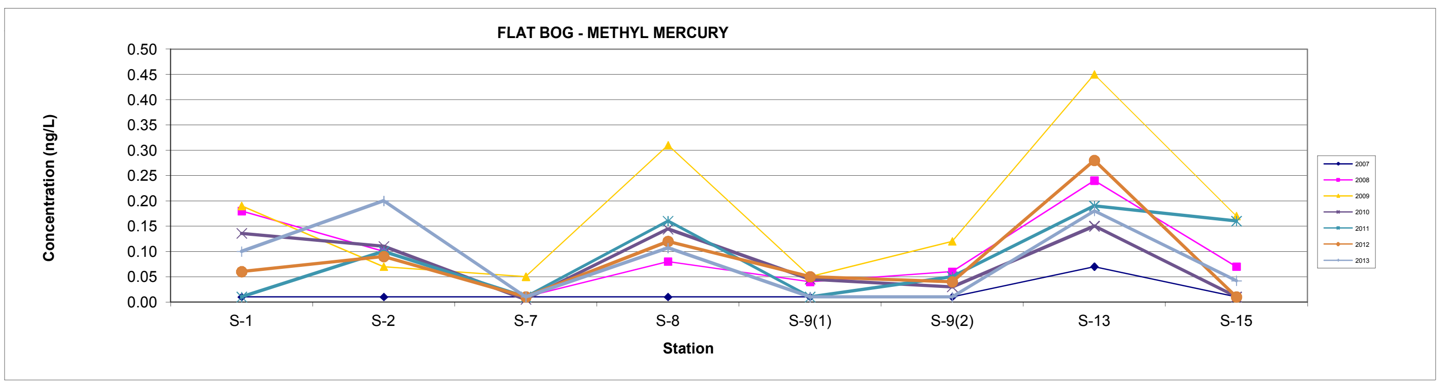


Non-detect - <0.01
No sample - blank

TABLE 2b
MUSKEG PORE WATER - FLAT BOG 2007-2013 (Filtered)
(concentrations in ng/L)

Cluster Location	Total Mercury							Methyl Mercury						
	2007	2008	2009	2010	2011	2012	2013	2007	2008	2009	2010	2011	2012	2013
S-1	2.73	3.04	0.83	1.47	1.18	1.31	0.79	0.01	0.18	0.19	0.14	<0.01	0.06	0.10
S-2	3.12	3.05	2.35	2.74	5.79	1.53	2.48	<0.01	0.10	0.07	0.11	0.10	0.09	0.20
S-7	1.23	1.61	0.27	0.85	1.09	0.86	1.32	0.01	<0.01	0.05	0.01	0.01	<0.01	<0.01
S-8	1.91	2.85	1.46	2.76	4.34	3.08	3.31	<0.01	0.08	0.31	0.14	0.16	0.12	0.11
S-9(1)	2.53	1.74	0.37	1.36	0.69	1.08	1.27	0.01	0.04	0.05	0.05	<0.01	0.05	<0.01
S-9(2)	1.10	1.27	0.57	1.21	0.98	1.25	1.02	<0.01	0.06	0.12	0.03	0.05	0.04	<0.01
S-13	1.60	2.79	0.92	1.30	1.83	1.22	1.23	0.07	0.24	0.45	0.15	0.19	0.28	0.18
S-15	2.66	2.56	0.30	0.35	1.92	<0.1	0.63	<0.01	0.07	0.17	<0.01	0.16	<0.01	0.04





Non-detect - <0.01

TABLE 2c
MUSKEG PORE WATER - HORIZONTAL FEN 2007-2013 (Filtered)
(concentrations in ng/L)

Cluster Location	Total Mercury							Methyl Mercury						
	2007	2008	2009	2010	2011	2012	2013	2007	2008	2009	2010	2011	2012	2013
S-1		1.77	0.36	0.53	0.3	0.48	0.28			0.10	0.04	0.01	0.10	0.04
S-2														
S-7	1.24	2.18	0.68	1.35	0.61	0.74	1.01	0.02	0.06	0.10	0.04	0.03	0.46	0.04
S-8	0.56	0.55	0.18	0.01	0.01	0.14	0.44	0.01	0.01	0.07	0.02	<0.01	<0.01	<0.01
S-9(1)	2.65	2.06	0.45	1.01	0.71	0.68	0.48	0.02	0.05	0.11	0.03	0.04	0.02	<0.01
S-9(2)	0.80	0.59	0.30	0.01	0.01	0.11	1.37	<0.01	0.01	0.08	0.02	<0.01	<0.01	0.06
S-13		0.57	0.35	0.42	0.31	<0.1	0.11	0.02	0.01	0.29	0.01	0.02	<0.01	0.04
S-15	0.99	0.90	0.22	0.01	0.01	0.10	0.13		0.01	0.10	0.01	0.02	<0.01	<0.02

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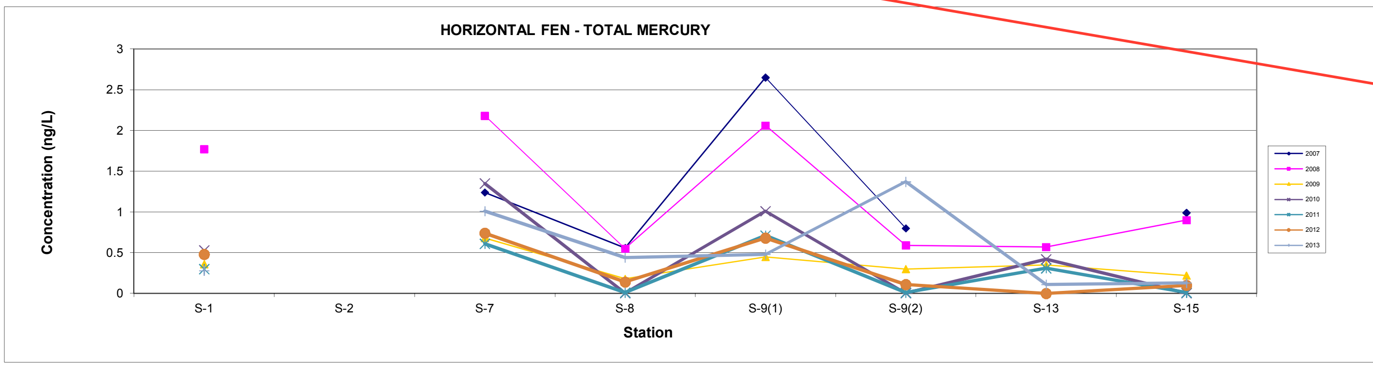
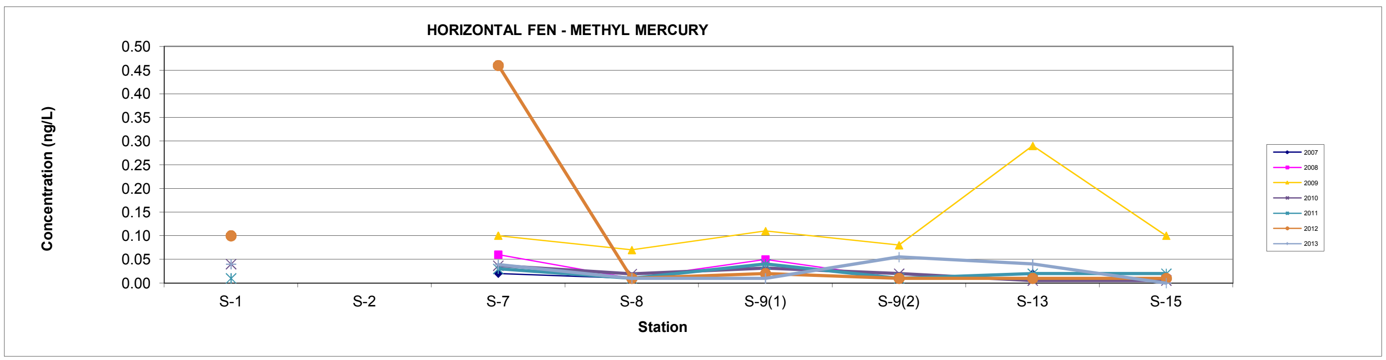
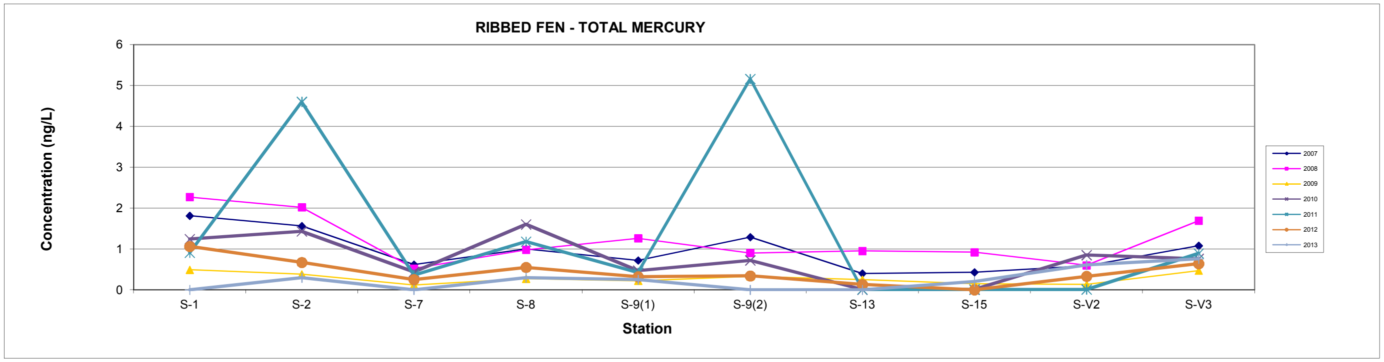




Non-detect - <0.01

TABLE 2d
MUSKEG PORE WATER - RIBBED FEN 2007-2013 (Filtered)
(concentrations in ng/L)

Cluster Location	Total Mercury							Methyl Mercury						
	2007	2008	2009	2010	2011	2012	2013	2007	2008	2009	2010	2011	2012	2013
S-1	1.81	2.27	0.49	1.24	0.91	1.06	<0.1	0.02	0.07	0.06	0.06	0.05	<0.01	0.05
S-2	1.56	2.02	0.38	1.43	4.6	0.67	0.3	<0.01	0.04	0.09	0.08	0.06	0.29	0.11
S-7	0.62	0.52	0.12	0.44	0.36	0.25	<0.1	0.01	0.01	0.03	0.02	0.01	<0.01	<0.02
S-8	1.00	0.98	0.27	1.60	1.18	0.55	0.30	<0.01	0.01	0.09	<0.01	0.02	<0.01	0.07
S-9(1)	0.72	1.26	0.22	0.47	0.42	0.32	0.25	0.02	0.03	0.04	0.02	0.02	<0.01	<0.01
S-9(2)	1.29	0.90	0.33	0.72	5.16	0.34	<0.1	<0.01	0.06	0.17	0.05	0.18	0.06	0.02
S-13	0.40	0.95	0.25	0.01	0.01	0.13	<0.1	0.13	<0.01	0.05	0.01	0.03	<0.01	0.03
S-15	0.43	0.92	0.15	0.01	0.01	<0.1	0.20	0.02	0.02	<0.01	0.02	0.01	<0.01	0.03
S-V2	0.59	0.60	0.13	0.85	0.01	0.33	0.61		<0.01	0.03	0.04	0.01	<0.01	<0.01
S-V3	1.08	1.69	0.47	0.76	0.89	0.64	0.76		0.02	0.04	0.02	0.01	<0.01	0.05



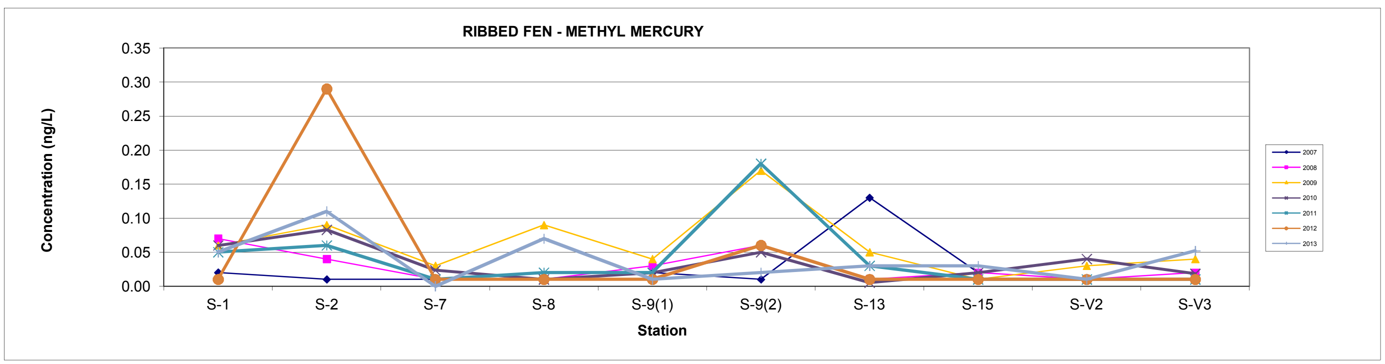
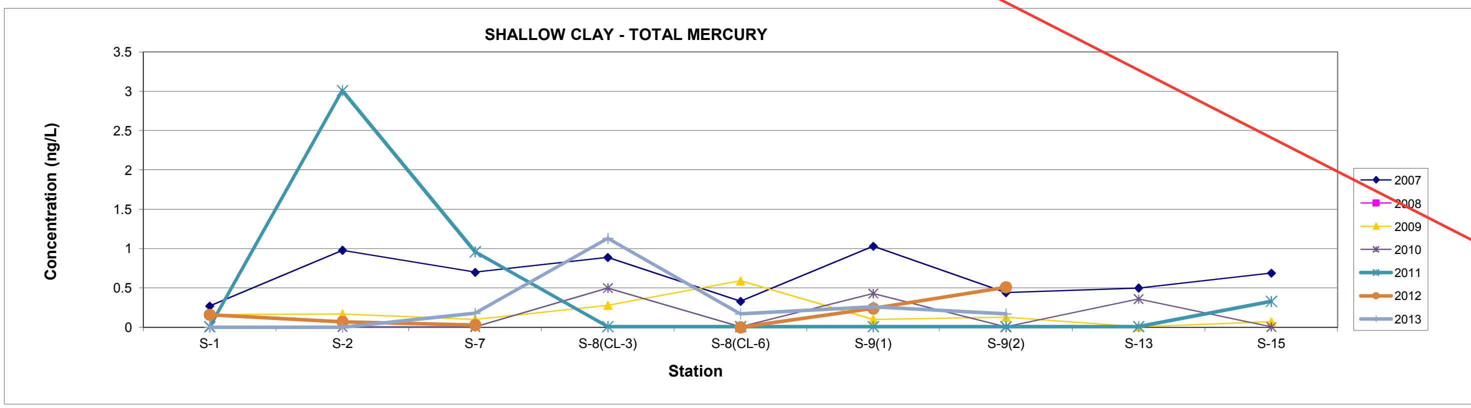


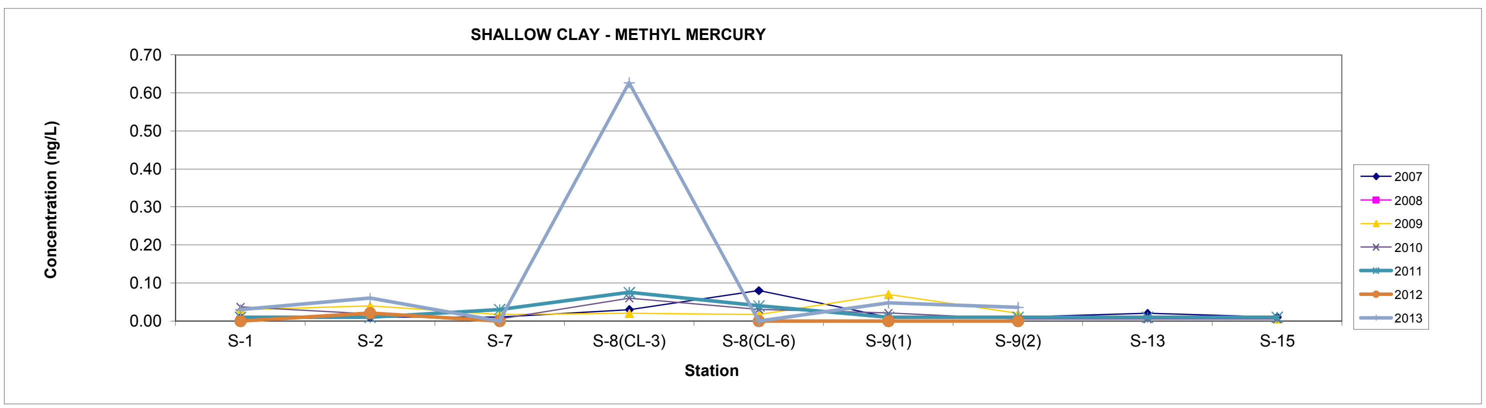
TABLE 2e
MINERAL HORIZON PORE WATER - SHALLOW CLAY 2007-2013 (Filtered)
(concentrations in ng/L)

Cluster Location	Total Mercury							Methyl Mercury						
	2007	2008	2009	2010	2011	2012	2013	2007	2008	2009	2010	2011	2012	2013
S-1	0.27		0.16	0.01	<0.01	0.16	<0.1	0.01		0.03	0.04	0.01	<0.01	0.03
S-2	0.98		0.17	0.01	3.01	0.07	<0.1	<0.01		0.04	0.02	0.01	0.021	0.06
S-7	0.70		0.10	0.01	0.96	0.03	0.18	0.01		0.02	0.01	0.03	<0.01	<0.01
S-8(CL-3)	0.89		0.28	0.50	0.01		1.13	0.03		0.02	0.06	0.08		0.63
S-8(CL-6)	0.33		0.59	0.01	0.01	<0.1	0.17	0.08		0.02	0.03	0.04	<0.01	<0.01
S-9(1)	1.03		0.10	0.43	0.01	0.24	0.26	0.01		0.07	0.02	0.01	<0.01	0.05
S-9(2)	0.44		0.13	0.01	<0.01	0.51	0.17	<0.01		0.02	0.01	0.01	<0.01	0.04
S-13	0.50		0.01	0.36	0.01			0.02			0.01	<0.01		
S-15	0.69		0.07	0.01	0.33			0.01		0.01	0.01	<0.01		



S-8: Cluster around research transect

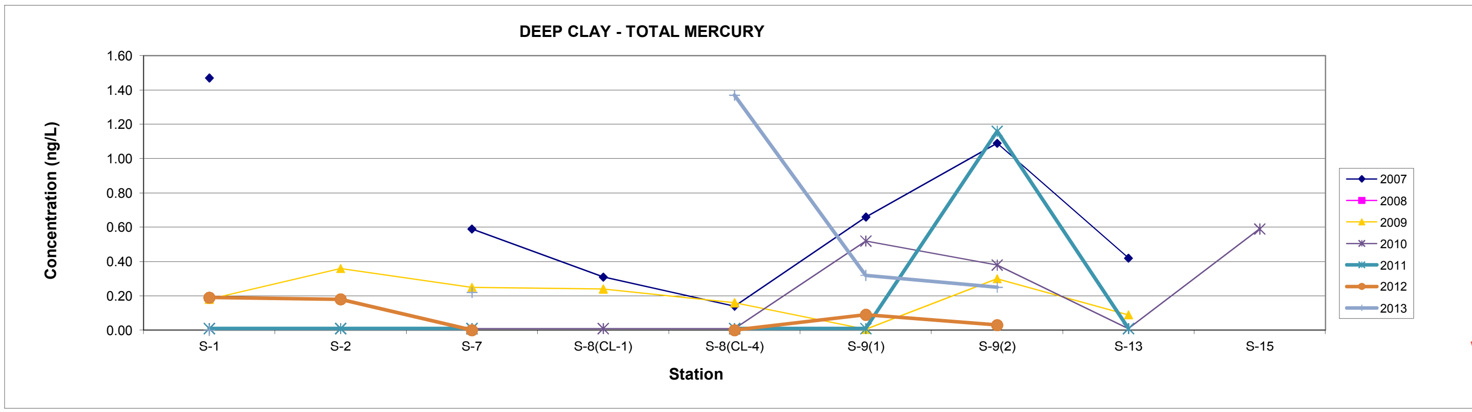
data gaps?



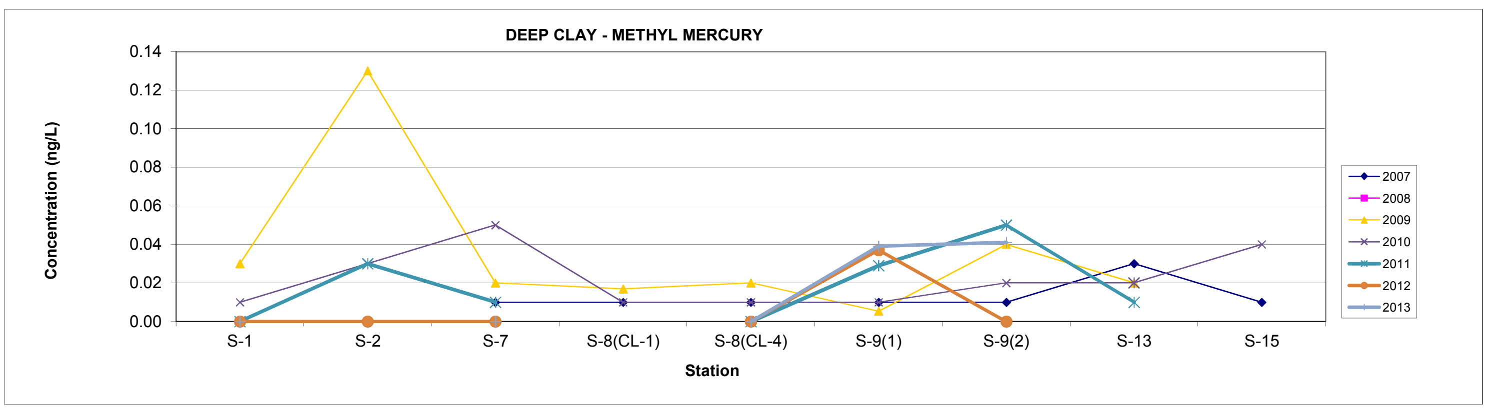
Non-detect - <0.01
No sample - blank

TABLE 2f
MINERAL HORIZON PORE WATER - DEEP CLAY 2007-2013 (Filtered)
(concentrations in ng/L)

Cluster Location	Total Mercury							Methyl Mercury						
	2007	2008	2009	2010	2011	2012	2013	2007	2008	2009	2010	2011	2012	2013
S-1	1.47		0.18	0.01	<0.01	0.19	<0.1			0.03	0.01	<0.01	<0.01	<0.02
S-2			0.36	0.01	0.01	0.18				0.13	0.03	0.03	<0.01	
S-7	0.59		0.25	0.01	0.01	<0.01	0.22	<0.01		0.02	0.05	<0.01	<0.01	<0.01
S-8(CL-1)	0.31		0.24	0.01				0.01		0.02	0.01			
S-8(CL-4)	0.14		0.16	0.01	0.01	<0.1	1.37	0.01		0.02	0.01	<0.01	<0.01	<0.01
S-9(1)	0.66		0.01	0.52	0.01	0.09	0.32	0.01		0.01	0.01	0.03	0.037	0.04
S-9(2)	1.09		0.30	0.38	1.16	0.03	0.25	0.01		0.04	0.02	0.05	<0.01	0.04
S-13	0.42		0.09	0.01	<0.01			0.03		0.02	0.02	0.01		
S-15				0.59				0.01			0.04			



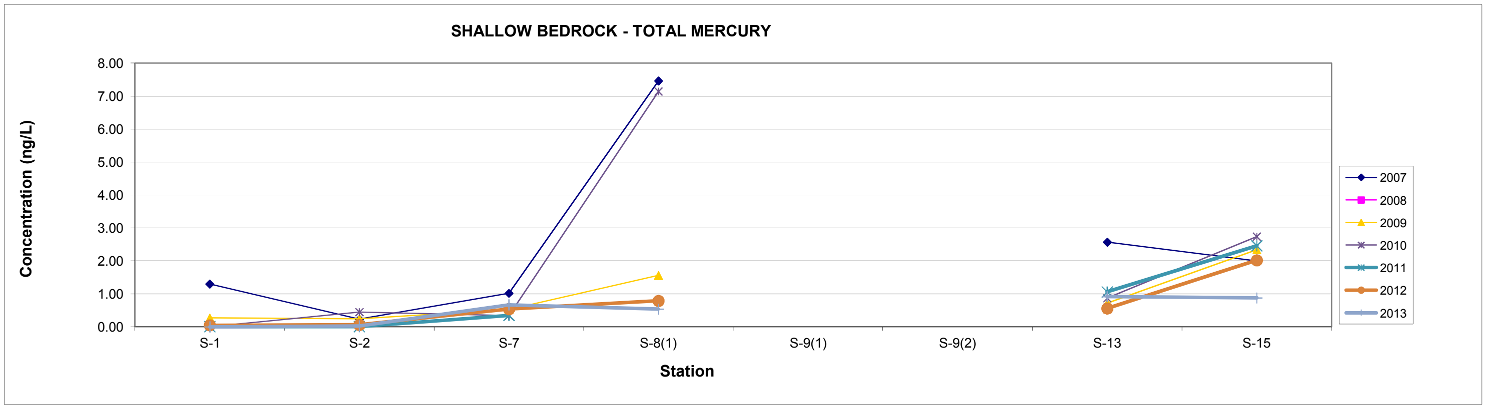
why extra decimal accuracy for this one sample?



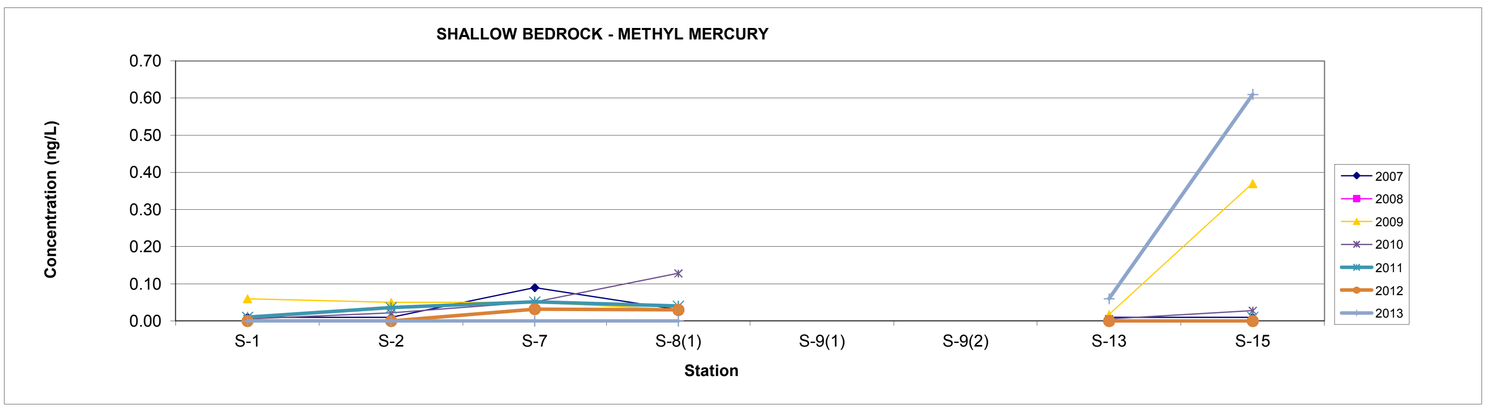
Non-detect - <0.01
No sample - blank

TABLE 2g
MINERAL HORIZON PORE WATER - SHALLOW BEDROCK 2007-2013 (Filtered)
(concentrations in ng/L)

Cluster Location	Total Mercury							Methyl Mercury						
	2007	2008	2009	2010	2011	2012	2013	2007	2008	2009	2010	2011	2012	2013
S-1	1.30		0.27	0.01	<0.01	0.05	<0.1	0.01		0.06	0.01	<0.01	<0.01	<0.02
S-2	0.23		0.24	0.45	0.01	0.06	<0.03	<0.01		0.05	0.02	0.04	<0.01	<0.1
S-7	1.02		0.53	0.34	0.35	0.54	0.67	0.09		0.05	0.05	0.05	0.03	<0.01
S-8(1)	7.46		1.56	7.14		0.79	0.54	0.03		0.03	0.13	0.04	0.03	<0.01
S-9(1)														
S-9(2)														
S-13	2.57		0.72	0.87	1.06	0.56	0.92	<0.01		0.02	<0.01		<0.01	0.06
S-15	2.00		2.34	2.74	2.46	2.02	0.88	0.01		0.37	0.03	0.01	<0.01	0.61



S-15 is far field (US off of Nash R)



Non-detect - <0.01
No sample - blank

amec

TABLE 3
TOTAL MERCURY - FENS (Unfiltered)
(concentrations in ng/L)

Date	Southwest Fen (SWF/F)	Northeast Fen (NEF/F)	Southeast Fen (SEF/F)	Northwest Control (HgCON)
May-06	0.77	0.62		
Jun-06	2.44	1.72		
Jul-06	2.49	1.26	2.51	2.64
Aug-06	1.86	0.83		
Sep-06	1.29	1.25		
Oct-06	1.59	0.53	1.09	1.70
Dec-06	4.65	1.08		
Jan-07	3.01	0.86	1.51	2.77
Feb-07	2.84	0.99		
Mar-07	F	3.14		
Apr-07	F	2.34		
May-07	2.07	1.31	1.43	1.25
Jun-07	1.96	1.21		
Jul-07	2.40	0.87	1.57	2.87
Aug-07	3.85	1.30		
Sep-07	2.28	1.32		
Oct-07	3.74	1.12	3.57	4.51
Nov-07	2.86	0.68		
Dec-07	3.42	1.41		
Jan-08	6.55	3.33	13.30	4.36
Feb-08	5.70	3.52		
Mar-08	9.79	4.64		
Apr-08	16.30	5.67	F	2.80
May-08	1.78	1.33		
Jun-08	2.37	1.11		
Jul-08	3.19	1.54	2.42	3.47
Aug-08	2.98	2.51		
Sep-08	2.76	2.22		
Oct-08	1.84	1.02	1.44	1.60
Nov-08	1.80	0.76		
Dec-08	2.19	0.92		
Jan-09	F	3.43	1.83	2.66
Feb-09	8.61	5.14		
Mar-09				
Apr-09	4.89	7.35		
May-09	1.44	2.92	2.60	2.91
Jun-09	Revoked	1.25		
Jul-09	Revoked	1.46	2.12	2.97
Aug-09	Revoked	1.11		
Sep-09	Revoked	1.42		
Oct-09	Revoked	1.41	0.94	1.15
Nov-09	Revoked	0.38		
Dec-09	Revoked	0.19		
Jan-10	Revoked	3.21	3.16	2.93
Feb-10	Revoked			
Mar-10	Revoked			
Apr-10	Revoked	1.03	0.55	
May-10	Revoked	0.70		1.20
Jun-10	Revoked	0.74		
Jul-10	Revoked	1.34	1.21	1.21
Aug-10	Revoked	1.76		
Sep-10	Revoked	1.15		
Oct-10	Revoked	0.78	1.29	1.86
Nov-10	Revoked	0.56		
Dec-10	Revoked	0.98		
Jan-11	Revoked	1.26	1.61	1.87
Feb-11	Revoked	F		
Mar-11	Revoked	F		
Apr-11	Revoked	2.81	3.74	2.05
May-11	Revoked	1.23		
Jun-11	Revoked	1.05		
Jul-11	Revoked	3.18	1.41	1.99
Aug-11	Revoked	3.29		
Sep-11**	Revoked			
Oct-11	Revoked	1.68	2.78	3.97
Nov-11	Revoked	1.23		
Dec-11	Revoked	1.17		
Jan-12	Revoked	5.31	7.75	5.49
Feb-12	Revoked			
Mar-12	Revoked	1.88		
Apr-12	Revoked	2.06	3.32	0.72
May-12	Revoked	0.68		
Jun-12	Revoked	1.16		
Jul-12	Revoked	3.59	1.36	1.90
Aug-12	Revoked	4.93		
Sep-12	Revoked	3.79		
Oct-12	Revoked	0.60	1.33	1.33
Nov-12	Revoked	2.70		
Dec-12	Revoked	2.37		
Jan-13	Revoked	3.30		4.59
Feb-13	Revoked			
Mar-13	Revoked			
Apr-13	Revoked	7.39		
May-13	Revoked	0.64	2.55	3.36
Jun-13	Revoked	0.26		
Jul-13	Revoked	1.52	1.11	1.67
Aug-13	Revoked	2.29		
Sep-13	Revoked	3.06		
Oct-13	Revoked	1.34	4.52	1.86
Nov-13	Revoked			
Dec-13	Revoked	1.72		
*Average 2009	5.03	2.31	1.87	2.42
*Average 2010	-	1.59	1.55	1.80
*Average 2011	-	1.88	2.39	2.47
*Average 2012	-	2.89	3.44	2.36
*Average 2013	-	2.39	2.73	2.87
Average All Years	3.62	1.95	2.64	2.52

F = Frozen
Southwest Fen - Receives effluent from central quarry (2006 only)
Northeast Fen - Receives effluent from plant site excavation, sewage treatment plant and pit sump
Southeast Fen - Control site
Northwest Control - Control site
*Annual average values are only for dates when control samples were collected
** Samples discarded due to lab miscommunicaton

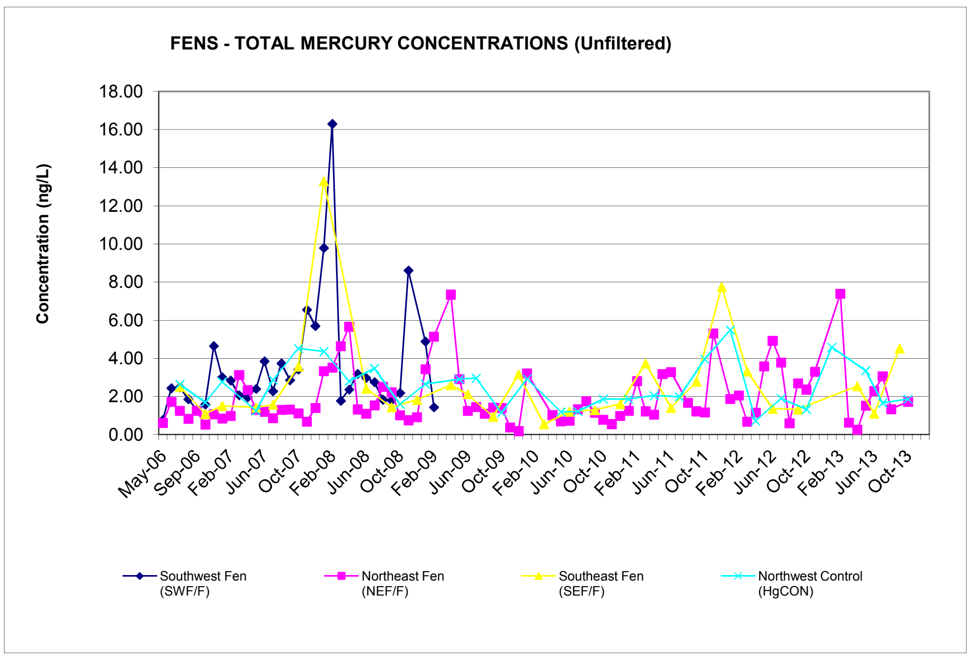


TABLE 4
TOTAL MERCURY - FENS (Filtered)
(concentrations in ng/L)

Date	Southwest Fen (SWF/F)	Northeast Fen (NEF/F)	Southeast Fen (SEF/F)	Northwest Control (HgCON)
May-06	0.64	0.48		
Jun-06	2.32			
Jul-06	1.96	0.86	1.38	1.82
Aug-06	1.34	0.72		
Sep-06	1.11	0.61		
Oct-06	0.85	0.44	0.94	1.19
Dec-06	3.05	0.59		
Jan-07	1.86	0.47	1.01	1.73
Feb-07	1.90	0.48		
Mar-07	F	3.03		
Apr-07	F	1.69		
May-07	1.31	1.41	0.89	1.03
Jun-07	1.24	1.05		
Jul-07	1.74	0.70	1.48	1.70
Aug-07	2.45	0.98		
Sep-07	1.87	0.69		
Oct-07	2.89	1.04	3.11	3.92
Nov-07	2.66	0.60		
Dec-07	3.22	1.00		
Jan-08	4.86	2.10	2.21	3.07
Feb-08	5.40	2.32		
Mar-08	3.79	3.41		
Apr-08	6.72	2.41	F	2.41
May-08	1.22	1.01		
Jun-08	1.63	1.11		
Jul-08	2.87	1.38	2.02	2.88
Aug-08	2.55	1.81		
Sep-08	2.07	1.90		
Oct-08	1.71	1.04	1.12	1.33
Nov-08	1.77	0.66		
Dec-08	2.02	0.86		
Jan-09	F	2.86	1.61	2.00
Feb-09	7.42	3.62		
Mar-09				
Apr-09	3.89	5.09		
May-09	1.44	1.55	2.25	1.85
Jun-09	Revoked	1.20		
Jul-09	Revoked	1.12	1.49	2.09
Aug-09	Revoked	0.79		
Sep-09	Revoked	1.15		
Oct-09	Revoked	1.46	0.92	1.02
Nov-09	Revoked	0.21		
Dec-09	Revoked	0.08		
Jan-10	Revoked	1.40	1.93	2.21
Feb-10	Revoked	F?		
Mar-10	Revoked			
Apr-10	Revoked	0.65		0.01
May-10	Revoked	0.50	0.76	
Jun-10	Revoked	0.59		
Jul-10	Revoked	1.00	0.80	0.95
Aug-10	Revoked	1.25		
Sep-10	Revoked	0.89		
Oct-10	Revoked	0.37	1.35	0.64
Nov-10	Revoked	0.55		
Dec-10	Revoked	0.45		
Jan-11	Revoked	0.81	0.95	1.37
Feb-11	Revoked	F		
Mar-11	Revoked	F		
Apr-11	Revoked	1.65	0.79	0.53
May-11	Revoked	0.60		
Jun-11	Revoked	0.91		
Jul-11	Revoked	2.00	1.16	1.57
Aug-11	Revoked	2.20		
Sep-11**	Revoked	**		
Oct-11	Revoked	0.96	1.59	2.89
Nov-11	Revoked	0.48		
Dec-11	Revoked	0.66		
Jan-12	Revoked	3.32	2.00	4.73
Feb-12	Revoked			
Mar-12	Revoked	0.69		
Apr-12	Revoked	0.98	2.06	0.25
May-12	Revoked	0.41		
Jun-12	Revoked	0.68		
Jul-12	Revoked	2.09	1.11	1.56
Aug-12	Revoked	3.01		
Sep-12	Revoked	2.86		
Oct-12	Revoked	0.43	0.85	0.96
Nov-12	Revoked	1.07		
Dec-12	Revoked	0.89		
Jan-13	Revoked	2.33		2.19
Feb-13	Revoked			
Mar-13	Revoked			
Apr-13	Revoked	3.25		
May-13	Revoked	0.37	1.83	2.32
Jun-13	Revoked	0.17		
Jul-13	Revoked	0.69	0.70	1.00
Aug-13	Revoked	1.06		
Sep-13	Revoked	1.83		
Oct-13	Revoked	0.82	1.44	1.27
Nov-13	Revoked			
Dec-13	Revoked	1.60		
*Average 2009	4.43	1.75	1.57	1.74
*Average 2010	-	0.86	1.21	0.95
*Average 2011	-	1.14	1.12	1.59
*Average 2012	-	1.71	1.51	1.88
*Average 2013	-	1.35	1.32	1.70
Average All Years	2.56	1.28	1.42	1.75

F = Frozen
Southwest Fen - Receives effluent from central quarry (2006 only)
Northeast Fen - Receives effluent from plant site excavation, sewage treatment plant and pit sump
Southeast Fen - Control site
Northwest Control - Control site
*Annual average values are only for dates when control samples were collected
** Samples discarded due to lab miscommunication

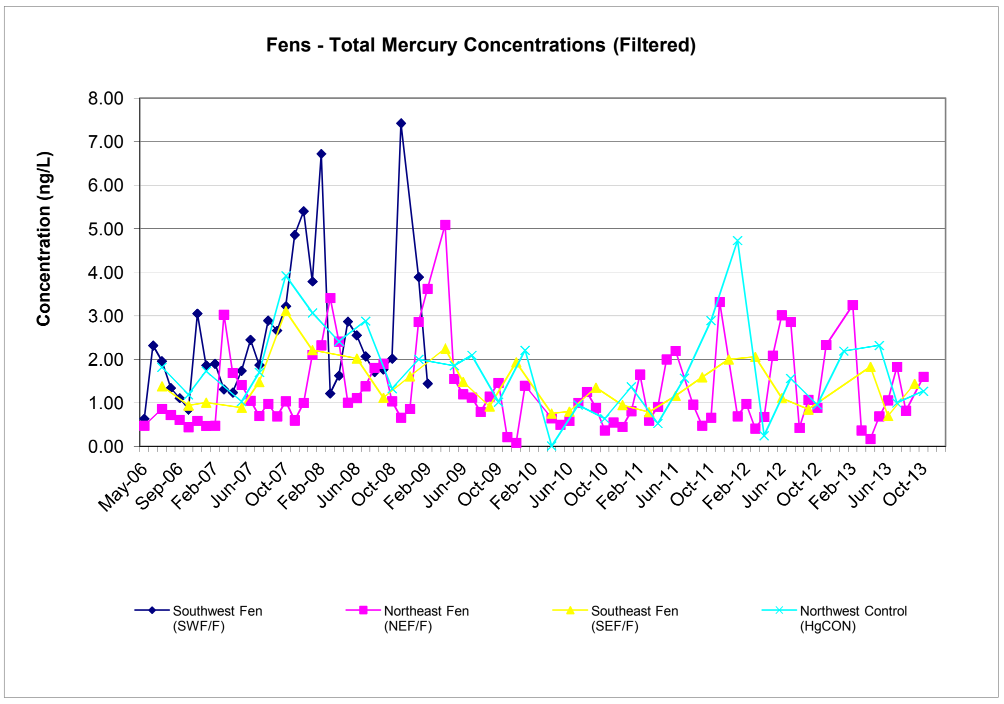
Nov ?

NOTES:
unfiltered value is reported table 3

why aren't controls collected at same frequency?
affects utility of the data

Frozen notations do not seem to be consistently applied

** explanation is actually provided for one gap - very rare throughout the document. No consistency

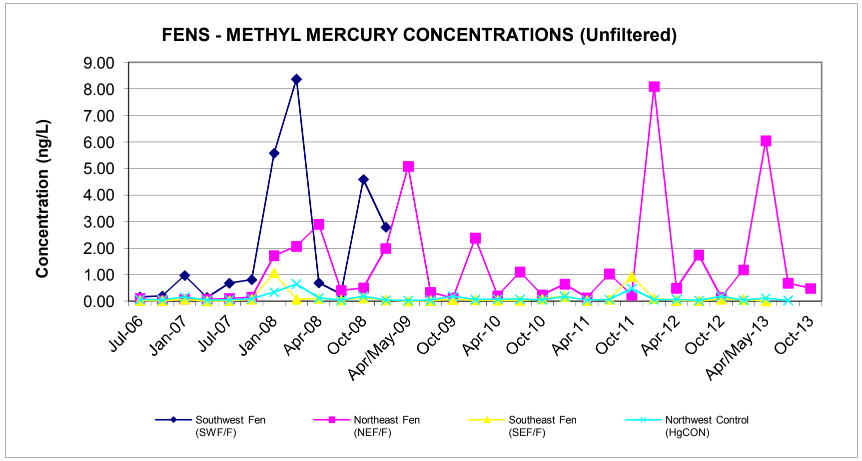


runoff-induced?

TABLE 5
METHYL MERCURY - FENS (Unfiltered)
(concentrations in ng/L)

Date	Southwest Fen (SWF/F)	Northeast Fen (NEF/F)	Southeast Fen (SEF/F)	Northwest Control (HgCON)
Jul-06	0.16	0.10	0.03	0.06
Oct-06	0.20	0.02	0.02	0.05
Jan-07	0.97	0.07	0.07	0.16
May-07	0.14	0.07	0.01	0.04
Jul-07	0.68	0.10	0.02	0.05
Oct-07	0.81	0.15	0.08	0.09
Jan-08	5.58	1.72	1.07	0.34
Mar-08	F	2.07	F	F
Apr-08	8.37	2.90	0.07	0.65
Jul-08	0.69	0.40	0.11	0.12
Oct-08	0.27	0.50	0.05	0.04
Jan-09	4.59	1.99	0.12	0.19
Apr/May-09	2.79	5.08	0.05	0.04
Jul-09	Revoked	0.34	<0.01	0.03
Oct-09	Revoked	0.12	0.03	0.04
Jan-10	Revoked	2.38	0.06	0.18
Apr-10	Revoked	0.21	0.04	0.06
Jul-10	Revoked	1.10	0.03	0.08
Oct-10	Revoked	0.24	0.03	0.07
Jan-11	Revoked	0.65	0.08	0.06
Apr-11	Revoked	0.13	0.18	0.18
Jul-11	Revoked	1.03	0.03	0.04
Oct-11	Revoked	0.23	0.07	0.07
Jan-12	Revoked	8.09	0.94	0.47
Apr-12	Revoked	0.49	0.10	0.05
Jul-12	Revoked	1.74	0.03	0.07
Oct-12	Revoked	0.15	0.02	0.03
Jan-13	Revoked	1.18		0.19
Apr/May-13	Revoked	6.05	0.08	0.04
Jul-13	Revoked	0.68	0.07	0.11
Oct-13	Revoked	0.48	<0.01	0.03
Average 2009	3.69	1.88	0.05	0.07
Average 2010	-	0.98	0.04	0.10
Average 2011	-	0.51	0.09	0.09
Average 2012	-	2.62	0.27	0.16
Average 2013	-	2.10	0.05	0.09
Average all Data	2.10	1.30	0.12	0.12

F = Frozen
Southwest Fen - Received effluent from the Central Quarry
Northeast Fen - Receives effluent from plant site excavation, sewage treatment plant and pit sump
Southwest Fen - Control site
Northwest Control - Control site
CCME Protection of Aquatic Life Guideline - 4 ng/L (unfiltered)
Quarterly sampling in accordance with Amended C. of A. #3960-7Q4K2G, dated March 13, 2009



NOTE: MeHg only collected sporaticaly, at less frequency than ttl Hg

some samples actually exceed even the erroneously used CCME guideline for Aquatic Life @ 4ng/L (unfiltered).

TABLE 6
METHYL MERCURY - FENS (Filtered)
(concentrations in ng/L)

Date	Southwest Fen (SWF/F)	Northeast Fen (NEF/F)	Southeast Fen (SEF/F)	Northwest Control (HgCON)
Jul-06	0.13	0.08	0.02	0.01
Oct-06	0.15	0.02	0.01	0.02
Jan-07	0.68	0.04	0.06	0.10
May-07	0.08	0.06	0.02	0.04
Jul-07	0.30	0.10	0.02	0.04
Oct-07	0.63	0.12	0.04	0.09
Jan-08	3.48	1.29	0.39	0.17
Mar-08	F	1.34	F	F
Apr-08	3.42	1.73	0.03	0.37
Jul-08	0.58	0.41	0.08	0.07
Oct-08	0.29	0.39	0.02	0.04
Jan-09	3.03	0.89	0.09	0.14
Apr/May-09	1.85	3.32	0.05	0.05
Jul-09	Revoked	0.16	0.07	0.08
Oct-09	Revoked	0.13	0.05	0.06
Jan-10	Revoked	0.76	0.11	0.07
Apr-10	Revoked	0.12	0.03	0.05
Jul-10	Revoked	0.59	0.02	0.04
Oct-10	Revoked	0.23	0.03	0.06
Jan-11	Revoked	0.40	0.03	0.03
Apr-11	Revoked	0.01	0.04	0.06
Jul-11	Revoked	0.88	0.02	0.04
Oct-11	Revoked	0.04	0.03	0.01
Jan-12	Revoked	4.09	0.17	0.20
Apr-12	Revoked	0.27	0.07	<0.02
Jul-12	Revoked	1.18	0.02	0.04
Oct-12	Revoked	0.11	<0.01	0.03
Jan-13	Revoked	0.97		0.24
Apr/May-13	Revoked	2.85	<0.02	0.04
Jul-13	Revoked	0.45	0.06	0.09
Oct-13	Revoked	0.18	<0.01	<0.01
Average 2009	2.44	1.12	0.07	0.08
Average 2010	-	0.43	0.05	0.06
Average 2011	-	0.33	0.03	0.03
Average 2012	-	1.41	0.07	0.07
Average 2013	-	1.11	0.03	0.09
Average All Data	1.22	0.75	0.06	0.08

F = Frozen
Southwest Fen - Received effluent from the Central Quarry
Northeast Fen - Receives effluent from plant site excavation, sewage treatment plant and pit sump
Southwest Fen - Control site
Northwest Control - Control site
CCME Protection of Aquatic Life Guideline - 4 ng/L (unfiltered)
Quarterly sampling in accordance with Amended C. of A. #3960-7Q4K2G, dated March 13, 2009

are these reasonable controls… both very proximate to site, and both within drawdown effect…

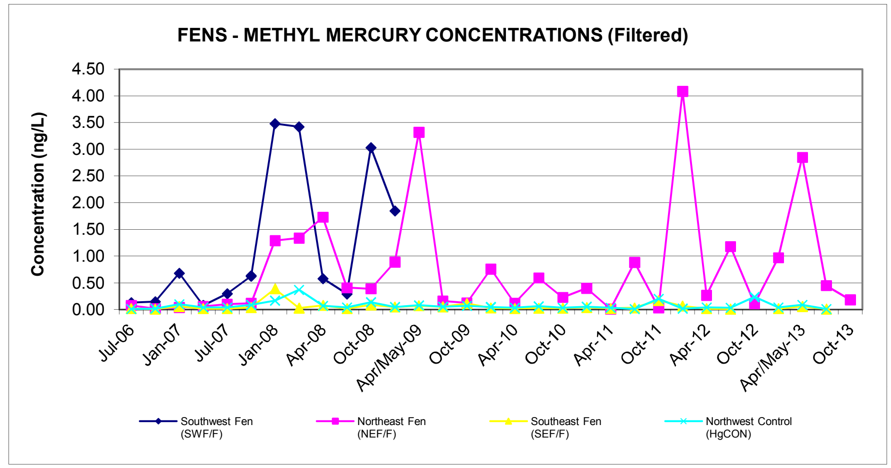


TABLE 7a

TOTAL MERCURY - RIBBED FEN SURFACE WATERS (Sampled as Peat Pore Water 2007-2013) (Filtered)

(concentrations in ng/L)

Date	MS-1-R (ES1-R)	MS-2-R (ES2-R)	MS-7-R (NS7-R)	MS-8-R (NS8-1R)	MS-9(1)-R (SS9-1R)	MS-9(2)-R (SS9-2R)	MS-13-R (WS13-R)	MS-15-R (WS15-R)	MS-V(1)-R (ES2-R)	MS-V(2)-R (SSV2-R)	MS-V(3)-R (SSV3-R)
Aug / Sep-07	1.81	1.56	0.62	1.00	0.72	1.29	0.40	0.43	1.56	0.01	0.01
Nov-07	1.67	2.30	0.82	1.36	1.11	1.01	1.70	1.11	2.30	0.01	0.01
May-08	2.86	5.56	F	0.91	0.53	F	0.42	0.38	5.56	F	F
Aug-08	2.27	2.02	0.52	0.98	1.26	0.90	0.95	0.92	2.02	0.60	1.69
Oct-08	1.52	1.07	0.72	1.26	1.26	0.70	1.22	0.37	1.07	0.41	1.33
Jan-09	F	F	F	F	F	F	F	F	F	F	F
May-09	2.90	1.98	1.92	3.25	2.10	2.40	4.08	2.19	1.98	2.38	3.19
Aug-09	1.00	0.95	0.95	1.38	1.01	1.44	2.54	0.86	0.95	0.94	1.78
Oct-09	1.19	1.01	1.15	1.19	1.18	1.24	2.54	0.75	1.01	0.86	2.01
Jan-10	0.65	0.01	<0.01	2.45	1.17	0.01	1.21	0.01	0.01	0.01	F
May-10	1.86	1.75	0.74	1.32	1.32	1.40	0.93	2.68	1.75	0.83	2.06
Aug-10	1.24	1.43	0.44	1.60	0.47	0.72	0.01	0.01	1.43	0.85	0.76
Oct-10	1.11	1.24	0.81	1.79	1.25	1.05	3.03	0.68	1.24	1.03	1.67
Jan / Feb-11	F	0.60	0.41	1.42	0.94	0.54	1.92	0.49	0.60	F	F
Apr-11	1.07	0.83	0.84	1.35	0.92	0.84	2.63	0.63	0.83	0.47	1.01
Jul-11	2.10	1.23	1.20	1.52	1.52	1.04	3.06	0.51	1.23	1.36	1.38
Oct-11	2.52	2.07	4.43	2.73	2.00	2.01	3.43	1.02	2.07	1.45	3.92
Jan-12	1.68	F	0.84	4.44	1.98	0.94	4.84	0.73	F	1.70	1.95
Apr-12	2.00	2.28	1.03	0.87	1.21	1.37	2.09	0.69	2.28	0.49	0.71
Jul-12	1.70	0.66	0.76	1.18	1.23	1.70	2.97	0.62	0.66	1.24	2.87
Oct-12	2.05	1.76	2.89	1.87	1.34	0.71	3.25	0.67	1.76	0.76	2.61
Jan / Feb-13	F	F	F	F	2.09	1.58	F	0.66	F	F	F
Apr / May-13	2.43	1.56	1.92	1.12	1.66	1.35	2.59	1.23	1.56	3.14	2.76
Jul-13	1.00	1.00	0.50	1.00	0.4	0.40	1.7	0.4	1	0.60	0.8
Oct-13	1.64	1.01	0.52	1.12	1.2	0.85	3.31	0.48	1.01	0.84	0.91
2009 Average	1.70	1.31	1.34	1.94	1.43	1.69	3.05	1.27	1.31	1.39	2.32
2010 Average	1.22	1.11	0.50	1.79	1.05	0.79	1.29	0.84	1.11	0.68	1.50
2011 Average	1.90	1.18	1.72	1.76	1.35	1.11	2.76	0.66	1.18	1.09	2.10
2012 Average	1.86	1.57	1.38	2.09	1.44	1.18	3.29	0.68	1.57	1.05	2.04
2013 Average	1.69	1.19	0.98	1.08	1.34	1.05	2.53	0.69	1.19	1.53	1.49
Average All Years	1.74	1.54	1.09	1.61	1.24	1.11	2.21	0.77	1.54	0.95	1.67

Notes:

(yellow)	MS-2-R and MS-v(1)-R are the same stations
F	Frozen - no sample
(orange)	Stations located at or inside the Upper Bedrock 2 m drawdown contour
(green)	Stations located outside the Upper Bedrock 2 m drawdown contour

Amended C. of A. #3960-7Q4K2G dated March 13, 2009 provides for annual sampling of peat pore water and quarterly sampling of ribbed fen surface water (the previous C. of A. #4111-7DXKQW dated October 3, 2008 provided for the same sampling frequency

amec

TABLE 7b
METHYL MERCURY - RIBBED FEN SURFACE WATERS (Sampled as Peat Pore Water 2007-2013) (Filtered)
(concentrations in ng/L)

Date	MS-1-R (ES1-R)	MS-2-R (ES2-R)	MS-7-R (NS7-R)	MS-8-R (NS8-1R)	MS-9(1)-R (SS9-1R)	MS-9(2)-R (SS9-2R)	MS-13-R (WS13-R)	MS-15-R (WS15-R)	MS-V(1)-R (ES2-R)	MS-V(2)-R (SSV2-R)	MS-V(3)-R (SSV3-R)
Aug / Sep-07	0.02	<0.01	0.01	<0.01	0.02	<0.01	0.13	0.02	<0.01	0.01	0.01
Nov-07	0.02	<0.01	0.01	0.01	<0.01	0.02	<0.01	0.01	<0.01	0.01	0.01
May-08	0.11	0.07	F	<0.01	0.01	F	0.01	0.02	0.07	F	F
Aug-08	0.07	0.04	0.01	0.01	0.03	0.06	<0.01	0.02	0.04	<0.01	0.02
Oct-08	0.02	0.01	0.01	0.01	0.02	0.04	0.01	0.02	0.01	<0.01	0.01
Jan-09	F	F	F	F	F	F	F	F	F	F	F
May / June-09	0.07	0.05	0.02	0.08	0.02	0.01	0.08	0.01	0.05	0.04	0.04
Aug-09	0.03	0.05	0.03	0.09	0.02	0.04	0.04	0.11	0.05	0.04	0.01
Oct-09	0.05	0.03	0.05	0.06	0.04	0.04	0.09	0.02	0.03	0.05	0.14
Jan-10	0.07	0.01	<0.01	0.10	0.01	<0.01	0.05	0.02	0.01	<0.01	F
May-10	0.04	0.04	0.03	0.03	0.04	0.03	0.02	0.07	0.04	0.03	0.06
Aug-10	0.06	0.08	0.02	<0.01	0.02	0.05	0.01	0.02	0.08	0.04	0.02
Oct-10	0.03	0.04	0.01	0.08	0.03	0.02	0.12	0.01	0.04	0.01	0.07
Jan / Feb-11	F	0.03	<0.01	0.03	0.09	0.01	0.04	<0.01	0.03	F	F
Apr-11	<0.01	<0.01	0.01	<0.01	0.01	<0.01	<0.01	<0.01	0.01	0.01	0.01
Jul-11	0.05	0.07	0.03	0.05	0.03	0.01	0.16	0.01	0.07	0.03	0.03
Oct-11	0.07	0.06	0.08	0.14	0.03	0.04	0.15	0.01	0.06	0.05	0.23
Jan-12	0.29	F	0.03	0.95	0.02	0.13	0.63	0.07	F	0.18	0.10
Apr-12	0.06	0.06	0.03	0.05	0.04	0.06	0.10	0.02	0.06	<0.02	0.03
Jul-12	0.04	0.05	<0.01	0.11	<0.01	0.05	0.20	<0.01	0.05	0.03	<0.01
Oct-12	0.04	0.02	0.02	0.03	<0.02	0.02	0.06	<0.02	0.02	<0.01	0.10
Jan / Feb-13	F	F	F	F	0.05	0.09	F	0.04	F	F	F
Apr / May-13	<0.02	<0.02	<0.02	0.05	0.03	0.03	<0.02	0.03	<0.02	0.06	0.04
Jul-13	0.12	0.05	0.03	0.09	0.04	0.03	0.21	<0.02	0.05	<0.02	0.05
Oct-13	<0.01	<0.01	<0.01	<0.01	<0.01	0.04	0.09	<0.01	<0.01	<0.01	<0.01
2009 Average	0.05	0.04	0.03	0.08	0.03	0.03	0.07	0.05	0.04	0.04	0.06
2010 Average	0.05	0.04	0.02	0.05	0.02	0.03	0.05	0.03	0.04	0.02	0.05
2011 Average	0.04	0.04	0.03	0.06	0.04	0.02	0.09	0.01	0.04	0.03	0.09
2012 Average	0.11	0.04	0.02	0.28	0.02	0.06	0.25	0.03	0.04	0.06	0.06
2013 Average	0.05	0.03	0.02	0.05	0.03	0.05	0.11	0.02	0.03	0.03	0.03
Average All Years	0.06	0.04	0.02	0.09	0.03	0.04	0.10	0.03	0.04	0.03	0.05

<0.01 / <0.02 - various detection limits? no notes

Notes:

(yellow)	MS-2-R and MS-v(1)-R are the same stations
F	Frozen - no sample
(orange)	Stations located at or inside the Upper Bedrock 2 m drawdown contour
(green)	Stations located outside the Upper Bedrock 2 m drawdown contour

Amended C. of A. #3960-7Q4K2G dated March 13, 2009 provides for annual sampling of peat pore water and quarterly sampling of ribbed fen surface water (the previous C. of A. #4111-7DXKQW dated October 3, 2008 provided for the same sampling frequency

TABLE 8
MUSKEG SYSTEM RIBBED FEN GENERAL CHEMISTRY RESULTS - ALL YEARS

Station	Year	Number of Samples	Parameter										
			Cl (mg/L)	Cond (µs/cm)	Nitrate (mg/L)	DOC (mg/L)	pH (units)	SO_4 (mg/L)	TP (mg/L)	Ca-D (mg/L)	Fe-D (mg/L)	Mg-D (mg/L)	Na-D (mg/L)
MS-1V-R (ES2-R)	2007	2	0.6	44	<0.1	16.7	6.06	<0.1	0.10	7.2	0.660	0.7	<0.8
	2008	3	0.6	37	<0.1	23.3	5.68	<0.1	0.21	4.6	1.132	0.3	<0.5
	2009	3	0.4	19	<0.1	10.0	6.43	<0.1	<0.01	3.4	0.320	0.4	<0.4
	2010	4	0.6	27	<0.1	22.2	5.84	<1.0	0.01	3.7	0.860	0.3	0.4
	2011	4	5.7	60	<0.1	23.7	6.41	7.5	0.03	5.0	1.292	0.8	3.2
	2012	3	0.5	26	<0.1	36.0	6.09	<1.0	0.01	3.2	1.064	0.4	0.4
	2013	1	4.6	126	<0.1	35.7	6.14	<1.0	0.07	8.5	1.380	0.7	1.1
MS-2V-R (SSV2-R)	2007	1	1.2	131	<0.1	29.0	6.18	0.2	1.81	24.4	1.910	1.6	0.8
	2008	2	0.9	91	<0.1	35.1	5.87	<0.1	0.06	11.6	0.557	0.5	0.7
	2009	3	0.4	19	<0.1	14.8	6.52	<0.1	<0.01	18.9	0.107	2.8	7.1
	2010	4	0.5	70	<0.1	18.7	6.93	<1.0	0.02	12.4	0.568	0.7	0.5
	2011	4	2.1	84	<0.1	18.9	7.53	<1.0	0.08	11.8	0.070	0.9	0.7
	2012	4	2.5	194	<0.1	38.3	7.28	<1.0	0.05	32.8	0.950	3.1	1.8
	2013	1	1.3	41	<0.1	53.6	6.63	<1.0	0.07	6.4	0.425	0.3	0.6
MS-3V-R (SSV3-R)	2007	1	1.8	141	<0.1	51.6	6.23	0.3	2.47	50.2	5.540	12.0	0.8
	2008	2	1.0	68	<0.1	59.2	5.75	<0.1	0.09	9.5	0.457	1.3	<0.5
	2009	3	0.3	18	<0.1	20.8	5.34	<0.1	<0.01	1.0	0.100	0.1	<0.5
	2010	3	0.3	20	<0.1	23.6	5.08	<1.0	0.01	1.8	0.161	0.2	0.2
	2011	4	0.5	37	<0.1	22.9	6.07	<1.0	0.01	3.6	0.108	0.5	0.4
	2012	4	2.3	75	<0.1	38.0	6.48	<1.0	0.04	11.1	0.318	1.4	0.7
	2013	2	1.0	63	<0.1	59.7	5.89	<1.0	0.32	8.9	0.394	1.8	0.2
MS-1R (ES1-R)	2007	2	0.6	98	<0.1	21.0	6.17	<0.1	0.20	11.3	0.340	0.8	1.5
	2008	3	0.8	47	<0.1	20.2	5.98	<0.1	0.13	5.5	0.340	0.4	1.2
	2009	3	0.5	26	<0.1	18.9	6.47	<0.1	<0.01	3.4	0.136	0.3	<0.6
	2010	4	0.4	34	<0.1	22.6	6.22	<1.0	0.01	5.6	0.499	0.4	0.8
	2011	4	0.7	43	<0.1	24.8	6.77	<1.0	0.01	5.7	0.317	0.5	1.1
	2012	4	2.3	82	<0.1	44.7	6.66	<1.0	0.01	13.1	2.578	1.3	2.1
	2013	1	0.9	249	<0.1	18.1	7.06	<1.0	0.03	43.0	1.310	2.5	8.4
MS-7R (NS-7-R)	2007	2	1.1	246	<0.1	28.7	6.33	<0.2	0.14	47.4	1.350	3.6	4.6
	2008	2	0.8	198	<0.1	14.9	6.40	<0.1	0.03	20.5	1.775	2.1	5.8
	2009	2	0.6	31	<0.1	13.6	7.14	<0.1	<0.01	2.6	0.165	0.3	0.9
	2010	4	0.6	76	<0.1	16.6	6.83	<1.0	0.01	11.2	1.966	1.1	1.5
	2011	4	0.6	67	<0.1	21.4	6.92	<1.0	0.01	9.9	2.187	0.7	1.5
	2012	4	2.5	78	<0.1	18.3	6.92	<1.0	0.07	10.1	0.892	1.2	1.9
	2013	1	1.2	154	<0.1	15.5	6.72	<1.0	0.03	18.1	1.310	1.8	4.6
MS-8R (NS-8-1R)	2007	2	85.8	591	<0.1	28.1	6.98	7.0	0.46	28.6	0.078	10.2	92.8
	2008	3	52.5	452	<0.1	33.2	7.13	<0.2	0.08	10.8	0.053	5.8	57.6
	2009	2	1.2	28	<0.1	16.4	6.81	<0.2	<0.01	1.9	0.119	0.5	2.3
	2010	4	4.2	82	<0.1	35.3	6.40	<1.0	0.02	8.4	0.993	1.4	7.2
	2011	4	4.6	80	0.16	30.5	6.95	<1.0	0.01	8.2	1.313	1.4	73.1
	2012	4	8.9	147	<0.1	72.1	7.00	1.25	0.03	15.3	7.257	3.0	11.4
	2013	1	3.9	230	<0.1	46.7	7.28	5.5	0.10	9.0	0.044	5.1	32.1
MS-9(1)R (SS9-1R)	2007	2	0.5	199	<0.1	19.8	6.65	<0.3	0.22	38.5	0.245	1.0	1.4
	2008	3	0.4	77	<0.2	16.7	5.87	<0.1	0.02	9.8	0.241	0.7	<0.6
	2009	3	0.3	22	<0.1	14.6	6.56	<0.1	<0.02	2.5	0.670	0.2	<0.5
	2010	4	0.3	32	<0.1	19.4	6.14	<1.0	0.01	5.5	0.238	0.4	0.4
	2011	4	0.4	32	<0.1	18.0	6.73	<1.0	0.01	5.0	0.114	0.4	0.5
	2012	4	1.5	37	<0.1	20.9	6.57	<1.0	0.01	5.8	0.392	0.5	0.5
	2013	1	0.8	60	<0.1	20.3	6.40	<1.0	0.01	10.1	0.390	0.6	0.5
MS-9(2)R (SS9-2R)	2007	2	0.7	70	<0.1	17.8	6.28	<0.1	0.16	12.7	0.398	1.7	<1.1
	2008	2	0.4	79	<0.1	17.2	6.26	<0.1	0.05	10.4	0.847	1.1	1.4
	2009	3	0.5	30	<0.1	13.0	6.98	<0.1	<0.02	3.6	0.087	0.4	<0.5
	2010	4	0.7	58	<0.1	19.2	6.66	<1.0	0.03	10.1	0.881	1.1	0.7
	2011	4	0.7	70	<0.1	18.3	7.12	<1.0	0.01	10.5	1.618	1.0	1.1
	2012	4	0.8	60	<0.1	19.1	7.02	<1.0	0.01	8.9	1.278	1.2	1.3
	2013	1	0.9	184	<0.1	13.7	6.87	<1.0	0.05	19.2	0.850	2.1	2.6
MS-13R (WS-13R)	2007	2	1.2	248	<0.1	20.9	6.25	<0.1	0.07	47.9	1.360	3.7	4.9
	2008	3	0.8	203	<0.1	67.0	5.91	<0.1	0.06	33.1	1.357	2.5	0.7
	2009	3	0.4	21	<0.1	22.9	4.53	<0.1	<0.01	0.7	0.067	0.1	<0.5
	2010	3	0.9	31	<0.1	26.0	4.34	<1.0	0.00	0.9	0.090	0.1	0.3
	2011	4	2.6	51.6	0.2	50.9	4.30	1.4	0.02	2.5	0.351	0.4	0.4
	2012	4	1.4	42.0	<0.1	66.2	4.75	1.0	0.01	2.4	0.458	0.3	0.4
	2013	1	2.0	98.9	<0.1	107.0	5.89	<1.0	0.03	20.4	1.050	1.2	0.5
MS-15R (WS15-R)	2007	2	0.8	172	<0.1	11.6	6.43	<0.1	0.04	36.8	0.769	2.6	1.3
	2008	3	0.7	191	<0.1	11.5	6.44	<0.1	0.04	24.0	0.666	1.9	1.0
	2009	3	0.4	50	<0.1	9.8	7.27	<0.1	<0.01	6.8	0.019	0.5	<0.5
	2010	4	0.7	86	<0.1	12.7	7.12	<1.0	0.00	15.7	0.344	1.3	0.6
	2011	4	0.5	86	<0.1	10.2	7.49	<1.0	0.01	12.9	0.499	1.0	0.7
	2012	4	0.7	98	<0.1	13.4	7.30	<1.0	0.01	15.5	0.263	1.3	0.9
	2013	1	0.9	163	<0.1	15.7	6.79	<1.0	0.33	25.7	0.530	2.2	1.0

MS-8R This station stands out as being influenced by natural groundwater upwellings, as evidenced by elevated Cl and Na

Beyond zone of dewatering influence

TABLE 9
TOTAL MERCURY - GRANNY CREEK (Unfiltered)
(concentrations in ng/L)

Date	N. Granny Creek Upstream (NGC/UP/NWF)	N. Granny Creek Downstream (NGC/DN/NEF)	S. Granny Creek Upstream (SGC/UP/SWF)	S. Granny Creek Downstream (SGC/DS/SWF)
May-06	1.18	1.66	0.86	1.26
Jun-06	3.55		3.37	3.16
Jul-06	2.92	2.80	2.72	3.08
Aug-06	4.21	3.77	2.57	2.6
Sep-06	2.37	2.26	2.28	2.74
Oct-06		1.61	1.34	1.30
Dec-06	2.53	4.58	2.23	2.08
Jan-07	2.02	2.35	16.20	4.52
Feb-07		2.02	3.57	3.16
Mar-07	7.17	F	F	7.43
Apr-07	8.82	5.87	3.72	3.76
May-07	3.01	3.02	2.46	2.08
Jun-07	3.34	2.99	2.49	3.04
Jul-07	3.16	2.23	2.73	2.03
Aug-07	3.10	1.94		2.17
Sep-07	1.96	2.04	4.41	1.61
Oct-07	5.91	5.67	5.16	3.79
Nov-07	3.19	3.00	2.74	2.49
Dec-07	2.42	2.60	2.67	2.61
Jan-08	2.95	2.42	2.97	2.94
Feb-08	2.19	2.29	3.76	2.91
Mar-08	0.46	2.66	3.06	3.35
Apr-08	11.90	F	2.19	2.91
May-08	3.54	3.73	3.37	3.42
Jun-08	3.06	3.08	2.55	2.81
Jul-08	3.28	1.61	3.60	2.68
Aug-08	2.71	2.69	2.63	2.38
Sep-08	1.76	2.32	1.94	2.78
Oct-08	1.37	1.57	2.14	1.83
Nov-08	3.20	2.39		1.81
Dec-08	1.82	1.83	1.84	1.88
Jan-09	1.41	1.54	4.42	1.64
Feb-09	1.18	1.34	2.22	1.52
Mar-09	1.48	2.26	2.56	1.45
Apr-09	3.19	1.41	2.19	2.98
May-09	5.18	3.81	3.31	3.82
Jun-09	2.95	2.72	2.65	2.76
Jul-09	3.62	3.48	2.70	2.69
Aug-09	2.07	2.08	2.06	2.05
Sep-09	1.45	1.82	1.47	1.39
Oct-09	1.47	1.38	1.40	1.05
Nov-09	1.70	1.79	3.65	0.98
Dec-09	1.11	1.02	1.08	0.96
Jan-10	1.46	1.03	0.94	1.89
Feb-10	1.49	1.36	1.89	2.03
Mar-10	1.64	1.78	2.14	1.84
Apr-10	1.56	2.05	1.68	1.90
May-10	1.99	1.80	1.90	2.13
Jun-10	0.93	0.97	0.83	0.78
Jul-10	0.92	1.04	0.70	1.28
Aug-10	3.90	3.15	3.06	3.37
Sep-10	2.44	2.71	2.21	2.00
Oct-10	1.46	1.81	1.59	1.55
Nov-10	1.94	2.10	1.82	1.86
Dec-10	1.50	1.62	1.59	1.67
Jan-11	1.31	1.24	1.50	1.46
Feb-11	1.77	1.64	1.70	1.42
Mar-11	1.56	1.36	2.55	1.11
Apr-11	0.92	1.04	2.40	1.38
May-11	3.58	3.75	2.98	3.53
Jun-11	2.99	2.65	2.34	2.36
Jul-11	1.51	2.03	2.08	2.00
Aug-11	1.81	1.92	2.42	2.28
**Sep-11				
Oct-11	4.36	4.11	3.67	3.57
Nov-11	3.12	3.45	3.00	2.72
Dec-11	1.82	2.05	2.32	1.97
Jan-12			2.33	1.56
Feb-12	0.78	0.81	2.06	0.95
Mar-12	0.78	1.15	29.4*	0.82
Apr-12			2.72	2.41
May-12	2.08	2.23	2.13	2.42
Jun-12	3.96	4.06	3.36	2.95
Jul-12	1.94	2.29	2.42	2.68
Aug-12	1.48	1.75	2.28	1.74
Sep-12	1.71	2.15	2.77	2.61
Oct-12			2.63	2.34
Nov-12		5.12	2.33	3.53
Dec-12	3.76	3.31	3.26	3.31
Jan-13			2.49	2.10
Feb-13	1.72	1.69	2.53	2.14
Mar-13	1.39	1.31	2.14	1.32
Apr-13	1.27	1.24	2.35	1.64
May-13	3.68	3.6	3.33	3.16
Jun-13	3.48	3.53	2.84	2.68
Jul-13				
Aug-13	1.49	1.54	2.95	2.43
Sep-13	1.75	2.25	2.16	1.71
Oct-13			1.41	0.86
Nov-13	1.09	1.29	1.96	2.51
Dec-13	1.12	1.19	1.87	0.95
Average 2009	2.23	2.06	2.48	1.94
Average 2010	1.77	1.79	1.70	1.86
Average 2011	2.25	2.29	2.45	2.16
Average 2012	2.06	2.54	2.57	2.28
Average 2013	1.89	1.96	2.37	1.95
Average All Data	2.54	2.33	2.62	2.30

* Samples excluded from annual average calculation
** Samples discarded due to lab miscommunication
F = Frozen
CCME Protection of Aquatic Life Guideline - 26 ng/L

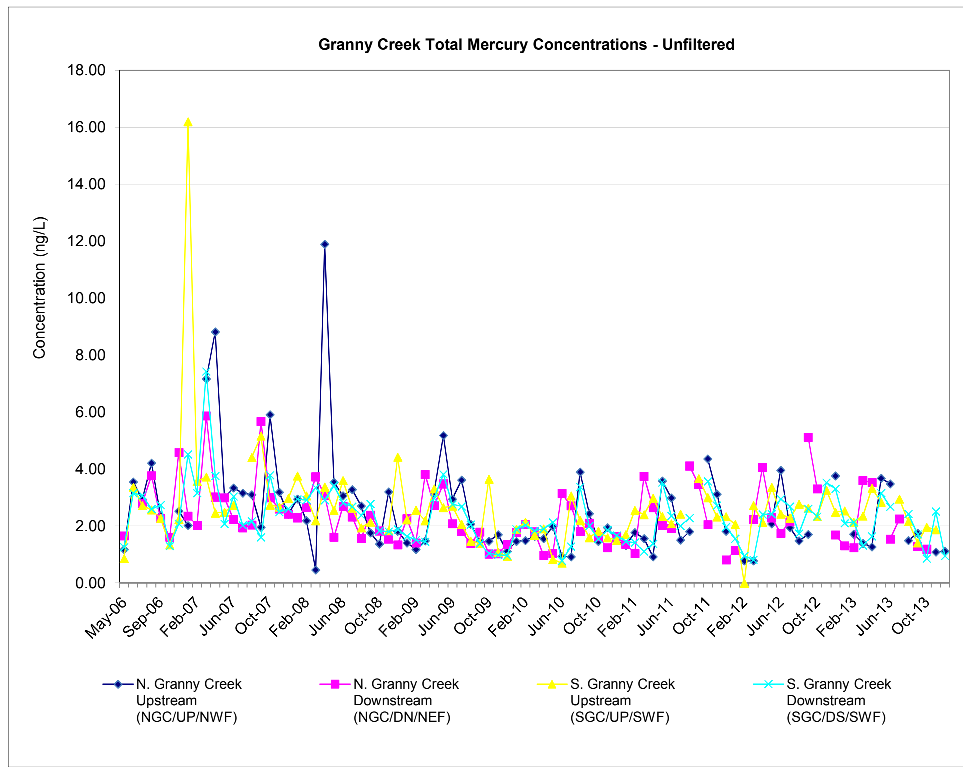
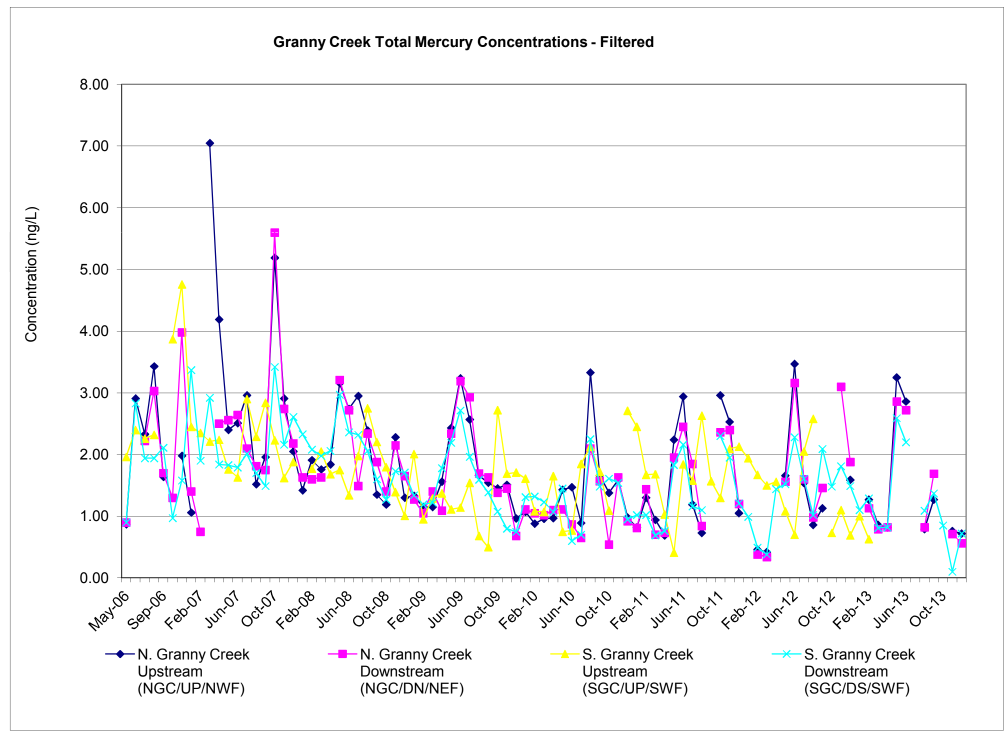


TABLE 10
TOTAL MERCURY - GRANNY CREEK (Filtered)
(concentrations in ng/L)

Date	N. Granny Creek Upstream (NGC/UP/NWF)	N. Granny Creek Downstream (NGC/DN/NEF)	S. Granny Creek Upstream (SGC/UP/SWF)	S. Granny Creek Downstream (SGC/DS/SWF)
May-06	0.87	0.90	0.55	0.90
Jun-06	2.91			2.83
Jul-06	2.33	2.22	2.07	1.94
Aug-06	3.43	3.03	2.07	1.94
Sep-06	1.64	1.70	1.34	2.11
Oct-06		1.30	1.11	0.97
Dec-06	1.98	3.98	1.92	1.58
Jan-07	1.06	1.40	2.01	3.37
Feb-07		0.75	0.79	1.90
Mar-07	7.05			2.92
Apr-07	4.19	2.50	1.96	1.84
May-07	2.40	2.56	2.40	1.83
Jun-07	2.51	2.64	2.26	1.79
Jul-07	2.96	2.10	2.32	2.01
Aug-07	1.52	1.81		1.70
Sep-07	1.96	1.75	3.87	1.49
Oct-07	5.19	5.60	4.76	3.42
Nov-07	2.91	2.74	2.45	2.16
Dec-07	2.05	2.18	2.35	2.61
Jan-08	1.42	1.63	2.21	2.33
Feb-08	1.91	1.60	2.24	2.08
Mar-08	1.76	1.63	1.76	1.98
Apr-08	1.84		1.63	2.06
May-08	3.16	3.21	2.90	2.97
Jun-08	2.74	2.72	2.29	2.36
Jul-08	2.95	1.49	2.84	2.32
Aug-08	2.39	2.34	2.23	2.06
Sep-08	1.35	1.88	1.62	1.60
Oct-08	1.19	1.40	1.88	1.27
Nov-08	2.28	2.15		1.73
Dec-08	1.30	1.65	1.77	1.71
Jan-09	1.33	1.27	2.05	1.34
Feb-09	1.15	1.05	1.68	1.19
Mar-09	1.15	1.40	1.75	1.22
Apr-09	1.56	1.09	1.34	1.78
May-09	2.43	2.34	1.98	2.19
Jun-09	3.24	3.19	2.75	2.71
Jul-09	2.57	2.93	2.20	1.96
Aug-09	1.66	1.69	1.80	1.59
Sep-09	1.54	1.63	1.39	1.39
Oct-09	1.45	1.38	1.01	1.08
Nov-09	1.51	1.45	2.01	0.80
Dec-09	0.97	0.68	0.95	0.75
Jan-10	1.07	1.11	1.29	1.31
Feb-10	0.88	1.05	1.37	1.32
Mar-10	0.96	1.02	1.11	1.23
Apr-10	0.97	1.10	1.14	1.07
May-10	1.43	1.11	1.54	1.45
Jun-10	1.47	0.87	0.68	0.60
Jul-10	0.89	0.65	0.50	0.70
Aug-10	3.33	2.10	2.72	2.25
Sep-10	1.66	1.57	1.69	1.48
Oct-10	1.38	0.54	1.71	1.61
Nov-10	1.59	1.63	1.61	1.54
Dec-10	0.98	0.92	1.08	0.95
Jan-11	0.82	0.81	1.07	1.02
Feb-11	1.30	1.44	1.65	1.02
Mar-11	0.94	0.70	0.75	0.69
Apr-11	0.69	0.73	0.77	0.76
May-11	2.24	1.95	1.85	1.83
Jun-11	2.94	2.45	2.13	2.16
Jul-11	1.19	1.85	1.72	1.16
Aug-11	0.73	0.84	1.09	1.10
* Sep-11				
Oct-11	2.96	2.36	2.71	2.30
Nov-11	2.53	2.40	2.45	1.95
Dec-11	1.05	1.20	1.67	1.21
Jan-12			1.68	0.99
Feb-12	0.46	0.38	1.03	0.49
Mar-12	0.42	0.34	0.41	0.38
Apr-12			1.84	1.44
May-12	1.66	1.56	1.58	1.52
Jun-12	3.47	3.16	2.63	2.28
Jul-12	1.54	1.60	1.57	1.61
Aug-12	0.86	0.98	1.30	1.02
Sep-12	1.13	1.46	2.09	2.09
Oct-12			2.13	1.48
Nov-12		3.10	1.94	1.81
Dec-12	1.59	1.88	1.67	1.49
Jan-13			1.50	1.1
Feb-13	1.27	1.13	1.56	1.29
Mar-13	0.86	0.79	1.08	0.81
Apr-13	0.82	0.82	0.7	0.82
May-13	3.25	2.86	2.05	2.59
Jun-13	2.86	2.72	2.58	2.2
Jul-13				
Aug-13	0.79	0.82	0.73	1.09
Sep-13	1.27	1.69	1.10	1.37
Oct-13			0.69	0.85
Nov-13	0.76	0.71	1.00	0.1
Dec-13	0.72	0.56	0.63	0.72
Average 2009	1.71	1.68	1.74	1.50
Average 2010	1.38	1.14	1.37	1.29
Average 2011	1.58	1.52	1.62	1.38
Average 2012	1.39	1.61	1.66	1.38
Average 2013	1.40	1.34	1.24	1.18
Average All Data	1.85	1.70	1.72	1.60

* Samples discarded due to lab miscommunication
F = Frozen
CCME Protection of Aquatic Life Guideline - 26 ng/L

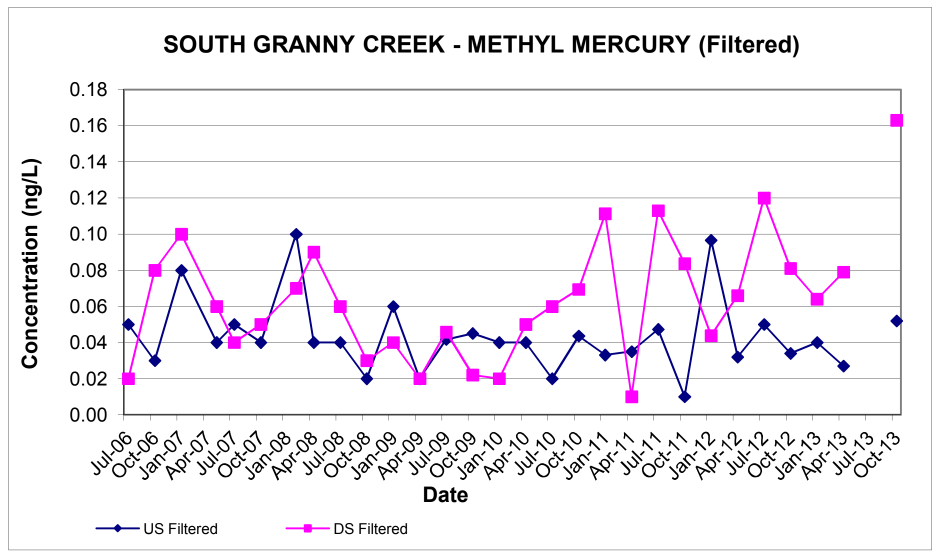


increasing data gaps - no explanations…
sampling often reported on SGC when
NGC gaps occurred

TABLE 11
METHYL MERCURY - SOUTH GRANNY CREEK
(concentrations in ng/L)

Date	Upstream SGC/UP/SWF		Downstream SGC/DS/SWF	
	US Unfiltered	US Filtered	DS Unfiltered	DS Filtered
Jul-06	0.06	0.05	0.04	0.02
Oct-06	0.03	0.03	0.11	0.08
Jan-07	0.10	0.08	0.13	0.10
May-07	0.04	0.04	0.06	0.06
Jul-07	0.05	0.05	0.05	0.04
Oct-07	0.05	0.04	0.07	0.05
Feb-08	0.17	0.10	0.11	0.07
Apr-08	0.06	0.04	0.15	0.09
Jul-08	0.06	0.04	0.07	0.06
Oct-08	0.02	0.02	0.04	0.03
Jan-09	0.01	0.06	0.06	0.04
Apr-09	0.08	0.02	0.06	0.02
Jul-09	0.01	0.04	0.05	0.05
Oct-09	0.02	0.05	0.01	0.02
Jan-10	0.06	0.04	0.07	0.02
Apr-10	0.05	0.04	0.08	0.05
Jul-10	0.06	0.02	0.08	0.06
Oct-10	0.04	0.04	0.07	0.07
Jan-11	0.03	0.03	0.17	0.11
Apr-11	0.09	0.04	<0.01	<0.01
Jul-11	0.05	0.05	0.14	0.11
Oct-11	0.04	0.01	0.23	0.08
Jan-12	0.25	0.10	0.07	0.04
Apr-12	0.08	0.03	0.07	0.07
Jul-12	0.07	0.05	0.17	0.12
Oct-12	0.03	0.03	0.09	0.08
Jan-13	0.06	0.04	0.08	0.06
Apr-13	0.09	0.03	0.10	0.08
Jul-13				
Oct-13	0.06	0.05	0.25	0.16
2009 Average	0.03	0.04	0.04	0.03
2010 Average	0.05	0.04	0.08	0.05
2011 Average	0.05	0.03	0.14	0.08
2012 Average	0.11	0.05	0.10	0.08
2013 Average	0.07	0.04	0.14	0.10
Average All Years	0.06	0.04	0.09	0.06

CCME Protection of Aquatic Life Guideline - 4 ng/L (unfiltered)
Quarterly sampling in accordance with Amended C. of A. #3960-7Q4K2G, dated March 13, 2009



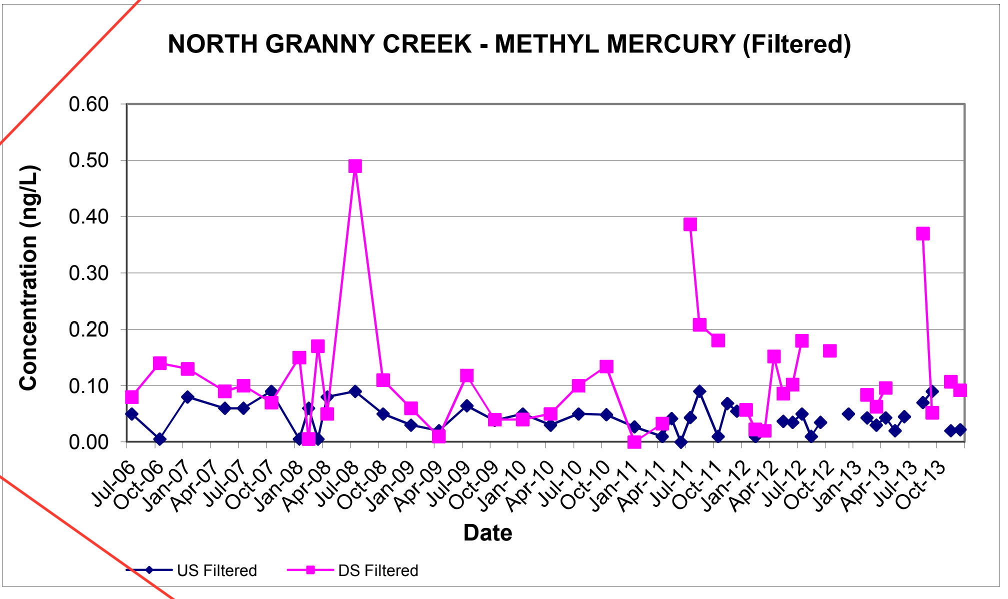
why data gap?
(July)

TABLE 12
METHYL MERCURY - NORTH GRANNY CREEK
(concentrations in ng/L)

Date	Upstream NGC/UP/NWF		Downstream NGC/DN/NEF	
	US Unfiltered	US Filtered	DS Unfiltered	DS Filtered
Jul-06	0.11	0.05	0.10	0.08
Oct-06	0.01	0.01	0.13	0.14
Jan-07	0.12	0.08	0.18	0.13
May-07	0.07	0.06	0.09	0.09
Jul-07	0.09	0.06	0.10	0.10
Oct-07	0.09	0.09	0.10	0.07
Jan-08	0.01	0.01	0.26	0.15
Feb-08	0.09	0.06	0.01	0.01
Mar-08	0.01	0.01	0.29	0.17
Apr-08	0.44	0.08	0.13	0.05
Jul-08	0.09	0.09	0.52	0.49
Oct-08	0.04	0.05	0.11	0.11
Jan-09	0.04	0.03	0.08	0.06
Apr-09	0.04	0.02	0.01	0.01
Jul-09	0.06	0.06	0.02	0.12
Oct-09	0.01	0.04	0.07	0.04
Jan-10	0.19	0.05	0.11	0.04
Apr-10	0.06	0.03	0.10	0.05
Jul-10	0.06	0.05	0.19	0.10
Oct-10	0.07	0.05	0.16	0.13
Jan-11	0.07	0.03	0.09	<0.01
Apr-11	<0.01	<0.01	0.06	0.03
May-11	0.05	0.04		
Jun-11	0.07	<0.01		
Jul-11	0.06	0.04	0.35	0.39
Aug-11	0.10	0.09	0.53	0.21
Oct-11	<0.01	0.01		0.18
Nov-11	0.11	0.07		
Dec-11	0.08	0.05		
Jan-12			0.18	0.06
Feb-12	0.03	0.01	0.07	0.02
Mar-12	0.03	<0.02	0.04	<0.02
Apr-12			0.22	0.15
May-12	0.05	0.04	0.11	0.09
Jun-12	0.05	0.04	0.12	0.10
Jul-12	0.06	0.05	0.24	0.18
Aug-12	0.02	<0.01		
Sep-12	0.07	0.04		
Oct-12			0.19	0.16
Dec-12	0.12	0.05		
Jan-13				
Feb-13	0.04	0.04	0.09	0.08
Mar-13	0.04	0.03	0.09	0.06
Apr-13	0.11	0.04	0.14	0.10
May-13	0.06	<0.02		
Jun-13	0.06	0.05		
Jul-13				
Aug-13	0.08	0.07	0.52	0.37
Sep-13	0.14	0.09	0.43	0.05
Oct-13				
Nov-13	0.05	<0.02	0.16	0.11
Dec-13	0.03	0.02	0.14	0.09
2009 Average	0.04	0.04	0.04	0.06
2010 Average	0.09	0.04	0.14	0.08
2011 Average	0.07	0.04	0.26	0.20
2012 Average	0.05	0.03	0.14	0.10
2013 Average	0.07	0.04	0.22	0.12
Average All Years	0.07	0.04	0.17	0.12

CCME Protection of Aquatic Life Guideline - 4 ng/L (unfiltered)
Quarterly sampling in accordance with Amended C. of A. #3960-7Q4K2G, dated March 13, 2009

multiple instances of filtered values exceeding unfiltered



change in reporting frequency, from quarterly to monthly?

Missing a row for Sep 09
Sampling occurred, as filtered values
are reported on Table 13b

Why quarterly sampling for Naysh vs Attawapiskat?

amec

TABLE 13a
<u>TOTAL MERCURY</u> - NAYSHKOOTAYAOW AND ATTAWAPISKAT RIVERS (Unfiltered)
(concentrations in ng/L)

Date	Naysh. R. Upstream (Naysh Riv up)	Naysh. R. Middle (Naysh Riv dn)	Naysh. R. Downstream (Naysh Riv up Att Riv)	Monument Channel (Naysh Riv Control)	Attawapiskat R. A-1 (Att Riv up 2)	Attawapiskat R. A-2 (Att Riv up A2-1)	Attawapiskat R. A-5 (Att Riv dn 500(40))	Attawapiskat R. A-3 (Att Riv dn A3-1)	Attawapiskat R. A-4 (Att Riv dn Naysh Riv)
Feb-08	1.48	1.47	5.33	0.81	8.75	2.19		10.50	2.20
May-08	4.31	4.58	3.30	3.15	3.41	3.64		3.64	3.61
Aug-08	1.98	2.14	2.28	2.13	1.91	2.32		2.09	1.82
Oct-08	2.30	2.31	2.53	1.86	1.93	1.25		1.72	1.79
Jan-09	1.39	1.19	2.00	1.07	1.39	2.09		2.35	1.34
Feb-09	-	-	-	-	-	2.17		1.84	-
Mar-09	-	-	-	-	-	1.36		1.28	-
Apr-09	-	1.00	1.47	0.69	1.36	1.26		1.93	1.22
May-09	5.26	-	-	-	-	4.17		3.19	-
Jun-09	-	-	-	-	-	2.81		2.57	-
Jul-09	2.80	2.58	2.47	2.83	3.58	3.23		3.48	3.50
Aug-09	-	-	-	-	-	1.69		1.79	-
Oct-09	0.80	0.70	1.33	1.07	1.58	1.25		1.39	1.35
Nov-09	-	-	-	-	-	1.07		1.13	-
Dec-09	-	-	-	-	-	0.81		0.96	-
Jan-10	-	-	-	-	-	1.20		1.52	-
Feb-10	1.39	1.11	1.50	1.03	1.76	1.43		1.93	1.52
Mar-10	-	-	-	-	-	1.67		1.80	-
Apr-10	-	-	-	1.60	-	2.13		2.31	-
May-10	2.54	2.21	2.17	-	2.58	2.68		2.82	2.77
Jun-10	-	-	-	-	-	0.70		0.94	-
Jul-10	1.28	1.10	1.12	1.10	1.40	1.08		0.87	0.90
Aug-10	-	-	-	-	-	2.50		1.89	-
Sep-10	-	-	-	-	-	1.23		1.12	-
Oct-10	1.27	1.35	1.28	1.30	1.31	1.71		1.24	1.26
Nov-10	-	-	-	-	-	1.52		1.28	-
Dec-10	-	-	-	-	-	2.17		1.35	-
Jan-11	0.86	0.86	0.98	0.74	1.07	1.31		1.10	1.05
Feb-11	-	-	-	-	-	1.12		1.39	-
Mar-11	-	-	-	-	-	2.67		1.22	-
Apr-11	0.69	0.66	1.30	0.68	0.70	2.18		0.93	0.77
May-11	-	-	-	-	-	3.20		3.83	-
Jun-11	-	-	-	-	-	1.76		1.90	-
Jul-11	1.16	1.46	1.67	2.14	1.36	1.42		1.43	1.44
Aug-11	-	-	-	-	-	1.48		1.55	-
Sep-11*	-	-	-	-	-	-		-	-
Oct-11	1.90	2.53	2.09	2.99	-	2.85		1.99	1.95
Nov-11	-	-	-	-	-	1.79		2.09	-
Dec-11	-	-	-	-	-	3.51		1.23	-
Jan-12	1.53	1.28	1.47	0.94	1.27	1.16		1.28	1.15
Feb-12	-	-	-	-	-	0.85		0.88	-
Mar-12	-	-	-	-	-	0.73		0.75	-
Apr-12	-	-	-	-	-	-		-	-
May-12	2.22	1.86	2.06	2.54	1.80	1.62		1.51	1.61
Jun-12	-	-	-	-	-	3.59		4.00	-
Jul-12	2.00	1.79	1.77	2.39	2.27	2.93		2.20	2.37
Aug-12	-	-	-	-	-	1.76		1.51	-
Sep-12	-	-	-	-	-	1.43		1.88	-
Oct-12	1.82	1.80	1.91	2.56	1.30	1.08		1.03	1.09
Nov-12	-	-	-	-	-	-		-	-
Dec-12	-	-	-	-	-	2.11		2.24	-
Jan-13	2.13	6.63	1.47	3.72	1.58	3.14		2.63	-
Feb-13	-	-	-	-	-	2.00		1.89	-
Mar-13	-	-	-	-	-	1.24		1.36	1.32
Apr-13	0.82	0.88	0.78	2.79	1.77	1.09		1.01	0.83
May-13	-	-	-	-	-	3.11		2.43	-
Jun-13	-	-	-	-	-	3.06		2.48	-
Jul-13	0.77	0.76	0.84	0.99	1.04	1.16	0.98	0.95	1.06
Aug-13	-	-	-	-	-	1.90	1.48	1.34	-
Sep-13	-	-	-	-	-	1.70	1.63	1.60	-
Oct-13	0.96	1.16	1.12	1.08	1.08	1.03	1.22	1.21	1.35
Nov-13	-	-	-	-	-	1.14		0.97	-
Dec-13	-	-	-	-	-	0.82		0.82	-
Average 2009	**2.56**	**1.37**	**1.82**	**1.42**	**1.98**	**1.99**		**1.99**	**1.85**
Average 2010	**1.62**	**1.44**	**1.52**	**1.26**	**1.76**	**1.67**		**1.59**	**1.61**
Average 2011	**1.15**	**1.38**	**1.51**	**1.64**	**1.04**	**2.12**		**1.70**	**1.30**
Average 2012	**1.89**	**1.68**	**1.80**	**2.11**	**1.66**	**1.73**		**1.73**	**1.56**
Average 2013	**1.17**	**2.36**	**1.05**	**2.15**	**1.37**	**1.78**	**1.33**	**1.56**	**1.14**
Average All Years	**1.82**	**1.81**	**1.84**	**1.76**	**2.01**	**1.69**	**1.33**	**1.89**	**1.64**

CCME Protection of Aquatic Life Guideline - 26 ng/L
Sampling locations and frequency governed by Amended C. of A. #3960-7Q4K2G, dated March 13, 2009
Bracketted sampling notations are field identifications
* Samples discarded as a result of lab miscommunication

TABLE 13b

TOTAL MERCURY - NAYSHKOOTAYAOW AND ATTAWAPISKAT RIVERS (Filtered)

(concentrations in ng/L)

Date	Naysh. R. Upstream (Naysh Riv up)	Naysh. R. Middle (Naysh Riv dn)	Naysh. R. Downstream (Naysh Riv up Att Riv)	Monument Channel (Naysh Riv Control)	Attawapiskat R. A-1 (Att Riv up 2)	Attawapiskat R. A-2 (Att Riv up A2-1)	Attawapiskat R. A-5 (Att Riv dn 500(40))	Attawapiskat R. A-3 (Att Riv dn A3-1)	Attawapiskat R. A-4 (Att Riv dn Naysh Riv)
Feb-08	1.15	1.12	2.31	0.69	2.36	2.12		1.73	1.97
May-08	2.71	2.71	2.35	2.57	2.62	2.58		2.80	2.64
Aug-08	1.66	1.71	1.89	1.68	1.57	1.53		1.53	1.49
Oct-08	1.79	1.79	1.90	1.72	1.60	1.24		1.39	1.39
Jan-09	0.96	0.99	1.99	0.80	1.14	1.58		1.49	1.17
Feb-09	-	-	-	-	-	-		-	-
Mar-09	-	-	-	-	-	-		-	-
Apr-09	-	0.78	0.76	0.67	1.08	1.11		1.36	1.06
May-09	2.40	-	-	-	-	2.11		2.07	-
Jun-09	-	-	-	-	-	1.93		1.84	-
Jul-09	1.49	1.43	1.50	1.75	2.36	1.82		2.03	2.34
Aug-09	-	-	-	-	-	1.20		1.22	-
Sep-09	-	-	-	-	-	1.32		1.53	-
Oct-09	0.80	0.68	0.86	0.80	1.05	1.05		1.02	0.94
Nov-09	-	-	-	-	-	0.76		0.69	-
Dec-09	-	-	-	-	-	0.67		0.68	-
Jan-10	-	-	-	-	-	1.41		1.49	-
Feb-10	0.85	0.65	1.06	0.50	1.21	1.47		1.64	1.49
Mar-10	-	-	-	-	-	1.30		1.30	-
Apr-10	-	-	-	1.05	-	1.45		1.58	-
May-10	1.28	1.59	1.28	-	1.69	1.77		1.29	1.84
Jun-10	-	-	-	-	-	0.60		0.69	-
Jul-10	0.74	0.74	0.73	0.70	0.77	0.72		1.55	0.63
Aug-10	-	-	-	-	-	1.62		1.59	-
Sep-10	-	-	-	-	-	0.86		0.71	-
Oct-10	1.07	1.08	1.10	1.09	1.17	1.24		1.27	1.30
Nov-10	-	-	-	-	-	1.04		1.39	-
Dec-10	-	-	-	-	-	0.98		0.94	-
Jan-11	0.62	0.59	0.62	0.51	0.92	0.98		0.89	0.99
Feb-11	-	-	-	-	-	0.85		0.94	-
Mar-11	-	-	-	-	-	1.05		0.98	-
Apr-11	0.68	0.46	1.12	0.37	0.67	0.78		0.73	0.94
May-11	-	-	-	-	-	1.99		2.06	-
Jun-11	-	-	-	-	-	1.18		1.21	-
Jul-11	1.15	1.15	1.28	0.94	1.28	0.93		0.88	0.90
Aug-11	-	-	-	-	-	<0.01		0.98	-
Sep-11*	-	-	-	-	-	-		-	-
Oct-11	1.35	1.53	1.51	1.72	1.35	1.73		1.31	1.33
Nov-11	-	-	-	-	-	1.28		1.23	-
Dec-11	-	-	-	-	-	1.00		0.91	-
Jan-12	1.47	0.68	0.84	0.43	0.77	0.72		0.75	0.73
Feb-12	-	-	-	-	-	0.49		0.52	-
Mar-12	-	-	-	-	-	0.49		0.45	-
Apr-12	-	-	-	-	-	-		-	-
May-12	1.07	1.06	1.23	1.49	0.94	0.81		0.86	0.87
Jun-12	-	-	-	-	-	1.68		1.62	-
Jul-12	0.99	0.99	1.02	1.46	1.23	1.28		1.18	1.03
Aug-12	-	-	-	-	-	0.81		0.82	-
Sep-12	-	-	-	-	-	1.05		1.23	-
Oct-12	1.08	0.96	1.08	1.57	0.78	0.80		0.69	0.66
Nov-12	-	-	-	-	-	-		-	-
Dec-12	-	-	-	-	-	1.26		1.20	-
Jan-13	1.58	1.62	0.63	1.73	1.24	1.98		1.94	-
Feb-13	-	-	-	-	-	1.29		1.18	-
Mar-13	-	-	-	-	-	0.91		0.87	0.82
Apr-13	0.40	0.44	0.47	0.41	0.63	0.74		0.75	0.48
May-13	-	-	-	-	-	1.65		1.23	-
Jun-13	-	-	-	-	-	1.61		1.64	-
Jul-13	0.40	0.40	0.50	0.40	0.70	0.70	0.6	0.60	0.60
Aug-13	-	-	-	-	-	0.82	0.79	0.80	-
Sep-13	-	-	-	-	-	1.31	1.28	1.32	-
Oct-13	0.82	0.25	0.68	1.07	0.73	0.78	1.03	0.73	0.76
Nov-13	-	-	-	-	-	0.10		0.71	-
Dec-13	-	-	-	-	-	0.59		0.78	-
Average 2009	**1.41**	**0.97**	**1.28**	**1.01**	**1.41**	**1.36**		**1.39**	**1.38**
Average 2010	**0.99**	**1.01**	**1.04**	**0.83**	**1.21**	**1.21**		**1.29**	**1.32**
Average 2011	**0.95**	**0.93**	**1.13**	**0.89**	**1.06**	**1.18**		**1.10**	**1.04**
Average 2012	**1.15**	**0.92**	**1.04**	**1.24**	**0.93**	**0.94**		**0.93**	**0.82**
Average 2013	**0.80**	**0.68**	**0.57**	**0.90**	**0.83**	**1.04**	**0.93**	**1.05**	**0.67**
Average All Years	**1.19**	**1.06**	**1.20**	**1.09**	**1.24**	**1.19**	**0.93**	**1.20**	**1.18**

CCME Protection of Aquatic Life Guideline - 26 ng/L

Sampling locations and frequency governed by Amended C. of A. #3960-7Q4K2G, dated March 13, 2009

Bracketted sampling notations are field identifications

* Samples discarded as a result of lab miscommunication

TABLE 14a

METHYL MERCURY - NAYSHKOOTAYAOW AND ATTAWAPISKAT RIVERS (Unfiltered)
(concentrations in ng/L)

where are A2-1 and A3-1?

Date	Naysh. R. Upstream (Naysh Riv Up)	Naysh. R. Middle (Naysh Riv dn)	Naysh. R. Downstream (Naysh Riv up Att Riv)	Monument Channel (Naysh Riv Control)	Attawapiskat R. A-1 (Att Riv up 2)	Attawapiskat R. A-2 (Att Riv up A2-1)	Attawapiskat R. A-5 (Att Riv dn 500(40))	Attawapiskat R. A-3 (Att Riv dn A3-1)	Attawapiskat R. A-4 (Att Riv dn Naysh Riv)
Feb-08	0.03	0.03	0.09	0.04	0.14	0.03		0.20	0.04
May-08	0.04	0.04	0.01	0.08	0.06	0.07		0.05	0.04
Aug-08	0.06	0.07	0.11	0.14	0.06	0.05		0.03	0.04
Oct-08	0.06	0.05	0.07	0.06	0.04	0.02		0.03	0.02
Jan-09	0.03	0.02	0.04	0.05	0.02	0.04		0.03	0.02
Feb-09	-	-	-	-	-	-		-	-
Apr-09	-	0.03	0.02	0.02	0.03	0.02		<0.01	0.03
May-09	0.03	-	-	-	-	0.02		0.02	-
Jun-09	-	-	-	-	-	0.10		0.07	-
Jul-09	0.05	0.05	0.03	0.03	0.04	0.04		0.10	0.02
Oct-09	0.06	0.05	0.05	0.10	0.09	0.06		0.05	0.10
Nov-09	-	-	-	-	-	0.04		0.05	-
Dec-09	-	-	-	-	-	0.08		0.10	-
Jan-10	-	-	-	-	-	0.09		0.08	-
Feb-10	0.20	0.04	0.03	0.02	0.04	0.05		0.07	0.03
Mar-10	-	-	-	-	-	0.06		0.03	-
Apr-10	-	-	-	0.07	-	0.06		0.06	-
May-10	0.05	<0.01	0.05	-	<0.01	0.02		0.05	0.01
Jun-10	-	-	-	-	-	0.08		0.05	-
Jul-10	0.02	0.10	0.11	0.14	0.15	0.04		0.12	0.09
Aug-10	-	-	-	-	-	0.08		0.07	-
Sep-10	-	-	-	-	-	0.04		0.04	-
Oct-10	0.04	0.05	0.05	0.14	0.03	0.03		0.04	0.03
Nov-10	-	-	-	-	-	0.07		0.04	-
Dec-10	-	-	-	-	-	<0.01		0.04	-
Jan-11	0.03	0.03	0.01	0.05	0.04	0.04		0.03	0.04
Feb-11	-	-	-	-	-	<0.01		0.01	-
Mar-11	-	-	-	-	-	0.03		0.01	-
Apr-11	-	-	-	-	-	0.06		0.03	-
May-11	-	-	-	-	-	0.07		0.05	-
Jun-11	-	-	-	-	-	0.03		0.03	-
Jul-11	0.07	0.06	0.08	0.13	0.05	0.05		0.05	0.03
Aug-11	-	-	-	-	-	0.07		0.07	-
Sep-11*	-	-	-	-	-	-		-	-
Oct-11	0.27	0.08	0.08	0.12	-	0.10		0.07	0.04
Nov-11	-	-	-	-	-	0.07		0.06	-
Dec-11	-	-	-	-	-	0.07		0.04	-
Jan-12	0.08	0.09	0.06	0.12	0.06	0.06		0.08	0.06
Feb-12	-	-	-	-	-	0.06		0.01	-
Mar-12	-	-	-	-	-	0.03		0.03	-
Apr-12	-	-	-	-	-	-		-	-
May-12	0.05	0.05	0.05	0.10	0.07	0.06		0.06	0.04
Jun-12	-	-	-	-	-	<0.02		0.08	-
Jul-12	0.07	0.07	0.08	0.17	0.06	0.07		0.04	0.06
Aug-12	-	-	-	-	-	0.05		0.03	-
Sep-12	-	-	-	-	-	0.04		0.04	-
Oct-12	0.03	0.04	0.06	0.07	<0.01	0.02		<0.02	0.04
Nov-12	-	-	-	-	-	-		-	-
Dec-12	-	-	-	-	-	0.05		0.05	-
Jan-13	<0.02	0.03	<0.02	0.10	<0.02	0.04		0.04	-
Feb-13	-	-	-	-	-	0.04		0.04	-
Mar-13	-	-	-	-	-	0.03		0.04	-
Apr-13	0.04	0.03	0.03	0.09	0.05	0.08		0.03	0.04
May-13	-	-	-	-	-	0.04		0.09	0.02
Jun-13	-	-	-	-	-	0.07		0.06	-
Jul-13	0.02	<0.02	0.04	0.03	<0.02	0.04	0.05	0.02	0.08
Aug-13	-	-	-	-	-	0.05	0.06	0.07	-
Sep-13	-	-	-	-	-	0.07	0.05	0.05	-
Oct-13	0.18	0.08	0.05	0.11	0.04	0.04	ND	0.02	0.02
Nov-13	-	-	-	-	-	0.03		0.04	-
Dec-13	-	-	-	-	-	<0.01		<0.01	-
Average 2009	**0.04**	**0.04**	**0.03**	**0.05**	**0.04**	**0.05**		**0.05**	**0.04**
Average 2010	**0.08**	**0.05**	**0.06**	**0.09**	**0.06**	**0.05**		**0.06**	**0.04**
Average 2011	**0.12**	**0.05**	**0.05**	**0.10**	**0.05**	**0.06**		**0.04**	**0.04**
Average 2012	**0.06**	**0.06**	**0.06**	**0.11**	**0.05**	**0.05**		**0.04**	**0.05**
Average 2013	**0.07**	**0.04**	**0.03**	**0.08**	**0.03**	**0.05**	**0.05**	**0.04**	**0.04**
Average All Years	**0.07**	**0.05**	**0.05**	**0.09**	**0.05**	**0.05**	**0.05**	**0.05**	**0.04**

CCME Protection of Aquatic Life Guideline - 4 ng/L (unfiltered)
Sampling locations and frequency governed by Ammended C. of A. #3960-7Q4K2G, dated March 13, 2009
Bracketted sampling notations are field identifications
* Samples discarded as a result of lab miscommunication

amec

TABLE 14b
<u>METHYL MERCURY</u> - NAYSHKOOTAYAOW AND ATTAWAPISKAT RIVERS (Filtered)
(concentrations in ng/L)

where are A2-1 and A3-1?

Date	Naysh. R. Upstream (Naysh Riv Up)	Naysh. R. Middle (Naysh Riv dn)	Naysh. R. Downstream (Naysh Riv up Att Riv)	Monument Channel (Naysh Riv Control)	Attawapiskat R. A-1 (Att Riv up 2)	Attawapiskat R. A-2 (Att Riv up A2-1)	Attawapiskat R. A-5 (Att Riv dn 500(40))	Attawapiskat R. A-3 (Att Riv dn A3-1)	Attawapiskat R. A-4 (Att Riv dn Naysh Riv)
Feb-08	0.03	0.02	0.03	0.03	0.04	0.05		0.03	0.04
May-08	0.01	0.03	0.02	0.06	0.01	0.03		0.02	0.03
Aug-08	0.05	0.05	0.06	0.10	0.04	0.02		0.03	0.03
Oct-08	0.03	0.02	0.03	0.04	0.03	0.02		0.02	0.02
Jan-09	0.03	0.03	0.03	0.02	0.02	0.02		0.02	0.02
Feb-09	-	-	-	-	-	-		-	-
Apr-09	-	0.01	0.01	0.01	0.02	0.02		0.03	0.01
May-09	0.09	-	-	-	-	0.03		0.03	-
Jun-09	-	-	-	-	-	0.03		0.03	-
Jul-09	0.04	0.10	0.11	0.07	0.15	0.03		0.02	0.03
Aug-09	-	-	-	-	-	0.05		0.03	-
Oct-09	0.07	0.04	0.06	0.04	0.04	0.05		0.06	0.07
Nov-09	-	-	-	-	-	0.03		0.15	-
Dec-09	-	-	-	-	-	0.08		0.09	-
Jan-10	-	-	-	-	-	0.01		0.04	-
Feb-10	0.01	0.05	0.09	0.03	0.04	0.07		0.05	0.04
Mar-10	-	-	-	-	-	0.05		0.03	-
Apr-10	-	-	-	0.05	-	0.04		0.03	-
May-10	0.04	0.12	0.04	-	0.05	0.03		0.04	0.05
Jun-10	-	-	-	-	-	0.01		0.02	-
Jul-10	0.05	0.06	0.03	0.07	<0.01	0.03		0.04	0.04
Aug-10	-	-	-	-	-	0.04		0.05	-
Sep-10	-	-	-	-	-	0.03		0.02	-
Oct-10	0.05	0.04	0.05	0.10	0.04	0.03		0.04	0.03
Nov-10	-	-	-	-	-	0.02		<0.01	-
Dec-10	-	-	-	-	-	0.04		0.02	-
Jan-11	0.01	0.01	<0.01	0.03	0.02	<0.01		0.02	0.01
Feb-11	-	-	-	-	-	<0.01		0.01	-
Mar-11	-	-	-	-	-	0.01		0.01	-
Apr-11	-	-	-	-	-	0.01		0.01	-
May-11	-	-	-	-	-	0.02		0.01	-
Jun-11	-	-	-	-	-	0.01		0.02	-
Jul-11	0.04	0.05	0.05	0.03	0.02	0.02		0.02	0.03
Aug-11	-	-	-	-	-	0.07		0.07	-
Sep-11*	-	-	-	-	-	-		-	-
Oct-11	0.06	0.06	0.07	0.11	0.05	0.06		0.04	0.04
Nov-11	-	-	-	-	-	0.04		0.04	-
Dec-11	-	-	-	-	-	0.01		0.03	-
Jan-12	0.01	0.02	0.04	0.08	<0.01	0.04		0.05	0.02
Feb-12	-	-	-	-	-	0.05		0.01	-
Mar-12	-	-	-	-	-	<0.02		0.03	-
Apr-12	-	-	-	-	-	-		-	-
May-12	0.04	0.02	0.04	0.08	0.03	0.04		0.02	0.02
Jun-12	-	-	-	-		<0.02		0.04	-
Jul-12	0.04	0.05	0.05	0.09	0.03	0.05		0.02	0.02
Aug-12	-	-	-	-	-	0.04		0.03	-
Sep-12	-	-	-	-	-	0.03		0.03	-
Oct-12	0.02	0.02	0.04	0.04	<0.02	0.03		<0.01	<0.02
Nov-12	-	-	-	-	-	-		-	-
Dec-12	-	-	-	-	-	0.06		0.04	-
Jan-13	0.06	0.04	0.02	0.02	<0.02	0.03		0.03	-
Feb-13	-	-	-	-	-	0.04		0.02	-
Mar-13	-	-	-	-	-	<0.02		<0.02	<0.02
Apr-13	<0.02	<0.02	<0.02	0.04	0.02	0.04		<0.02	<0.02
May-13	-	-	-	-	-	0.03		0.04	-
Jun-13	-	-	-	-	-	<0.02		0.03	-
Jul-13	<0.02	<0.02	0.04	<0.02	<0.02	<0.02	0.03	0.02	<0.02
Aug-13	-	-	-	-	-	0.18	<0.02	<0.02	-
Sep-13	-	-	-	-	-	0.06	0.02	0.04	-
Oct-13	0.03	0.05	0.04	0.04	<0.01	0.04	ND	<0.01	<0.01
Nov-13	-	-	-	-	-	<0.20		<0.02	-
Dec-13	-	-	-	-	-	<0.01		<0.01	-
Average 2009	**0.06**	**0.05**	**0.05**	**0.03**	**0.06**	**0.04**		**0.05**	**0.03**
Average 2010	**0.04**	**0.07**	**0.05**	**0.06**	**0.03**	**0.03**		**0.03**	**0.04**
Average 2011	**0.04**	**0.04**	**0.06**	**0.06**	**0.03**	**0.03**		**0.03**	**0.03**
Average 2012	**0.03**	**0.03**	**0.04**	**0.07**	**0.02**	**0.04**		**0.03**	**0.02**
Average 2013	**0.03**	**0.03**	**0.03**	**0.03**	**0.02**	**0.06**	**0.02**	**0.02**	**0.02**
Average All Years	**0.04**	**0.04**	**0.04**	**0.05**	**0.03**	**0.04**	**0.02**	**0.03**	**0.03**

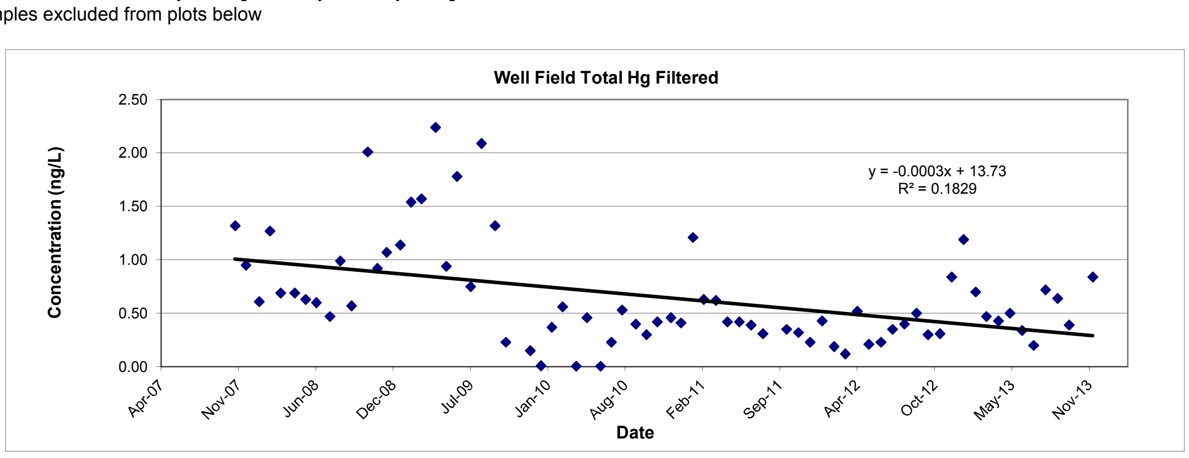
CCME Protection of Aquatic Life Guideline - 4 ng/L (unfiltered)
Sampling locations and frequency governed by Ammended C. of A. #3960-7Q4K2G, dated March 13, 2009
Bracketted sampling notations are field identifications
* Samples discarded as a result of lab miscommunication

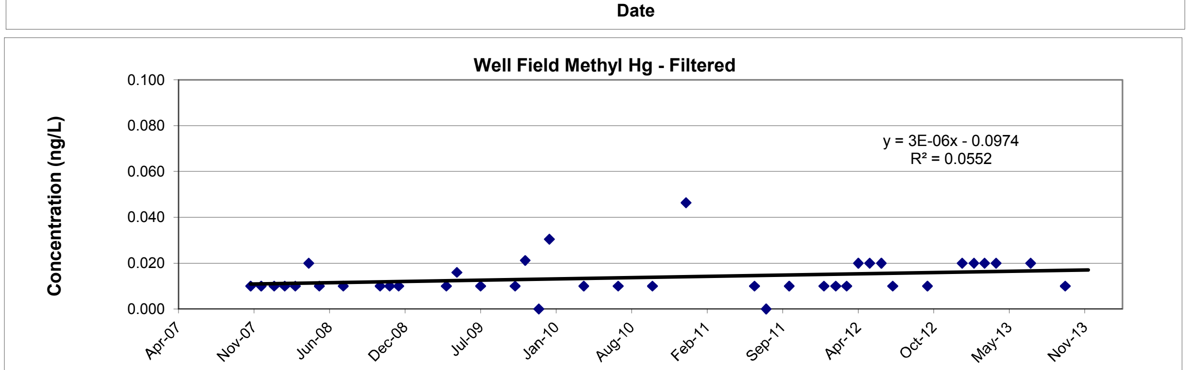
appropriate distinction made here, vs previous paired tables

TABLE 15
MERCURY CONTENT IN WELL FIELD DISCHARGE
(concentrations in ng/L)

Date	Total Mercury		Methyl Mercury		Wells in Production
	Unfiltered	Filtered	Unfiltered	Filtered	
Nov-07	1.33	1.32	<0.01	<0.01	VDW-6, 11 and 22
Dec-07	1.33	0.95	0.01	0.01	VDW-6, 11 and 22
Jan-08	0.87	0.61	0.01	0.01	VDW-6, 11, 15, 17 and 22
Feb-08	1.55	1.27	<0.01	0.01	VDW-6, 11 and 22
Mar-08	0.70	0.69	<0.01	0.01	VDW-6, 11, 15, 17 and 22
Apr-08	0.84	0.69	0.02	0.02	VDW-7, 11, 15, 17 and 22
May-08	0.78	0.63	<0.01	<0.01	VDW-7, 11, 15, 17 and 22
Jun-08	0.72	0.60			VDW-7, 11, 15, 17 and 22
Jul-08	0.65	0.47	0.01	0.01	VDW-6, 11, 15, 17 and 22
Aug-08	2.63	0.99			VDW-6, 11, 15, 17 and 22
Sep-08	0.67	0.57			VDW-6, 11, 15, 17 and 22
Oct-08	2.20	2.01	<0.01	<0.01	VDW-3, 6, 7, 11, 15, 17 and 22
Nov-08	1.00	0.92	<0.01	<0.01	VDW-3, 6, 7, 11, 15, 17 and 22
Dec-08	1.34	1.07	0.01	0.01	VDW-3, 6, 7, 11, 15, 17 and 22
Jan-09	1.43	1.14			VDW-3, 6, 7, 11, 15, 17 and 22
Feb-09	1.71	1.54			VDW-3, 6, 7, 11, 15, 17 and 22
Mar-09	1.73	1.57			VDW-3, 6, 7, 11, 15, 17 and 22
Apr-09	2.42	2.24	0.01	0.01	VDW-3, 6, 7, 11, 15, 17 and 22
May-09	2.53	0.94		0.02	VDW-3, 6, 7, 11, 15, 17 and 22
Jun-09	0.72	1.78	0.04		VDW-3, 6, 7, 11, 15, 17 and 22
Jul-09	1.69	0.75	0.09	0.01	VDW-3, 6, 7, 11, 15, 17 and 22
Aug-09	4.22	2.09	0.01		VDW-3, 6, 7, 11, 15, 17 and 22
Sep-09	0.77	1.32			VDW-3, 6, 7, 11, 15, 17 and 22
Oct-09	0.63	0.23	0.02	0.01	VDW-3, 6, 7, 11, 15, 17 and 22
Nov-09				0.02	VDW-3, 6, 7, 11, 15, 17 and 22
Dec-09	0.34	0.15	0.08	0.12*	VDW-3, 6, 7, 11, 15, 17 and 22
Jan-10	1.09	<0.01	0.06	0.03	VDW-3, 6, 7, 11, 14, 15, 17 and 22
Feb-10	1.54	0.37			VDW-3, 6, 7, 11, 14, 15, 17 and 22
Mar-10	1.20	0.56			VDW-3, 6, 7, 11, 14, 15, 17 and 22
Apr-10	1.03	0.01	0.01	<0.01	VDW-3, 6, 7, 11, 14, 15, 17 and 22
May-10	1.03	0.46			VDW-3, 6, 7, 11, 14, 15, 17 and 22
Jun-10	0.62	0.01			VDW-3, 6, 7, 11, 14, 15, 17 and 22
Jul-10	0.92	0.23	0.01	0.01	VDW-3, 6, 7, 11, 14, 15, 17 and 22
Aug-10	1.10	0.53			VDW-3, 6, 7, 11, 14, 15, 17 and 22
Sep-10	1.25	0.40			VDW-3, 6, 7, 11, 14, 15, 17 and 22
Oct-10	1.61	0.30	<0.01	<0.01	VDW-3, 6, 7, 11, 14, 15, 17 and 22
Nov-10	1.15	0.42			VDW-3, 6, 7, 11, 14, 15, 17 and 22
Dec-10	0.94	0.46			VDW-3, 6, 7, 11, 14, 15, 17 and 22
Jan-11	1.04	0.41	<0.01	0.05	VDW-6, 7, 11, 12, 14, 15, 17, 18 and 22
Feb-11	1.33	1.21			VDW-6, 7, 11, 12, 14, 15, 17, 18 and 22
Mar-11	1.73	0.63			VDW-6, 7, 11, 12, 14, 15, 17, 18 and 22
Apr-11	1.28	0.62			VDW-6, 7, 11, 12, 14, 15, 17, 18 and 22
May-11	1.48	0.42			VDW-6, 7, 11, 12, 14, 15, 17, 18 and 22
Jun-11	1.64	0.42			VDW-2, 6, 7, 11, 12, 14, 15, 17, 18 and 22
Jul-11	1.41	0.39	0.01	0.01	VDW-2, 6, 7, 11, 12, 14, 15, 17, 18 and 22
Aug-11	1.05	0.31	0.21	<0.01	VDW-2, 7, 11, 12, 14, 15, 17, 18 and 22
Sep-11					VDW-2, 6, 7, 11, 12, 14, 15, 17, 18 and 22
Oct-11	6.36	0.35	0.01	0.01	VDW-2, 6, 7, 11, 12, 14, 15, 17, 18 and 22
Nov-11	4.40	0.32			VDW-2, 6, 7, 11, 12, 14, 15, 17, 18 and 22
Dec-11	1.05	0.23			VDW-2, 6, 7, 12, 14, 15, 17, 18 and 22
Jan-12	0.97	0.43	0.02	0.01	VDW-2, 6, 7, 12, 14, 15, 17, 18, 21 and 22
Feb-12	0.57	0.19	0.01	0.01	VDW-2, 6, 7, 12, 14, 15, 17, 18, 21 and 22
Mar-12	0.31	0.12	<0.01	<0.01	VDW-2, 6, 7, 12, 14, 15, 17, 18, 21 and 22
Apr-12	0.98	0.52	<0.01	<0.02	VDW-2, 6, 7, 12, 14, 15, 17, 18, 21 and 22
May-12	1.42	0.21	0.27	0.02	VDW-2, 6, 7, 11, 12, 14, 15, 17, 18, 21 and 22
Jun-12	0.66	0.23	<0.02	<0.02	VDW-2, 6, 7, 12, 14, 15, 17, 18, 21 and 22
Jul-12	0.76	0.35	0.02	<0.01	VDW-2, 6, 7, 12, 14, 15, 17, 18, 21 and 22
Aug-12	5.70	0.40			VDW-2, 6, 7, 12, 14, 15, 17, 18, 21 and 22
Sep-12	2.52	0.50			VDW-2, 6, 7, 12, 14, 15, 17, 18, 21 and 22
Oct-12	1.87	0.30	<0.01	<0.01	VDW-2, 6, 7, 12, 14, 15, 17, 18, 21 and 22
Nov-12	0.87	0.31			VDW-2, 6, 7, 12, 14, 15, 17, 18, 21 and 22
Dec-12	2.83	0.84			VDW-2, 6, 7, 12, 14, 15, 17, 18, 21 and 22
Jan-13	2.07	<1.19	<0.02	<0.02	VDW-2, 6, 7, 11, 12, 14, 15, 17, 18, 21 and 22
Feb-13	2.99	<0.70	<0.02	<0.02	VDW-2, 6, 7, 11, 12, 14, 15, 17, 18, 21 and 22
Mar-13	1.63	<0.47	<0.02	<0.02	VDW-2, 6, 7, 11, 12, 14, 15, 17, 18, 21 and 22
Apr-13	1.18	0.43	0.019	<0.02	VDW-2, 6, 7, 11, 12, 14, 15, 17, 18, 21 and 22
May-13	1.10	0.5			VDW-2, 6, 7, 11, 12, 14, 15, 17, 18, 21 and 22
Jun-13	1	0.34			VDW-2, 6, 7, 11, 12, 14, 15, 17, 18, 21 and 22
Jul-13	0.51	<0.20	<0.02	<0.02	VDW-2, 6, 7, 11, 12, 14, 15, 17, 18, 21 and 22
Aug-13	2.12	0.72			VDW-2, 6, 7, 11, 12, 14, 15, 17, 18, 21, 22, 23 and 25
Sep-13	2.45	0.64			VDW-2, 6, 7, 11, 12, 14, 15, 17, 18, 21, 22, 23 and 25
Oct-13	1.02	0.39	0.05	<0.01	VDW-2, 6, 7, 11, 12, 14, 15, 17, 18, 21, 22, 23 and 25
Nov-13					VDW-2, 6, 7, 11, 12, 14, 15, 17, 18, 21, 22, 23 and 25
Dec-13	2.56	0.84			VDW-2, 6, 7, 11, 12, 14, 15, 17, 18, 21, 22, 23 and 25
Average 2009	**1.65**	**1.25**	**0.04**	**0.01**	
Average 2010	**1.12**	**0.31**	**0.02**	**0.02**	
Average 2011	**2.07**	**0.48**	**0.06**	**0.02**	
Average 2012	**1.62**	**0.37**	**0.05**	**0.01**	
Average 2013	**1.69**	**0.58**	**0.02**	**0.02**	
Average All Years	**1.54**	**0.65**	**0.03**	**0.01**	

CEQG-PAL: Total Mercury - 26 ng/L; Methyl Mercury - 4 ng/L
*Samples excluded from plots below





VDW-6, VDW-14, VDW-15, VDW-18 and VDW-22

missing data for VDW-23 and VDW-25???

TABLE 16a

TOTAL MERCURY - INDIVIDUAL MINE DEWATERING WELLS (Unfiltered)

(concentrations in ng/L)

Date	VDW-2	VDW-3	VDW-6	VDW-7	VDW-11	VDW-12	VDW-14	VDW-15	VDW-17	VDW-18	VDW-21	VDW-22
Nov-07	-	-	-	-	-	-	-	-	-	-		-
Dec-07	-	-	0.07	-	1.31	-	-	-	-	-		3.08
Jan-08	-	-	0.06	-	1.64	-	-	0.29	0.09	-		3.66
Feb-08	-	-	0.12	-	1.41	-	-	-	-	-		3.13
Mar-08	-	-	0.33	-	2.93	-	-	0.22	0.28	-		3.26
Apr-08	-	-	-	-	1.89	-	-	0.64	0.31	-		4.27
Jul-08	-	-	0.14	-	2.18	-	-	0.20	0.19	-		2.28
Oct-08	-	0.03	0.05	0.42	*38.6	-	-	0.07	0.06	-		6.52
Jan-09	-	0.04	0.02	0.25	3.33	-	-	0.07	0.10	-		6.56
Apr-09	-	0.03	0.05	-	3.34	-	-	0.03	0.10	-		5.59
Jul-09	-	0.74	0.52	1.11	3.50	-	-	0.69	0.85	-		4.37
Oct-09	-	0.14	0.63	0.16	1.55	-	-	0.41	0.09	-		1.61
Jan-10	-	<0.01	<0.01	<0.01	3.40	-	0.01	<0.01	<0.01	-		3.80
Apr-10	-	<0.01	<0.01	<0.01	2.59	-	<0.01	<0.01	<0.01	-		3.32
Jul-10	-	0.12	0.09	0.28	3.00	-	0.08	0.03	0.24	-		3.36
Oct-10	-	<0.01	0.01	0.01	4.31	-	<0.01	<0.01	<0.01	0.35		5.18
Jan-11	-	-	-	0.23	3.34	1.39	0.20	<0.01	0.01	0.01		3.66
Apr-11	-	-	0.39	0.72	3.76	1.37	1.07	0.44	0.66	0.40		2.92
Jul-11	0.85	-	-	0.57	5.15	2.18	0.37	0.79	0.25	0.39		5.18
Oct-11	0.59	-	0.60	2.08	*125.15	2.75	0.67	0.55	0.95	1.21		15.86*
Jan-12	0.43	-	0.01	0.43	-	2.48	0.01	0.41	0.01	0.60	1.23	109.24*
Apr-12	0.54	-	0.47	0.68	-	3.65	0.51	0.56	0.32	1.00	0.89	6.63
Jul-12	0.12	-	0.13	0.28	-	2.66	<0.10	0.12	<0.10	0.47	0.42	8.29
Oct-12	<0.10	-	<0.10	0.69	-	3.63	<0.10	<0.10	<0.10	1.19	0.66	9.69
Jan-13	1.15	-	0.34	0.33	29.80	4.00	1.92	0.71	1.26	2.43	2.63	8.97
Apr-13	0.12	-	0.16	0.28	20.99	3.26	0.18	0.12	0.13	0.96	0.42	10.19
Jul-13	<0.10	-	0.23	0.23	24.70	2.88	<0.10	0.24	<0.10	1.46	1.53	3.85
Oct-13	0.33	-	0.39	9.50	34.40	1.98	0.36	0.49	<0.01	1.61	6.98	3.54
Average 2009	**-**	**0.24**	**0.31**	**0.51**	**2.93**	**-**	**-**	**0.30**	**0.29**	**-**	**-**	**4.53**
Average 2010	**-**	**0.04**	**0.03**	**0.08**	**3.32**	**-**	**-**	**0.01**	**0.07**	**-**	**-**	**3.91**
Average 2011	**0.72**	**-**	**0.50**	**0.90**	**4.08**	**1.92**	**0.58**	**0.45**	**0.47**	**0.50**	**-**	**3.92**
Average 2012	**0.30**	**-**	**0.18**	**0.52**	**7.55**	**3.11**	**0.18**	**0.30**	**0.13**	**0.82**	**0.80**	**8.20**
Average 2013	**0.43**	**-**	**0.28**	**2.59**	**27.47**	**3.03**	**0.64**	**0.39**	**0.38**	**1.62**	**2.89**	**6.64**
Average All Years	**0.43**	**0.13**	**0.21**	**0.91**	**7.55**	**2.69**	**0.36**	**0.29**	**0.25**	**0.93**	**1.85**	**4.92**

* Samples excluded from average calculations

CCME Protection of Aquatic Life Guideline - 26 ng/L

Sampling locations and frequency governed by Amended C. of A. #3960-7Q4K2G, dated March 13, 2009

missing data for VDW-23 and VDW-25???

two detection limits? no notation. recent move to less accuracy?

TABLE 16b

TOTAL MERCURY - INDIVIDUAL MINE DEWATERING WELLS (Filtered)

(concentrations in ng/L)

Date	VDW-2	VDW-3	VDW-6	VDW-7	VDW-11	VDW-12	VDW-14	VDW-15	VDW-17	VDW-18	VDW-21	VDW-22
Nov-07	-	-	0.08	-	1.07	-	-	-	-	-		2.36
Dec-07	-	-	0.08	-	0.96	-	-	-	-	-		2.27
Jan-08	-	-	0.05	-	1.01	-	-	0.08	0.12	-		1.87
Feb-08	-	-	0.10	-	1.17	-	-	-	-	-		2.74
Mar-08	-	-	0.25	-	0.14	-	-	0.09	0.17	-		2.92
Apr-08	-	-	-	-	1.21	-	-	0.18	0.35	-		3.71
Jul-08	-	-	0.18	-	1.56	-	-	0.15	0.18	-		1.82
Oct-08	-	0.05	0.06	0.41	*17.4	-	-	0.09	0.06	-		6.09
Jan-09	-	0.02	0.01	0.19	2.30	-	-	0.05	0.09	-		4.63
Apr-09	-	0.04	0.06	-	3.34	-	-	0.03	0.08	-		5.28
Jul-09	-	0.61	0.62	0.60	1.12	-	-	0.58	0.45	-		0.95
Oct-09	-	0.09	0.34	0.10	0.49	-	-	0.36	0.08	-		0.38
Jan-10	-	0.01	0.01	<0.01	0.53	-	0.01	<0.01	<0.01	-		0.62
Apr-10	-	<0.01	<0.01	<0.01	0.82	-	<0.01	<0.01	<0.01	-		0.57
Jul-10	-	0.10	0.06	0.11	0.42	-	0.20	0.03	0.12	-		0.45
Oct-10	-	0.39	0.36	0.42	0.75	-	-	0.01	0.01	0.01		0.01
Jan-11	-	-	0.01	0.23	0.88	0.48	0.40	0.01	-	0.01		0.73
Apr-11	-	-	0.01	0.36	0.80	0.46	0.54	0.01	0.38	0.37		1.10
Jul-11	0.01	-	-	0.01	0.01	0.01	0.01	0.01	0.01	0.01		1.86
Oct-11	0.01	-	0.01	0.01	0.73	0.54	0.01	0.01	0.35	0.35		1.08
Jan-12	0.42	-	<0.01	0.40	-	0.82	0.01	0.01	0.01	0.42	0.01	0.71
Apr-12	0.18	-	0.16	0.30	-	0.28	0.18	0.06	0.18	0.38	0.33	1.07
Jul-12	0.10	-	<0.10	0.15	-	1.59	<0.10	0.12	<0.10	0.20	0.14	0.64
Oct-12	<0.10	-	<0.10	<0.10	-	1.03	<0.10	<0.10	<0.10	0.36	0.18	1.08
Jan-13	1.19	-	0.11	0.14	3.52	2.34	1.21	<0.10	1.08	1.09	1.07	0.93
Apr-13	0.16	-	0.16	0.24	5.35	1.15	0.16	0.17	0.09	0.50	0.15	0.62
Jul-13	<0.10	-	<0.10	<0.10	4.88	0.5	<0.10	<0.10	<0.10	0.20	<0.10	0.9
Oct-13	0.15	-	0.14	0.39	10.9	0.57	0.23	0.60	<0.01	0.59	0.11	1.27
Average 2009	**-**	**0.19**	**0.26**	**0.30**	**1.81**	**-**	**-**	**0.22**	**0.18**	**-**	**-**	**2.81**
Average 2010	**-**	**0.13**	**0.11**	**0.14**	**0.63**	**-**	**-**	**0.02**	**0.04**	**-**	**-**	**0.41**
Average 2011	**0.01**	**-**	**0.01**	**0.15**	**0.61**	**0.37**	**0.24**	**0.01**	**0.25**	**0.19**	**-**	**1.19**
Average 2012	**0.20**	**-**	**0.09**	**0.24**	**-**	**0.93**	**0.10**	**0.07**	**0.10**	**0.34**	**0.17**	**0.88**
Average 2013	**0.40**	**-**	**0.13**	**0.22**	**6.16**	**1.14**	**0.43**	**0.24**	**0.32**	**0.60**	**0.36**	**0.93**
Average All Years	**0.24**	**0.15**	**0.12**	**0.21**	**1.91**	**0.81**	**0.22**	**0.12**	**0.17**	**0.35**	**0.26**	**1.74**

* Samples excluded from average calculations

CCME Protection of Aquatic Life Guideline - 26 ng/L

Sampling locations and frequency governed by Amended C. of A. #3960-7Q4K2G, dated March 13, 2009

TABLE 17a

<u>METHYL MERCURY</u> - INDIVIDUAL MINE DEWATERING WELLS (Unfiltered)

(concentrations in ng/L)

Date	VDW-2	VDW-3	VDW-6	VDW-7	VDW-11	VDW-12	VDW-14	VDW-15	VDW-17	VDW-18	VDW-21	VDW-22
Nov-07	-	-	-	-	-	-	-	-	-	-	-	-
Dec-07	-	-	<0.01	-	0.01	-	-	-	-	-	-	0.01
Jan-08	-	-	0.01	-	0.01	-	-	0.01	0.01	-	-	0.01
Feb-08	-	-	<0.01	-	<0.01	-	-	-	-	-	-	<0.01
Mar-08	-	-	0.02	-	0.02	-	-	0.02	0.01	-	-	0.02
Apr-08	-	-	-	-	0.01	-	-	0.01	<0.01	-	-	<0.01
Jul-08	-	-	0.01	-	0.02	-	-	0.02	0.02	-	-	0.01
Oct-08	-	<0.01	0.01	0.01	0.01	-	-	<0.01	0.01	-	-	0.01
Jan-09	-	-	-	-	-	-	-	-	-	-	-	-
Apr-09	-	0.01	0.01	-	0.02	-	-	0.02	<0.01	-	-	<0.01
Jul-09	-	0.03	-	-	0.01	-	-	-	-	-	-	-
Oct-09	-	0.01	0.01	0.01	0.01	-	-	0.01	0.01	-	-	0.04
Jan-10	-	0.04	0.03	0.07	0.07	-	0.03	0.06	0.20 (outlier)	-	-	0.06
Apr-10	-	0.01	0.05	0.01	0.01	-	<0.01	<0.01	0.02	-	-	0.01
Jul-10	-	0.02	0.01	<0.01	<0.01	-	<0.01	0.03	<0.01	-	-	<0.01
Oct-10	-	0.01	<0.01	<0.01	0.01	-	<0.01	<0.01	<0.01	0.03	-	<0.01
Jan-11	-	-	0.01	0.02	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	-	0.01
Apr-11	-	-	<0.01	<0.01	<0.01	-	-	0.55	<0.01	-	-	0.03
Jul-11	0.01	-	-	<0.01	0.03	0.01	0.01	0.01	<0.01	0.01	-	0.01
Oct-11	0.01	-	0.04	0.01	0.01	<0.01	<0.01	<0.01	<0.01	0.06	-	0.01
Jan-12	0.02	-	0.07	<0.01	-	0.04	0.03	0.05	0.01	0.05	0.01	0.06
Apr-12	<0.01	-	<0.01	<0.01	-	<0.02	<0.01	<0.01	<0.01	<0.02	<0.02	0.04
Jul-12	<0.01	-	<0.01	<0.01	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Oct-12	<0.01	-	<0.01	<0.01	-	<0.01	<0.01	<0.01	<0.02	<0.01	<0.01	<0.01
Jan-13	<0.02	-	<0.02	<0.02	0.09	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Apr-13	<0.02	-	<0.02	<0.02	0.03	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Jul-13	0.07	-	0.05	0.03	0.19	0.03	<0.02	0.04	0.05	0.05	0.03	0.03
Oct-13	<0.01	-	<0.01	<0.01	0.05	<0.01	0.02	<0.01	<0.01	<0.01	<0.01	<0.01
Average 2009	**-**	**0.02**	**0.01**	**0.01**	**0.01**	**-**	**-**	**0.02**	**0.01**	**-**	**-**	**0.02**
Average 2010	**-**	**0.02**	**0.03**	**0.03**	**0.02**	**-**	**-**	**0.03**	**0.06**	**-**	**-**	**0.02**
Average 2011	**0.01**	**-**	**0.02**	**0.01**	**0.02**	**0.01**	**0.01**	**0.14**	**<0.01**	**0.03**	**-**	**0.01**
Average 2012	**0.01**	**-**	**0.03**	**0.01**	-	**0.02**	**0.01**	**0.02**	**0.01**	**0.02**	**0.01**	**0.03**
Average 2013	**0.03**	**-**	**0.02**	**0.02**	**0.09**	**0.02**	**0.02**	**0.02**	**0.02**	**0.02**	**0.02**	**0.02**
Average All Years	**0.02**	**0.02**	**0.02**	**0.02**	**0.03**	**0.02**	**0.02**	**0.04**	**0.02**	**0.02**	**0.02**	**0.02**

CCME Protection of Aquatic Life Guideline - 4 ng/L (unfiltered)

Sampling locations and frequency governed by Amended C. of A. #3960-7Q4K2G, dated March 13, 2009

why are some of these filtered values HIGHER than their unfiltered counterparts?

TABLE 17b

METHYL MERCURY - INDIVIDUAL MINE DEWATERING WELLS (Filtered)

(concentrations in ng/L)

Date	VDW-2	VDW-3	VDW-6	VDW-7	VDW-11	VDW-12	VDW-14	VDW-15	VDW-17	VDW-18	VDW-21	VDW-22
Nov-07	-	-	0.01	-	0.01	-	-	-	-	-	-	<0.01
Dec-07	-	-	0.01	-	<0.01	-	-	-	-	-	-	0.01
Jan-08	-	-	0.01	-	0.01	-	-	0.01	0.01	-	-	0.01
Feb-09	-	-	0.01	-	0.01	-	-	-	-	-	-	0.01
Mar-09	-	-	<0.01	-	0.01	-	-	0.01	0.01	-	-	0.02
Apr-08	-	-	-	-	0.01	-	-	0.02	0.01	-	-	0.02
Jul-08	-	-	0.02	-	<0.01	-	-	0.01	0.01	-	-	0.02
Oct-08	-	0.01	<0.01	<0.01	<0.01	-	-	0.01	0.01	-	-	0.01
Jan-09	-	-	-	-	-	-	-	-	-	-	-	-
Apr-09	-	0.01	0.02	-	0.02	-	-	0.02	0.01	-	-	0.02
Jul-09	-	0.05	0.18	-	0.06	-	-	0.03	0.14	-	-	0.03
Oct-09	-	0.01	0.01	0.01	0.01	-	-	0.01	0.01	-	-	0.01
Jan-10	-	0.07	0.02	0.04	<0.01	-	0.04	0.01	0.02	-	-	0.01
Apr-10	-	0.01	0.01	<0.01	0.02	-	<0.01	<0.01	0.01	-	-	<0.01
Jul-10	-	0.01	0.02	0.01	0.01	-	0.04	<0.01	0.01	-	-	<0.01
Oct-10	-	0.01	0.01	0.01	0.01	-	<0.01	<0.01	<0.01	0.05	-	<0.01
Jan-11	-	-	0.04	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	-	<0.01
Apr-11	-	-	<0.01	<0.01	<0.01	-	-	<0.01	0.01	-	-	<0.01
Jul-11	0.01	-	-	<0.01	<0.01	<0.01	<0.01	0.01	<0.01	<0.01	-	<0.01
Oct-11	0.01	-	0.04	<0.01	0.01	<0.01	<0.01	<0.01	<0.01	0.05	-	<0.01
Jan-12	0.02	-	0.05	<0.01	-	0.03	0.01	0.01	0.01	0.03	0.01	<0.01
Apr-12	<0.02	-	<0.02	<0.01	-	<0.01	<0.01	<0.02	<0.01	<0.02	<0.02	<0.02
Jul-12	<0.02	-	<0.01	<0.01	-	<0.01	<0.01	<0.02	<0.01	<0.01	<0.01	<0.02
Oct-12	<0.01	-	<0.01	<0.01	-	<0.02	<0.02	<0.02	<0.01	<0.01	<0.02	<0.02
Jan-13	<0.02	-	<0.02	<0.02	0.02	<0.02	<0.02	<0.02	<0.02	<0.02	0.02	<0.02
Apr-13	<0.02	-	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Jul-13	<0.02	-	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Oct-13	<0.01	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Average 2009	**-**	**0.02**	**0.07**	**0.01**	**0.03**	**-**	**-**	**0.02**	**0.05**	**-**	**-**	**0.02**
Average 2010	**-**	**0.03**	**0.01**	**0.02**	**0.01**	**-**	**-**	**0.01**	**0.01**	**-**	**-**	**0.01**
Average 2011	**0.01**	**-**	**0.03**	**0.01**	**0.01**	**0.01**	**0.01**	**0.01**	**0.01**	**0.02**	**-**	**0.01**
Average 2012	**0.02**	**-**	**0.02**	**0.01**	**-**	**0.02**	**0.01**	**0.02**	**0.01**	**0.02**	**0.02**	**0.02**
Average 2013	**0.02**	**-**	**0.02**	**0.02**	**0.02**	**0.02**	**0.02**	**0.02**	**0.02**	**0.02**	**0.02**	**0.02**
Average All Years	**0.02**	**0.02**	**0.02**	**0.01**	**0.01**	**0.02**	**0.02**	**0.01**	**0.02**	**0.02**	**0.02**	**0.01**

CCME Protection of Aquatic Life Guideline - 4 ng/L (unfiltered)

Sampling locations and frequency governed by Amended C. of A. #3960-7Q4K2G, dated March 13, 2009

TABLE 18
SPECIES-SPECIFIC CATCH PER HOUR PER 15.24 m STANDARD GILL NET SET BY LOCATION (2013)

	Waterbody	Attawapiskat R.		Monument Channel	Nayshkootayaow R.		Species CPUE Total	Species Catch Total (n)
	Sample Area	ATT-NF	ATT-US	MC	NAYSH	NAYSH-MOUTH		
	Set Hours	650	1072	583	502	367		
	Total Gill Net Sets	11	22	11	13	12		
Species-Specific Catch per hour of 15 m Standard Gillnet Set	Brook Trout	0.000	0.004	0.002	0.002	0.011	**0.02**	**10**
	Cisco	0.000	0.017	0.000	0.000	0.000	**0.02**	**18**
	Lake Sturgeon	0.002	0.035	0.000	0.000	0.000	**0.04**	**38**
	Lake Whitefish	0.022	0.026	0.003	0.008	0.000	**0.06**	**48**
	Longnose Sucker	0.000	0.000	0.002	0.000	0.000	**0.002**	**1**
	Northern Pike	0.031	0.023	0.038	0.018	0.008	**0.12**	**79**
	Shorthead Redhorse	0.011	0.004	0.000	0.000	0.000	**0.01**	**11**
	Walleye	0.068	0.053	0.024	0.054	0.046	**0.25**	**159**
	White Sucker	0.014	0.011	0.046	0.046	0.057	**0.17**	**92**
	Yellow Perch	0.000	0.000	0.002	0.000	0.000	**0.002**	**1**
	Sample Area CPUE Total	**0.15**	**0.17**	**0.12**	**0.13**	**0.12**	**0.69**	**-**
	Site Catch Total (n)	**95**	**185**	**68**	**64**	**45**	**-**	**457**

TABLE 19

SPECIES-SPECIFIC CATCH PER UNIT EFFORT FOR ELECTROFISHING BY LOCATION (2013)

Why diff level of effort?

Waterbody		Attawapiskat R.			Nayshkootayaow R.		North Granny	South Granny	Species CPUE	Species Catch
Sample Area		ATT-US	ATT-NF	AFF-FF	NAY-DS6	NAY-US-ST3	Cr.	Cr.	Total	Total (n)
Electroshocking seconds		4803.00	8356.00	11511.00	2565.00	2790.00	7340.00	10379.00		
Species-specific Count	Brook Stickleback	0.00	0.00	0.01	0.00	0.00	0.01	0.00	**0.02**	**4**
	Brook Trout	0.00	0.00	0.00	0.00	0.00	0.05	0.02	**0.07**	**10**
	Burbot	0.00	0.00	0.00	0.00	0.00	0.00	0.01	**0.01**	**1**
	Finescale Dace	0.00	0.00	0.00	0.00	0.00	0.01	0.00	**0.01**	**2**
	Iowa Darter	0.00	0.00	0.00	0.00	0.00	0.10	0.04	**0.13**	**18**
	Johnny Darter	0.00	0.08	0.00	0.08	0.00	0.04	0.08	**0.28**	**30**
	Lake Chub	0.00	0.17	0.12	0.00	0.00	0.00	0.00	**0.29**	**56**
	Lake Whitefish	0.02	0.01	0.00	0.00	0.00	0.00	0.00	**0.03**	**4**
	Longnose Dace	0.00	0.00	0.00	0.00	0.07	0.00	0.00	**0.07**	**2**
	Longnose Sucker	0.00	0.05	0.01	0.00	0.00	0.00	0.00	**0.06**	**10**
	Mottled Sculpin	0.19	0.13	0.13	0.16	0.04	0.00	0.00	**0.64**	**75**
	Northern Pike	0.04	0.11	0.27	0.12	0.14	0.03	0.00	**0.71**	**95**
	Pearl Dace	0.00	0.04	0.00	0.86	2.22	0.35	0.96	**4.43**	**242**
	Shorthead Redhorse	0.00	0.14	0.22	0.00	0.00	0.00	0.00	**0.36**	**74**
	Slimy Sculpin	0.00	0.04	0.00	0.00	0.00	0.00	0.00	**0.04**	**6**
	Spottail Shiner	0.25	0.00	0.00	0.00	0.00	0.00	0.00	**0.25**	**24**
	Trout Perch	1.60	0.83	0.20	3.08	0.50	0.26	0.00	**6.47**	**469**
	Walleye	0.08	0.10	0.06	0.23	0.00	0.00	0.00	**0.47**	**44**
	White sucker	0.04	0.10	0.16	0.08	0.72	0.00	0.45	**1.54**	**125**
	Yellow Perch	0.02	0.01	0.10	0.00	0.00	0.00	0.00	**0.14**	**28**
Sample Area CPUE Total		**2.25**	**1.80**	**1.28**	**4.60**	**3.69**	**0.86**	**1.56**	**16.03**	**-**
Sample Area Catch Total (n)		**108**	**150**	**147**	**118**	**103**	**63**	**162**	**-**	**1319**

TABLE 20
SPECIES-SPECIFIC CPUE FOR ANGLING ROD-HOUR BY LOCATION (2013)

Waterbody	Sample Area	Date (dd/mm/yy)	Effort (# rods)	Duration	Sampling Effort (rod-hours)	Species-Specific CPUE (fish / rod-hour)		Sample Area CPUE	Sample Area Catch Total (n)
						Walleye	Northern Pike		
Attawapiskat R.	ATT-NF	11/09/13	4	4.50	18.00	0.17	0.22	**0.39**	**7**
South Granny Creek	SGC	12/09/13	1	0.75	0.75	0.00	0.00	**0.00**	**0**
South Granny Creek	SGC	12/09/13	1	0.75	0.75	0.00	0.00	**0.00**	**0**
South Granny Creek	SGC	12/09/13	1	0.50	0.50	0.00	0.00	**0.00**	**0**
South Granny Creek	SGC	13/09/13	1	0.50	0.50	0.00	0.00	**0.00**	**0**
South Granny Creek	SGC	13/09/13	1	0.50	0.50	0.00	0.00	**0.00**	**0**
South Granny Creek	SGC	13/09/13	1	0.25	0.25	0.00	0.00	**0.00**	**0**
Nayshkotaow R.	NAY	14/09/13	2	1.00	2.00	0.00	0.00	**0.00**	**0**
Attawapiskat R.	ATT-NF	15/09/13	2	1.00	2.00	0.00	0.50	**0.50**	**1**
Nayshkotaow R.	NAY	15/09/13	2	1.00	2.00	0.50	0.50	**1.00**	**2**
Nayshkotaow R.	NAY	16/09/13	2	1.00	2.00	0.00	0.00	**0.00**	**0**
Nayshkotaow R.	NAY	17/09/13	2	1.50	3.00	0.00	0.00	**0.00**	**0**
Nayshkotaow R.	NAY	20/09/13	2	0.75	1.50	0.00	0.00	**0.00**	**0**
Attawapiskat R.	ATT-US	20/09/13	2	0.75	1.50	0.00	0.00	**0.00**	**0**
Attawapiskat R.	ATT-US	20/09/13	2	1.50	3.00	0.00	0.00	**0.00**	**0**
Nayshkotaow R.	NAY	21/09/13	2	0.75	1.50	0.00	0.00	**0.00**	**0**
Monument Channel	MC	24/09/13	2	2.00	4.00	0.00	0.25	**0.25**	**1**
Monument Channel	MC	24/09/13	2	1.00	2.00	0.50	0.00	**0.50**	**1**
Monument Channel	MC	24/09/13	1	0.50	0.50	0.00	0.00	**0.00**	**0**
Monument Channel	MC	25/09/13	2	1.50	3.00	0.00	0.00	**0.00**	**0**
Species CPUE Total						**1.17**	**1.47**	**2.64**	**-**
Species Catch Total (n)						**5**	**7**	**-**	**12**

TABLE 21
SPECIES-SPECIFIC CPUE IN MINNOW TRAPS BY LOCATION (2013)

Waterbody	Sample Area	Lift Date (dd/mm/yy)	# of Traps Set	Hours	Total Trap Hours (# traps*hours)	Species-specific Catch per 100 Trap Hours (# fish/trap hours)				Sample Area CPUE	Sample Area Catch Total (n)
						Finescale Dace	Johnny Darter	Pearl Dace	White Sucker		
South Granny Creek	SGC	13/09/13	9	22.00	198	0.00	0.00	0.03	0.00	**0.03**	**6**
South Granny Creek	SGC	13/09/13	6	20.00	120	0.00	0.00	0.01	0.00	**0.01**	**1**
South Granny Creek	SGC	13/09/13	6	21.00	126	0.00	0.00	0.00	0.00	**0.00**	**0**
South Granny Creek	SGC	13/09/13	6	21.00	126	0.00	0.00	0.01	0.00	**0.01**	**1**
South Granny Creek	SGC	14/09/13	9	29.00	261	0.00	0.00	0.05	0.00	**0.05**	**14**
North Granny Creek	NGC	14/09/13	6	45.00	270	0.00	0.00	0.00	0.00	**0.00**	**0**
North Granny Creek	NGC	18/09/13	6	97.00	582	0.00	0.00	0.00	0.00	**0.00**	**0**
North Granny Creek	NGC	18/09/13	9	65.00	585	0.00	0.00	0.00	0.00	**0.01**	**4**
North Granny Creek	NGC	18/09/13	9	65.00	585	0.00	0.00	0.00	0.00	**0.01**	**4**
Tributary 5A	ST-5A	18/09/13	9	22.00	198	0.24	0.00	0.49	0.06	**0.79**	**157**
North Granny Creek	NGC	19/09/13	9	24.00	216	0.00	0.00	0.00	0.00	**0.00**	**1**
North Granny Creek	NGC	19/09/13	9	24.00	216	0.00	0.00	0.00	0.00	**0.00**	**1**
North Granny Creek	NGC	19/09/13	7	28.00	196	0.00	0.00	0.00	0.00	**0.00**	**0**
South Granny Creek	SGC	24/09/13	6	20.00	120	0.00	0.00	0.00	0.00	**0.00**	**0**
South Granny Creek	SGC	24/09/13	6	15.00	90	0.00	0.00	0.00	0.00	**0.00**	**0**
South Granny Creek	SGC	24/09/13	6	19.00	114	0.00	0.00	0.00	0.00	**0.00**	**0**
North Granny Creek	NGC	25/09/13	10	90.00	900	0.00	0.00	0.00	0.00	**0.00**	**3**
North Granny Creek	NGC	25/09/13	8	89.00	712	0.00	0.00	0.00	0.00	**0.00**	**0**
Species CPUE Total						**0.26**	**0.00**	**0.59**	**0.07**	**0.92**	**-**
Species Catch Total (n)						**53**	**3**	**120**	**16**	**-**	**192**

TABLE 22
MATRIX OF COMPARISONS BY SAMPLE TYPE AND ANALYTICAL LABORATORY/METHOD

Sample Type	Laboratory of Analysis	Comparison Sample Type	Comparative Analysis Laboratory
Tissue plug	UWO	Epaxial Muscle Fillet	UWO
Epaxial Muscle Fillet	UWO	Epaxial Muscle Fillet	Flett Lab
Epaxial Muscle Fillet	UWO	Epaxial Muscle Fillet	MOE Lab
Epaxial Muscle Fillet	Flett Lab	Epaxial Muscle Fillet	MOE Lab

TABLE 23

REPEATED MEASURES MIXED EFFECTS MODEL RESULTS

Comparison	Species	n	F-value	P-value	Bonferroni Correction (α/n)	Significant Difference
UWO (Fillet vs. Plug)	Brook Trout	4	5.65	0.147	0.008	No
	Cisco	10	1.63	0.234		No
	Lake Whitefish	35	0.09	0.740		No
	Northern Pike	88	2.02	0.122		No
	Walleye	115	5.63	0.019		No
	White Sucker	55	0.23	0.630		No
UWO vs. Flett	Northern Pike	29	7.80	0.009	0.025	Yes
	Walleye	72	37.097	< 0.001		Yes
UWO vs. MOE	Lake Whitefish	14	0.002	0.964	0.013	No
	Northern Pike	24	5.695	0.026		No
	Walleye	25	4.374	0.047		No
	White Sucker	16	4.305	0.057		No
MOE vs. Flett	Northern Pike	24	0.194	0.664	0.025	No
	Walleye	25	0.051	0.824	0.025	No

TABLE 24

SUMMARY OF TOTAL LENGTH AND MERCURY VALUES BY LABORATORY/METHOD

		Species															
		Lake Whitefish				Northern Pike				Walleye				White Sucker			
	Area	ATT-NF	ATT-US	MC	NAY	ATT-NF	ATT-US	MC	NAY	ATT-NF	ATT-US	MC	NAY	ATT-NF	ATT-US	MC	NAY
Total Length (mm)	n	15	13	2	4	28	21	23	17	31	41	15	29	16	10	10	19
	Min	265	210	299	329	265	307	320	189	286	245	304	246	237	271	281	235
	Max	475	435	354	446	967	925	792	775	580	624	661	685	427	414	392	476
	Mean	360.5	321.4	326.5	367.5	569.1	649.2	546.7	537.5	401.7	446.3	435.1	436.0	332.1	302.2	351.1	356.4
	SD	55.0	57.1	38.9	53.3	213.3	151.7	154.3	170.4	83.8	93.0	103.3	87.0	62.3	40.9	39.0	61.1
Total Hg (mg/kg) UWO Lab	n	15	14	2	4	28	21	23	17	31	41	15	28	16	10	10	19
	Min	0.05	0.02	0.13	0.13	0.11	0.11	0.13	0.10	0.20	0.26	0.35	0.36	0.05	0.05	0.08	0.07
	Max	0.30	0.15	0.13	0.22	0.95	1.26	0.75	0.70	1.25	1.72	1.87	2.20	0.24	0.14	0.41	0.37
	Mean	0.13	0.09	0.13	0.16	0.37	0.41	0.37	0.29	0.63	0.83	0.76	0.95	0.12	0.09	0.18	0.18
	SD	0.07	0.04	0.00	0.04	0.25	0.31	0.15	0.13	0.32	0.39	0.42	0.41	0.06	0.03	0.11	0.09
Total Hg (mg/kg) Flett Lab	n					28				31	41						
	Min					0.10				0.20	0.23						
	Max					0.85				1.11	1.42						
	Mean					0.32				0.56	0.72						
	SD					0.19				0.28	0.31						
Total Hg (mg/kg) MOE Lab	n	14				24				25				16			
	Min	0.05				0.11				0.19				0.05			
	Max	0.26				0.99				1.00				0.23			
	Mean	0.13				0.36				0.48				0.12			
	SD	0.06				0.23				0.22				0.06			

TABLE 25
SUMMARY OF RELATIVE PERCENT DIFFERENCE VALUES WITHIN REPEATED MEASURES BY LABORATORY/METHODS

	Species							RPD Proportions	
Relative Percent Difference	**Brook Trout**	**Cisco**	**Lake Whitefish**	**Northern Pike**	**Walleye**	**White Sucker**	**Total**	**< 20**	**> 20**
UWO (Fillet vs. Plug)									
n	4	10	35	88	115	55	307	200 (65%)	107 (35%)
Min.	0.9	1.0	0.0	0.0	0.1	0.9			
Max.	39.6	28.8	59.8	73.3	56.8	72.2			
Mean	19.7	13.8	20.4	19.8	15.7	18.6			
SD	16.2	10.1	23.8	15.3	13.3	15.8			
SE	8.1	3.2	4.0	1.6	1.2	2.1			
UWO vs. Flett Lab									
n	0	0	0	29	72	0	101	67 (66%)	34 (34%)
Min.	na	na	na	0.4	0.5	na			
Max.	na	na	na	72.7	62.9	na			
Mean	na	na	na	16.9	15.4	na			
SD	na	na	na	15.8	12.4	na			
SE	na	na	na	2.9	1.5	na			
UWO vs. MOE									
n	0	0	14	24	25	16	79	51 (65%)	28 (35%)
Min.	na	na	0.0	1.8	0.8	0.0			
Max.	na	na	32.3	47.1	47.4	45.3			
Mean	na	na	14.4	19.6	18.5	10.9			
SD	na	na	9.6	12.7	12.5	11.5			
SE	na	na	2.6	2.6	2.5	2.9			
MOE vs. Flett									
n	0	0	0	24	25	0	49	44 (90%)	5 (10%)
Min.	na	na	na	0.6	0.2	na			
Max.	na	na	na	28.0	44.1	na			
Mean	na	na	na	8.2	9.7	na			
SD	na	na	na	7.1	10.2	na			
SE	na	na	na	1.5	2.0	na			

TABLE 26

SUMMARY OF PRESENTED FISH BODY BURDEN COMPARISONS (BACI)

Size Class	Control / Reference Area	Impacted / Exposure Area	Species Investigated
Small-bodied	ST-5A	NGC & SGC	Pearl Dace
	NAY-US3	NAY-DS6	Trout-Perch
	ATT-US	ATT-NF & ATT-FF	Trout-Perch
Large-bodied	ATT-US	ATT-NF/FF	Northern Pike, Walleye, White Sucker, Lake Whitefish and Cisco
	MC	NAY	Northern Pike, Walleye, White Sucker, Lake Whitefish and Cisco

TABLE 27
BACI DESIGN ANCOVA RESULTS 2007/08 AND 2009 VS. 2013 BY CONTROL VS. IMPACT SITES

Comparison (Period*Site)	Species	n	F-value	P-value	Significant Difference	Significant (Bonferroni Corrected) Pairwise Comparisons
2007/08*ATT-US | 2007/08*ATT-NF/FF | 2013*ATT-US | 2013*ATT-NF	Lake Whitefish	43	0.58	0.45	No	
	Northern Pike	117	15.90	0.0001	Yes	2007/08*ATT-NF vs. 2013*ATT-NF 2007/08*ATT-US vs. 2007/08*ATT-NF
	Walleye	93	0.16	0.69	No	
	White Sucker		NA	NA	NA	Interaction comparison not balanced
2007/08*NAY | 2007/08*MC | 2013*NAY | 2013*MC	Lake Whitefish	33	0.04	0.85	No	
	Northern Pike	115	7.50	0.007	Yes	2007/08*MC vs. 2013*ATT-MC
	Walleye	62	0.006	0.94	No	
	White Sucker	62	0.007	0.94	No	
2008*NGC | 2008*SGC | 2008*ST5A | 2013*NGC | 2013*SGC | 2013*ST5A	Pearl Dace	275	0.78	0.46	No	
2009*ATT-US | 2009*ATT-NF | 2009*ATT-FF | 2013*ATT-NF | 2013*ATT-NF | 2013*ATT-FF	Trout-Perch	254	18.95	< 0.0001	Yes	2009*ATT-US vs. 2009*ATT-NF 2009*ATT-US vs. 2013*ATT-US 2013*ATT-US vs. 2013*ATT-NF
2009*NAY-US3 | 2009*NAY-DS6 | 2013*NAY-US3 | 2013*NAY-DS6	Trout-Perch	97	1.44	0.23	No	

Notes:

F-value and P-value are specific to the interaction term of Period*Site
NA - adequate samples not available for analysis there "no analysis" conducted

TABLE 28
BACI DESIGN ANCOVA RESULTS 2010 AND 2012 VS. 2013 BY CONTROL VS. IMPACT SITES

Comparison (Period*Site)	Species	n	F-value	P-value	Significant Difference	Significant (Bonferroni Corrected) Pairwise Comparisons
2010*ATT-US | 2010*ATT-NF/FF | 2013*ATT-US | 2013*ATT-NF	Lake Whitefish		NA	NA	NA	
	Northern Pike	106	0.42	0.52	No	
	Walleye	121	3.81	0.05	No	
	White Sucker	37	0.77	0.39	No	
2010*NAY | 2010*MC | 2013*NAY | 2013*MC	Lake Whitefish		NA	NA	NA	Interaction comparison not balanced
	Northern Pike	108	2.55	0.11	No	
	Walleye	75	0.26	0.61	No	
	White Sucker	69	0.023	0.88	No	
2012*NGC | 2012*SGC | 2012*ST5A | 2013*NGC | 2013*SGC | 2013*ST5A	Pearl Dace	355	29.53	< 0.001	Yes	2012*SGC vs. 2013*SGC 2012*NGC vs. 2013*NGC 2012*SGC vs. 2012*NGC 2012*NGC vs. 2012*ST5A 2013*NGC vs. 2013*ST5A 2013*SGC vs. 2013*ST5A
2012*ATT-US | 2012*ATT-NF | 2012*ATT-FF | 2013*ATT-NF | 2013*ATT-NF | 2013*ATT-FF	Trout-Perch	326	56.71	< 0.001	Yes	2012*ATT-US vs. 2012*ATT-FF 2012*ATT-US vs. 2012*ATT-NF 2012*ATT-US vs. 2013*ATT-US 2013*ATT-US vs. 2013*ATT-NF
2012*NAY-US3 | 2012*NAY-DS6 | 2013*NAY-US3 | 2013*NAY-DS6	Trout-Perch	180	0.011	0.9616	No	

Notes:

F-value and P-value are specific to the interaction term of Period*Site
NA - adequate samples not available for analysis there "no analysis" conducted

TABLE 29a
MUSKEG MONITORING PROGRAM - STATISTICAL ANALYSIS OF CLUSTER PEAT HORIZON MERCURY PORE WATERS
ANNUAL SAMPLING PROGRAM 2013 RESULTS - CLUSTER S-1

TOTAL AND METHYL MERCURY PORE WATER CONCENTRATIONS (ng/L)

Cluster Location	Substrate/Condition	Well Name	Total Mercury (Filtered)	Methyl Mercury (Filtered)
S-1	Peat - Domed Bog	MS-1-D	0.28	0.10
	Peat - Flat Bog	MS-1-F	0.79	0.10
	Peat - Horizontal Fen	MS-1-H	0.28	0.04
	Peat - Ribbed Fen	MS-1-R	<0.1	0.05
S-2	Peat - Domed Bog	MS-2-D	1.21	0.14
	Peat - Flat Bog	MS-2-F	2.48	0.20
	Peat - Ribbed Fen	MS-2-R	0.3	0.11
S-7	Peat - Domed Bog	MS-7-D	0.72	<0.01
	Peat - Flat Bog	MS-7-F	1.32	<0.01
	Peat - Horizontal Fen	MS-7-H	1.01	0.04
	Peat - Ribbed Fen	MS-7-R	<0.1	<0.02
S-8	Peat - Domed Bog	MS-8-D	1.72	0.23
	Peat - Flat Bog	MS-8-F	3.31	0.11
	Peat - Horizontal Fen	MS-8-H	0.44	<0.01
	Peat - Ribbed Fen	MS-8-R	0.30	0.07
S-9(1)	Peat - Domed Bog	MS-9(1)-D	0.52	<0.01
	Peat - Flat Bog	MS-9(1)-F	1.27	<0.01
	Peat - Horizontal Fen	MS-9(1)-H	0.48	<0.01
	Peat - Ribbed Fen	MS-9(1)-R	0.25	<0.01
S-9(2)	Peat - Domed Bog	MS-9(2)-D	1.38	<0.01
	Peat - Flat Bog	MS-9(2)-F	1.02	<0.01
	Peat - Horizontal Fen	MS-9(2)-H	1.37	0.06
	Peat - Ribbed Fen	MS-9(2)-R	<0.1	0.02
S-13	Peat - Domed Bog	MS-13-D	1.25	0.06
	Peat - Flat Bog	MS-13-F	1.23	0.18
	Peat - Horizontal Fen	MS-13-H	0.11	0.04
	Peat - Ribbed Fen	MS-13-R	<0.1	0.03
S-15	Peat - Domed Bog	MS-15-D	0.23	0.13
	Peat - Flat Bog	MS-15-F	0.63	0.04
	Peat - Horizontal Fen	MS-15-H	0.13	<0.02
	Peat - Ribbed Fen	MS-15-R	0.2	0.03
S-V1	Peat - Domed Bog	MS-V(1)-D	0.17	<0.02
	Peat - Ribbed Fen	MS-V(1)-R	0.3	0.11
S-V2	Peat - Domed Bog	MS-V(2)-D	0.55	0.05
	Peat - Ribbed Fen	MS-V(2)-R	0.61	<0.01
S-V3	Peat - Domed Bog	MS-V(3)-D	0.64	<0.01
	Peat - Ribbed Fen	MS-V(3)-R	0.76	0.05

Clusters used for statistical analysis (green shading: S-1, S-13, S-15)

TWO-WAY ANALYSIS OF VARIANCE TABLES

TOTAL MERCURY

Habitat	Control Mean (S13+S15)	S-1	Sum r.
D. Bog	0.74	0.28	1.020
F. Bog	0.93	0.79	1.720
H. Fen	0.12	0.28	0.400
R. Fen	0.15	0.1	0.250
Sum c.	1.94	1.450	3.390

Total SS	0.804
Treat SS	0.030
Block SS	0.674
Error SS	0.100

ANOVA Table					
Source V.	d.f.	SS	MS	F_{cal}	F_{tab} 0.05
Total	7	0.804	-		
Treatment	1	0.030	0.030	**0.90**	10.1
Block	3	0.674	0.225	6.77	9.28
Error	3	0.100	0.033		

Treatment Effect (i.e., difference between Control and S-1) **Not Significant**

METHYL MERCURY

Habitat	Control Mean (S13+S15)	S-1	Sum r.
D. Bog	0.10	0.10	0.195
F. Bog	0.11	0.10	0.211
H. Fen	0.03	0.04	0.070
R. Fen	0.03	0.05	0.080
Sum c.	0.266	0.290	0.556

Total SS	0.009
Treat SS	0.000
Block SS	0.008
Error SS	0.000

ANOVA Table					
Source V.	d.f.	SS	MS	F_{cal}	F_{tab} 0.05
Total	7	0.009	-		
Treatment	1	0.000	0.000	**0.861**	10.1
Block	3	0.008	0.003	32.99	9.28
Error	3	0.000	0.000		

Treatment Effect (i.e., difference between Control and S-1) **Not Significant**

TABLE 29b
MUSKEG MONITORING PROGRAM - STATISTICAL ANALYSIS OF CLUSTER PEAT HORIZON MERCURY PORE WATERS
ANNUAL SAMPLING PROGRAM 2013 RESULTS - CLUSTER S-2

TOTAL AND METHYL MERCURY PORE WATER CONCENTRATIONS (ng/L)

Cluster Location	Substrate/Condition	Well Name	Total Mercury (Filtered)	Methyl Mercury (Filtered)
S-1	Peat - Domed Bog	MS-1-D	0.28	0.14
	Peat - Flat Bog	MS-1-F	0.79	0.10
	Peat - Horizontal Fen	MS-1-H	0.28	0.04
	Peat - Ribbed Fen	MS-1-R	<0.1	0.05
S-2	Peat - Domed Bog	MS-2-D	1.21	0.14
	Peat - Flat Bog	MS-2-F	2.48	0.20
	Peat - Ribbed Fen	MS-2-R	0.3	0.11
S-7	Peat - Domed Bog	MS-7-D	0.72	<0.01
	Peat - Flat Bog	MS-7-F	1.32	<0.01
	Peat - Horizontal Fen	MS-7-H	1.01	0.04
	Peat - Ribbed Fen	MS-7-R	<0.1	<0.02
S-8	Peat - Domed Bog	MS-8-D	1.72	0.23
	Peat - Flat Bog	MS-8-F	3.31	0.11
	Peat - Horizontal Fen	MS-8-H	0.44	<0.01
	Peat - Ribbed Fen	MS-8-R	0.30	0.07
S-9(1)	Peat - Domed Bog	MS-9(1)-D	0.52	<0.01
	Peat - Flat Bog	MS-9(1)-F	1.27	<0.01
	Peat - Horizontal Fen	MS-9(1)-H	0.48	<0.01
	Peat - Ribbed Fen	MS-9(1)-R	0.25	<0.01
S-9(2)	Peat - Domed Bog	MS-9(2)-D	1.38	<0.01
	Peat - Flat Bog	MS-9(2)-F	1.02	<0.01
	Peat - Horizontal Fen	MS-9(2)-H	1.37	0.06
	Peat - Ribbed Fen	MS-9(2)-R	<0.1	0.02
S-13	Peat - Domed Bog	MS-13-D	1.25	0.06
	Peat - Flat Bog	MS-13-F	1.23	0.18
	Peat - Horizontal Fen	MS-13-H	0.11	0.04
	Peat - Ribbed Fen	MS-13-R	<0.1	0.03
S-15	Peat - Domed Bog	MS-15-D	0.23	0.13
	Peat - Flat Bog	MS-15-F	0.63	0.04
	Peat - Horizontal Fen	MS-15-H	0.13	<0.02
	Peat - Ribbed Fen	MS-15-R	0.2	0.03
S-V1	Peat - Domed Bog	MS-V(1)-D	0.17	<0.02
	Peat - Ribbed Fen	MS-V(1)-R	0.3	0.11
S-V2	Peat - Domed Bog	MS-V(2)-D	0.55	0.05
	Peat - Ribbed Fen	MS-V(2)-R	0.61	<0.01
S-V3	Peat - Domed Bog	MS-V(3)-D	0.64	<0.01
	Peat - Ribbed Fen	MS-V(3)-R	0.76	0.05

Clusters used for statistical analysis

TWO-WAY ANALYSIS OF VARIANCE TABLES

TOTAL MERCURY

Habitat	Control Mean (S13+S15)	S-2	Sum r.
D. Bog	0.74	1.21	1.950
F. Bog	0.93	2.48	3.410
R. Fen	0.15	0.3	0.450
Sum c.	1.82	3.990	5.810

Total SS	3.513
Treat SS	0.785
Block SS	2.191
Error SS	0.538

ANOVA Table

Source V.	d.f.	SS	MS	F_{cal}	F_{tab} 0.05
Total	5	3.513	-		
Treatment	1	0.785	0.785	**2.92**	18.5
Block	2	2.191	1.095	4.07	19.0
Error	2	0.538	0.269		

Treatment Effect (i.e., difference between Control and S-2) **Not Significant**

METHYL MERCURY

Habitat	Control Mean (S13+S15)	S-2	Sum r.
D. Bog	0.10	0.14	0.235
F. Bog	0.11	0.20	0.311
R. Fen	0.03	0.11	0.140
Sum c.	0.236	0.450	0.686

Total SS	0.016
Treat SS	0.008
Block SS	0.007
Error SS	0.001

ANOVA Table

Source V.	d.f.	SS	MS	F_{cal}	F_{tab} 0.05
Total	5	0.016	-		
Treatment	1	0.008	0.008	**28.25**	18.5
Block	2	0.007	0.004	13.58	19.0
Error	2	0.001	0.000		

Treatment Effect (i.e., difference between Control and S-2) **Statistically Significant**

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TABLE 29c
MUSKEG MONITORING PROGRAM - STATISTICAL ANALYSIS OF CLUSTER PEAT HORIZON MERCURY PORE WATERS
ANNUAL SAMPLING PROGRAM 2013 RESULTS - CLUSTER S-7

TOTAL AND METHYL MERCURY PORE WATER CONCENTRATIONS (ng/L)

Cluster Location	Substrate/Condition	Well Name	Total Mercury (Filtered)	Methyl Mercury (Filtered)
S-1	Peat - Domed Bog	MS-1-D	0.28	0.14
	Peat - Flat Bog	MS-1-F	0.79	0.10
	Peat - Horizontal Fen	MS-1-H	0.28	0.04
	Peat - Ribbed Fen	MS-1-R	<0.1	0.05
S-2	Peat - Domed Bog	MS-2-D	1.21	0.14
	Peat - Flat Bog	MS-2-F	2.48	0.20
	Peat - Ribbed Fen	MS-2-R	0.3	0.11
S-7	Peat - Domed Bog	MS-7-D	0.72	<0.01
	Peat - Flat Bog	MS-7-F	1.32	<0.01
	Peat - Horizontal Fen	MS-7-H	1.01	0.04
	Peat - Ribbed Fen	MS-7-R	<0.1	<0.02
S-8	Peat - Domed Bog	MS-8-D	1.72	0.23
	Peat - Flat Bog	MS-8-F	3.31	0.11
	Peat - Horizontal Fen	MS-8-H	0.44	<0.01
	Peat - Ribbed Fen	MS-8-R	0.30	0.07
S-9(1)	Peat - Domed Bog	MS-9(1)-D	0.52	<0.01
	Peat - Flat Bog	MS-9(1)-F	1.27	<0.01
	Peat - Horizontal Fen	MS-9(1)-H	0.48	<0.01
	Peat - Ribbed Fen	MS-9(1)-R	0.25	<0.01
S-9(2)	Peat - Domed Bog	MS-9(2)-D	1.38	<0.01
	Peat - Flat Bog	MS-9(2)-F	1.02	<0.01
	Peat - Horizontal Fen	MS-9(2)-H	1.37	0.06
	Peat - Ribbed Fen	MS-9(2)-R	<0.1	0.02
S-13	Peat - Domed Bog	MS-13-D	1.25	0.06
	Peat - Flat Bog	MS-13-F	1.23	0.18
	Peat - Horizontal Fen	MS-13-H	0.11	0.04
	Peat - Ribbed Fen	MS-13-R	<0.1	0.03
S-15	Peat - Domed Bog	MS-15-D	0.23	0.13
	Peat - Flat Bog	MS-15-F	0.63	0.04
	Peat - Horizontal Fen	MS-15-H	0.13	<0.02
	Peat - Ribbed Fen	MS-15-R	0.2	0.03
S-V1	Peat - Domed Bog	MS-V(1)-D	0.17	<0.02
	Peat - Ribbed Fen	MS-V(1)-R	0.3	0.11
S-V2	Peat - Domed Bog	MS-V(2)-D	0.55	0.05
	Peat - Ribbed Fen	MS-V(2)-R	0.61	<0.01
S-V3	Peat - Domed Bog	MS-V(3)-D	0.64	<0.01
	Peat - Ribbed Fen	MS-V(3)-R	0.76	0.05

Clusters used for statistical analysis

TWO-WAY ANALYSIS OF VARIANCE TABLES

TOTAL MERCURY

Habitat	Control Mean (S13+S15)	S-7	Sum r.
D. Bog	0.74	0.72	1.460
F. Bog	0.93	1.32	2.250
H. Fen	0.12	1.01	1.130
R. Fen	0.15	0.1	0.250
Sum c.	1.94	3.150	5.090

Total SS	1.502
Treat SS	0.183
Block SS	1.028
Error SS	0.291

ANOVA Table

Source V.	d.f.	SS	MS	F_{cal}	F_{tab} 0.05
Total	7	1.502	-		
Treatment	1	0.183	0.183	**1.89**	10.1
Block	3	1.028	0.343	3.54	9.28
Error	3	0.291	0.097		

Treatment Effect (i.e., difference between Control and S-7) **Not Significant**

METHYL MERCURY

Habitat	Control Mean (S13+S15)	S-7	Sum r.
D. Bog	0.10	0.01	0.105
F. Bog	0.11	0.01	0.121
H. Fen	0.03	0.04	0.069
R. Fen	0.03	0.02	0.050
Sum c.	0.266	0.079	0.345

Total SS	0.010
Treat SS	0.004
Block SS	0.002
Error SS	0.004

ANOVA Table

Source V.	d.f.	SS	MS	F_{cal}	F_{tab} 0.05
Total	7	0.010	-		
Treatment	1	0.004	0.004	**2.96**	10.1
Block	3	0.002	0.001	0.36	9.28
Error	3	0.004	0.001		

Treatment Effect (i.e., difference between Control and S-7) **Not Significant**

TABLE 29d
MUSKEG MONITORING PROGRAM - STATISTICAL ANALYSIS OF CLUSTER PEAT HORIZON MERCURY PORE WATERS
ANNUAL SAMPLING PROGRAM 2013 RESULTS -CLUSTER S-8

TOTAL AND METHYL MERCURY PORE WATER CONCENTRATIONS (ng/L)

Cluster Location	Substrate/Condition	Well Name	Total Mercury (Filtered)	Methyl Mercury (Filtered)
S-1	Peat - Domed Bog	MS-1-D	0.28	0.14
	Peat - Flat Bog	MS-1-F	0.79	0.10
	Peat - Horizontal Fen	MS-1-H	0.28	0.04
	Peat - Ribbed Fen	MS-1-R	<0.1	0.05
S-2	Peat - Domed Bog	MS-2-D	1.21	0.14
	Peat - Flat Bog	MS-2-F	2.48	0.20
	Peat - Ribbed Fen	MS-2-R	0.3	0.11
S-7	Peat - Domed Bog	MS-7-D	0.72	<0.01
	Peat - Flat Bog	MS-7-F	1.32	<0.01
	Peat - Horizontal Fen	MS-7-H	1.01	0.04
	Peat - Ribbed Fen	MS-7-R	<0.1	<0.02
S-8	Peat - Domed Bog	MS-8-D	1.72	0.23
	Peat - Flat Bog	MS-8-F	3.31	0.11
	Peat - Horizontal Fen	MS-8-H	0.44	<0.01
	Peat - Ribbed Fen	MS-8-R	0.30	0.07
S-9(1)	Peat - Domed Bog	MS-9(1)-D	0.52	<0.01
	Peat - Flat Bog	MS-9(1)-F	1.27	<0.01
	Peat - Horizontal Fen	MS-9(1)-H	0.48	<0.01
	Peat - Ribbed Fen	MS-9(1)-R	0.25	<0.01
S-9(2)	Peat - Domed Bog	MS-9(2)-D	1.38	<0.01
	Peat - Flat Bog	MS-9(2)-F	1.02	<0.01
	Peat - Horizontal Fen	MS-9(2)-H	1.37	0.06
	Peat - Ribbed Fen	MS-9(2)-R	<0.1	0.02
S-13	Peat - Domed Bog	MS-13-D	1.25	0.06
	Peat - Flat Bog	MS-13-F	1.23	0.18
	Peat - Horizontal Fen	MS-13-H	0.11	0.04
	Peat - Ribbed Fen	MS-13-R	<0.1	0.03
S-15	Peat - Domed Bog	MS-15-D	0.23	0.13
	Peat - Flat Bog	MS-15-F	0.63	0.04
	Peat - Horizontal Fen	MS-15-H	0.13	<0.02
	Peat - Ribbed Fen	MS-15-R	0.2	0.03
S-V1	Peat - Domed Bog	MS-V(1)-D	0.17	<0.02
	Peat - Ribbed Fen	MS-V(1)-R	0.3	0.11
S-V2	Peat - Domed Bog	MS-V(2)-D	0.55	0.05
	Peat - Ribbed Fen	MS-V(2)-R	0.61	<0.01
S-V3	Peat - Domed Bog	MS-V(3)-D	0.64	<0.01
	Peat - Ribbed Fen	MS-V(3)-R	0.76	0.05

(Green) Clusters used for statistical analysis

TWO-WAY ANALYSIS OF VARIANCE TABLES

TOTAL MERCURY

Habitat	Control Mean (S13+S15)	S-8	Sum r.
D. Bog	0.74	1.72	2.460
F. Bog	0.93	3.31	4.240
H. Fen	0.12	0.44	0.560
R. Fen	0.15	0.30	0.450
Sum c.	1.94	5.770	7.710

Total SS	8.217
Treat SS	1.834
Block SS	4.842
Error SS	1.541

ANOVA Table					
Source V.	d.f.	SS	MS	F_{cal}	F_{tab} 0.05
Total	7	8.217	-		
Treatment	1	1.834	1.834	**3.57**	10.1
Block	3	4.842	1.614	3.14	9.28
Error	3	1.541	0.514		

Treatment Effect (i.e., difference between Control and S-8) **Not Significant**

METHYL MERCURY

Habitat	Control Mean (S13+S15)	S-8	Sum r.
D. Bog	0.10	0.23	0.328
F. Bog	0.11	0.11	0.218
H. Fen	0.03	0.01	0.040
R. Fen	0.03	0.07	0.100
Sum c.	0.266	0.420	0.686

Total SS	0.035
Treat SS	0.003
Block SS	0.025
Error SS	0.008

ANOVA Table					
Source V.	d.f.	SS	MS	F_{cal}	F_{tab} 0.05
Total	7	0.035	-		
Treatment	1	0.003	0.003	**1.18**	10.1
Block	3	0.025	0.008	3.24	9.28
Error	3	0.008	0.003		

Treatment Effect (i.e., difference between Control and S-8) **Not Significant**

amec

TABLE 29e
MUSKEG MONITORING PROGRAM - STATISTICAL ANALYSIS OF CLUSTER PEAT HORIZON MERCURY PORE WATERS
ANNUAL SAMPLING PROGRAM 2013 RESULTS - CLUSTER S-9(1)

TOTAL AND METHYL MERCURY PORE WATER CONCENTRATIONS (ng/L)

Cluster Location	Substrate/Condition	Well Name	Total Mercury (Filtered)	Methyl Mercury (Filtered)
S-1	Peat - Domed Bog	MS-1-D	0.28	0.14
	Peat - Flat Bog	MS-1-F	0.79	0.10
	Peat - Horizontal Fen	MS-1-H	0.28	0.04
	Peat - Ribbed Fen	MS-1-R	<0.1	0.05
S-2	Peat - Domed Bog	MS-2-D	1.21	0.14
	Peat - Flat Bog	MS-2-F	2.48	0.20
	Peat - Ribbed Fen	MS-2-R	0.3	0.11
S-7	Peat - Domed Bog	MS-7-D	0.72	<0.01
	Peat - Flat Bog	MS-7-F	1.32	<0.01
	Peat - Horizontal Fen	MS-7-H	1.01	0.04
	Peat - Ribbed Fen	MS-7-R	<0.1	<0.02
S-8	Peat - Domed Bog	MS-8-D	1.72	0.23
	Peat - Flat Bog	MS-8-F	3.31	0.11
	Peat - Horizontal Fen	MS-8-H	0.44	<0.01
	Peat - Ribbed Fen	MS-8-R	0.30	0.07
S-9(1)	Peat - Domed Bog	MS-9(1)-D	0.52	<0.01
	Peat - Flat Bog	MS-9(1)-F	1.27	<0.01
	Peat - Horizontal Fen	MS-9(1)-H	0.48	<0.01
	Peat - Ribbed Fen	MS-9(1)-R	0.25	<0.01
S-9(2)	Peat - Domed Bog	MS-9(2)-D	1.38	<0.01
	Peat - Flat Bog	MS-9(2)-F	1.02	<0.01
	Peat - Horizontal Fen	MS-9(2)-H	1.37	0.06
	Peat - Ribbed Fen	MS-9(2)-R	<0.1	0.02
S-13	Peat - Domed Bog	MS-13-D	1.25	0.06
	Peat - Flat Bog	MS-13-F	1.23	0.18
	Peat - Horizontal Fen	MS-13-H	0.11	0.04
	Peat - Ribbed Fen	MS-13-R	<0.1	0.03
S-15	Peat - Domed Bog	MS-15-D	0.23	0.13
	Peat - Flat Bog	MS-15-F	0.63	0.04
	Peat - Horizontal Fen	MS-15-H	0.13	<0.02
	Peat - Ribbed Fen	MS-15-R	0.2	0.03
S-V1	Peat - Domed Bog	MS-V(1)-D	0.17	<0.02
	Peat - Ribbed Fen	MS-V(1)-R	0.3	0.11
S-V2	Peat - Domed Bog	MS-V(2)-D	0.55	0.05
	Peat - Ribbed Fen	MS-V(2)-R	0.61	<0.01
S-V3	Peat - Domed Bog	MS-V(3)-D	0.64	<0.01
	Peat - Ribbed Fen	MS-V(3)-R	0.76	0.05

Clusters used for statistical analysis

TWO-WAY ANALYSIS OF VARIANCE TABLES

TOTAL MERCURY

Habitat	Control Mean (S13+S15)	S-9(1)	Sum r.
D. Bog	0.74	0.52	1.260
F. Bog	0.93	1.27	2.200
H. Fen	0.12	0.48	0.600
R. Fen	0.15	0.25	0.400
Sum c.	1.94	2.520	4.460

Total SS	1.139
Treat SS	0.042
Block SS	0.987
Error SS	0.110

ANOVA Table

Source V.	d.f.	SS	MS	F_{cal}	F_{tab} 0.05
Total	7	1.139	-		
Treatment	1	0.042	0.042	**1.15**	10.1
Block	3	0.987	0.329	9.00	9.28
Error	3	0.110	0.037		

Treatment Effect (i.e., difference between Control and S-9[1])**Not Significant**

METHYL MERCURY

Habitat	Control Mean (S13+S15)	S-9(1)	Sum r.
D. Bog	0.10	0.01	0.105
F. Bog	0.11	0.01	0.121
H. Fen	0.03	0.01	0.040
R. Fen	0.03	0.01	0.040
Sum c.	0.266	0.040	0.306

Total SS	0.012
Treat SS	0.006
Block SS	0.003
Error SS	0.003

ANOVA Table

Source V.	d.f.	SS	MS	F_{cal}	F_{tab} 0.05
Total	7	0.012	-		
Treatment	1	0.006	0.006	**7.02**	10.1
Block	3	0.003	0.001	1.00	9.28
Error	3	0.003	0.001		

Treatment Effect (i.e., difference between Control and S-9[1])**Not Significant**

TABLE 29f
MUSKEG MONITORING PROGRAM - STATISTICAL ANALYSIS OF CLUSTER PEAT HORIZON MERCURY PORE WATERS
ANNUAL SAMPLING PROGRAM 2013 RESULTS - CLUSTER S-9(2)

TOTAL AND METHYL MERCURY PORE WATER CONCENTRATIONS (ng/L)

Cluster Location	Substrate/Condition	Well Name	Total Mercury (Filtered)	Methyl Mercury (Filtered)
S-1	Peat - Domed Bog	MS-1-D	0.28	0.14
	Peat - Flat Bog	MS-1-F	0.79	0.10
	Peat - Horizontal Fen	MS-1-H	0.28	0.04
	Peat - Ribbed Fen	MS-1-R	<0.1	0.05
S-2	Peat - Domed Bog	MS-2-D	1.21	0.14
	Peat - Flat Bog	MS-2-F	2.48	0.20
	Peat - Ribbed Fen	MS-2-R	0.3	0.11
S-7	Peat - Domed Bog	MS-7-D	0.72	<0.01
	Peat - Flat Bog	MS-7-F	1.32	<0.01
	Peat - Horizontal Fen	MS-7-H	1.01	0.04
	Peat - Ribbed Fen	MS-7-R	<0.1	<0.02
S-8	Peat - Domed Bog	MS-8-D	1.72	0.23
	Peat - Flat Bog	MS-8-F	3.31	0.11
	Peat - Horizontal Fen	MS-8-H	0.44	<0.01
	Peat - Ribbed Fen	MS-8-R	0.30	0.07
S-9(1)	Peat - Domed Bog	MS-9(1)-D	0.52	<0.01
	Peat - Flat Bog	MS-9(1)-F	1.27	<0.01
	Peat - Horizontal Fen	MS-9(1)-H	0.48	<0.01
	Peat - Ribbed Fen	MS-9(1)-R	0.25	<0.01
S-9(2)	Peat - Domed Bog	MS-9(2)-D	1.38	<0.01
	Peat - Flat Bog	MS-9(2)-F	1.02	<0.01
	Peat - Horizontal Fen	MS-9(2)-H	1.37	0.06
	Peat - Ribbed Fen	MS-9(2)-R	<0.1	0.02
S-13	Peat - Domed Bog	MS-13-D	1.25	0.06
	Peat - Flat Bog	MS-13-F	1.23	0.18
	Peat - Horizontal Fen	MS-13-H	0.11	0.04
	Peat - Ribbed Fen	MS-13-R	<0.1	0.03
S-15	Peat - Domed Bog	MS-15-D	0.23	0.13
	Peat - Flat Bog	MS-15-F	0.63	0.04
	Peat - Horizontal Fen	MS-15-H	0.13	<0.02
	Peat - Ribbed Fen	MS-15-R	0.2	0.03
S-V1	Peat - Domed Bog	MS-V(1)-D	0.17	<0.02
	Peat - Ribbed Fen	MS-V(1)-R	0.3	0.11
S-V2	Peat - Domed Bog	MS-V(2)-D	0.55	0.05
	Peat - Ribbed Fen	MS-V(2)-R	0.61	<0.01
S-V3	Peat - Domed Bog	MS-V(3)-D	0.64	<0.01
	Peat - Ribbed Fen	MS-V(3)-R	0.76	0.05

Clusters used for statistical analysis

TWO-WAY ANALYSIS OF VARIANCE TABLES

TOTAL MERCURY

Habitat	Control Mean (S13+S15)	S-9(2)	Sum r.
D. Bog	0.74	1.38	2.120
F. Bog	0.93	1.02	1.950
H. Fen	0.12	1.37	1.490
R. Fen	0.15	0.10	0.250
Sum c.	1.94	3.870	5.810

Total SS	2.062
Treat SS	0.466
Block SS	1.070
Error SS	0.526

ANOVA Table					
Source V.	d.f.	SS	MS	F_{cal}	F_{tab} 0.05
Total	7	2.062	-		
Treatment	1	0.466	0.466	**2.66**	10.1
Block	3	1.070	0.357	2.04	9.28
Error	3	0.526	0.175		

Treatment Effect (i.e., difference between Control and S-9[2]) **Not Significant**

METHYL MERCURY

Habitat	Control Mean (S13+S15)	S-9(2)	Sum r.
D. Bog	0.10	0.01	0.105
F. Bog	0.11	0.01	0.121
H. Fen	0.03	0.06	0.085
R. Fen	0.03	0.02	0.050
Sum c.	0.266	0.095	0.361

Total SS	0.010
Treat SS	0.004
Block SS	0.001
Error SS	0.005

ANOVA Table					
Source V.	d.f.	SS	MS	F_{cal}	F_{tab} 0.05
Total	7	0.010	-		
Treatment	1	0.004	0.004	**2.02**	10.1
Block	3	0.001	0.000	0.26	9.28
Error	3	0.005	0.002		

Treatment Effect (i.e., difference between Control and S-9[2]) **Not Significant**

TABLE 29g
MUSKEG MONITORING PROGRAM - STATISTICAL ANALYSIS OF CLUSTER PEAT HORIZON MERCURY PORE WATERS
ANNUAL SAMPLING PROGRAM 2013 RESULTS - CLUSTER S-V SERIES

TOTAL AND METHYL MERCURY PORE WATER CONCENTRATIONS (ng/L)

Cluster Location	Substrate/Condition	Well Name	Total Mercury (Filtered)	Methyl Mercury (Filtered)
S-1	Peat - Domed Bog	MS-1-D	0.28	0.14
	Peat - Flat Bog	MS-1-F	0.79	0.10
	Peat - Horizontal Fen	MS-1-H	0.28	0.04
	Peat - Ribbed Fen	MS-1-R	<0.1	0.05
S-2	Peat - Domed Bog	MS-2-D	1.21	0.14
	Peat - Flat Bog	MS-2-F	2.48	0.20
	Peat - Ribbed Fen	MS-2-R	0.3	0.11
S-7	Peat - Domed Bog	MS-7-D	0.72	<0.01
	Peat - Flat Bog	MS-7-F	1.32	<0.01
	Peat - Horizontal Fen	MS-7-H	1.01	0.04
	Peat - Ribbed Fen	MS-7-R	<0.1	<0.02
S-8	Peat - Domed Bog	MS-8-D	1.72	0.23
	Peat - Flat Bog	MS-8-F	3.31	0.11
	Peat - Horizontal Fen	MS-8-H	0.44	<0.01
	Peat - Ribbed Fen	MS-8-R	0.30	0.07
S-9(1)	Peat - Domed Bog	MS-9(1)-D	0.52	<0.01
	Peat - Flat Bog	MS-9(1)-F	1.27	<0.01
	Peat - Horizontal Fen	MS-9(1)-H	0.48	<0.01
	Peat - Ribbed Fen	MS-9(1)-R	0.25	<0.01
S-9(2)	Peat - Domed Bog	MS-9(2)-D	1.38	<0.01
	Peat - Flat Bog	MS-9(2)-F	1.02	<0.01
	Peat - Horizontal Fen	MS-9(2)-H	1.37	0.06
	Peat - Ribbed Fen	MS-9(2)-R	<0.1	0.02
S-13	Peat - Domed Bog	MS-13-D	1.25	0.06
	Peat - Flat Bog	MS-13-F	1.23	0.18
	Peat - Horizontal Fen	MS-13-H	0.11	0.04
	Peat - Ribbed Fen	MS-13-R	<0.1	0.03
S-15	Peat - Domed Bog	MS-15-D	0.23	0.13
	Peat - Flat Bog	MS-15-F	0.63	0.04
	Peat - Horizontal Fen	MS-15-H	0.13	<0.02
	Peat - Ribbed Fen	MS-15-R	0.2	0.03
S-V1	Peat - Domed Bog	MS-V(1)-D	0.17	<0.02
	Peat - Ribbed Fen	MS-V(1)-R	0.3	0.11
S-V2	Peat - Domed Bog	MS-V(2)-D	0.55	0.05
	Peat - Ribbed Fen	MS-V(2)-R	0.61	<0.01
S-V3	Peat - Domed Bog	MS-V(3)-D	0.64	<0.01
	Peat - Ribbed Fen	MS-V(3)-R	0.76	0.05

Clusters used for statistical analysis

TWO-WAY ANALYSIS OF VARIANCE TABLES

TOTAL MERCURY

Habitat	Control Mean (S13+S15)	S-V1	S-V2	S-V3	Sum r.
D. Bog	0.74	0.17	0.55	0.64	2.10
R. Fen	0.15	0.30	0.61	0.76	1.82
Sum c.	0.89	0.47	1.16	1.40	3.92

Total SS	0.430
Treat SS	0.239
Block SS	0.010
Error SS	0.182

ANOVA Table

Source V.	d.f.	SS	MS	F_{cal}	F_{tab} 0.05
Total	7	0.430	-		
Treatment	3	0.239	0.080	**1.31**	**9.28**
Block	1	0.010	0.010	0.16	10.1
Error	3	0.182	0.061		

Treatment Effect (i.e., difference between Control and S-V Series) **Not Significant**

METHYL MERCURY

Habitat	Control Mean (S13+S15)	S-V1	S-V2	S-V3	Sum r.
D. Bog	0.10	0.02	0.05	0.01	0.17
R. Fen	0.03	0.11	0.01	0.05	0.20
Sum c.	0.13	0.13	0.06	0.06	0.37

Total SS	0.010
Treat SS	0.002
Block SS	0.000
Error SS	0.008

ANOVA Table

Source V.	d.f.	SS	MS	F_{cal}	F_{tab} 0.05
Total	7	0.010	-		
Treatment	3	0.002	0.001	**0.31**	**9.28**
Block	1	0.000	0.000	0.05	10.1
Error	3	0.008	0.003		

Treatment Effect (i.e., difference between Control and S-V Series) **Not Significant**

TABLE 30a

GRANNY CREEK - STATISTICAL ANALYSIS - TOTAL MERCURY - 2013 (Filtered)

(concentrations in ng/L)

unfiltered is not presented

NORTH GRANNY CREEK DATA AND TWO-WAY ANALYSIS OF VARIANCE TABLES

Date	US NWF (G1)	DS NEF (G3)	Sum r.
Jan*	1.40	1.34	2.74
Feb	1.27	1.13	2.4
Mar	0.86	0.79	1.65
Apr	0.82	0.82	1.64
May	3.25	2.86	6.11
Jun	2.86	2.72	5.58
Jul*	1.40	1.34	2.74
Aug	0.79	0.82	1.61
Sep	1.27	1.69	2.96
Oct*	1.40	1.34	2.74
Nov	0.76	0.71	1.47
Dec	0.72	0.56	1.28
Sum c.	16.80	16.12	32.92

Total SS	13.709
Treat SS	0.019
Block SS	13.503
Error SS	0.187

ANOVA Table					
Source V.	d.f.	SS	MS	F_{cal}	F_{tab} 0.05
Total	23	13.709	-		
Treatment	1	0.019	0.019	**1.13**	**4.84**
Block	11	13.503	1.228	72.23	2.98
Error	11	0.187	0.017		

Treatment Effect (i.e., difference between US and DS)

Not Significant

Notes: US NWF - Upstream Northwest Fen; DS NEF - Downstream Northeast Fen

r. - rows; c. - columns

* Samples discarded/not obtained due to freezing (annual average substituted)

What does this refer to? Asterisk is against July?

SOUTH GRANNY CREEK DATA AND TWO-WAY ANALYSIS OF VARIANCE TABLES

Date	US SWF (G5)	DS SWF (G6)	Sum r.
Jan	1.50	1.10	2.60
Feb	1.56	1.29	2.85
Mar	1.08	0.81	1.89
Apr	0.70	0.82	1.52
May	2.05	2.59	4.64
Jun	2.58	2.20	4.78
Jul*	1.24	1.18	2.42
Aug	0.73	1.09	1.82
Sep	1.10	1.37	2.47
Oct	0.69	0.85	1.54
Nov	1.00	0.10	1.1
Dec	0.63	0.72	1.35
Sum c.	14.86	14.12	28.98

Total SS	8.818
Treat SS	0.023
Block SS	7.915
Error SS	0.880

ANOVA Table					
Source V.	d.f.	SS	MS	F_{cal}	F_{tab} 0.05
Total	23	8.818	-		
Treatment	1	0.023	0.023	**0.29**	**4.84**
Block	11	7.915	0.720	8.99	2.98
Error	11	0.880	0.080		

Treatment Effect (i.e., difference between US and DS)

Not Significant

Notes: US SWF - Upstream Southwest Fen; DS SWF - Downstream Southwest Fen

r. - rows; c. - columns

* Samples discarded/not obtained due to freezing (annual average substituted)

What does this refer to? Asterisk is against July?

TABLE 30b
GRANNY CREEK - STATISTICAL ANALYSIS - METHYL MERCURY - 2013 (Filtered)
(concentrations in ng/L)

unfiltered is not presented

NORTH GRANNY CREEK DATA AND TWO-WAY ANALYSIS OF VARIANCE TABLES

Habitat	US NWF (G1)	DS NEF (G3)	US CONF (G4)	Sum r.
Jan / Feb	0.04	0.08	0.10	0.22
Apr / May	0.04	0.10	0.05	0.19
Jul*	0.04	0.12	0.25	0.41
Sep / Oct	0.09	0.05	0.31	0.45
Sum c.	0.21	0.35	0.70	1.26

Total SS	0.082
Treat SS	0.032
Block SS	0.018
Error SS	0.033

ANOVA Table					
Source V.	d.f.	SS	MS	F_{cal}	F_{tab} 0.05
Total	11	0.082	-		
Treatment	2	0.032	0.016	**2.94**	**5.14**
Block	3	0.018	0.006	1.07	4.76
Error	6	0.033	0.005		

Treatment Effect (i.e., difference between US and DS)
Not Significant

Notes: US NWF - Upstream Northwest Fen; DS NEF - Downstream Northeast Fen; US CONF - Upstream Confluence
r. - rows; c. - columns
* Samples for SWF not obtained due to freezing (annual average substituted)

What does this refer to? Asterisk is against July?

SOUTH GRANNY CREEK DATA AND TWO-WAY ANALYSIS OF VARIANCE TABLES

Habitat	US SWF (G5)	DS SWF (G6)	US CONF (G7)	Sum r.
Jan	0.04	0.06	0.08	0.18
Apr	0.03	0.08	<0.02	0.13
Jul*	0.04	0.10	0.48	0.62
Oct	0.05	0.16	0.24	0.45
Sum c.	0.16	0.40	0.82	1.38

Total SS	0.187
Treat SS	0.055
Block SS	0.052
Error SS	0.079

ANOVA Table					
Source V.	d.f.	SS	MS	F_{cal}	F_{tab} 0.05
Total	11	0.187	-		
Treatment	2	0.055	0.028	**2.10**	**5.14**
Block	3	0.052	0.017	1.33	4.76
Error	6	0.079	0.013		

Treatment Effect (i.e., difference between US and DS)
Not Significant

Notes: US SWF - Upstream Southwest Fen; DS SWF - Downstream Southwest Fen; US CONF - Upstream Confluence
r. - rows; c. - columns
* Samples for SWF not obtained due to freezing (annual average substituted)

TABLE 30c
NAYSHKOOTAYAOW RIVER - STATISTICAL ANALYSIS - MERCURY - 2013 (Filtered)
(concentrations in ng/L)

TOTAL MERCURY DATA AND TWO-WAY ANALYSIS OF VARIANCE TABLES

Habitat	Nash R. US (N1)	Nash R. M (N2)	Nash R. DS (N3)	Sum r.
Jan / Feb	1.58	1.62	0.63	3.83
Apr / May	0.4	0.44	0.47	1.31
Jul	0.4	0.4	0.5	1.30
Oct	0.82	0.25	0.68	1.75
Sum c.	3.2	2.71	2.28	8.19

Notes: US - Upstream; M - Middle; DS - Downstream
r. - rows; c. - columns

Total SS	2.270
Treat SS	0.106
Block SS	1.456
Error SS	0.708

ANOVA Table					
Source V.	d.f.	SS	MS	F_{cal}	F_{tab} 0.05
Total	11	2.270	-		
Treatment	2	0.106	0.053	**0.45**	**5.14**
Block	3	1.456	0.485	4.12	4.76
Error	6	0.708	0.118		

Treatment Effect (i.e., difference between US and DS)
Not Significant

METHYL MERCURY DATA AND TWO-WAY ANALYSIS OF VARIANCE TABLES

Habitat	Nash R. US (N1)	Nash R. M (N2)	Nash R. DS (N3)	Sum r.
Jan / Feb	0.06	0.04	0.02	0.12
Apr / May	<0.02	<0.02	<0.02	0.06
Jul	<0.02	<0.02	0.04	0.08
Oct	0.03	0.05	0.04	0.12
Sum c.	0.14	0.13	0.12	0.39

Notes: US - Upstream; M - Middle; DS - Downstream
r. - rows; c. - columns

Total SS	0.002
Treat SS	0.000
Block SS	0.001
Error SS	0.001

ANOVA Table					
Source V.	d.f.	SS	MS	F_{cal}	F_{tab} 0.05
Total	11	0.002	-		
Treatment	2	0.000	0.000	**0.05**	**5.14**
Block	3	0.001	0.000	1.53	4.76
Error	6	0.001	0.000		

Treatment Effect (i.e., difference between US and DS)
Not Significant

TABLE 30d
ATTAWAPISKAT RIVER - STATISTICAL ANALYSIS - MERCURY - 2013 (Filtered)
(concentrations in ng/L)

TOTAL MERCURY DATA AND TWO-WAY ANALYSIS OF VARIANCE TABLES

Habitat	Att R. (A-1)	Att R. (A-2)	Att R. (A-3)	Att R. (A-4)	Sum r.
Jan	1.24	1.98	1.94		5.16
Apr / May	0.63	0.74	0.75	0.48	2.60
Jul	0.70	0.70	0.60	0.60	2.60
Oct	0.73	0.78	0.73	0.76	3.00
Sum c.	3.3	4.20	4.02	1.84	13.36

Notes: US - Upstream; DN - Downstream
r. - rows; c. - columns

Total SS	3.755
Treat SS	0.863
Block SS	1.131
Error SS	1.761

ANOVA Table

Source V.	d.f.	SS	MS	F_{cal}	F_{tab} 0.05
Total	15	3.755	-		
Treatment	3	0.863	0.288	**1.47**	**3.86**
Block	3	1.131	0.377	1.93	3.86
Error	9	1.761	0.196		

Treatment Effect (i.e., difference between US and DS)
Not Significant

METHYL MERCURY DATA AND TWO-WAY ANALYSIS OF VARIANCE TABLES

Habitat	Att R. (A-1)	Att R. (A-2)	Att R. (A-3)	Att R. (A-4)	Sum r.
Jan	<0.02	0.03	0.03		0.08
Apr/May	0.02	0.04	<0.02	<0.02	0.10
Jul	<0.02	<0.02	0.02	<0.02	0.08
Oct	<0.01	0.04	<0.01	<0.01	0.07
Sum c.	0.07	0.13	0.08	0.05	0.33

Notes: US - Upstream;DN - Downstream
r. - rows; c. - columns

Total SS	0.002
Treat SS	0.001
Block SS	0.000
Error SS	0.001

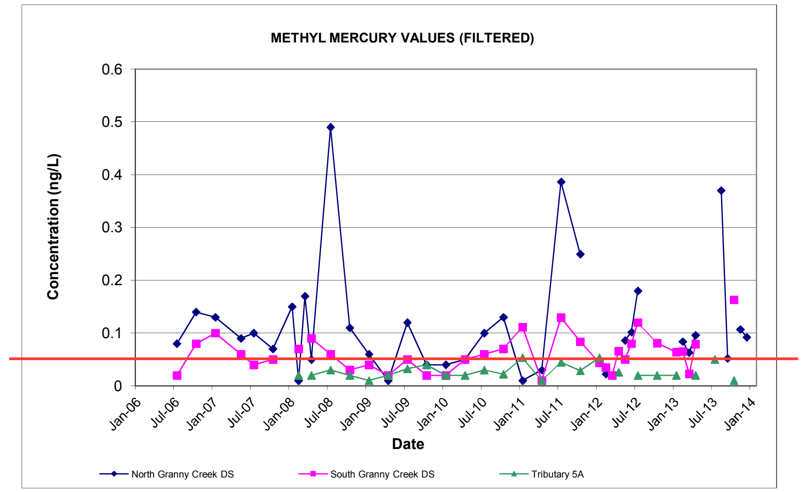
ANOVA Table

Source V.	d.f.	SS	MS	F_{cal}	F_{tab} 0.05
Total	15	0.002	-		
Treatment	3	0.001	0.000	**3.80**	**3.86**
Block	3	0.000	0.000	0.64	3.86
Error	9	0.001	0.000		

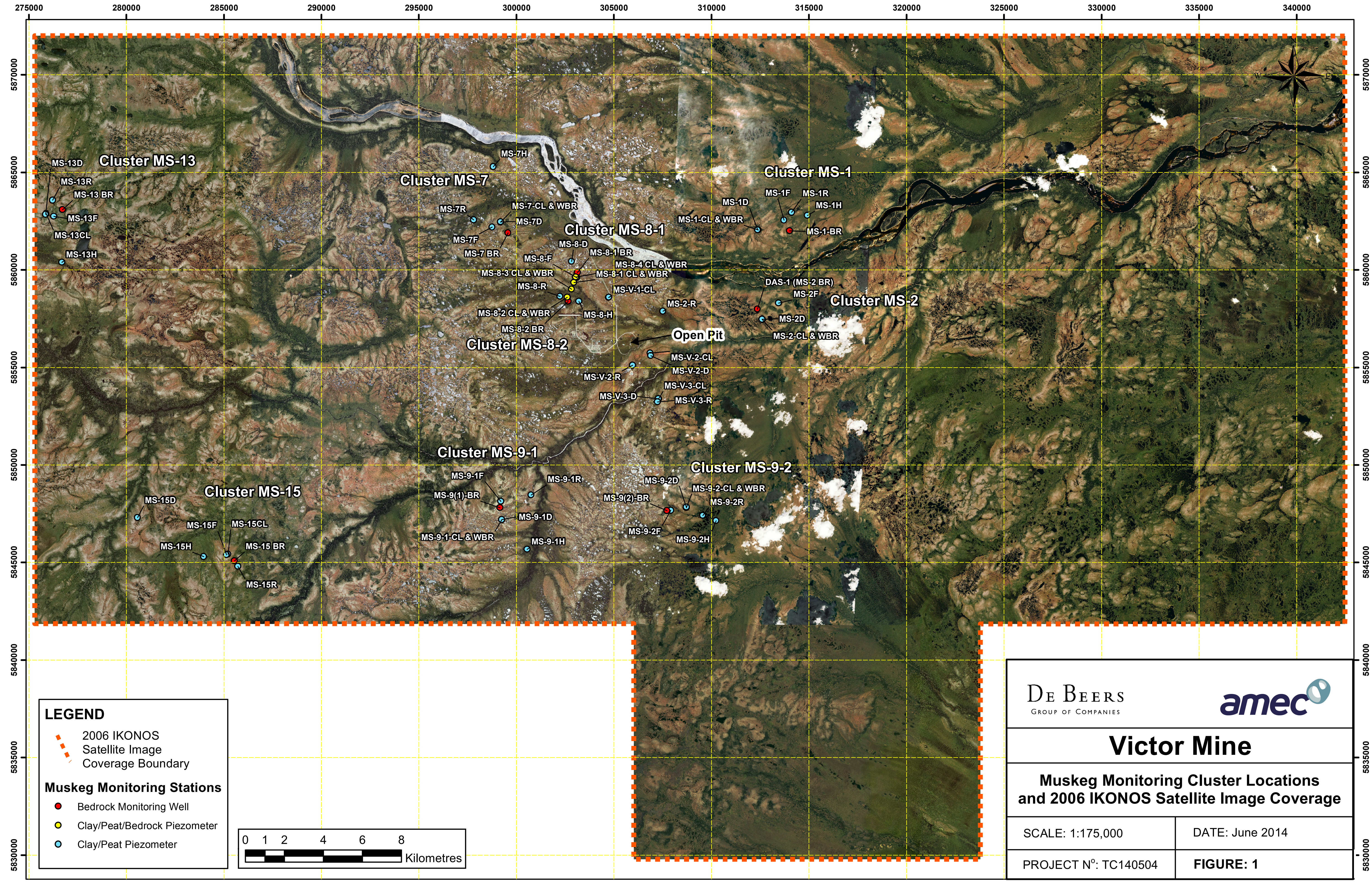
Treatment Effect (i.e., difference between US and DS)
Not Significant

TABLE 31
Granny Creek and Tributary 5A Background Methyl Mercury Water Quality (Filtered)
(concentrations in ng/L)

Date	North Granny Creek DS	South Granny Creek DS	Tributary 5A
Jul-06	0.08	0.02	
Oct-06	0.14	0.08	
Jan-07	0.13	0.10	
May-07	0.09	0.06	
Jul-07	0.10	0.04	
Oct-07	0.07	0.05	
Jan-08	0.15		
Feb-08	0.01	0.07	0.02
Mar-08	0.17		
Apr-08	0.05	0.09	0.02
Jul-08	0.49	0.06	0.03
Oct-08	0.11	0.03	0.02
Jan-09	0.06	0.04	0.01
Apr-09	0.01	0.02	0.02
Jul-09	0.12	0.05	0.03
Oct-09	0.04	0.02	0.04
Jan-10	0.04	0.02	0.02
Apr-10	0.05	0.05	0.02
Jul-10	0.10	0.06	0.03
Oct-10	0.13	0.07	0.02
Jan-11	<0.01	0.11	0.05
Apr-11	0.03	<0.01	0.01
Jul-11	0.39	0.13	0.04
Oct-11	0.25	0.08	0.03
Jan-12		0.04	0.05
Feb-12	0.02	0.04	
Mar-12	<0.02	<0.02	
Apr-12		0.07	0.03
May-12	0.09	0.05	
Jun-12	0.10	0.08	
Jul-12	0.18	0.12	0.02
Oct-12		0.08	<0.02
Jan-13		0.06	<0.02
Feb-13	0.08	0.07	
Mar-13	0.06	0.02	
Apr-13	0.10	0.08	<0.02
May-13			
Jun-13			
Jul-13			0.05
Aug-13	0.37		
Sep-13	0.05		
Oct-13		0.16	<0.01
Nov-13	0.11		
Dec-13	0.09		
Average 2008	**0.16**	**0.06**	**0.02**
Average 2009	**0.06**	**0.03**	**0.03**
Average 2010	**0.08**	**0.05**	**0.02**
Average 2011	**0.17**	**0.08**	**0.03**
Average 2012	**0.08**	**0.06**	**0.03**
Average 2013	**0.12**	**0.08**	**0.03**
Average All Years	**0.11**	**0.06**	**0.03**



0.05 ng/L is AMEC's calculated threshold
for protection of birds/mammals that rely on fish



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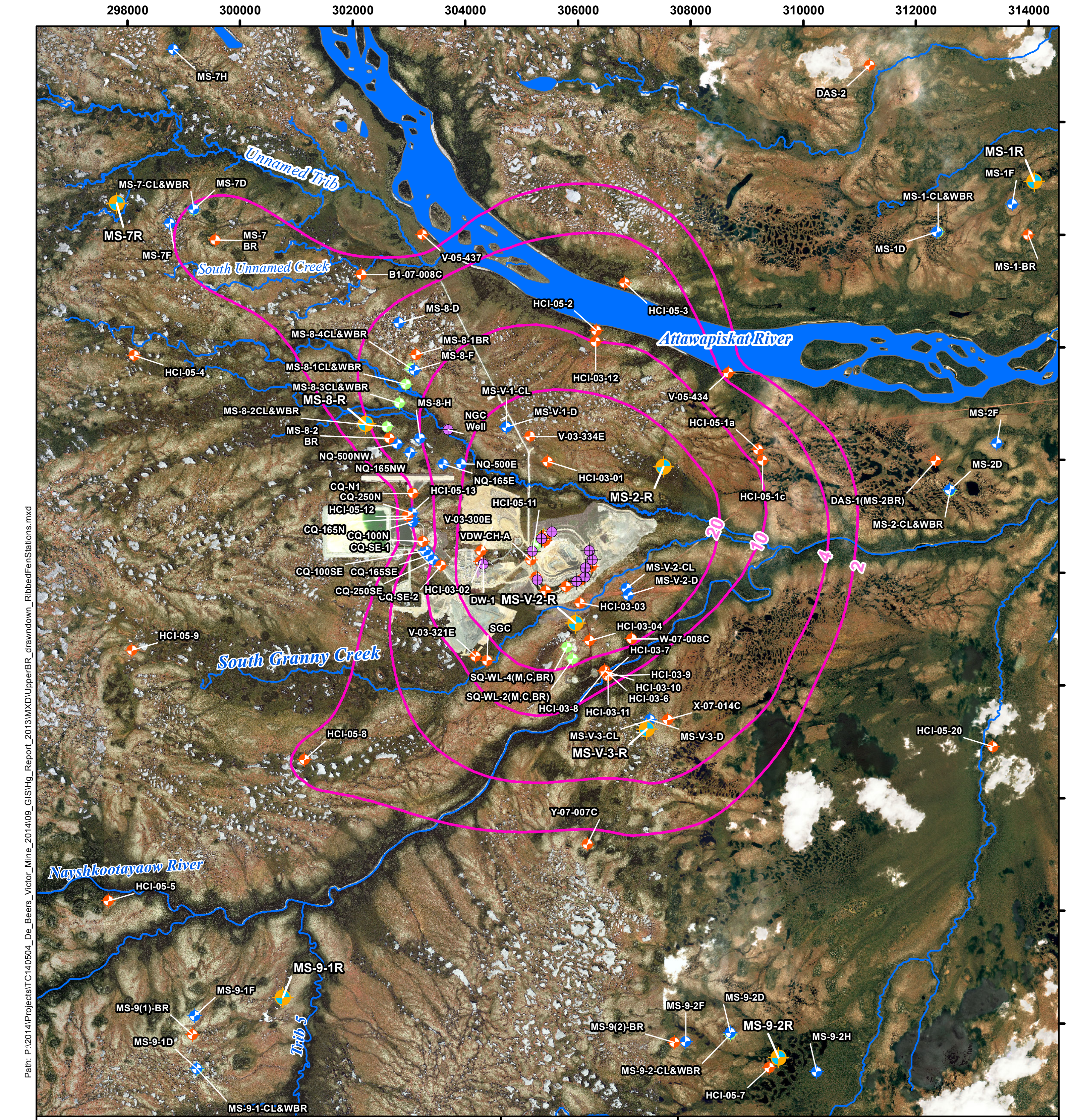
Victor Mine

Muskeg Monitoring Cluster Locations and 2006 IKONOS Satellite Image Coverage

SCALE: 1:175,000	DATE: June 2014
PROJECT N°: TC140504	**FIGURE: 1**

Path: P:\2014\Projects\TC140504_De_Beers_Victor_Mine_2014\09_GIS\Hg_Report_2013\MXD\muskeg_monitoring_cluster_loc_3.mxd



LEGEND

Ribbed Fen Station (Clay/Peat Piezometer)

Monitoring Locations

- Pumping Wells
- Bedrock Monitoring Well
- Clay/Peat Piezometer
- Clay/Peat/Bedrock Piezometer
- Drawdown in Upper Bedrock Aquifer Unit (2 m or 10 m Contour Interval)

0 1 2 4 6 8 Kilometres

NOTES:
- Ikonos Satellite Imagery, 2006

Datum: NAD83
Projection: UTM Zone 17N

N E S W

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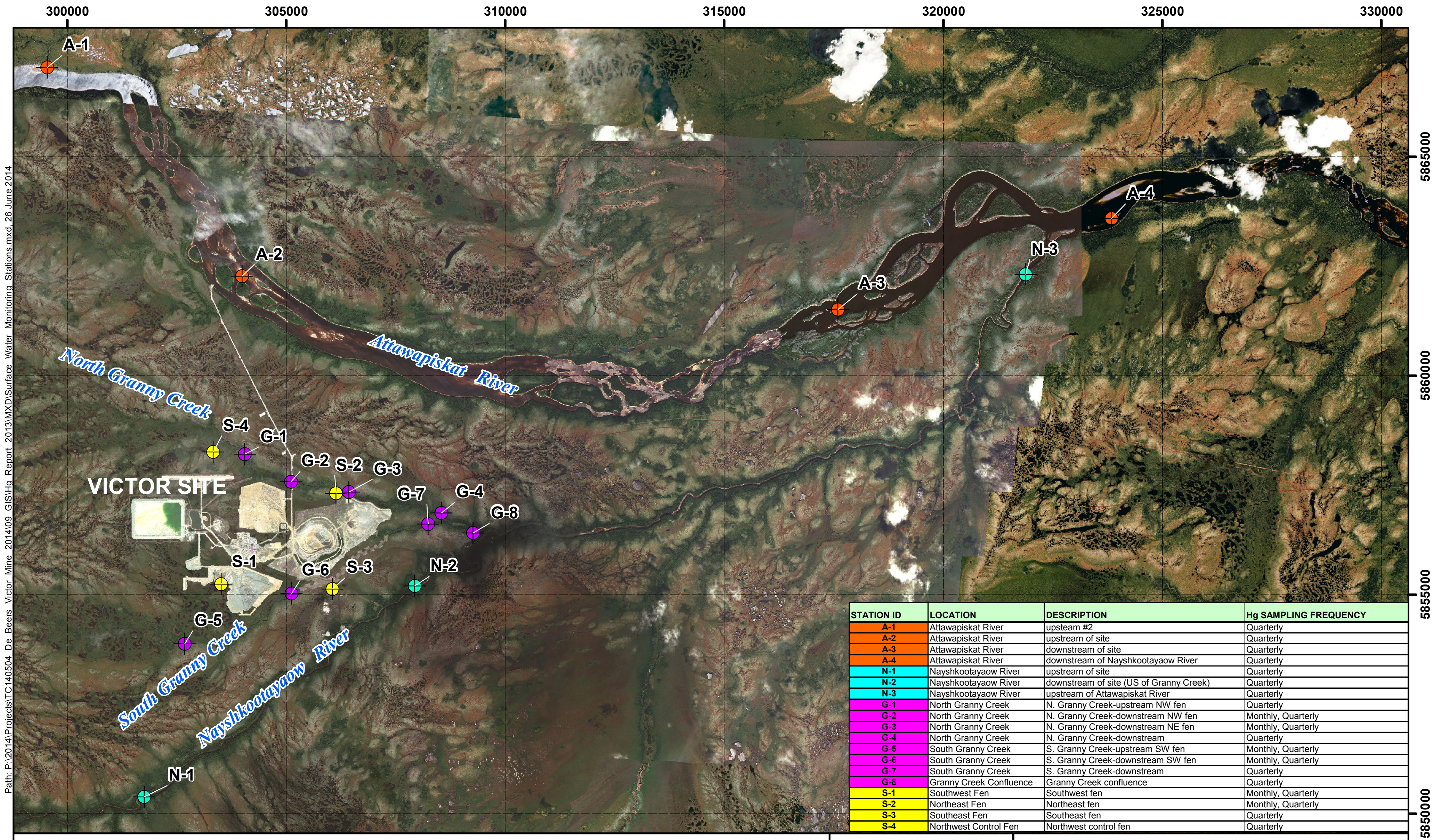
Interpreted Drawdown Contours (m) in Upper Bedrock Aquifer (June 2013 data)

PROJECT N°: TC140504	**FIGURE: 2**
SCALE: 1:90,000	DATE: June 2014



STATION ID	LOCATION	DESCRIPTION	Hg SAMPLING FREQUENCY
A-1	Attawapiskat River	upsteam #2	Quarterly
A-2	Attawapiskat River	upstream of site	Quarterly
A-3	Attawapiskat River	downstream of site	Quarterly
A-4	Attawapiskat River	downstream of Nayshkootayaow River	Quarterly
N-1	Nayshkootayaow River	upstream of site	Quarterly
N-2	Nayshkootayaow River	downstream of site (US of Granny Creek)	Quarterly
N-3	Nayshkootayaow River	upstream of Attawapiskat River	Quarterly
G-1	North Granny Creek	N. Granny Creek-upstream NW fen	Quarterly
G-2	North Granny Creek	N. Granny Creek-downstream NW fen	Monthly, Quarterly
G-3	North Granny Creek	N. Granny Creek-downstream NE fen	Monthly, Quarterly
G-4	North Granny Creek	N. Granny Creek-downstream	Quarterly
G-5	South Granny Creek	S. Granny Creek-upstream SW fen	Monthly, Quarterly
G-6	South Granny Creek	S. Granny Creek-downstream SW fen	Monthly, Quarterly
G-7	South Granny Creek	S. Granny Creek-downstream	Quarterly
G-8	Granny Creek Confluence	Granny Creek confluence	Quarterly
S-1	Southwest Fen	Southwest fen	Monthly, Quarterly
S-2	Northeast Fen	Northeast fen	Monthly, Quarterly
S-3	Southeast Fen	Southeast fen	Quarterly
S-4	Northwest Control Fen	Northwest control fen	Quarterly

LEGEND

Surface Water Monitoring Station Location

- **Attawapiskat River**
- **Nayshkootayaow River**
- **Granny Creek**
- **Fens**

0 3 6 9 12 15 Km

NOTES:
Imagery: GeoEye 1, Sept 2012

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Surface Water Monitoring Stations

Datum: NAD83
Projection: UTM Zone 17N

N W E S

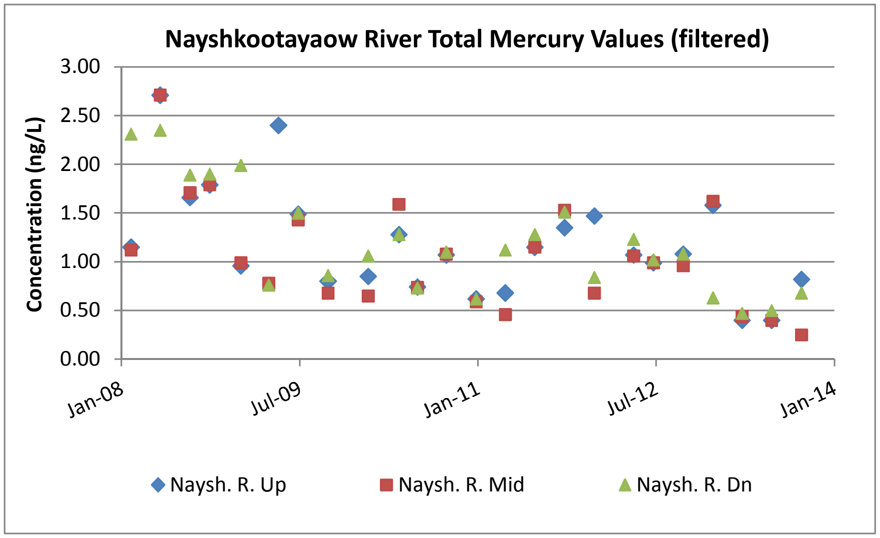
PROJECT N°: TC140504

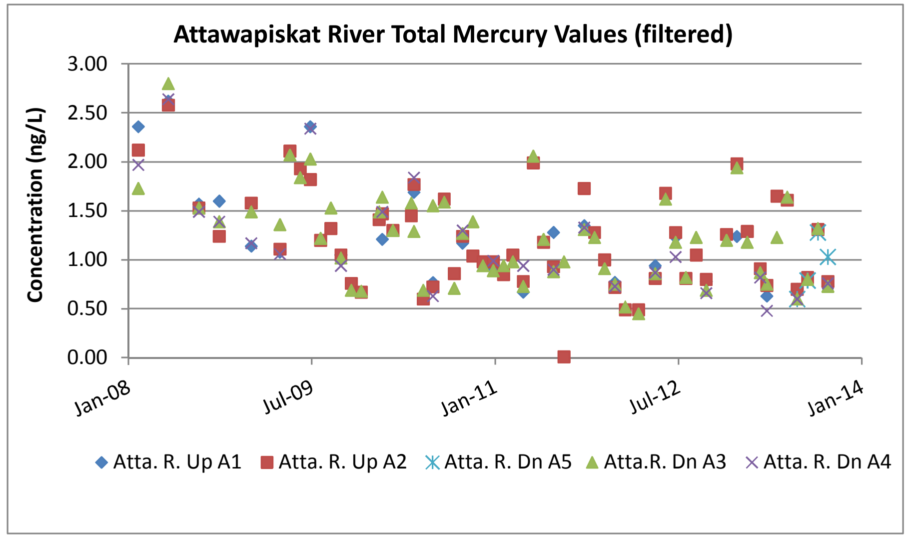
FIGURE: 3

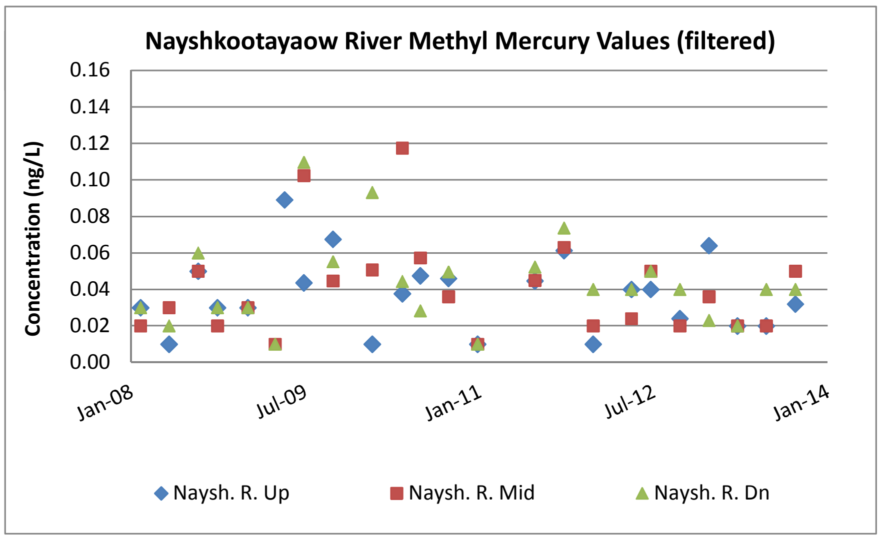
SCALE: 1:120,000

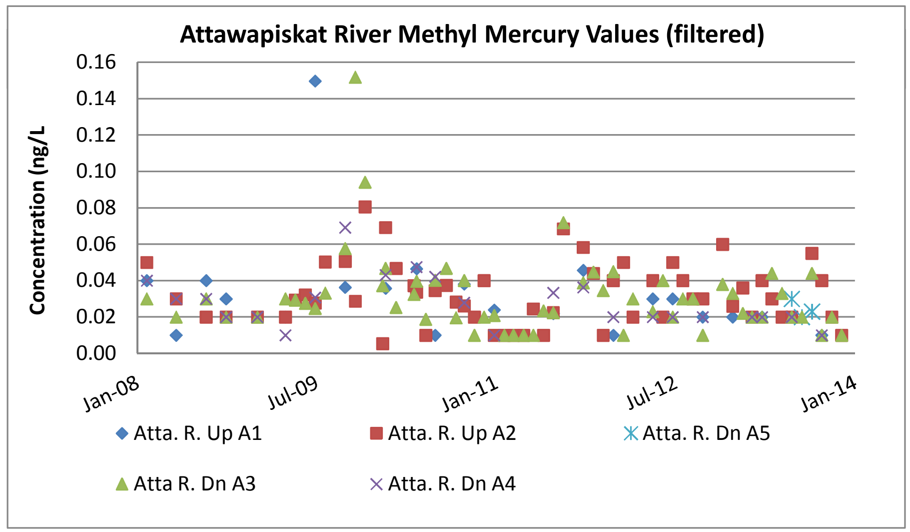
DATE: June 2014

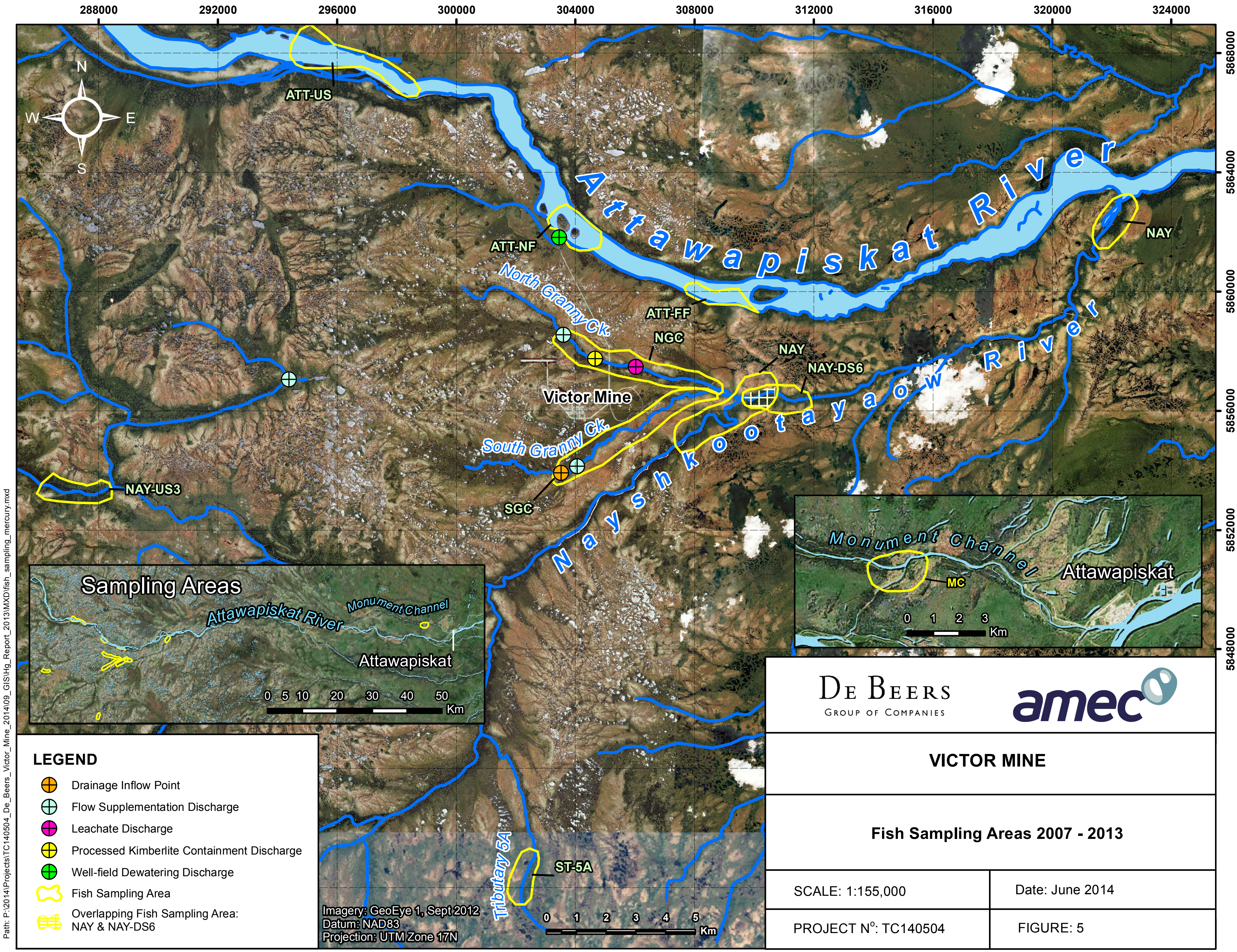
FIGURE 4
NAYSHKOOTAYAOW AND ATTAWAPISKAT RIVER TOTAL AND METHYL MERCURY TRENDS (filtered values)










288000
292000
296000
300000
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308000
312000
316000
320000
324000
5868000
5864000
5860000
5856000
5852000
5848000
N
S
W
E
ATT-US
ATT-NF
Attawapiskat River
ATT-FF
NAY
North Granny Ck.
NGC
NAY
NAY-DS6
Victor Mine
South Granny Ck.
SGC
Nayshkootayaow River
NAY-US3
Monument Channel
MC
Attawapiskat
0 1 2 3 Km
Sampling Areas
Attawapiskat River
Monument Channel
Attawapiskat
0 5 10 20 30 40 50 Km
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VICTOR MINE
Fish Sampling Areas 2007 - 2013
SCALE: 1:155,000
Date: June 2014
PROJECT N^{o}: TC140504
FIGURE: 5
LEGEND
Drainage Inflow Point
Flow Supplementation Discharge
Leachate Discharge
Processed Kimberlite Containment Discharge
Well-field Dewatering Discharge
Fish Sampling Area
Overlapping Fish Sampling Area: NAY & NAY-DS6
Tributary 5A
ST-5A
Imagery: GeoEye 1, Sept 2012
Datum: NAD83
Projection: UTM Zone 17N
0 1 2 3 4 5 Km
Path: P:\2014\Projects\TC140504_De_Beers_Victor_Mine_2014\09_GIS\Hg_Report_2013\MXD\fish_sampling_mercury.mxd

FIGURE 6: BOX PLOT SUMMARY OF TOTAL MERCURY CONCENTRATIONS BETWEEN FILLETS (UWO_F) AND TISSUE PLUGS (UWO_P)

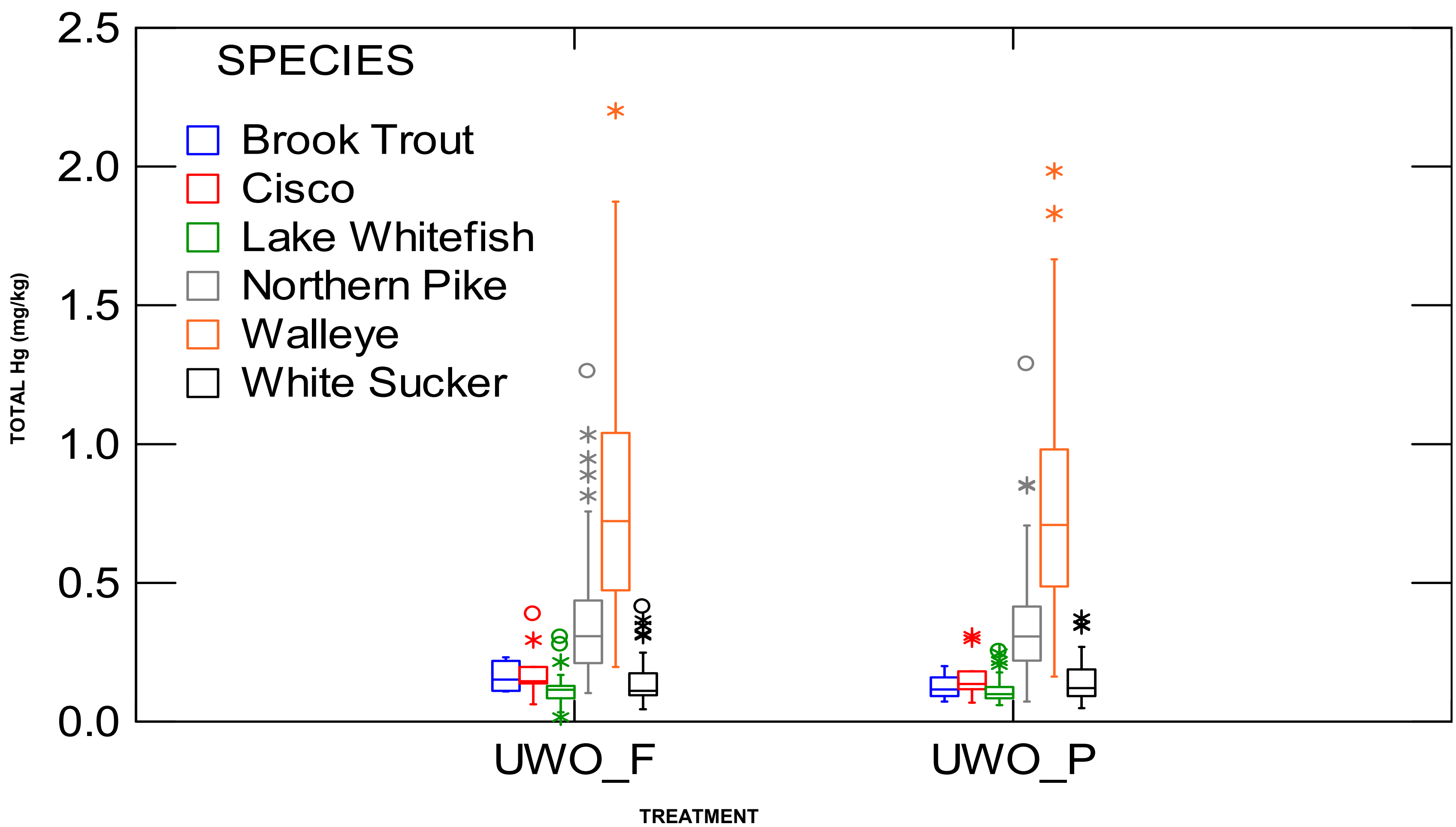


FIGURE 7: BOX PLOT SUMMARY OF TOTAL MERCURY CONCENTRATIONS IN FILLET SAMPLES AS ANALYZED BY UWO AND MOE LABORATORIES

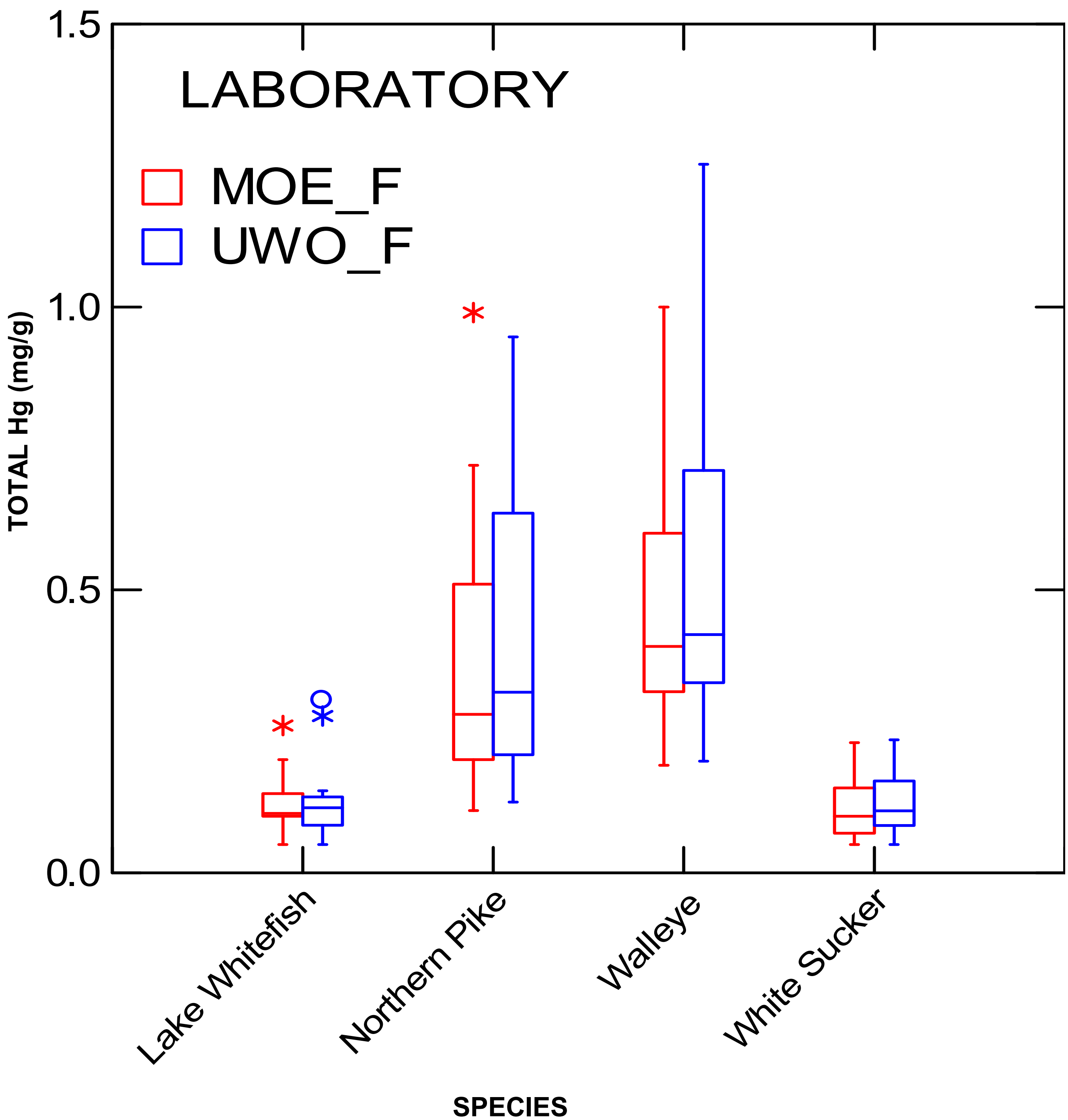


FIGURE 8: BOX PLOT SUMMARY OF TOTAL MERCURY CONCENTRATIONS IN FILLET SAMPLES AS ANALYZED BY FLETT AND MOE LABORATORIES

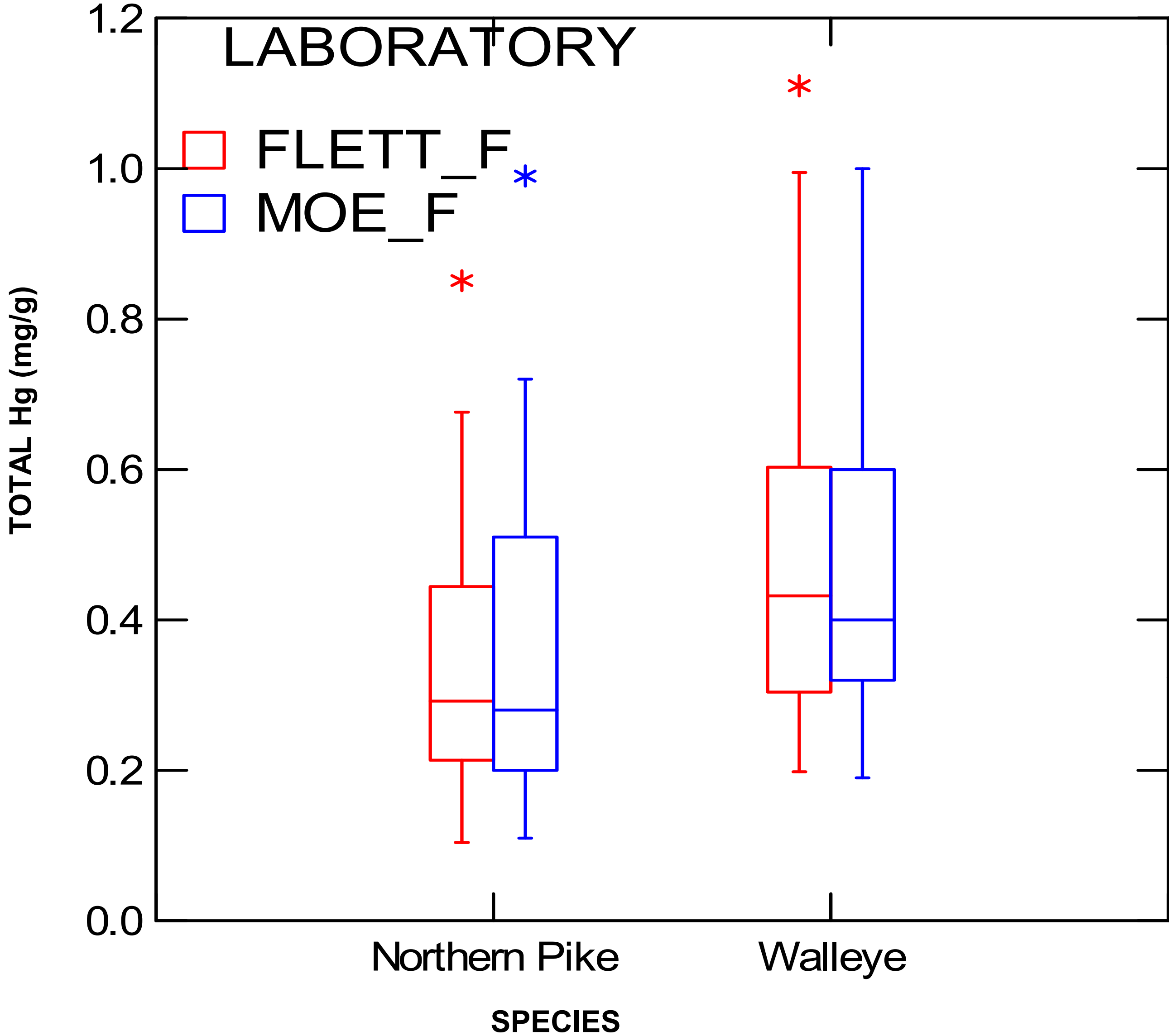


FIGURE 9: BOX PLOT SUMMARY OF TOTAL MERCURY CONCENTRATIONS IN FILLET SAMPLES AS ANALYZED BY UWO AND FLETT LABORATORIES

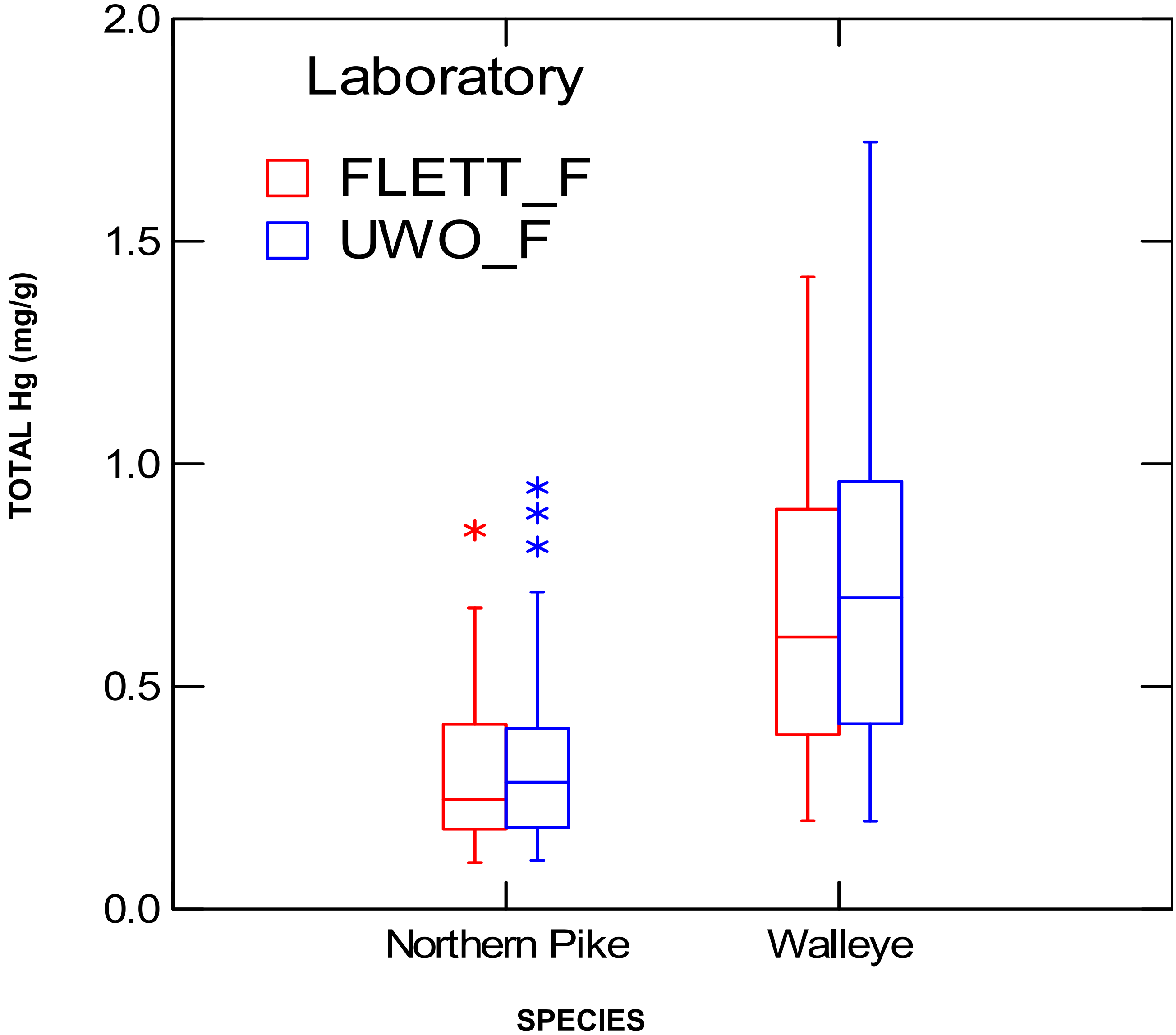
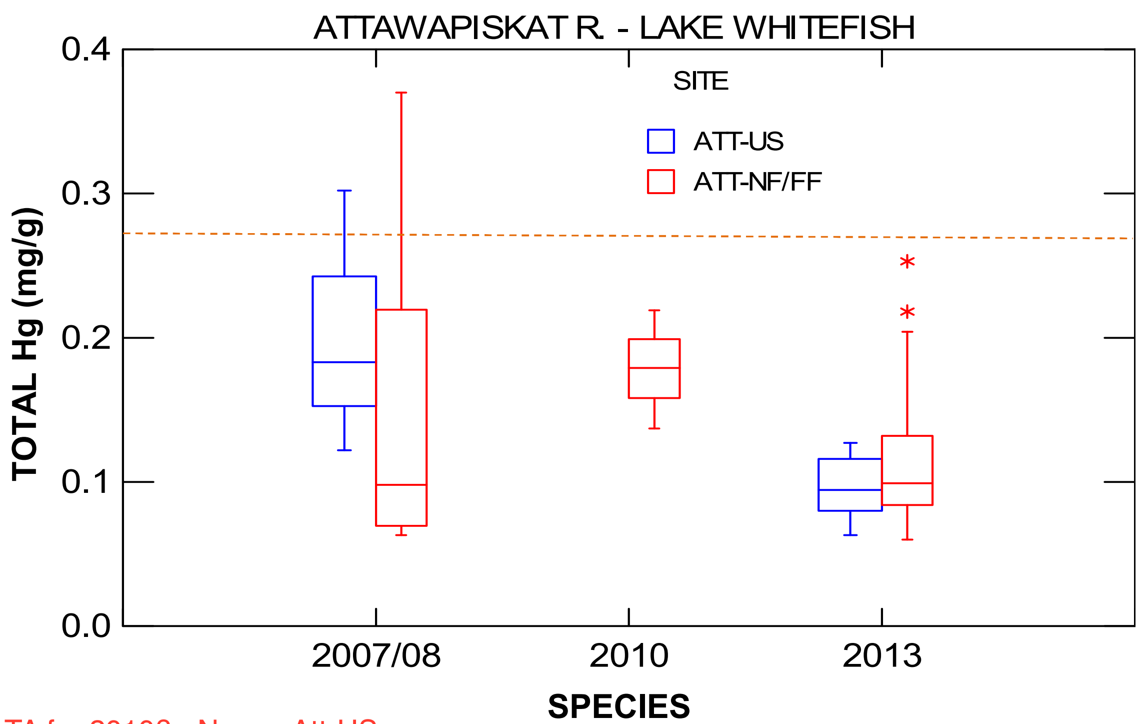
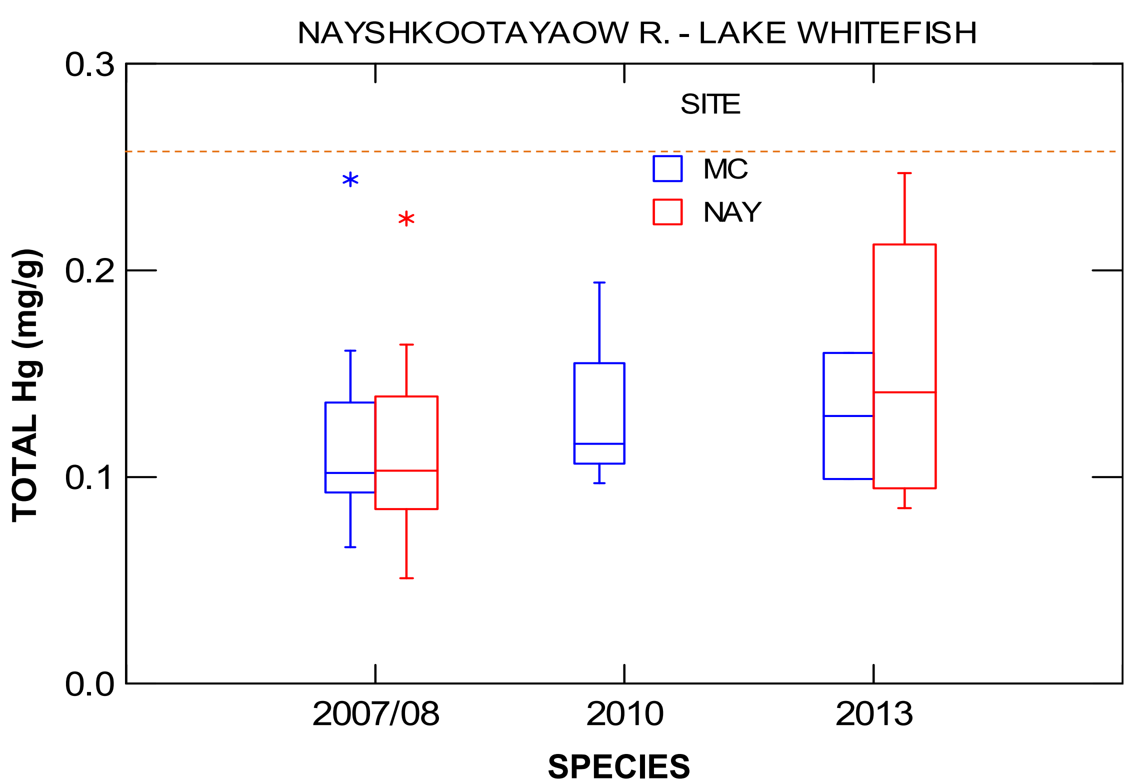


FIGURE 10: BOX PLOT SUMMARY OF TOTAL MERCURY CONCENTRATIONS FOR LAKE WHITEFISH YEAR AND SITE COMPARISONS

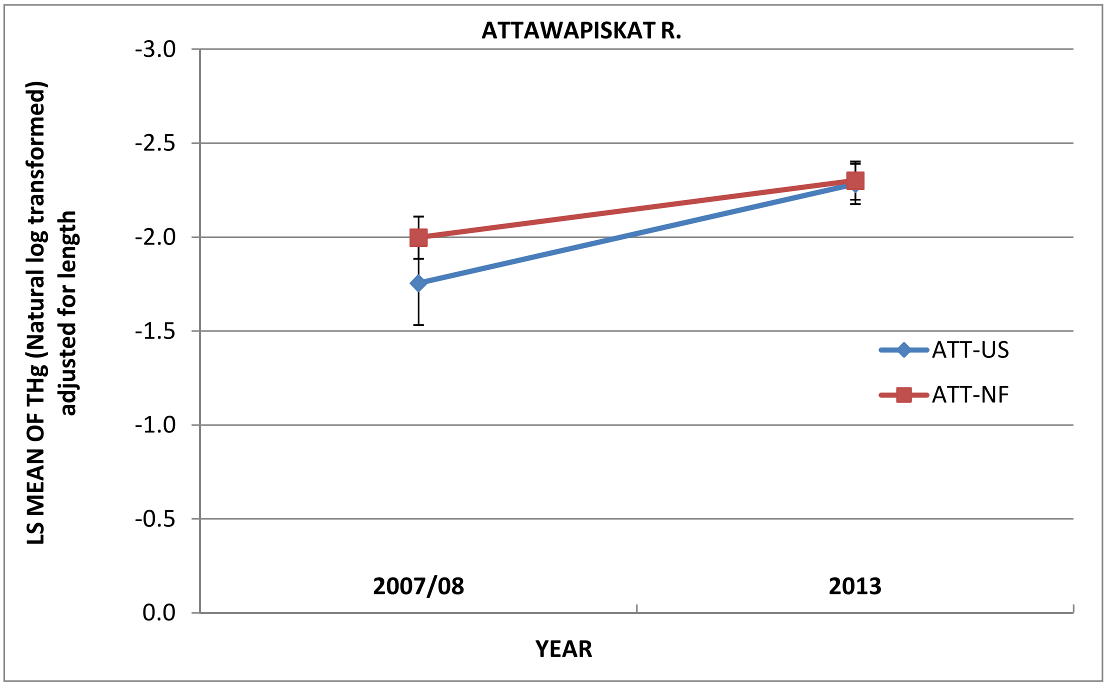


NO DATA for 2010? - Nay or Att-US



-------- start of advisory for women of child bearing age and children under 15 years = 0.26 ppm

FIGURE 11: PLOT OF LS MEANS OF TRANSFORMED TOTAL MERCURY ADJUSTED FOR LENGTH LAKE WHITEFISH YEAR AND SITE COMPARISIONS



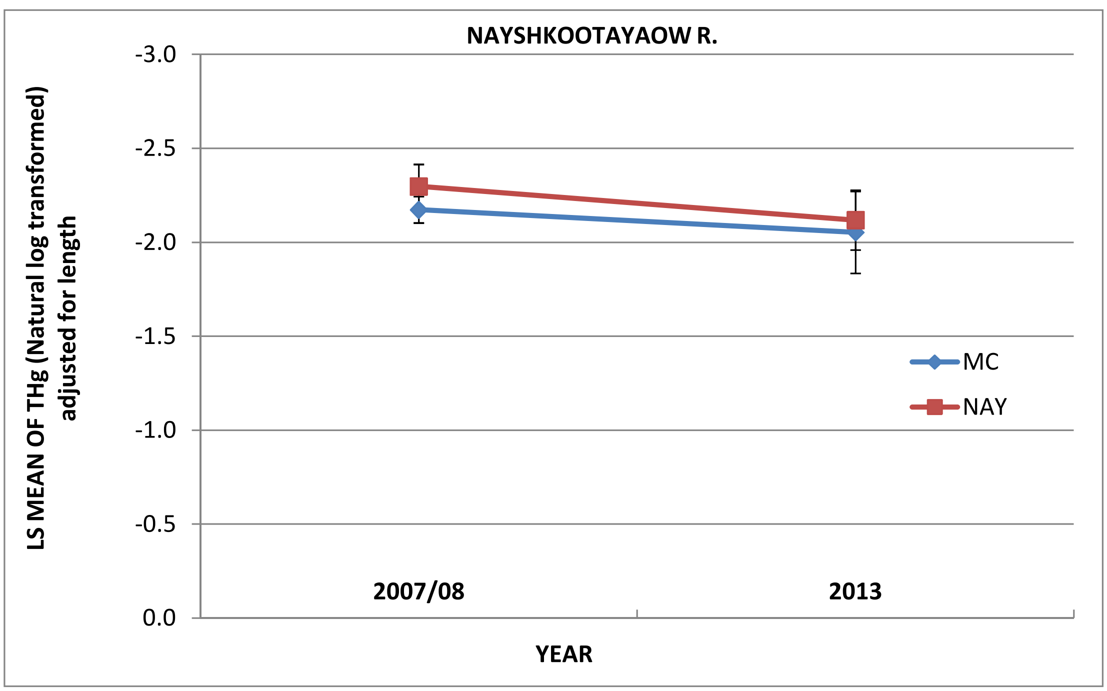
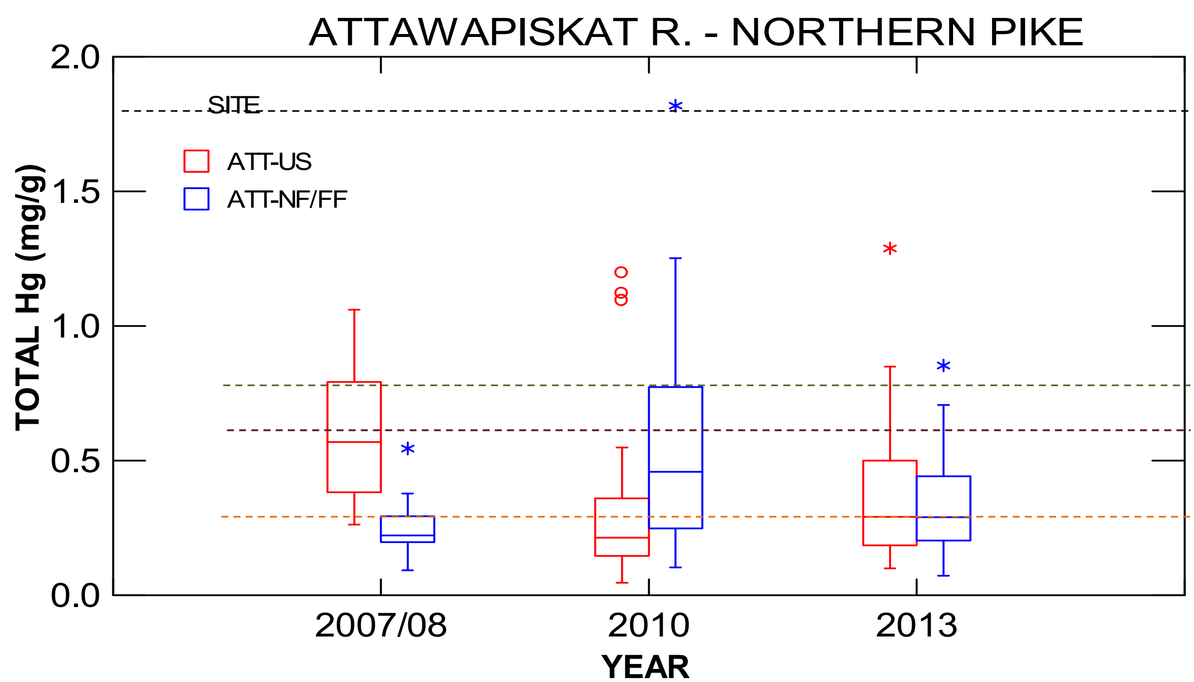
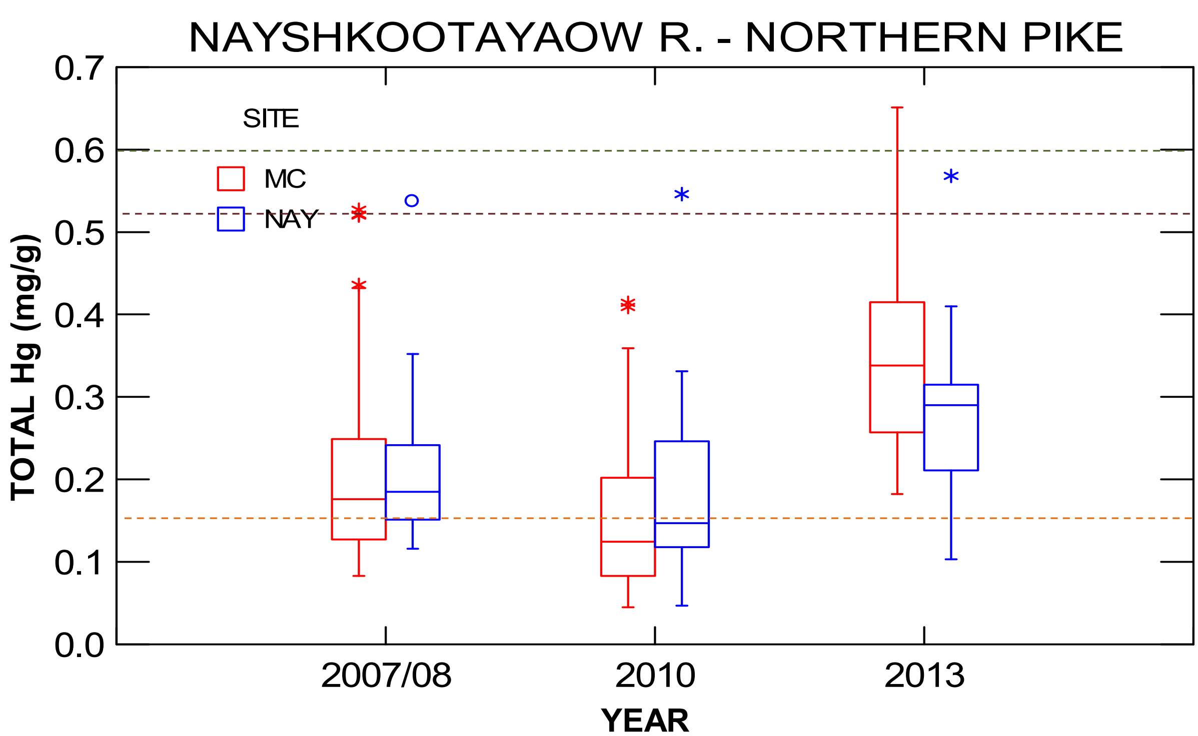


FIGURE 12: BOX PLOT SUMMARY OF TOTAL MERCURY CONCENTRATIONS FOR NORTHERN PIKE YEAR AND SITE COMPARISONS





start of advisory for women of child bearing age and children under 15 years = 0.26 ppm
total restriction for women of child bearing age and children under 15 years = 0.52 ppm
start of advisory for general population = 0.60
total restriction level for general population = 1.84 ppm

FIGURE 13: PLOT OF LS MEANS OF TRANSFORMED TOTAL MERCURY ADJUSTED FOR LENGTH NORTHERN PIKE YEAR AND SITE COMPARISIONS

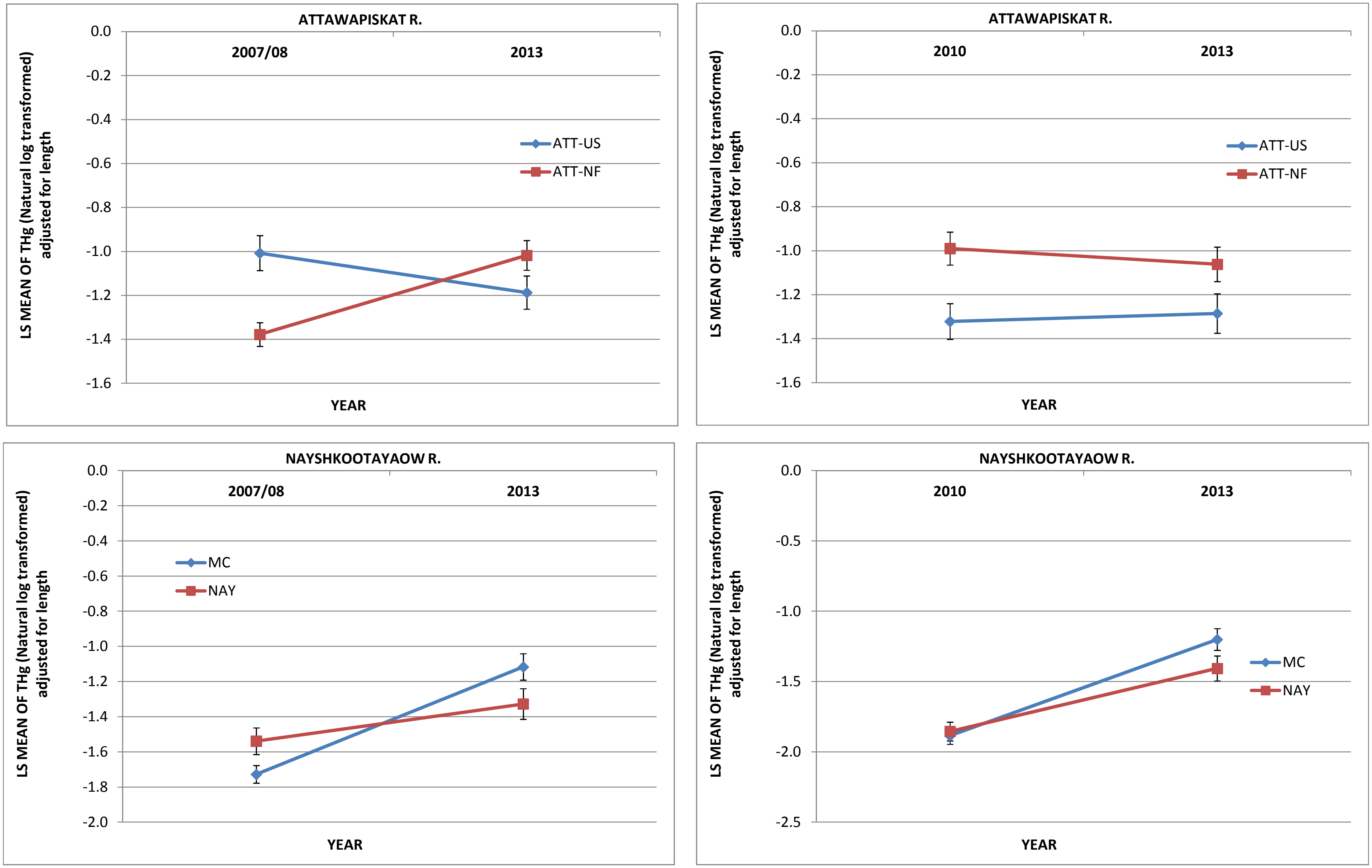
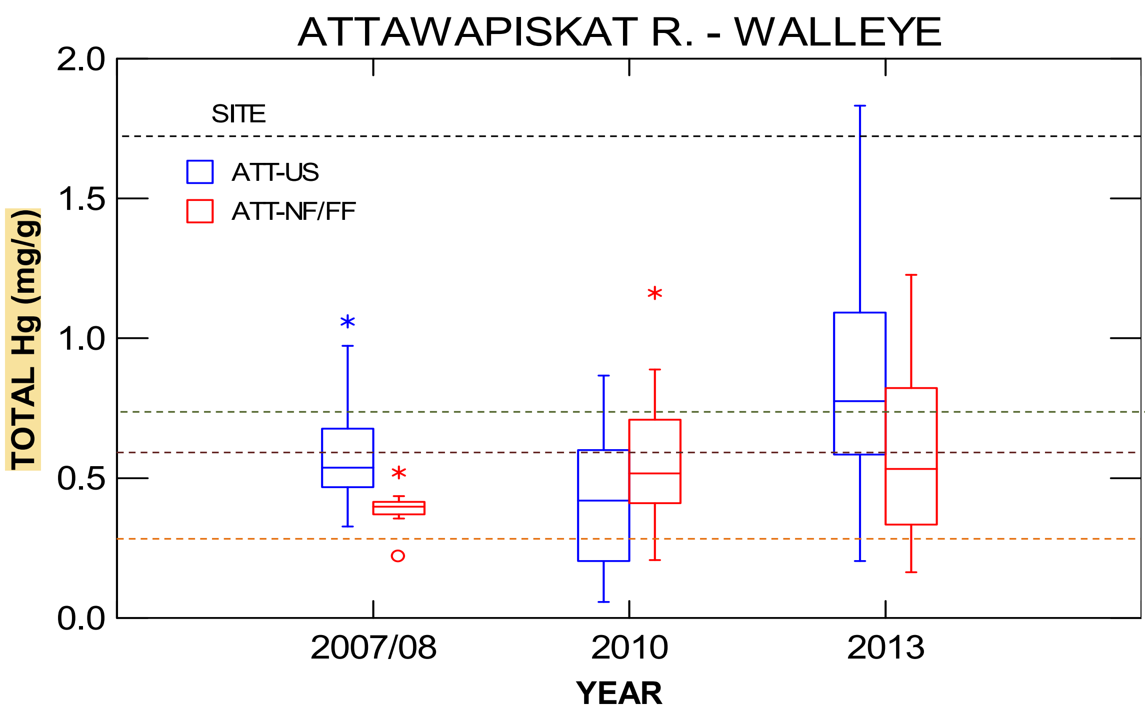
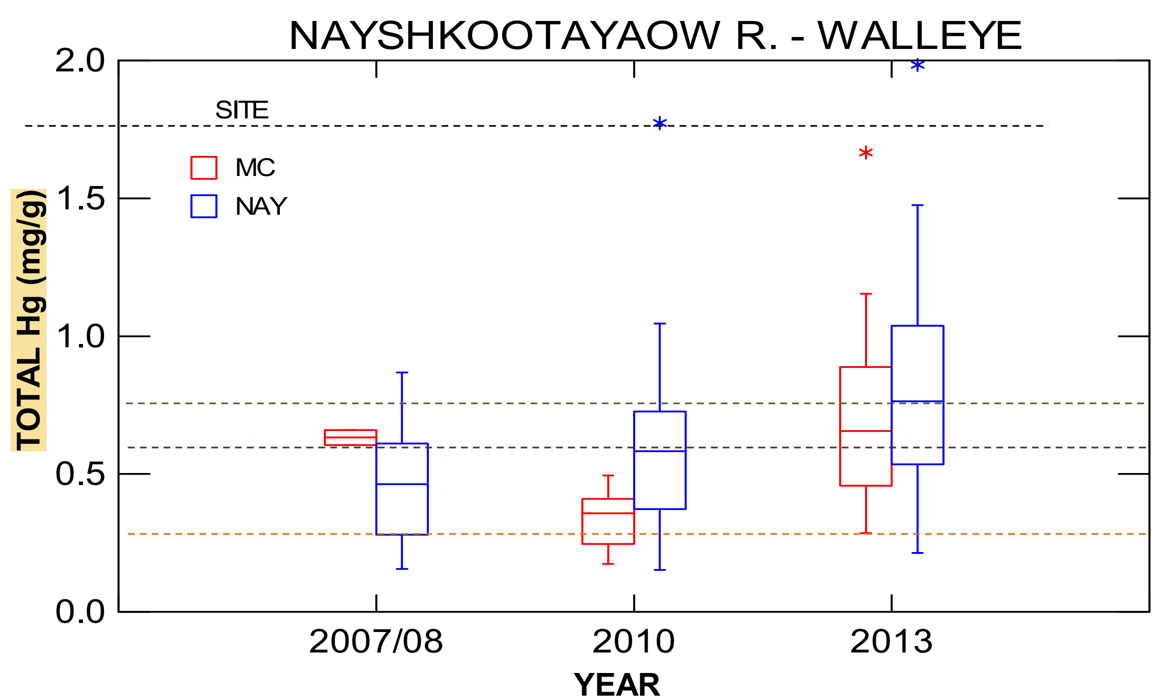


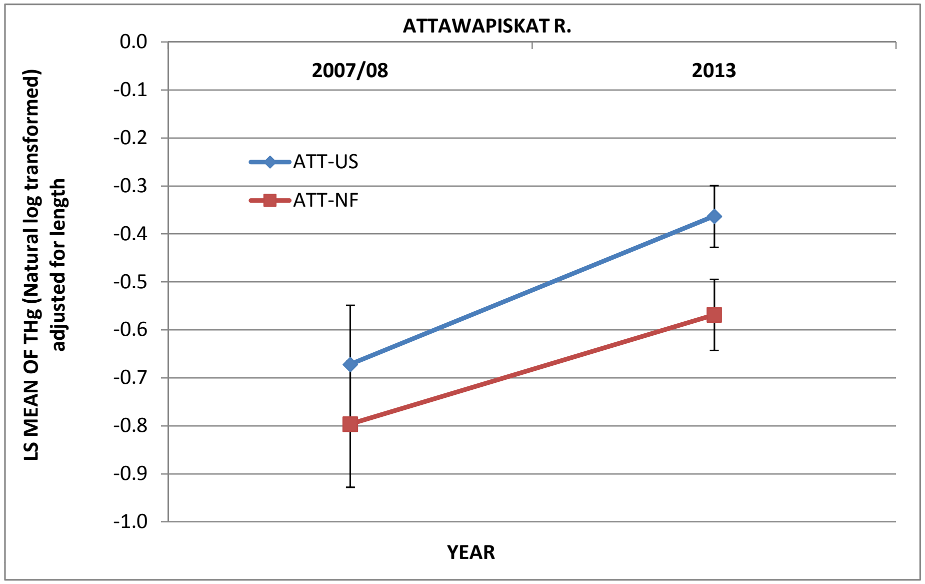
FIGURE 14: BOX PLOT SUMMARY OF TOTAL MERCURY CONCENTRATIONS FOR WALLEYE YEAR AND SITE COMPARISONS

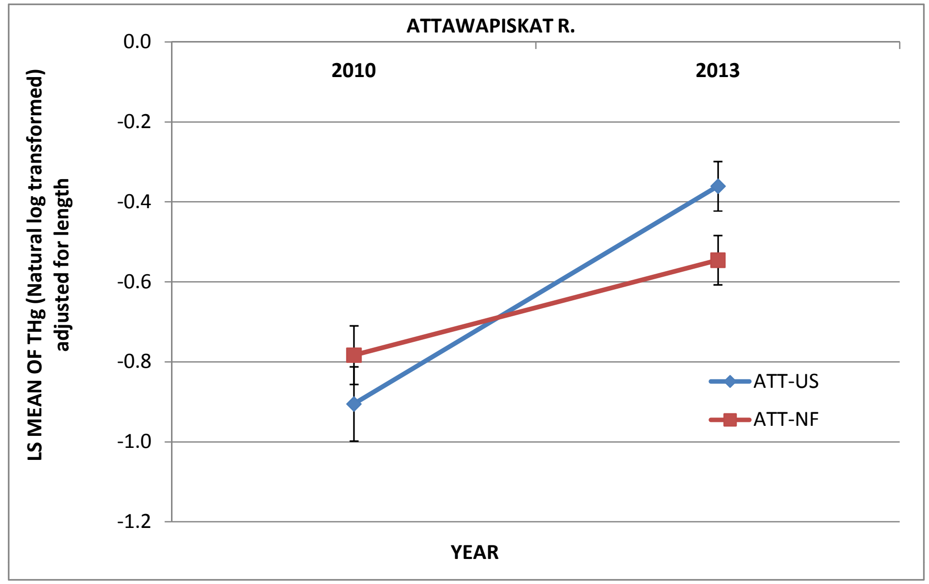


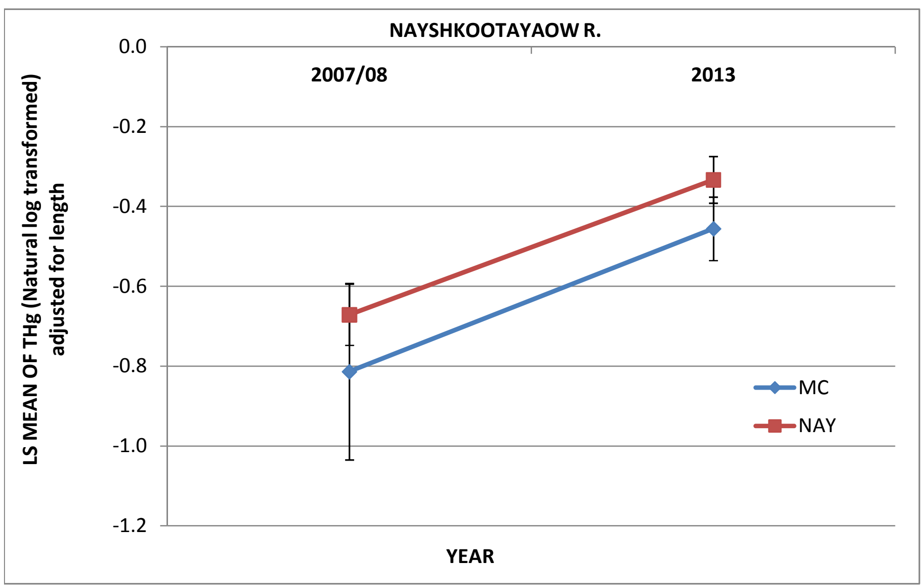


start of advisory for women of child bearing age and children under 15 years = 0.26 ppm
total restriction for women of child bearing age and children under 15 years = 0.52 ppm
start of advisory for general population = 0.60
total restriction level for general population = 1.84 ppm

FIGURE 15: PLOT OF LS MEANS OF TRANSFORMED TOTAL MERCURY ADJUSTED FOR LENGTH WALLEYE YEAR ANDSITE COMPARISONS







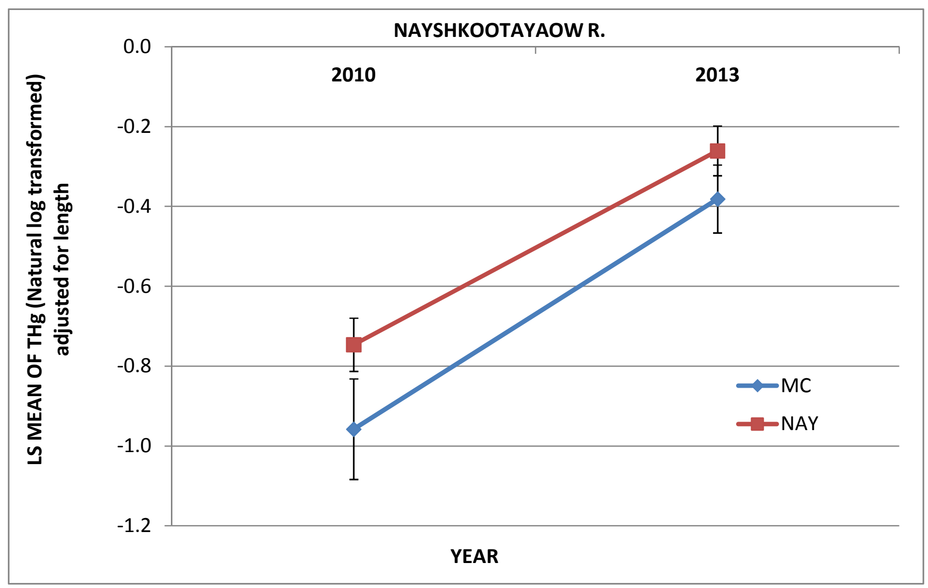
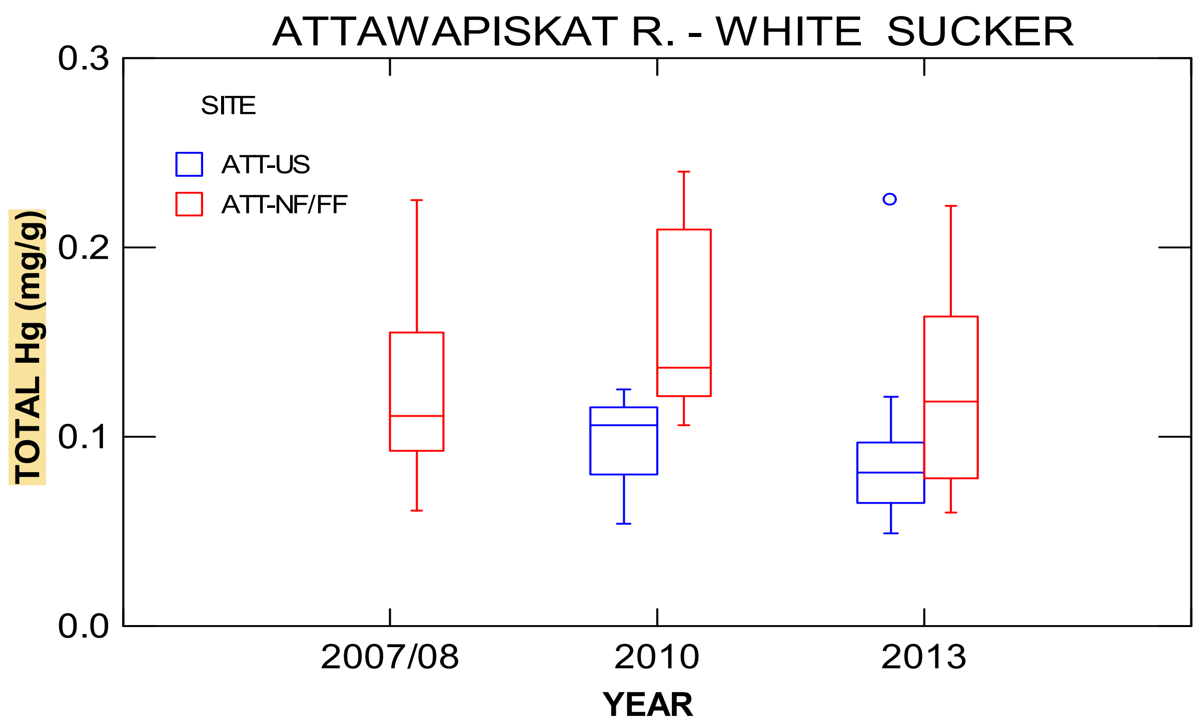


FIGURE 16: BOX PLOT SUMMARY OF TOTAL MERCURY CONCENTRATIONS FOR WHITE SUCKER YEAR AND SITE COMPARISONS



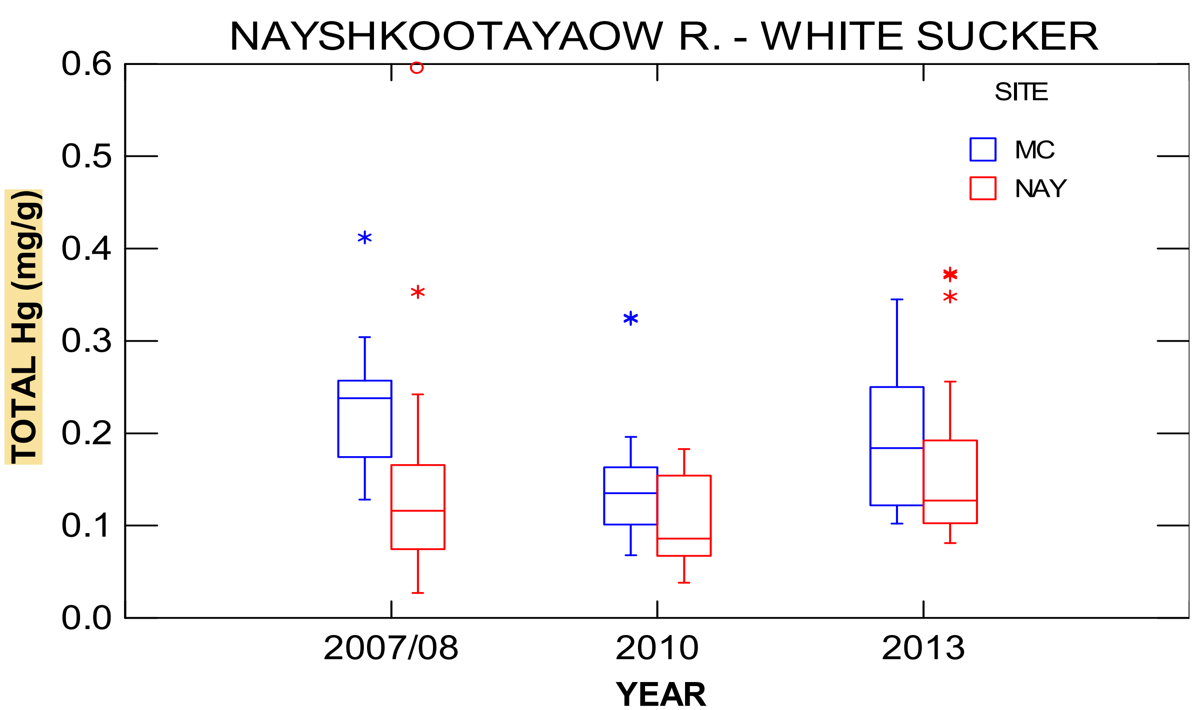


FIGURE 17: PLOT OF LS MEANS OF TRANSFORMED TOTAL MERCURY ADJUSTED FOR LENGTH WHITE SUCKER YEAR AND SITE COMPARISIONS

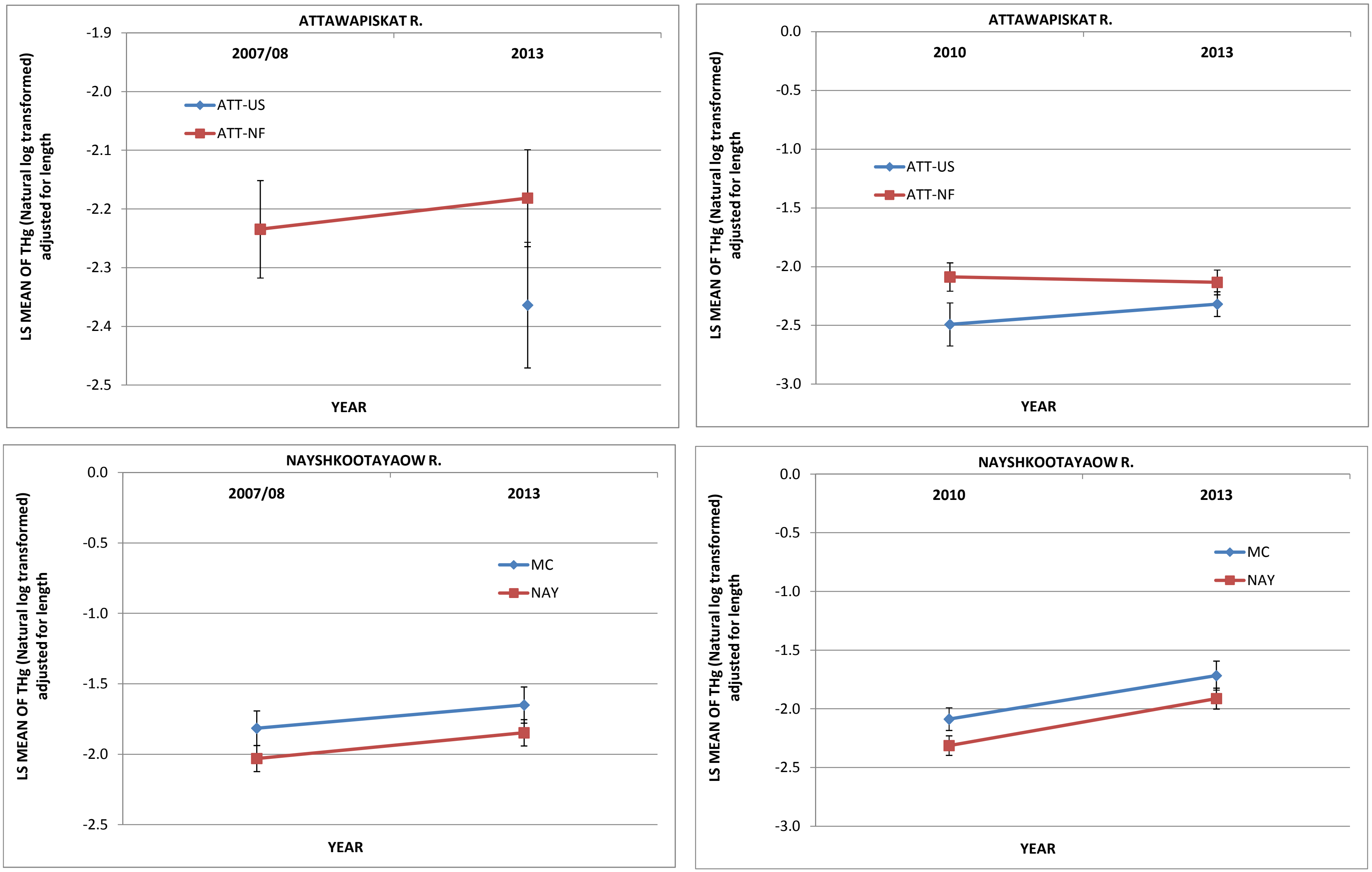


FIGURE 18: BOX PLOT SUMMARY OF TOTAL MERCURY CONCENTRATIONS FOR PEARL DACE YEAR AND SITE COMPARISONS

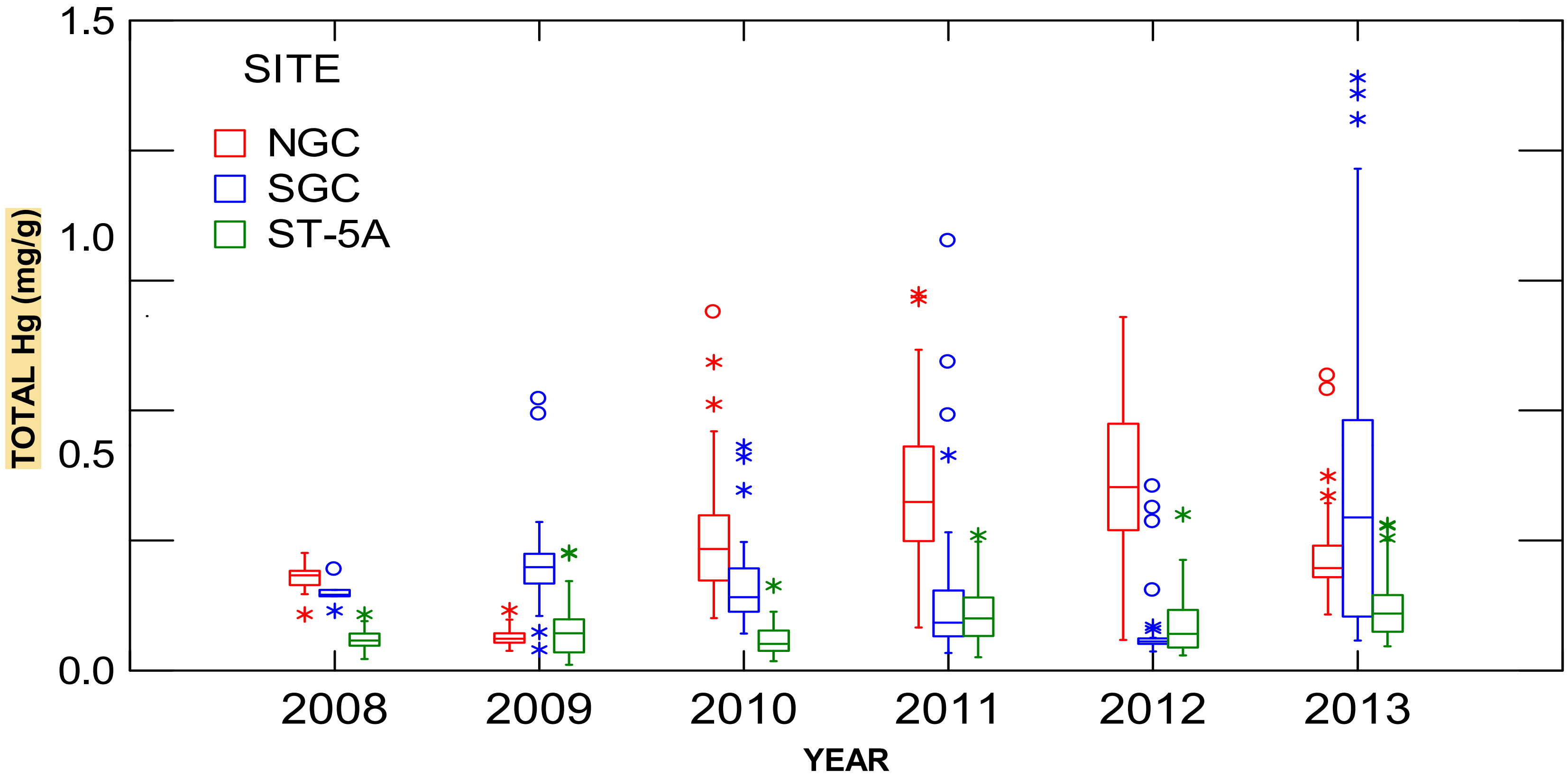
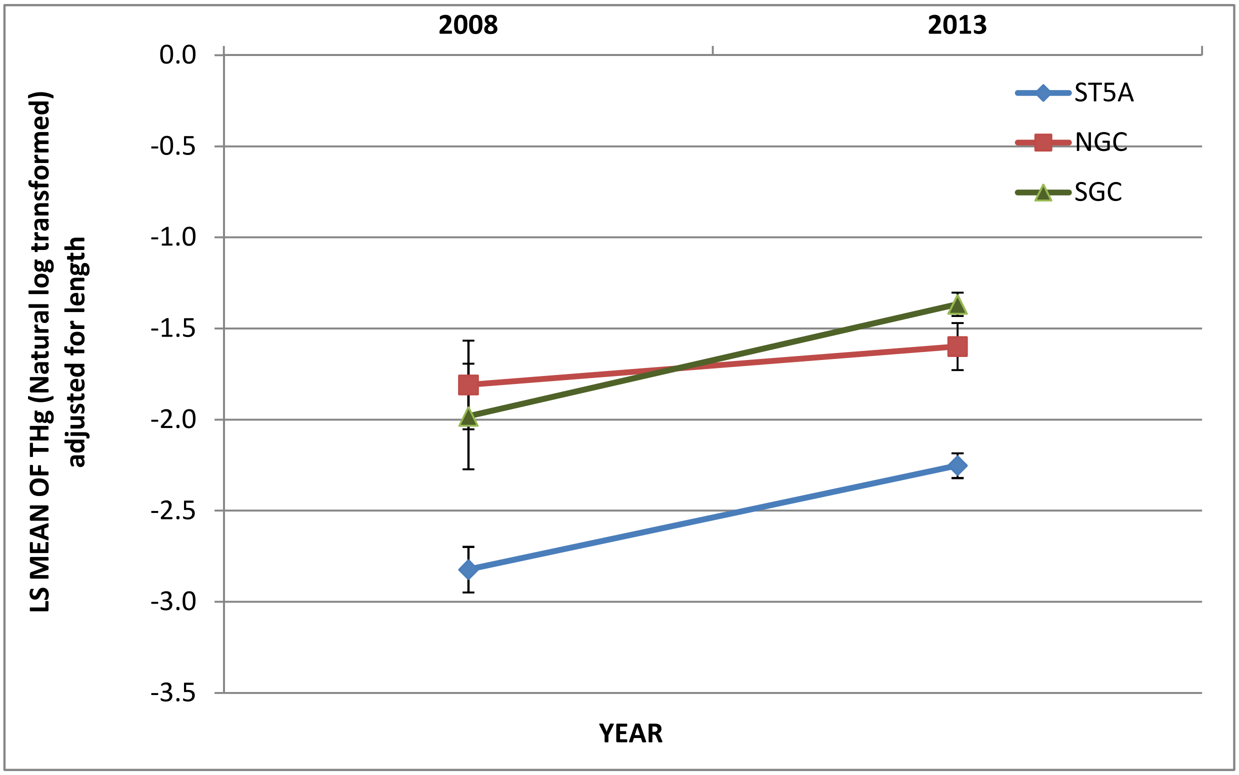


FIGURE 19: PLOT OF LS MEANS OF TRANSFORMED TOTAL MERCURY ADJUSTED FOR LENGTH PEARL DACE YEAR AND SITE COMPARISONS



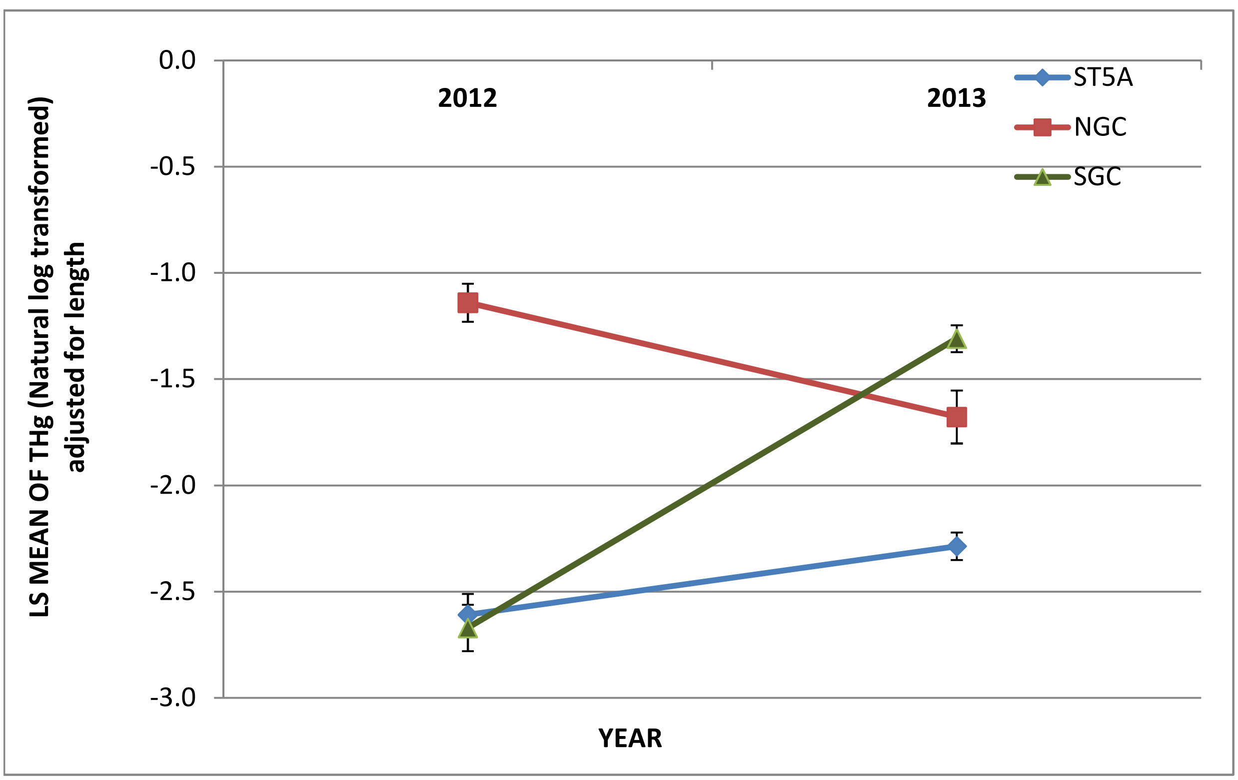
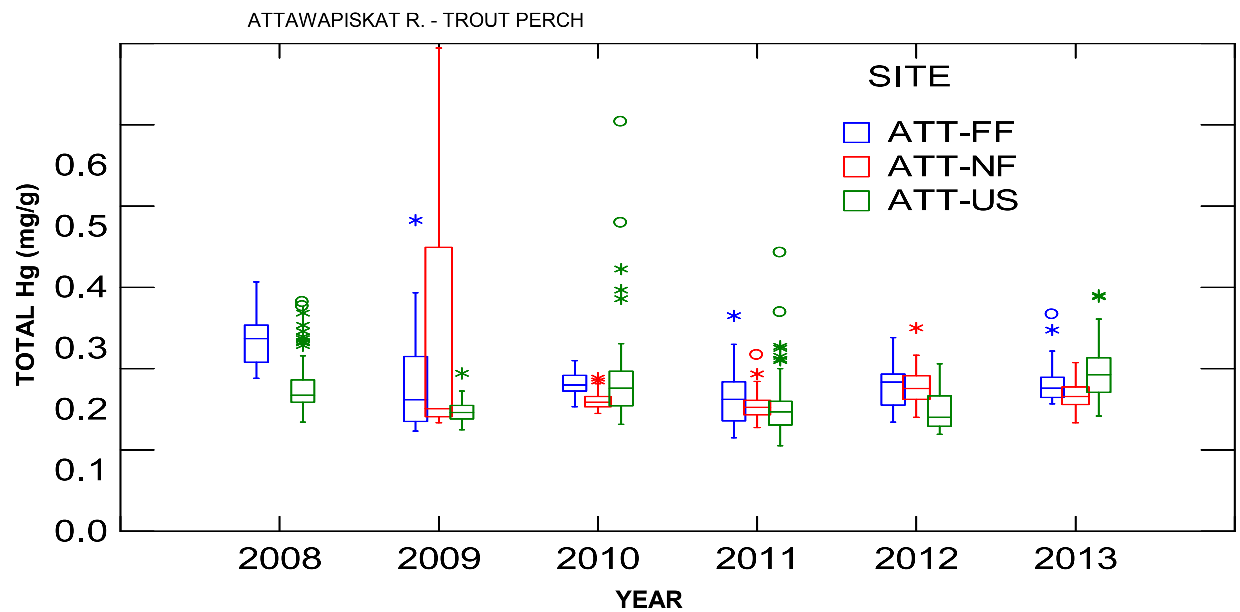


FIGURE 20: BOX PLOT SUMMARY OF TOTAL MERCURY CONCENTRATIONSFOR TROUT-PERCH YEAR AND SITE COMPARISONS



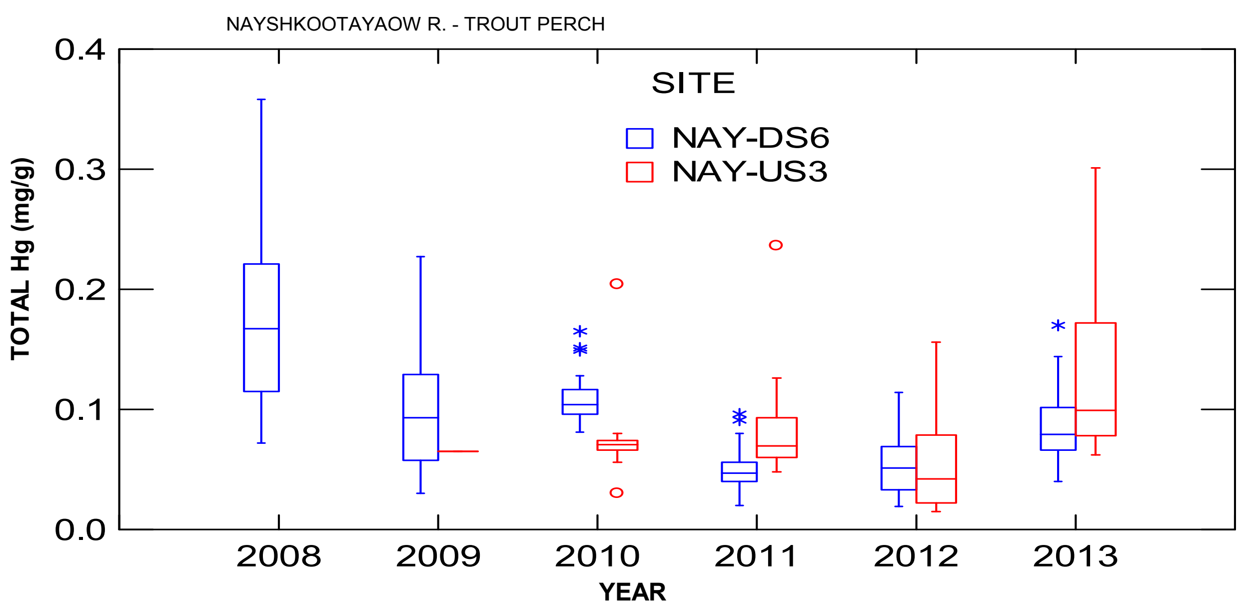


FIGURE 21: PLOT OF LS MEANS OF TRANSFORMED TOTAL MERCURY ADJUSTED FOR LENGTH
TROUT-PERCH
YEAR AND SITE COMPARISONS

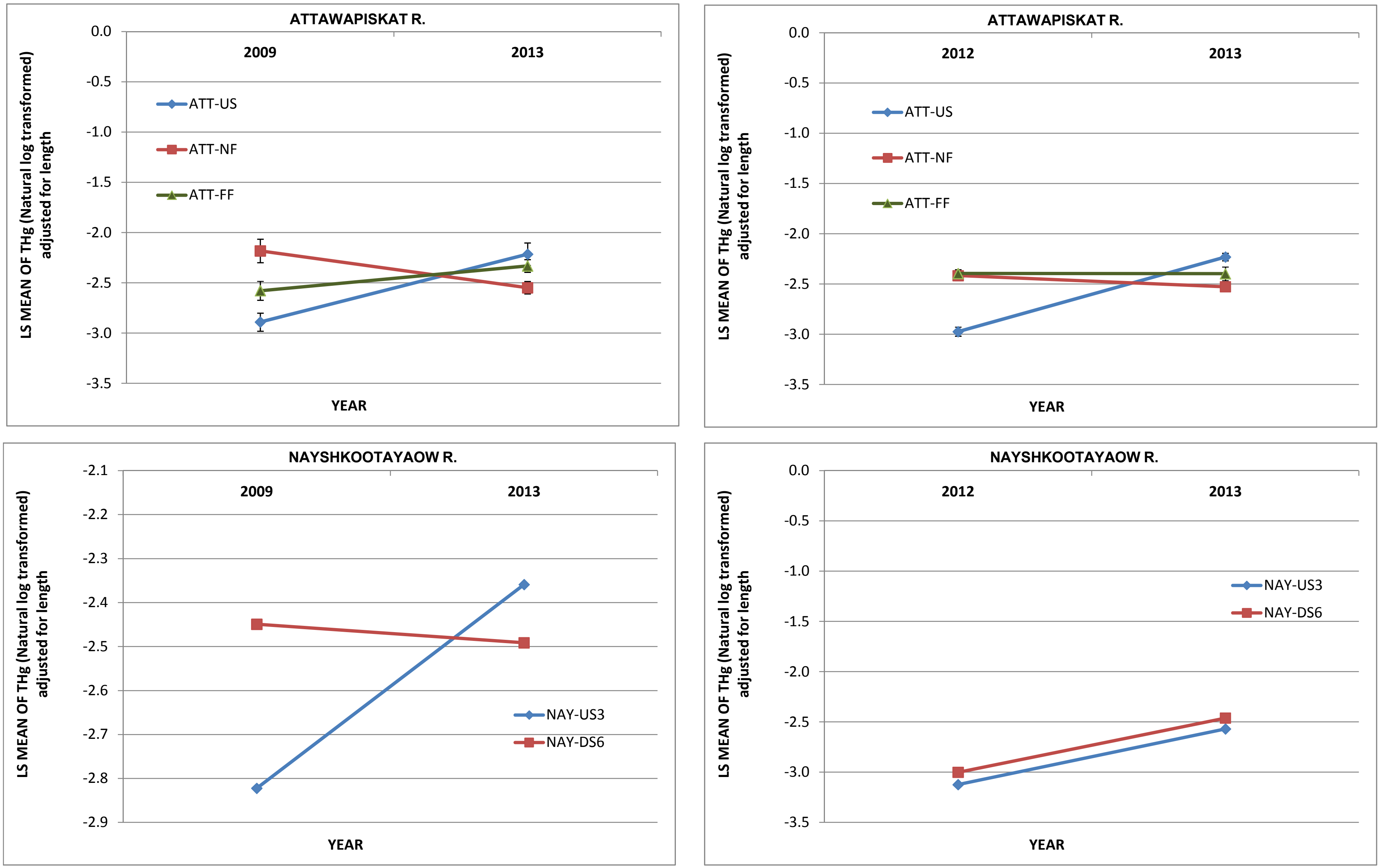
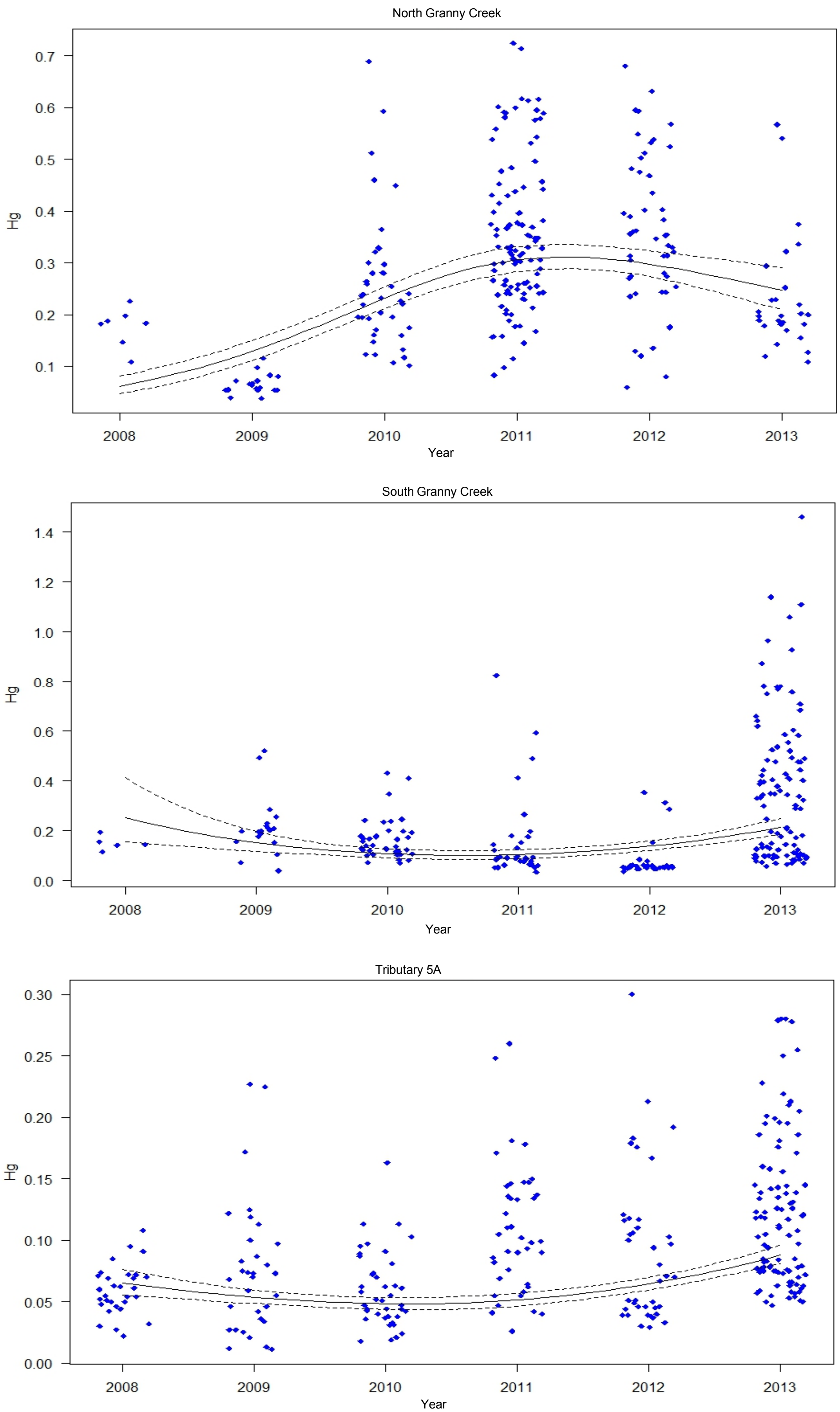


FIGURE 22: GENERAL ADDITIVE MODEL PLOT OF TOTAL MERCURY OVER TIME FOR PEARL DACE BY SITE



vertical scale differences

FIGURE 23: GENERAL ADDITIVE MODEL PLOT OF TOTAL MERCURY OVER TIME FOR ATTAWAPISKAT RIVER TROUT-PERCH SITE

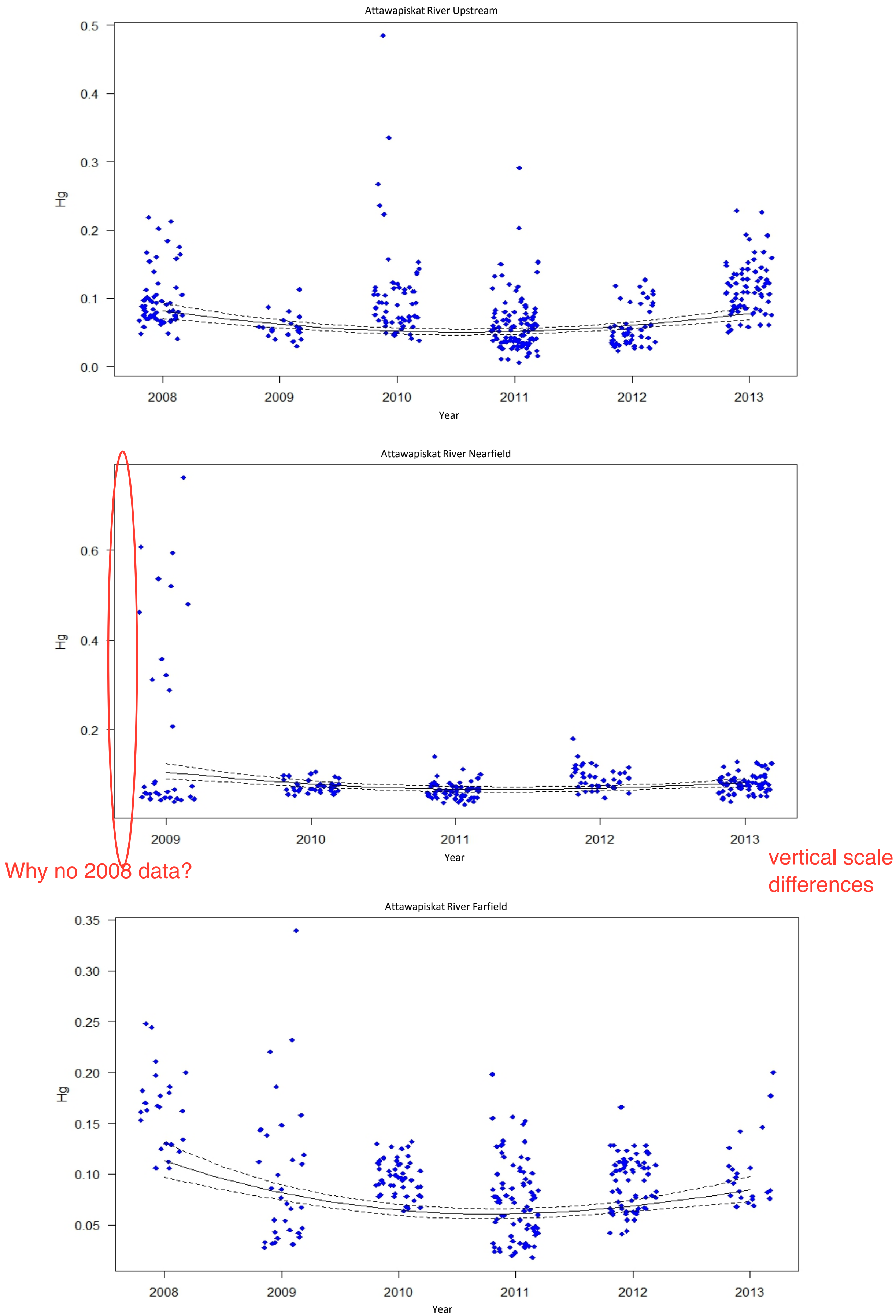
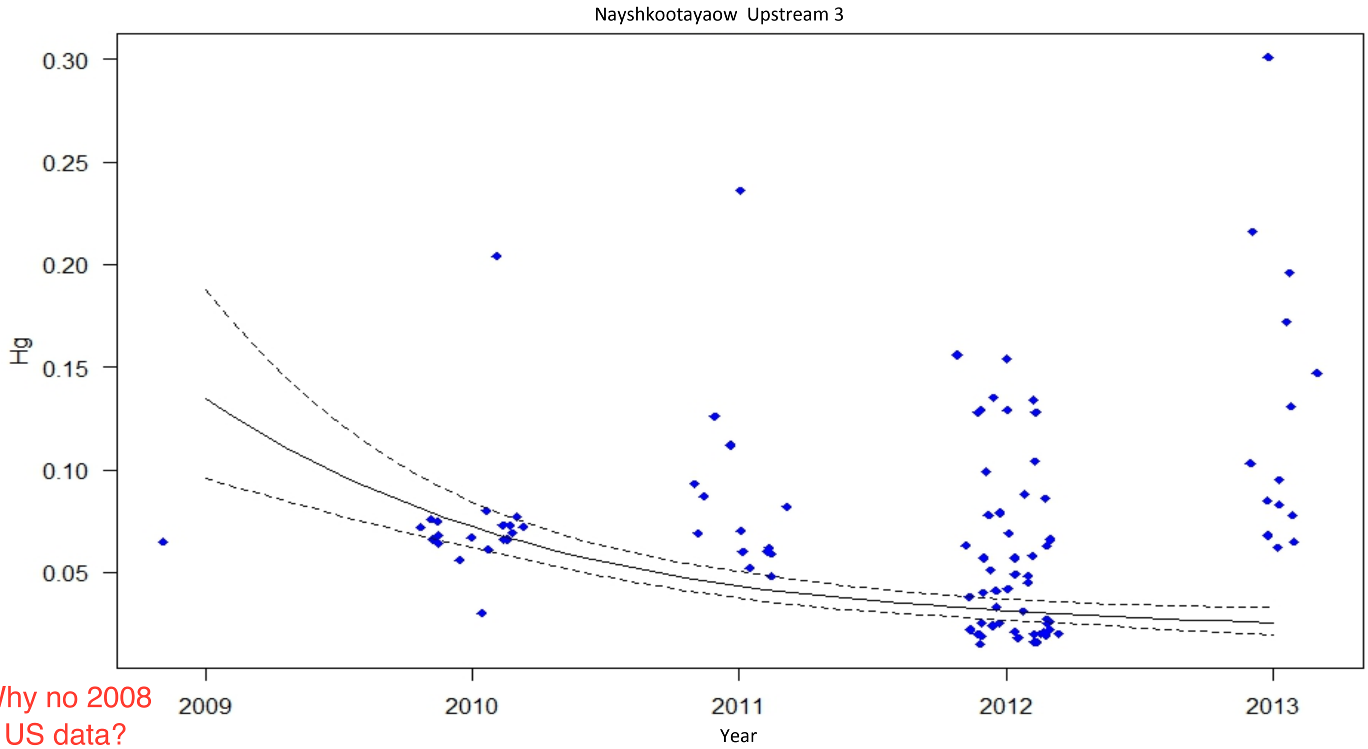
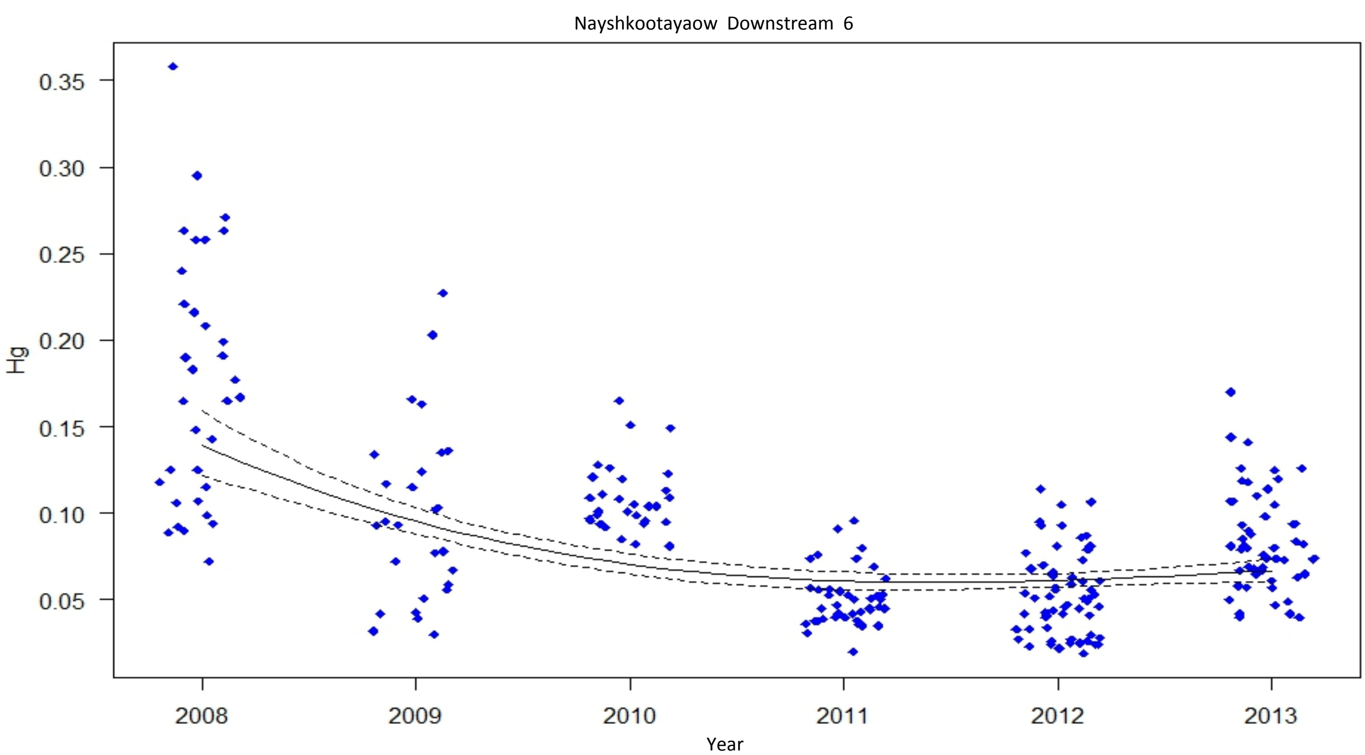


FIGURE 24: GENERAL ADDITIVE MODEL PLOT OF TOTAL MERCURY OVER TIME FOR NAYSHKOOTAYAOW RIVER TROUT-PERCH BY SITE



Why no 2008 US data?



APPENDIX A

COMMENTS AND RESPONSES FROM REVIEWERS REGARDING THE MINEWATER PTTW RENEWAL APPLICATION

APPENDIX A-1

DE BEERS CANADA RESPONSE TO COMMENTS ON MALROZ INDEPENDENT REVIEW

DE BEERS
GROUP OF COMPANIES

Stakeholder: **Malroz Engineering Inc.**
Steven Rose, P.Eng., P.Geo.
Comments dated: **February 14, 2014**
Comments regarding: **Independent Peer Review – Application for Renewal and Amendment, Permit to Take Water for Mine Dewatering, Victor Diamond Mine**

#	COMMENT	DE BEERS RESPONSE
8	p.6 / para 2 *"Thus far total and methyl mercury concentrations … have been low, within the expected range … and consistent with earlier predictions (Table1)."* Can the proponent explain why total mercury concentrations are increased at the river mouth station, when they are lower at the downstream station (relative to upstream measurements)? Is the downstream station properly located to measure the effects of mine related discharges?	The differences in average total mercury values between the three Nayshkootayaow River stations (i.e., Nayshkootayaow River US - 1.12, Nayshkootayaow River DS - 0.97 and Nayshkootayaow River Mouth - 1.15 ng/L) are all comparable measurements within the range of natural variability. If all samples had been collected from the same location, similar small differences in the results would be expected. The observed concentrations are all very low and well within the range of natural background values. There are no evident trends in the data.
20	p.11 / para 1 *"… there is some evidence that methyl mercury concentrations may be increasing … The data are as yet inconclusive … data from subsequent years will be required"* We agree with the proponent's conclusion that ongoing monitoring is required to understand trends (and indicators / predictors) for methyl mercury concentrations in surface water bodies. The proponent should also identify mitigative actions and trigger values for action if future trends diverge from expected values.	In Section 7 (Recommendations) of the "*MERCURY PERFORMANCE MONITORING 2012 ANNUAL REPORT AS PER CONDITIONS 7(5) and 7(6) OF CERTIFICATE OF APPROVAL #3960-7Q4K2G*" De Beers has already committed to undertaking a study of sulphate loadings, which have been linked to methyl mercury generation at the Victor Mine site, as per the following: "*De Beers commits to undertaking a study of sulphate loadings to mine site area muskeg systems, with the objective of assessing alternatives to better limit such loadings, as a means of reducing mercury methylation rates in affected muskeg systems.*" Some initial investigative work was conducted in the latter half of 2013 and further studies are ongoing. Mitigation options are being considered as part of this work.

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#	COMMENT	DE BEERS RESPONSE
21	p.11 / para 3 *"There is no evidence to suggest that possible elevated methyl mercury concentrations in the lower reaches of the Granny Creek system are due to mine dewatering effects …"* The proponent should explain how this statement is supported by the data in Tables 4 & 5, where average annual values are consistently higher in downstream stations for data collected in 2010 and more recently.	There is an extensive history on this topic, wherein certain reviewers of the Victor environmental assessment and dewatering permits speculated that mine dewatering would dry out extensive areas of muskeg terrain surrounding the Victor Mine site, and that this muskeg drying out of the muskeg would lead to decomposition of the peat layers and the resultant release of large qualities of mercury stored in the peat. AMEC and HCI Itasca provided evidence to the federal and provincial regulators that such extensive drying out of the muskeg environment was not expected to occur, because of the aquitard effects of the underlying marine sediments, and the drying out of the muskeg was only expected to occur in relatively small localized areas in the immediate vicinity of bedrock outcrops (bioherms) and in areas where bedrock was very close to surface such that there was no isolating marine sediment layer. Thus far there is no evidence to suggest that area muskeg environments are drying out, and that peat layers are decomposing, as shown in Figures 8 through 11 of the permit application document. Instead, the observed localized elevations in methyl mercury values have been linked to localized increases in sulphate concentrations within a specific localized area of the muskeg environment. Detailed discussions on this topic are provided in the annual mercury monitoring reports referenced in response to Comment #20.

APPENDIX A-2

DE BEERS Canada RESPONSE TO COMMENTS ON EBR REVIEW

Stakeholder: **Various (Unknown; Unknown Fort Albany First Nation member; Ontario Rivers Alliance (ORA); Attawapiskat First Nation member)**
Unknown; Unknown; Linda Heron, Chair ORA; Mr. Charles Hookimaw, Attawapiskat First Nation Member

Comments dated: **December 9, 2013**

Comments regarding: **Review Environmental Bill of Rights (EBR) – Application for Renewal and Amendment of the Permit to Take Water (PTTW) for Mine Dewatering, Victor Diamond Mine**

#	COMMENT	DE BEERS RESPONSE
Unknown		
1	In 2008...the request to take water should be denied because the Walleye and Northern Pike were already near or exceeding the human consumption guideline and that any increase in mercury in these rivers is too much of an increase...David Simms, author of the request to permit the DeBeers mining operation, admitted that mercury will increase but would not exceed the CCME Guideline permitted levels of mercury up to 24 µg/L and 4 µg/L for methyl mercury. At the time I said that this guideline would not protect the top predator fish. On closer examination a major error has occurred and interpretation of the methyl mercury guideline available at (http://ceqg-rcqe.ccme.ca/download/en/294/) and for total mercury available at (http://ceqg-rcqe.ccme.ca/download/en/191/) is incorrect. The guideline which DeBeers has been using is for toxic influence of mercury by direct exposure of the fish. A more careful reading of the guidelines clearly state that protection of the top predator fish and wildlife that become contaminated by their food requires that the values should only be 0.05 ng/L for methyl mercury and 0.641 for total mercury. This is discussed completely below.	In the original 2008 PTTW application support document, AMEC provided calculations that indicated that mercury concentrations within the lower portion of the Nayshkootayaow River could potentially increase by as much as 7 to 96% for total mercury, and from 3 to 55% for methyl mercury, with the expected case condition being the lower percentage values (AMEC 2008). The predicted increases were expected to result from a potential drying out of, and decomposition of, the peat in localized areas, thereby releasing mercury already present and stored in the peat. The projected base case increases were well within the federal guideline values adopted for the protection of aquatic life, and were considered to be well within the normal range of mercury concentration variation. Subsequent monitoring of Nayshkootayaow and Attawapiskat Rivers total and methyl mercury concentrations from upstream and downstream stations has shown no measurable increase in downstream concentrations of either total or methyl mercury (Tables 1 and 2). With regard to the values of 0.641 ng/L for total mercury and 0.05 ng/L for methyl mercury cited by the reviewer to protect fish and wildlife, compared with the CEQG values of 26 ng/L and 4 ng/L used by De Beers, these values derive from US EPA recommended values to protect certain fish-eating wildlife species for the long-term bioaccumulation of mercury (US EPA 1997). The 0.05 ng/L value for filtered methyl mercury is derived from direct measurements. The 0.641 ng/L value for filtered total mercury is a calculated value based on an assumed typical, filtered methyl to total mercury proportional value of 0.078 (i.e., 0.05 / .078 = 0.641), (US EPA 1997). The 0.05 ng/L methyl mercury value derived from the US EPA data is in fact generally met in the current condition for all years in the Nayshkootayaow and Attawapiskat Rivers at all stations, both upstream and downstream of the Victor Diamond Mine (VDM) site, with essentially no difference in methyl mercury concentrations between upstream and downstream stations (Table 2). Total mercury values for the Nayshkootayaow and Attawapiskat Rivers are also essentially the same both upstream

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#	COMMENT	DE BEERS RESPONSE
	and the Creeks….?	and downstream of the VDM site, indicating that water discharges from the VDM have not influenced Nayshkootayaow and Attawapiskat River total mercury concentrations (Table 1). With regard to the applicability of the 0.641 ng/L filtered, total mercury value to the Attawapiskat and Nayshkootayaow Rivers, this value is not applicable to these rivers as the proportions of filtered methyl mercury to filtered total mercury for the Nayshkootayaow and Attawapiskat Rivers are considerably less than the US EPA value of 0.078. The comparable average proportional values for these two rivers are 0.034 and 0.026, respectively (Table 3). The resultant calculated filtered total mercury values to protect fish-eating birds and mammals in the Nayshkootayaow and Attawapiskat Rivers are 1.471 ng/L and 1.923 ng/L, respectively. These values were met for all years in both rivers (Table 3). Monument Channel, shown in Tables 1 through 3, is a control station located downstream near to the community of Attawapiskat. This river drains to the Attawapiskat River and is not subject to drainage influences of either the Nayshkootayaow or Attawapiskat Rivers. Total and methyl mercury values for the control station averaged higher than for either the Attawapiskat or Nayshkootayaow Rivers.
2	I also pointed out that when water levels are pumped down, oxygen would be introduced and microbial activity will increase rates of decomposition. As a consequence, levels of sulphate will increase (now confirmed in the DeBeers reports). This occurs because the sulphides in the sediments bind mercury and other metals keeping the metals. With the drawdown, mercury and other metals will become more mobile and downstream contamination will occur. In addition, because of the higher sulphate levels, increased methyl mercury formation will occur. I also added that “once set in motion, these problems will persist even after the pumping activity stops”. I added “I have no doubt that this “dewatering” activity will result in increased mercury in the rivers receiving water and that mercury levels in the fish will increase. I have discussed this hypothesis with Dr. Holger Hintlemann at Trent University, well known for his research on mercury, and he agreed with my conclusion. I also discussed this concept with Dr. Daniel Engstrom...He said that any serious mercury researcher should know this! I told him about my concerns about the DeBeers Victor Diamond Mine operation and he agreed that what a potentially serious mistake was being made and that the drawdown of water from such a large wetland will result in increased mercury concentrations. I said that the mercury advisor for DeBeers, Dr. Brian Branfireun, may not be aware of this problem. He assured me that he knew Branfireun was well informed on this issue. [...]	The reviewer has assumed that increased sulphate concentrations that are contributing to localized mercury methylation at the VDM (for downstream North Granny Creek), are due to dewatering of VDM area sediments and the presumed associated oxidation of such sediments to release sulphates, which is in error. Based on an extensive network of monitoring stations, the muskeg environments associated with the VDM have remained saturated with the exception of very small localized areas around bioherms and where bedrock subcrops occur very near to surface. The generation of sulphates within the marine sediments underlying the peat, even in areas very near to bioherms, would not be expected to occur as oxygen would be consumed as air moves downward through the organic peat substrates, preventing such oxygen from reaching the sediments. Moreover, even if sulphates were generated within sediments underlying the peat, the net gradient for water movement is downward and toward the well field drawdown cone, and away from the overlying peat (muskeg) deposits. Hence there would be no means for any such derived sulphates to react with methylating bacteria within the overlying peat horizons. Instead it is believed that the sulphates which have lead to increased mercury methylation in the northeast and southwest fens (AMEC 2009) have been generated by pumping groundwater, which contains sulphates in the predevelopment natural condition, to surface. In the case of the southwest fen, the source of sulphates was

#	COMMENT	DE BEERS RESPONSE
	I applauded the Ministry of the Environment for setting up the "trigger values" procedures and requiring DeBeers to provide the reports. However the reports are painfully complex, misleading and have not been carefully reviewed. They clearly show that increased mercury contamination has occurred and that future pumping using the present mining techniques will exacerbate the problem. Indeed these observations extend to all future mining operations where water levels in wetlands are reduced. This includes the proposed mining operations at the Ring of Fire location.	groundwater pumped from the central quarry during 2006. Sulphates contained in the southwest fen when groundwater was being pumped to the fen measured from about 15 to 75 mg/L, and provided a readily available electron acceptor for mercury methylating bacteria within the fen. By mid to late 2008, approximately two years after pumping from the central quarry had ceased, sulphate levels in the southwest fen had returned to baseline concentrations of ≤1 mg/L. Methyl mercury levels in the southwest fen, however, remained elevated in mid to late 2008, because it takes time for the methyl mercury to be removed hydraulically from the system by rain and snowmelt precipitation, or by demethylation processes. Chloride contained in 2006 groundwater discharges to the fen also remained elevated in the southwest fen in mid to late 2008, despite the cessation of groundwater pumping in late 2006. No such sulphate increases were noted in either of the two local control fens (i.e., the southeast fen and the northwest fen). Further details are presented in AMEC (2009). Similarly, the northeast fen received groundwater inputs from initial pit dewatering and construction site excavations, as well as water from treated domestic sewage discharge, and other sources. These inputs continued into 2011, such that conditions for localized increased mercury methylation in this particular fen have persisted for several years. The northeast fen drains to the lower portion of North Granny Creek. Further details are presented in AMEC (2009). Sulphate loading to localized muskeg zones will also arise where mineral stockpiles containing minor amounts of sulphide minerals, such as contained in some kimberlite, are developed on surface and allowed to weather. De Beers is currently undertaking studies and proposing steps to limit the transfer of sulphate from groundwater sources and mineral stockpiles to localized muskeg environments at the VDM. As per the response to Comment #1, there have been no measurable changes to total or methyl mercury in the Nayshkootayaow or Attawapiskat Rivers at the VDM site.
3	As noted above, DeBeers did not use the appropriate interpretation of the CCME Guideline. I have reviewed these 2 documents and would be pleased to provide a more detailed review but essentially DeBeers are using a value of 24 ng/L for total mercury and 4 ng/L for methyl mercury as the limit for contamination in waste water released. However, this is the guideline for direct exposure to fish (in other words lethal effects will be observed when fish are in water with this contamination level) but to protect top predator fish and wildlife that derive their mercury from their food, the appropriate guideline is only 0.05 ng/L for methyl and 0.641 ng/L for total mercury. In the AMEC report in June 2012 submitted to MOE, they admit that their effluent has a total mercury concentration which averaged 1.65, 1.12 and 2.07 ng/L in 2009, 2010	See response to Comment #1 regarding the 26 ng/L value for total mercury and 4 ng/L for methyl mercury. Also these values are protection of aquatic life values, and not lethal values as indicated by the reviewer. Well field discharges to the Attawapiskat River (the main discharge from the VDM to the environment) have averaged lower values than the receiver for both total and methyl mercury, for both filtered and unfiltered values, as per Tables 1, 2 and 4.

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#	COMMENT	DE BEERS RESPONSE
	and 2011 respectively with some values over 4 ng/L. In other words their effluent has been about 3 times too high.	
4	In the same report they acknowledge high levels of sulphate have been observed but said that it was likely die to some local pollution event (such as sewage overflow that has now been contained). Instead I would argue (and consistent with observations made by Engstrom et al.) that it is the direct consequence of sulphate leaching from piles of muskeg mud and other substrates containing sulphide when these substrates are exposed to oxygen (as I predicted). Over and above the release of total mercury, these elevated sulphate levels will stimulate sulphate reducing bacteria to make methyl mercury.	See response to Comment #2. No sewage overflow was involved – only fully treated wastewater from the mine camp which met all MOE permit limits prior to discharge to the NE Fen for further polishing in the wetland fen. Also, there is negligible sulphide in the organic and overburden substrates, or in the kimberlite and adjacent limestone.
5	The small fish monitoring values at 0.2 and 0.3 µg/g or even higher are about 10 times higher than the acceptable CCME tissue guideline of 0.33 µg/g (33 µg/kg) for protection of top predator fish, birds and animals. This was also considered to be OK in the AMEC report. The guidelines are clear but they have not been interpreted correctly. Using the data provided in the report, we see that the Attawapiskat River has a concentration of 1-2 ng/L of total mercury. This too exceeds the recommended level of 0.641 ng/L for protection of top predator fish. It comes as no surprise that the level of mercury in top predator fish already often exceeds the 0.5 advisory for human consumption. The values for methyl mercury are at the 0.05 ng/L limit so the river was at the maximum concentration of methyl mercury before any increase resulting from Victor Diamond mine operation.	As per the data presented in the attached Tables 1 and 2, there has been no observed increase in either total or methyl mercury in the Attawapiskat River in the vicinity of the VDM. It is recognized that mercury values in top predator fish (pike and walleye) within the Attawapiskat River are elevated relative to some mercury consumption standards; but this is a background condition which existed before the VDM was developed. There is no evidence to suggest that activities at the VDM have aggravated this condition.
6	The significance of present pumping of up to 150,000 cubic meters of water per day becomes very important when we recognize that this is an additional NET transport of mercury from where it was stored for many years in sediments but now moved into the river. The mercury was dormant and not going anywhere before this activity was initiated. Using a conservative value for their effluent of 1.5 ng/L the 150,000 m^3 pumped each day into the river, results in 85 g being released. The authors claim that since these concentrations are near the so-called “background” it is not a problem. The critical error being made is that this is a net transport new mercury to the river that has been in the wetlands for many years. We know that some of this mercury will move to the atmosphere and some will washed into the ocean and not all of it will end up in fish to a level of 0.5 µg/g (human consumption guideline). We know that the Walleye and Northern Pike already range from 0.5 to 1.5 µg/g. Not included in the DeBeers calculation is additional mercury released downstream as a direct consequence of raising water levels in the Attawapiskat River. This comes from bank erosion where soils containing mercury move into the river and flooding of near shore areas in a similar way to the flooding of areas for power development.	The critical aspect of mercury uptake by fish in the Attawapiskat River is the concentration of mercury and especially methyl mercury, in the river water. There has been no change in the concentration of total or methyl mercury in the Attawapiskat River as a result of well field discharge to the river, and consequently no change in the availability of mercury for fish uptake. As stated in response to Comment #3, concentrations of total and methyl mercury in the well field discharge to the river have been lower than the background river concentrations. The concept of additive loading of a lesser concentration, as provided by the reviewer is not relevant to mercury uptake by fish. Relative to the last point regarding increasing water levels in the Attawapiskat River, it is important to note that the current approximately 85,000 m^3/d average well field discharge equates to about 0.24 % of the 36,000,000 m^3/d mean annual flow of the river. This flow increase is not sufficient to influence river water levels. Natural seasonal water level fluctuations in the Attawapiskat River are significant in

#	COMMENT	DE BEERS RESPONSE
		scale, particularly during spring freshet and autumn periods of heavy rainfall. However due to the incised nature of the river channel which is eroded into the surrounding lowlands, this inundation primarily affects mid-channel bars. While natural bank erosion and slumping are commonly observed along the Attawapiskat River both upstream and downstream of the mine, this is characteristic of regional geology and geomorphological processes, probably including some climate-change related melting of discontinuous permafrost in this muskeg environment. This is not influenced by the mine operation. The 0.24 % average annual flow increase to the river also puts into perspective any potential detrimental considerations relating to mercury loadings, as suggested by the reviewer.
7	Total mercury data for Nayshkootayaow and Attawapiskat Rivers are provided (Tables 13 and 14) of 2012 AMEC report. The authors comment that all values are low and well within CCME (CEQG) values. As noted above, there were no using the correct interpretation of the regulation. They also say that filtered values for all stations were generally comparable and well within the range of historical data. One should not be fooled by this. A filtered sample is of little use as filter feeding organisms eat the particles and do not take up substantial amounts of the fraction that passes a filter. They discarded the fraction that matters most and indeed most of the mercury is in the particles, not the filtrate. The authors should have known that bioavailable methyl mercury partitions very rapidly (minutes to hours) principally to the particulate fraction and they through that away. Throughout this report values for filtered mercury and methyl mercury are provided but serve no useful purpose in determination of impact.	Filtered and unfiltered values are provided for both total and methyl mercury. Metal concentrations in samples are affected by sediment loadings. It is therefore beneficial to be able to separate out any such effects. Hence data are presented for both filtered and unfiltered samples. In viewing results for both filtered and unfiltered values, there are no differences in upstream and downstream values for total or methyl mercury for either the Attawapiskat or Nayshkootayaow Rivers (Tables 1 and 2).
8	A similar error was made in looking at soil pore waters. On page 14 the 2012 report provides what is called total and methyl mercury in soil pore waters; however, they use filtered samples but do not specify how this was done or the pore size used. In general over 95% of the mercury in soils is in the particulate fraction, not in the filtrate. This was also observed by the Engstrom et al. Research of which Braunfireun was part of the research team. Any dissolved mercury released would be quickly bound to particulate material and removed by filtration. What we need to know is how the soils have changed with the removal of water. At a minimum the reducing capacity or Eh measurements should be made along with a more appropriate experimental design. Pearl Dace do provide a reliable way to examine potential impact from the activities. The body burden concentration at North Granny Creek (0.350 ig/g) was greater than at South Granny Creek (0.157 ig/g) and both sides were higher than at the control site ST-5A (0.109 ig/g) in 2011. These data clearly show that the Pearl Dace at these sites	Standard sampling protocols for groundwater samples provide for filtering, using standard 0.45 µm filters. Samples of the peat solids themselves were completed and reported by AMEC earlier (AMEC 2009). The localized increase in methyl mercury levels in North Granny Creek, and the likely associated fish tissue level increases in Pearl Dace in North Granny Creek, as per the above, are considered to most probably be the result of the addition of minor volume sulphate containing discharge waters to local muskeg areas (mainly to the northeast fen) that drain to North Granny Creek, and not to mine dewatering effects. De Beers is currently investigating means to limit the release of waters containing sulphates to the local muskeg environment at the VDM site.

#	COMMENT	DE BEERS RESPONSE
	are elevated compared to the control. The appropriate tissue guidelines is only 0.033 µg/g for protection of top predator fish. Consequently the North Granny Creek values are already too high by 10 times. The North Granny Creek Pearl Dace showed a change in mercury body burdens from 0.066 ig/g in 2009, to 0.259 ig/g in 2010 with a further increase to 0.350 ig/g in 2011. This provides clear evidence that North Granny Creek and likely South Granny Creek as well have been impacted by the mining activity. When we think of the greater, these levels would be 1.15, 0.73 and 0.21 for fish that eat the pearl dace from NGC, SGC and ST5A respectively.	No response provided to this last comment…
9	Data for large fish are provided in the 2010 and 2012 reports. There is an endless amount of information on catch per unit efforts and details of the methods used but little use is made of this data. It is not until Table 30 that we see some values for mercury in Northern Pike. In 2007-8 values reported for total mercury were 0.2 to 0.6 and for 2012 0.2 to 0.3 µg/g. Mean values are provided on Figure 10 but one should not be fooled by this as the larger values are for larger fish. Walleye data are provided on Table 31. Here the values range from 0.4 to 0.6 in 2007-8 and 0.3 to 0.6 in 2010. Their references to limits for women of child bearing age and children are not consistent with Health Canada limits and are of uncertain value. All values for mercury seem much too low compared to other existing data for the river and are suspect including 2008,9 data by MOE. On Tables 32 and 33 the sucker and whitefish data are provided and as expected are low in the range of 0.1 to 0.2. Again these values seem suspect. While there is some discussion of the need to standardize values to a specific length it would seem that station to station comparisons were done using size corrected values. The most impacted stations have fish that were smaller. The recent MOE data for Walleye and Northern Pike are higher than values reported by DeBeers. In the MOE data set, elevated levels of arsenic to 4µg/g were observed for Pike and to 6 for whitefish. The MOE consumption guideline is 2.5. This could be extremely important and should be resolved before granting approval for further pumping. The metal monitoring by AMEC is of no value as the detection limits are much too high. However, pumping water from deep in the soil has caused arsenic problems in other parts of the world. Here the pumping from the 275 m level or deeper might be causing these elevated arsenic levels.	The mercury data for the larger fish species indicate no changes from the background condition, where it is recognized that natural mercury levels in larger northern pike and walleye already exceed some of the mercury consumption guideline values, and especially those for women of child-bearing age and children under the age of 15. This condition is not a reflection of VDM operations. Carefully monitored total and methyl mercury concentrations in the Attawapiskat and Nayshkootayaow Rivers continue to show comparable upstream (control) and downstream (effects area) concentrations. Health Canada's "Fish Consumption Advisory" references the Ontario Guide to eating Ontario Sport Fish. AMEC has used the Ontario sport fish advisory levels in its comparative determinations. These values range from 0.26 ppm to 1.84 ppm fish flesh values, for various segments of the population, and have not changed for several years. The only thing that appears to have changed relative to the Attawapiskat River is the categorization of fish sizes that are associated with the Ontario sport fish mercury threshold values. Also see response to Comment 35. With regard to arsenic, arsenic concentrations were measured for surface water (Granny Creek, Nayshkootayaow River and Attawapiskat River), and groundwater (various formations to a depth of 220 m below surface), in the background condition during environmental baseline studies in support of the Environmental Assessment (EA) process. Nearly all values for surface and groundwater were below the detection limit of 0.001 mg/L, and virtually all values being below the interim Provincial Water Quality Objective (PWQO) and Canadian Environmental Quality Guidelines (CEQG) for protection of aquatic life value of 0.005 mg/L. Arsenic was therefore determined not to be a priority parameter and is not currently monitored at the VDM. Also see response to Comment # 27, below.
10	Potential irregularities and unacceptable laboratory procedures seem to exist. The initial analytical values were provided by Flett Environmental in Winnipeg. They have a long and recognized reputation for reliable total and methyl mercury analyses. The Branfireun laboratory, on the other hand, only recently moved to University of Western Ontario. It is not known for doing commercial analytical services and may not have certification or accreditation through such organizations as the Canadian Association	The MOE has recognized Dr. Branfireun's laboratory as being an appropriate facility for ultra-trace mercury detection. Nevertheless, in its review of 2011 annual mercury report for the VDM (issued June 2012), the MOE recommended that De Beers should undertake a QA/QC program that statistically defines the variance between the two labs (Flett and University of Western Ontario) for all media, with a particular focus on ultra-trace level water analysis. De Beers agreed with this suggestion, as per Section 5

#	COMMENT	DE BEERS RESPONSE
	for Laboratory Accreditation (CALA, http://www.cala.ca/). In addition, a blind inter laboratory calibration should have been conducted to ensure that both laboratories can get the same values. This is essential to determine long-term trends. Such work also requires what is called a chain of custody which basically means that there is an unbroken series of ownership of samples as they move through the different parts of the process from sampling to final disposal of the sample after analysis and means that there is always someone responsible for the samples at all times to ensure their integrity. At no time should a technician know where or when the sample was taken so that the results will not be biased. For full disclosure, the ongoing association between Branfireun and DeBeers should also be given. I believe that this laboratory and his research chair as well as a number of grants are funded in part by DeBeers. While NSERC funding grants are identified as ongoing work but it should be recognized that these are industrial sponsored grants where the sponsor provides matching funds to NSERC. Their matching funds can be in the form of helicopter service, meals and lodging at the field site as well as the cost of providing field assistants. Such disclosure will clarify the full extent of the ongoing working relationship and the reader can better appreciate if this laboratory is truly unbiased and independent.	of the 2012 annual mercury report (AMEC 2013a). The QA/QC program is currently being carried out. Cross comparison results have been reported in the 2013 annual mercury monitoring report issued June 30, 2014. Also, the Biotron laboratory at the University of Western Ontario is not under the direct control of Dr. Branfireun except in an administrative sense. It is managed by competent professional scientists who are responsible for implementing Quality Assurance and Quality Control (QA/QC) practices in accordance with internationally recognized standards. Chain of custody is in place, and parallel independent samples have been collected by researchers which are completely outside De Beers control. The UWO laboratory participates in the CALA laboratory accreditation process, and is registered to the ISO 17025 standard "General requirements for the competence of testing and calibration laboratories". The latter includes blind round-robin testing with Brooks Rand Labs in the USA – the lab is rated as having "excellent conformity". ISO 17025 registration includes verification of chain of custody requirements. The suggestion in this comment that Dr. Brian Branfireun is biased in his research because it is linked to an NSERC grant that is partially funded by De Beers is inappropriate. Dr. Brian Branfireun is a well-respected and published researcher and an Associate Professor / Canada Research Chair in Environment and Sustainability at a top Canadian University. De Beers does not and has never prescribed the research objectives, programs or results of this independent program – their interest is in facilitating good science to understand the biogeodynamics of mercury in this ecosystem so as to avoid unintended negative consequences. This support of independent research has continued beyond the initial NSERC program, with a further multi-year commitment to logistic and funding support for the Canadian Network for Aquatic Ecosystem Services (CNAES). This multi-government / multi-university partnership is researching ater quality throughout the Far North of Ontario, with a focus on the entire drainage basin of the Attawapiskat River.
18	The Mercury 2012 Annual Report indicates there were "*no adverse effects of mine dewatering on area mercury levels in peatlands, surface waters, or fish flesh for the 2012 monitoring period*", and yet Charles Hookimaw reports adverse environmental effects on water quality and water quantity, with sinkholes appearing, ponds and muskeg drying up, and an increase in mercury, arsenic and chloride levels. This Report also indicates that "*Elevated methyl mercury concentrations in the NEF*	The other peatland references cited by the reviewer such as in reference to the Sudbury area where there has been a long history of metal release and concerns regarding acidity from atmospheric releases from historic and active local mining operations are not relevant to the VDM site area. The VDM has very low associated metals and has no associated smelting or other such operations. The conclusion that the localized increases in methyl mercury concentrations in areas such as the northeast and southwest fens is fully supported by extensive data

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#	COMMENT	DE BEERS RESPONSE
	are likely attributed to sulphate-rich effluent waters which stimulate the mercury methylation process, and are not a function of well field dewatering effects." ORA suggests that this Report has no basis for forming this conclusion, and is at best a guess. We would like to draw your attention to a recently published study which reports on the impacts of drying of peat in wetlands. "*Climate change is predicted to cause an increase in frequency and severity of droughts in the boreal ecozone, which can result in the lowering of water tables and subsequent release of acidic, metal contaminated waters from wetlands. We believe that in areas where historical deposition of metals and sulphur was severe, these episodic pulses of metals could reach concentrations sufficiently high to severely affect aquatic communities in receiving waters and cause a delay in biological recovery…. Following a period of drought, there was a decline in pH and a large increase in concentrations of sulphate and metal ions (Al, Co, Cu, Fe, Mn, Ni, and Zn) in water draining both peatlands, with extreme concentrations occurring over a period of about two weeks. At the site with the higher peat organic matter content there was an increase in metals that have a high affinity to bind to DOC (Al, Cu, and Fe) during the onset of drought. This study demonstrates a dramatic response to drought at two sites that differ in metal and nutrient pool sizes, hydrology, and topography, suggesting the potential for a majority of peatlands in the region to experience this response.* This sulphate-release has been documented in wetland soils and riparian sediments in the Sudbury area and elsewhere, and can result in metal release with even small changes in soil moisture. It is our submission that heavy metal increase is not only due to the sulphates contained in the effluent, but also from the water taking itself, where the wetting and drying process results in heavy metal release from the peat, soils and sediments. Mercury, arsenic and chloride levels must be included for 2012 and 2013 on Nayshkootayaow River and Granny Creeks, as well as for the Attawapiskat River. This information is necessary to determine current heavy metal and chloride contamination levels on impacted rivers. This is crucial information for the Ministry to properly assess whether water taking should be continued for another 6 years. It is unacceptable that there are impacts from the current PTTW that have not been fully reported or addressed, let alone contained in the application for consideration in whether to extend and combine the permits.	collection and known science, and is not a "best guess". Extensive peatland water table monitoring data as described in the annual Follow-Up Program Agreement (FUPA) reports (AMEC 2013b, and its predecessors), and through the annual groundwater monitoring reports submitted to the MOE (AMEC 2013c, and its predecessors), have clearly demonstrated that water tables within the peat horizon, including areas near to the VDM open pit, have not declined, except in small, very localized areas near to bioherm outcrops, and where bedrock subcrops are very near to surface. These localized effects were predicted in the original PTTW support document (AMEC 2008). Compensation measures to sustain and enhance base flow in streams which were assessed to be at some potential risk from the mine dewatering (North Granny Creek, South Granny Creek and Tributary 3 of the Nayshkootayaow River) have to date proven effective. Base flows in both branches of Granny Creek in particular are maintained by flow supplementation at levels which are demonstrably above natural flows in similar local reference streams, in both summer and winter. The development of a small number of very small drainage points or "sinkholes" in the muskeg has been observed and tracked by De Beers since operations commenced. These have been restricted to a few relatively small areas where underlying limestone is very shallow, as expected and predicted in the Victor Mine environmental assessment. There is no evidence of metal release from VDM area peatlands with the exception of the localized mercury methylation condition apparently linked to sulphate-containing waters released to selected fen areas as described in the annual mercury and FUPA reports. More recent data for 2012 was provided to the MOE and First Nations in the region, subsequent to the submission of the subject permit application. Data from 2013 is currently being analyzed for reporting in the same manner, as required by various permits.
27	It is my understanding that methyl mercury, chloride and arsenic levels continue to increase and may exceed the Canadian Environmental Quality Guidelines (CEQG). Additionally, it is my understanding that DeBeers has used the wrong CEQG in its application and has minimized its impact on the environment as a result. This will have an impact on Attawapiskat's river downstream, way of life, fishing, hunting and possibly our drinking water. I stress that Attawapiskat members continue to live off the land and	Mercury and chloride values have been well with CEQG values in the local creeks and rivers, both upstream and downstream of the VDM. Arsenic concentrations are not currently being monitored as there is no meaningful arsenic source in the area, including groundwater that is discharged through the well field, as per the response to Comment #9.

#	COMMENT	DE BEERS RESPONSE
	depend on a healthy environment for their livelihood and well-being and will into the foreseeable future. We need guarantees that any dewatering will not impact water quality in our territory.	Nevertheless, if the MOE deems it prudent, De Beers could add arsenic as a monitored parameter for both the well field discharge, the processed kimberlite containment area discharge, and for the Granny Creek, Nayshkootayaow and Attawapiskat Rivers. Samples for arsenic would perhaps be most appropriately collected at monthly intervals for an initial period of two years to develop a baseline data set, then reduced to quarterly intervals unless the results suggest that more frequent analysis is warranted.
30	The application for the permit to take water is scoped down. For example on tables provided 1-5 only show data collected from 2009 - 2011 for mercury concentrations on Nayshkootayaow River and Granny Creeks. 2012, 2013 and Attawapiskat River are not included on the tables provided in this application and in my view, intended for the interest of Ministry of Environment approval and not the concerns of Attawapiskat First Nation.	The permit application was prepared and ready for submission in the fall of 2012, but was held by De Beers for submission until February 2013 in an effort to allow the Attawapiskat First Nation an opportunity to be in a better position to review the document. Hence full annual data from 2012 and 2013 were not available at the time of document preparation. Data from 2012 has since been updated in the annual mercury and FUPA reports released in 2013. No meaningful change in conditions has been noted in these reports, from information provided in the February PTTW application support document. 2013 data will be reported in 2014, as per the on-going annual schedule of data reporting.
35	Has the fact that mercury levels [have increased] in fish in the Attawapiskat Rivershed been fully considered? I note that the Ministry of Natural Resources' sport fish guide has changed since the De Beers mine has been operating such that fish consumption should decrease. This has a direct impact on Attawapiskat members who rely on consumption of fish in order to live.	The threshold mercury consumption guideline values listed in the 2013-2014 Guide to Eating Ontario Sport Fish have not changed from those used earlier, and those used by AMEC throughout its assessment of the suitability of fish for eating, related to mercury concentrations. The threshold values in the 2013-2014 guide remain as follows: • Women of child-bearing age and children under 15 (restriction beginning at 0.26 parts per million [ppm], with complete restriction at 0.52 ppm) • General population (restriction beginning at 0.61 ppm, with complete restriction at 1.84 ppm). Total and methyl mercury concentrations in the Attawapiskat and Nayshkootayaow Rivers have not changed as a result of mine dewatering activities at the VDM, and there is no indication of any changes in the mercury body burdens of sport fish in either the Attawapiskat or Nayshkootayaow Rivers.

References:

AMEC Earth & Environmental. 2008. Request for Amendment to PTTW #5607-78CL4V dated November 26, 2007, and C. of A. 8700-783LPK dated December 11, 2007, Well Field Dewatering De Beers Victor Mine, April 2008. 12 pp. plus figures, tables and appendices.

AMEC Earth & Environmental. 2008. Trigger Values for Mercury Concentrations and/or Body Burdens in Fish: Condition 6(10) of Certificate of Approval #8700-783LPK, De Beers Canada Inc., Victor Mine.

AMEC Earth & Environment. 2009. De Beers Canada Inc. Victor Mine, Mercury Performance Monitoring 2008 Annual Report as per Conditions 7(5) and 7(6) of Certificate of Approval No. 3960-7Q4K2G. 16 pp, plus tables and figures.

AMEC Environment & Infrastructure. 2013a. De Beers Canada Inc. Victor Mine, Mercury Performance Monitoring 2012 Annual Report as per Conditions 7(5) and 7(6) of Certificate of Approval No. 3960-7Q4K2G. 33 pp, plus tables and figures.

AMEC Environment & Infrastructure. 2013b. Victor Diamond Mine Follow Up Program Agreement, Sixth Annual Report, 2012 Reporting Period (Draft). 100 pp, plus tables and figures.

AMEC Environment & Infrastructure. 2013c. Annual Groundwater and Subsidence Report for 2012 period as per Condition 4.1.5 of Permit to Take Water #5521-8CZSNK, Victor Mine.

AMEC Environment & Infrastructure. 2013d. Application for Renewal and Amendment, Permit to Take Water for Mine Dewatering, Victor Diamond Mine. 17 pp, plus tables, figures and appendices.

Canadian Council of Ministers of the Environment. 2003. Canadian Water Quality Guidelines for the Protection of Aquatic Life: Mercury; Inorganic mercury and methylmercury.

Environment Canada. 2003. Canadian Water Quality Guidelines for the Protection of Aquatic Life: Inorganic Mercury and Methylmercury. Report No.1-7.

US EPA. 1997. Mercury Study Report to Congress. Volume 6: An Ecological Assessment for Anthropogenic Mercury Emissions in the United States.

TABLE 1a
<u>TOTAL MERCURY</u> - NAYSHKOOTAYAOW AND ATTAWAPISKAT RIVERS (Unfiltered)
(concentrations in ng/L)

Date	Naysh. R. Upstream (Naysh Riv up)	Naysh. R. Middle (Naysh Riv dn)	Naysh. R. Downstream (Naysh Riv up Att Riv)	Monument Channel (Naysh Riv Control)	Attawapiskat R. A-1 (Att Riv up 2)	Attawapiskat R. A-2 (Att Riv up A2-1)	Attawapiskat R. A-3 (Att Riv dn A3-1)	Attawapiskat R. A-4 (Att Riv dn Naysh Riv)
Feb-08	1.48	1.47	5.33	0.81	8.75	2.19	10.50	2.20
May-08	4.31	4.58	3.30	3.15	3.41	3.64	3.64	3.61
Aug-08	1.98	2.14	2.28	2.13	1.91	2.32	2.09	1.82
Oct-08	2.30	2.31	2.53	1.86	1.93	1.25	1.72	1.79
Jan-09	1.39	1.19	2.00	1.07	1.39	2.09	2.35	1.34
Feb-09	-	-	-	-	-	2.17	1.84	-
Mar-09	-	-	-	-	-	1.36	1.28	-
Apr-09	-	1.00	1.47	0.69	1.36	1.26	1.93	1.22
May-09	5.26	-	-	-	-	4.17	3.19	-
Jun-09	-	-	-	-	-	2.81	2.57	-
Jul-09	2.80	2.58	2.47	2.83	3.58	3.23	3.48	3.50
Aug-09	-	-	-	-	-	1.69	1.79	-
Oct-09	0.80	0.70	1.33	1.07	1.58	1.25	1.39	1.35
Nov-09	-	-	-	-	-	1.07	1.13	-
Dec-09	-	-	-	-	-	0.81	0.96	-
Jan-10	-	-	-	-	-	1.20	1.52	-
Feb-10	1.39	1.11	1.50	1.03	1.76	1.43	1.93	1.52
Mar-10	-	-	-	-	-	1.67	1.80	-
Apr-10	-	-	-	1.60	-	2.13	2.31	-
May-10	2.54	2.21	2.17	-	2.58	2.68	2.82	2.77
Jun-10	-	-	-	-	-	0.70	0.94	-
Jul-10	1.28	1.10	1.12	1.10	1.40	1.08	0.87	0.90
Aug-10	-	-	-	-	-	2.50	1.89	-
Sep-10	-	-	-	-	-	1.23	1.12	-
Oct-10	1.27	1.35	1.28	1.30	1.31	1.71	1.24	1.26
Nov-10	-	-	-	-	-	1.52	1.28	-
Dec-10	-	-	-	-	-	2.17	1.35	-
Jan-11	0.86	0.86	0.98	0.74	1.07	1.31	1.10	1.05
Feb-11	-	-	-	-	-	1.12	1.39	-
Mar-11	-	-	-	-	-	2.67	1.22	-
Apr-11	0.69	0.66	1.30	0.68	0.70	2.18	0.93	0.77
May-11	-	-	-	-	-	3.20	3.83	-
Jun-11	-	-	-	-	-	1.76	1.90	-
Jul-11	1.16	1.46	1.67	2.14	1.36	1.42	1.43	1.44
Aug-11	-	-	-	-	-	1.48	1.55	-
Sep-11	-	-	-	-	-	-	-	-
Oct-11	1.90	2.53	2.09	2.99	-	2.85	1.99	1.95
Nov-11	-	-	-	-	-	1.79	2.09	-
Dec-11	-	-	-	-	-	3.51	1.23	-
Jan-12	1.53	1.28	1.47	0.94	1.27	1.16	1.28	1.15
Feb-12	-	-	-	-	-	0.85	0.88	-
Mar-12	-	-	-	-	-	0.73	0.75	-
Apr-12	-	-	-	-	-	-	-	-
May-12	2.22	1.86	2.06	2.54	1.80	1.62	1.51	1.61
Jun-12	-	-	-	-	-	3.59	4.00	-
Jul-12	2.00	1.79	1.77	2.39	2.27	2.93	2.20	2.37
Aug-12	-	-	-	-	-	1.76	1.51	-
Sep-12	-	-	-	-	-	1.43	1.88	-
Oct-12	1.82	1.80	1.91	2.56	1.30	1.08	1.03	1.09
Nov-12	-	-	-	-	-	-	-	-
Dec-12	-	-	-	-	-	2.11	2.24	-
Average 2009	**2.56**	**1.37**	**1.82**	**1.42**	**1.98**	**1.99**	**1.99**	**1.85**
Average 2010	**1.62**	**1.44**	**1.52**	**1.26**	**1.76**	**1.67**	**1.59**	**1.61**
Average 2011	**1.15**	**1.38**	**1.51**	**1.64**	**1.04**	**2.12**	**1.70**	**1.30**
Average 2012	**1.89**	**1.68**	**1.80**	**2.11**	**1.66**	**1.73**	**1.73**	**1.56**
Average All Years	**1.95**	**1.70**	**2.00**	**1.68**	**2.14**	**1.91**	**1.98**	**1.74**

Notes: CCME Protection of Aquatic Life Guideline - 26 ng/L
Sampling locations and frequency governed by Amended C. of A. #3960-7Q4K2G, dated March 13, 2009
Bracketted sampling notations are field identifications

TABLE 1b
<u>TOTAL MERCURY</u> - NAYSHKOOTAYAOW AND ATTAWAPISKAT RIVERS (Filtered)
(concentrations in ng/L)

Date	Naysh. R. Upstream (Naysh Riv up)	Naysh. R. Middle (Naysh Riv dn)	Naysh. R. Downstream (Naysh Riv up Att Riv)	Monument Channel (Naysh Riv Control)	Attawapiskat R. A-1 (Att Riv up 2)	Attawapiskat R. A-2 (Att Riv up A2-1)	Attawapiskat R. A-3 (Att Riv dn A3-1)	Attawapiskat R. A-4 (Att Riv dn Naysh Riv)
Feb-08	1.15	1.12	2.31	0.69	2.36	2.12	1.73	1.97
May-08	2.71	2.71	2.35	2.57	2.62	2.58	2.80	2.64
Aug-08	1.66	1.71	1.89	1.68	1.57	1.53	1.53	1.49
Oct-08	1.79	1.79	1.90	1.72	1.60	1.24	1.39	1.39
Jan-09	0.96	0.99	1.99	0.80	1.14	1.58	1.49	1.17
Feb-09	-	-	-	-	-	-	-	-
Mar-09	-	-	-	-	-	-	-	-
Apr-09	-	0.78	0.76	0.67	1.08	1.11	1.36	1.06
May-09	2.40	-	-	-	-	2.11	2.07	-
Jun-09	-	-	-	-	-	1.93	1.84	-
Jul-09	1.49	1.43	1.50	1.75	2.36	1.82	2.03	2.34
Aug-09	-	-	-	-	-	1.20	1.22	-
Sep-09	-	-	-	-	-	1.32	1.53	-
Oct-09	0.80	0.68	0.86	0.80	1.05	1.05	1.02	0.94
Nov-09	-	-	-	-	-	0.76	0.69	-
Dec-09	-	-	-	-	-	0.67	0.68	-
Jan-10	-	-	-	-	-	1.41	1.49	-
Feb-10	0.85	0.65	1.06	0.50	1.21	1.47	1.64	1.49
Mar-10	-	-	-	-	-	1.30	1.30	-
Apr-10	-	-	-	1.05	-	1.45	1.58	-
May-10	1.28	1.59	1.28	-	1.69	1.77	1.29	1.84
Jun-10	-	-	-	-	-	0.60	0.69	-
Jul-10	0.74	0.74	0.73	0.70	0.77	0.72	1.55	0.63
Aug-10	-	-	-	-	-	1.62	1.59	-
Sep-10	-	-	-	-	-	0.86	0.71	-
Oct-10	1.07	1.08	1.10	1.09	1.17	1.24	1.27	1.30
Nov-10	-	-	-	-	-	1.04	1.39	-
Dec-10	-	-	-	-	-	0.98	0.94	-
Jan-11	0.62	0.59	0.62	0.51	0.92	0.98	0.89	0.99
Feb-11	-	-	-	-	-	0.85	0.94	-
Mar-11	-	-	-	-	-	1.05	0.98	-
Apr-11	0.68	0.46	1.12	0.37	0.67	0.78	0.73	0.94
May-11	-	-	-	-	-	1.99	2.06	-
Jun-11	-	-	-	-	-	1.18	1.21	-
Jul-11	1.15	1.15	1.28	0.94	1.28	0.93	0.88	0.90
Aug-11	-	-	-	-	-	<0.01	0.98	-
Sep-11	-	-	-	-	-	-	-	-
Oct-11	1.35	1.53	1.51	1.72	1.35	1.73	1.31	1.33
Nov-11	-	-	-	-	-	1.28	1.23	-
Dec-11	-	-	-	-	-	1.00	0.91	-
Jan-12	1.47	0.68	0.84	0.43	0.77	0.72	0.75	0.73
Feb-12	-	-	-	-	-	0.49	0.52	-
Mar-12	-	-	-	-	-	0.49	0.45	-
Apr-12	-	-	-	-	-	-	-	-
May-12	1.07	1.06	1.23	1.49	0.94	0.81	0.86	0.87
Jun-12	-	-	-	-	-	1.68	1.62	-
Jul-12	0.99	0.99	1.02	1.46	1.23	1.28	1.18	1.03
Aug-12	-	-	-	-	-	0.81	0.82	-
Sep-12	-	-	-	-	-	1.05	1.23	-
Oct-12	1.08	0.96	1.08	1.57	0.78	0.80	0.69	0.66
Nov-12	-	-	-	-	-	-	-	-
Dec-12	-	-	-	-	-	1.26	1.20	-
Average 2009	**1.41**	**0.97**	**1.28**	**1.01**	**1.41**	**1.36**	**1.39**	**1.38**
Average 2010	**0.99**	**1.01**	**1.04**	**0.83**	**1.21**	**1.21**	**1.29**	**1.32**
Average 2011	**0.95**	**0.93**	**1.13**	**0.89**	**1.06**	**1.07**	**1.10**	**1.04**
Average 2012	**1.15**	**0.92**	**1.04**	**1.24**	**0.93**	**0.94**	**0.93**	**0.82**
Average All Years	**1.27**	**1.13**	**1.32**	**1.13**	**1.33**	**1.21**	**1.24**	**1.29**

Notes: CCME Protection of Aquatic Life Guideline - 26 ng/L
Sampling locations and frequency governed by Amended C. of A. #3960-7Q4K2G, dated March 13, 2009
Bracketted sampling notations are field identifications

TABLE 2a
METHYL MERCURY - NAYSHKOOTAYAOW AND ATTAWAPISKAT RIVERS (Unfiltered)
(concentrations in ng/L)

Date	Naysh. R. Upstream (Naysh Riv Up)	Naysh. R. Middle (Naysh Riv DN)	Naysh. R. Downstream (Naysh Riv up Att Riv)	Monument Channel (Naysh Riv Control)	Attawapiskat R. A-1 (Att Riv up 2)	Attawapiskat R. A-2 (Att Riv up A2-1)	Attawapiskat R. A-3 (Att Riv dn A3-1)	Attawapiskat R. A-4 (Att Riv dn Naysh Riv)
Feb-08	0.03	0.03	0.09	0.04	0.14	0.03	0.20	0.04
May-08	0.04	0.04	0.01	0.08	0.06	0.07	0.05	0.04
Aug-08	0.06	0.07	0.11	0.14	0.06	0.05	0.03	0.04
Oct-08	0.06	0.05	0.07	0.06	0.04	0.02	0.03	0.02
Jan-09	0.03	0.02	0.04	0.05	0.02	0.04	0.03	0.02
Feb-09	-	-	-	-	-	-	-	-
Apr-09	-	0.03	0.02	0.02	0.03	0.02	<0.01	0.03
May-09	0.03	-	-	-	-	0.02	0.02	-
Jun-09	-	-	-	-	-	0.10	0.07	-
Jul-09	0.05	0.05	0.03	0.03	0.04	0.04	0.10	0.02
Oct-09	0.06	0.05	0.05	0.10	0.09	0.06	0.05	0.10
Nov-09	-	-	-	-	-	0.04	0.05	-
Dec-09	-	-	-	-	-	0.08	0.10	-
Jan-10	-	-	-	-	-	0.09	0.08	-
Feb-10	0.20	0.04	0.03	0.02	0.04	0.05	0.07	0.03
Mar-10	-	-	-	-	-	0.06	0.03	-
Apr-10	-	-	-	0.07	-	0.06	0.06	-
May-10	0.05	<0.01	0.05	-	<0.01	0.02	0.05	0.01
Jun-10	-	-	-	-	-	0.08	0.05	-
Jul-10	0.02	0.10	0.11	0.14	0.15	0.04	0.12	0.09
Aug-10	-	-	-	-	-	0.08	0.07	-
Sep-10	-	-	-	-	-	0.04	0.04	-
Oct-10	0.04	0.05	0.05	0.14	0.03	0.03	0.04	0.03
Nov-10	-	-	-	-	-	0.07	0.04	-
Dec-10	-	-	-	-	-	<0.01	0.04	-
Jan-11	0.03	0.03	0.01	0.05	0.04	0.04	0.03	0.04
Feb-11	-	-	-	-	-	<0.01	0.01	-
Mar-11	-	-	-	-	-	0.03	0.01	-
Apr-11	-	-	-	-	-	0.06	0.03	-
May-11	-	-	-	-	-	0.07	0.05	-
Jun-11	-	-	-	-	-	0.03	0.03	-
Jul-11	0.07	0.06	0.08	0.13	0.05	0.05	0.05	0.03
Aug-11	-	-	-	-	-	0.07	0.07	-
Sep-11*	-	-	-	-	-	-	-	-
Oct-11	0.27	0.08	0.08	0.12	-	0.10	0.07	0.04
Nov-11	-	-	-	-	-	0.07	0.06	-
Dec-11	-	-	-	-	-	0.07	0.04	-
Jan-12	0.08	0.09	0.06	0.12	0.06	0.06	0.08	0.06
Feb-12	-	-	-	-	-	<0.06	0.01	-
Mar-12	-	-	-	-	-	0.03	0.03	-
Apr-12	-	-	-	-	-	-	-	-
May-12	0.05	0.05	0.05	0.10	0.07	0.06	0.06	0.04
Jun-12	-	-	-	-	-	0.02	0.08	-
Jul-12	0.07	0.07	0.08	0.17	0.06	0.07	0.04	0.06
Aug-12	-	-	-	-	-	0.05	0.03	-
Sep-12	-	-	-	-	-	0.04	0.04	-
Oct-12	0.03	0.04	0.06	0.07	0.01	0.02	0.02	0.04
Nov-12	-	-	-	-	-	-	-	-
Dec-12	-	-	-	-	-	0.05	0.05	-
Average 2009	**0.04**	**0.04**	**0.03**	**0.05**	**0.04**	**0.05**	**0.05**	**0.04**
Average 2010	**0.08**	**0.05**	**0.06**	**0.09**	**0.06**	**0.05**	**0.06**	**0.04**
Average 2011	**0.12**	**0.05**	**0.05**	**0.10**	**0.05**	**0.05**	**0.04**	**0.04**
Average 2012	**0.06**	**0.06**	**0.06**	**0.11**	**0.05**	**0.05**	**0.04**	**0.05**
Average All Years	**0.07**	**0.05**	**0.06**	**0.09**	**0.06**	**0.05**	**0.05**	**0.04**

Notes:
CCME Protection of Aquatic Life Guideline - 4 ng/L (unfiltered)
Sampling locations and frequency governed by Ammended C. of A. #3960-7Q4K2G, dated March 13, 2009
Bracketted sampling notations are field identifications
*Sample discarded as a result of lab miscommunication

amec

TABLE 2b
METHYL MERCURY - NAYSHKOOTAYAOW AND ATTAWAPISKAT RIVERS (Filtered)
(concentrations in ng/L)

Date	Naysh. R. Upstream (Naysh Riv Up)	Naysh. R. Middle (Naysh Riv DN)	Naysh. R. Downstream (Naysh Riv up Att Riv)	Monument Channel (Naysh Riv Control)	Attawapiskat R. A-1 (Att Riv up 2)	Attawapiskat R. A-2 (Att Riv up A2-1)	Attawapiskat R. A-3 (Att Riv dn A3-1)	Attawapiskat R. A-4 (Att Riv dn Naysh Riv)
Feb-08	0.03	0.02	0.03	0.03	0.04	0.05	0.03	0.04
May-08	0.01	0.03	0.02	0.06	0.01	0.03	0.02	0.03
Aug-08	0.05	0.05	0.06	0.10	0.04	0.02	0.03	0.03
Oct-08	0.03	0.02	0.03	0.04	0.03	0.02	0.02	0.02
Jan-09	0.03	0.03	0.03	0.02	0.02	0.02	0.02	0.02
Feb-09	-	-	-	-	-	-	-	-
Apr-09	-	0.01	0.01	0.01	0.02	0.02	0.03	0.01
May-09	0.09	-	-	-	-	0.03	0.03	-
Jun-09	-	-	-	-	-	0.03	0.03	-
Jul-09	0.04	0.10	0.11	0.07	0.15	0.03	0.02	0.03
Aug-09	-	-	-	-	-	0.05	0.03	-
Oct-09	0.07	0.04	0.06	0.04	0.04	0.05	0.06	0.07
Nov-09	-	-	-	-	-	0.03	0.15	-
Dec-09	-	-	-	-	-	0.08	0.09	-
Jan-10	-	-	-	-	-	0.01	0.04	-
Feb-10	0.01	0.05	0.09	0.03	0.04	0.07	0.05	0.04
Mar-10	-	-	-	-	-	0.05	0.03	-
Apr-10	-	-	-	0.05	-	0.04	0.03	-
May-10	0.04	0.12	0.04	-	0.05	0.03	0.04	0.05
Jun-10	-	-	-	-	-	0.01	0.02	-
Jul-10	0.05	0.06	0.03	0.07	<0.01	0.03	0.04	0.04
Aug-10	-	-	-	-	-	0.04	0.05	-
Sep-10	-	-	-	-	-	0.03	0.02	-
Oct-10	0.05	0.04	0.05	0.10	0.04	0.03	0.04	0.03
Nov-10	-	-	-	-	-	0.02	<0.01	-
Dec-10	-	-	-	-	-	0.04	0.02	-
Jan-11	0.01	0.01	<0.01	0.03	0.02	<0.01	0.02	0.01
Feb-11	-	-	-	-	-	<0.01	0.01	-
Mar-11	-	-	-	-	-	0.01	0.01	-
Apr-11	-	-	-	-	-	0.01	0.01	-
May-11	-	-	-	-	-	0.02	0.01	-
Jun-11	-	-	-	-	-	0.01	0.02	-
Jul-11	0.04	0.05	0.05	0.03	0.02	0.02	0.02	0.03
Aug-11	-	-	-	-	-	0.07	0.07	-
Sep-11*	-	-	-	-	-	-	-	-
Oct-11	0.06	0.06	0.07	0.11	0.05	0.06	0.04	0.04
Nov-11	-	-	-	-	-	0.04	0.04	-
Dec-11	-	-	-	-	-	0.01	0.03	-
Jan-12	0.01	0.02	<0.04	0.08	0.01	<0.04	0.05	0.02
Feb-12	-	-	-	-	-	<0.05	0.01	-
Mar-12	-	-	-	-	-	0.02	0.03	-
Apr-12	-	-	-	-	-	-	-	-
May-12	0.04	0.02	0.04	0.08	0.03	0.04	0.02	0.02
Jun-12	-	-	-	-		0.02	0.04	-
Jul-12	0.04	0.05	0.05	0.09	0.03	0.05	0.02	0.02
Aug-12	-	-	-	-	-	0.04	0.03	-
Sep-12	-	-	-	-	-	0.03	0.03	-
Oct-12	0.02	0.02	0.04	0.04	0.02	0.03	0.01	0.02
Nov-12	-	-	-	-	-	-	-	-
Dec-12	-	-	-	-	-	0.06	0.04	-
Average 2009	**0.06**	**0.05**	**0.05**	**0.03**	**0.06**	**0.04**	**0.05**	**0.03**
Average 2010	**0.04**	**0.07**	**0.05**	**0.06**	**0.03**	**0.03**	**0.03**	**0.04**
Average 2011	**0.04**	**0.04**	**0.04**	**0.06**	**0.03**	**0.03**	**0.03**	**0.03**
Average 2012	**0.03**	**0.03**	**0.04**	**0.07**	**0.02**	**0.04**	**0.03**	**0.02**
Average All Years	**0.04**	**0.04**	**0.05**	**0.06**	**0.03**	**0.03**	**0.03**	**0.03**

Notes:
CCME Protection of Aquatic Life Guideline - 4 ng/L (unfiltered)
Sampling locations and frequency governed by Ammended C. of A. #3960-7Q4K2G, dated March 13, 2009
* Samples discarded as a result of lab miscommunication
Bracketted sampling notations are field identifications

Table 3: Annual Average Methyl and Total Mercury Concentrations for the Nayshkootayow and Attawapiskat Rivers, and Monument Channel and Applicable Wildlife Criteria to Protect Fish-eating Birds and Mammals (Filtered) (concentrations in ng/L)

Date	Naysh. R. Upstream (Naysh Riv Up)	Naysh. R. Middle (Naysh Riv DN)	Naysh. R. Downstream (Naysh Riv up Att Riv)	Monument Channel (Naysh Riv Control)	Attawapiskat R. A-1 (Att Riv up 2)	Attawapiskat R. A-2 (Att Riv up A2-1)	Attawapiskat R. A-3 (Att Riv dn A3-1)	Attawapiskat R. A-4 (Att Riv dn Naysh Riv)
Methyl Mercury								
2009	**0.058**	0.047	**0.051**	0.035	**0.057**	0.038	**0.052**	0.032
2010	0.035	**0.065**	**0.054**	**0.062**	0.033	0.032	0.031	0.040
2011	0.039	0.039	**0.063**	**0.058**	0.031	0.029	0.027	0.027
2012	0.029	0.029	0.043	**0.072**	0.023	0.038	0.028	0.020
Average	0.038	0.042	0.048	**0.057**	0.035	0.034	0.033	0.030
Total Mercury								
2009	1.413	0.970	1.278	**1.005**	1.408	1.355	1.393	1.378
2010	0.986	1.014	1.042	0.834	1.210	1.205	1.287	1.315
2011	0.950	0.933	1.133	0.885	1.055	1.177	1.102	1.040
2012	1.153	0.923	1.043	**1.238**	0.930	0.939	0.932	0.823
Average	1.266	1.134	1.321	**1.125**	1.328	1.231	1.240	1.286
Ratio Methyl / Total	0.030	0.037	0.036	0.050	0.026	0.027	0.027	0.023
Average River Ratio		0.034		0.050			0.026	

Calculated Wildlife Criteria (WC) for Total Mercury (ng/L)

Nayshkootayaow River	1.471
Attawapiskat River	1.923
Monument Channel	1.000

Notes: - bold values - exceed filtered WC for fish eating birds and mammals for methyl mercury (>0.050 ng/L), or total mercury
- fish-eating birds and mammals are defined as species such as Bald Eagles, Kingfishers and Otter that feed almost exclusively on fish

Reference: US EPA 1997. Mercury Study Report to Congress. Volume 6: An Ecological Assessment for Anthropogenic Mercury Emissions in the United States

TABLE 4
MERCURY CONTENT IN WELL FIELD DISCHARGE
(concentrations in ng/L)

Date	Total Mercury		Methyl Mercury		Wells in Production
	Unfiltered	Filtered	Unfiltered	Filtered	
TABLE 14 (Continu	1.33	1.32	<0.01	<0.01	VDW-6, 11 and 22
Dec-07	1.33	0.95	0.01	0.01	VDW-6, 11 and 22
Jan-08	0.87	0.61	0.01	0.01	VDW-6, 11, 15, 17 and 22
Feb-08	1.55	1.27	<0.01	0.01	VDW-6, 11 and 22
Mar-08	0.70	0.69	<0.01	0.01	VDW-6, 11, 15, 17 and 22
Apr-08	0.84	0.69	0.02	0.02	VDW-7, 11, 15, 17 and 22
May-08	0.78	0.63	<0.01	<0.01	VDW-7, 11, 15, 17 and 22
Jun-08	0.72	0.60			VDW-7, 11, 15, 17 and 22
Jul-08	0.65	0.47	0.01	0.01	VDW-6, 11, 15, 17 and 22
Aug-08	2.63	0.99			VDW-6, 11, 15, 17 and 22
Sep-08	0.67	0.57			VDW-6, 11, 15, 17 and 22
Oct-08	2.20	2.01	<0.01	<0.01	VDW-3, 6, 7, 11, 15, 17 and 22
Nov-08	1.00	0.92	<0.01	<0.01	VDW-3, 6, 7, 11, 15, 17 and 22
Dec-08	1.34	1.07	0.01	0.01	VDW-3, 6, 7, 11, 15, 17 and 22
Jan-09	1.43	1.14			VDW-3, 6, 7, 11, 15, 17 and 22
Feb-09	1.71	1.54			VDW-3, 6, 7, 11, 15, 17 and 22
Mar-09	1.73	1.57			VDW-3, 6, 7, 11, 15, 17 and 22
Apr-09	2.42	2.24	0.01	0.01	VDW-3, 6, 7, 11, 15, 17 and 22
May-09	2.53	0.94		0.02	VDW-3, 6, 7, 11, 15, 17 and 22
Jun-09	0.72	1.78	0.04		VDW-3, 6, 7, 11, 15, 17 and 22
Jul-09	1.69	0.75	0.09	0.01	VDW-3, 6, 7, 11, 15, 17 and 22
Aug-09	4.22	2.09	0.01		VDW-3, 6, 7, 11, 15, 17 and 22
Sep-09	0.77	1.32			VDW-3, 6, 7, 11, 15, 17 and 22
Oct-09	0.63	0.23	0.02	0.01	VDW-3, 6, 7, 11, 15, 17 and 22
Nov-09				0.02	VDW-3, 6, 7, 11, 15, 17 and 22
Dec-09	0.34	0.15	0.08	0.122	VDW-3, 6, 7, 11, 15, 17 and 22
Jan-10	1.09	<0.01	0.06	0.03	VDW-3, 6, 7, 11, 14, 15, 17 and 22
Feb-10	1.54	0.37			VDW-3, 6, 7, 11, 14, 15, 17 and 22
Mar-10	1.20	0.56			VDW-3, 6, 7, 11, 14, 15, 17 and 22
Apr-10	1.03	0.01	0.01	<0.01	VDW-3, 6, 7, 11, 14, 15, 17 and 22
May-10	1.03	0.46			VDW-3, 6, 7, 11, 14, 15, 17 and 22
Jun-10	0.62	0.01			VDW-3, 6, 7, 11, 14, 15, 17 and 22
Jul-10	0.92	0.23	0.01	0.01	VDW-3, 6, 7, 11, 14, 15, 17 and 22
Aug-10	1.10	0.53			VDW-3, 6, 7, 11, 14, 15, 17 and 22
Sep-10	1.25	0.40			VDW-3, 6, 7, 11, 14, 15, 17 and 22
Oct-10	1.61	0.30	<0.01	<0.01	VDW-3, 6, 7, 11, 14, 15, 17 and 22
Nov-10	1.15	0.42			VDW-3, 6, 7, 11, 14, 15, 17 and 22
Dec-10	0.94	0.46			VDW-3, 6, 7, 11, 14, 15, 17 and 22
Jan-11	1.04	0.41	<0.01	0.05	VDW-6, 7, 11, 12, 14, 15, 17, 18 and 22
Feb-11	1.33	1.21			VDW-6, 7, 11, 12, 14, 15, 17, 18 and 22
Mar-11	1.73	0.63			VDW-6, 7, 11, 12, 14, 15, 17, 18 and 22
Apr-11	1.28	0.62			VDW-6, 7, 11, 12, 14, 15, 17, 18 and 22
May-11	1.48	0.42			VDW-6, 7, 11, 12, 14, 15, 17, 18 and 22
Jun-11	1.64	0.42			VDW -2, 6, 7, 11, 12, 14, 15, 17, 18 and 22
Jul-11	1.41	0.39	0.01	0.01	VDW -2, 6, 7, 11, 12, 14, 15, 17, 18 and 22
Aug-11	1.05	0.31	0.21	<0.01	VDW -2, 7, 11, 12, 14, 15, 17, 18 and 22
Sep-11					VDW -2, 6, 7, 11, 12, 14, 15, 17, 18 and 22
Oct-11	6.36	0.35	0.01	0.01	VDW -2, 6, 7, 11, 12, 14, 15, 17, 18 and 22
Nov-11	4.40	0.32			VDW -2, 6, 7, 11, 12, 14, 15, 17, 18 and 22
Dec-11	1.05	0.23			VDW -2, 6, 7, 12, 14, 15, 17, 18 and 22
Jan-12	0.97	0.43	0.02	0.01	VDW-2, 6, 7, 12, 14, 15, 17, 18, 21 and 22
Feb-12	0.57	0.19	0.01	0.01	VDW-2, 6, 7, 12, 14, 15, 17, 18, 21 and 22
Mar-12	0.31	0.12	<0.01	<0.01	VDW-2, 6, 7, 12, 14, 15, 17, 18, 21 and 22
Apr-12	0.98	0.52	<0.01	<0.02	VDW-2, 6, 7, 12, 14, 15, 17, 18, 21 and 22
May-12	1.42	0.21	0.27	0.02	VDW-2, 6, 7, 11, 12, 14, 15, 17, 18, 21 and 22
Jun-12	0.66	0.23	<0.02	<0.02	VDW-2, 6, 7, 12, 14, 15, 17, 18, 21 and 22
Jul-12	0.76	0.35	0.02	<0.01	VDW-2, 6, 7, 12, 14, 15, 17, 18, 21 and 22
Aug-12	5.70	0.40			VDW-2, 6, 7, 12, 14, 15, 17, 18, 21 and 22
Sep-12	2.52	0.50			VDW-2, 6, 7, 12, 14, 15, 17, 18, 21 and 22
Oct-12	1.87	0.30	<0.01	<0.01	VDW-2, 6, 7, 12, 14, 15, 17, 18, 21 and 22
Nov-12	0.87	0.31			VDW-2, 6, 7, 12, 14, 15, 17, 18, 21 and 22
Dec-12	2.83	0.84			VDW-2, 6, 7, 12, 14, 15, 17, 18, 21 and 22
Average 2009	**1.65**	**1.25**	**0.04**	**0.01**	
Average 2010	**1.12**	**0.31**	**0.02**	**0.02**	
Average 2011	**2.07**	**0.48**	**0.06**	**0.02**	
Average 2012	**1.62**	**0.37**	**0.05**	**0.01**	
Average All Years	**1.51**	**0.67**	**0.03**	**0.01**	

CEQG-PAL: Total Mercury - 26 ng/L; Methyl Mercury - 4 ng/L

APPENDIX A-3

DE BEERS Canada RESPONSE TO WILDLANDS LEAGUE COMMENTS

Stakeholder: **Wildlands League**
Trevor Hesselink, Director, Policy and Research
Comments dated: **December 16, 2013**
Comments regarding: **Review Environmental Bill of Rights (EBR) – Application for Renewal and Amendment, Permit to Take Water for Mine Dewatering, Victor Diamond Mine**

#	COMMENT	De Beers RESPONSE
2	*A thorough review of associated discharge effluent is required* The purpose of the Ontario Water Resources Act is: "to provide for the conservation, protection and management of Ontario's waters and for their efficient and sustainable use, in order to promote Ontario's long-term environmental, social and economic well-being. One cannot provide for conservation, protection and management, nor their efficient and sustainable use unless withdrawals are understood in the context of the effects of associated discharges in the dimensions of both quality and quantity in the long-term, relative to a baseline condition. This project has advanced in the face of a great deal of uncertainty. For better or worse, it is serving as an experiment for this type of mining, in this sensitive ecosystem. That the experience gained in these first years of operation has provided some confidence in operations is only as good as how transparently and credibly that experience has been gained and considered. Some of this experience has included negative feedback demonstrating unexpected consequence, such as the elevated methyl mercury, and higher than expected chloride levels in effluent cited below. Conditions attached to authorizations are a common tool to provide for some of these tests, yet the trigger values relied upon for mercury monitoring represent one example where the conditions are unlikely to meet this need, particularly when considered alongside the comments below regarding the misuse of the CCME mercury guidelines, the uncertainty around the instances of elevated methyl mercury, and a pending operational change to a different dewatering regime. Documents obtained through the Ontario's *Freedom of Information and Protection of Privacy Act* show that the MeHg levels in fish in the vicinity of the Victor project have increased. These increases are characterized as 'statistically significant' in Debeers' 2012 annual report on Mercury Performance Monitoring, a report required under their certificate of approval. Elevation of MeHg has been detected in the surface waters of South and North Granny creeks, along with "statistically significant" increases in the	The root cause of the elevated methyl mercury concentrations in downstream North Granny Creek waters, and in Pearl Dace collected from North Granny Creek, was determined to be the result of both naturally elevated mercury concentrations in North Granny Creek compared with South Granny Creek and the Tributary 5A control system, and increased mercury methylation rates within the northeast fen as a probable result of mine related discharges and runoff containing waters which are elevated in sulphate. Sulphate serves as an energy source for mercury methylating bacteria. Detailed discussions are provided in Sections 3.3 and 3.5 of the *Mercury Performance Monitoring 2012 Annual Report* (AMEC 2013). The above effects are not related to well field dewatering, as there has been no demonstrated "drying out" of the local muskeg environment by such dewatering. It was originally hypothesized by others that well field dewatering could potentially result in the drying out of large areas of muskeg, which would then decompose releasing predevelopment stores of mercury originally supplied by long-range atmospheric transport. This has not happened. Muskeg dewatering has been confined to small localized areas in the immediate vicinity of bioherms, as originally predicted. Most of the effluent discharges to the northeast fen have ceased, with the exception of landfill runoff and leachate, runoff and seepage from the mine rock stockpile, and discharge from the Phase 1 mine water settling pond. The latter source primarily contains surface runoff water from the surrounding area that reports to the open pit perimeter drainage area, and not pit water per se. Virtually all precipitation that comes in contact with open pit seeps into the bedrock and is removed by the open pit well field system. De Beers is currently investigating means of collecting any sulphate rich mine drainage waters and routing these away from the northeast fen and other muskeg areas. De Beers takes this concern seriously, but would also state that the observed effect is localized to a very small portion of the Granny Creek watershed, and is not linked to well field dewatering. There is also no measurable effect on either the Nayshkootayaow or Attawapiskat Rivers.

#	COMMENT	De Beers RESPONSE
	mercury body burden of Pearl Dace in North Granny Creek. No root cause analysis has yet been undertaken, to our knowledge, despite obligations agreed to by the proponent with MOE, as outlined in the document "Trigger Values for Mercury Concentrations and/or Body Burdens in Fish, Condition 6(10) of Certificate of Approval #8700783LPK, De Beers Canada Inc. Victor Mine. Fish in the area waterbodies, including North and South Granny creeks, are already well above the Canadian tissue residue guidelines of 33 ug/kg for protection of Wildlife Consumers of Aquatic Biota (found on CCME web site at http://ceqg-cqe.ccme.ca/download/en/294/). Given this already elevated level of MeHg in the fish locally (as seen from the fish testing results of fish from the Attawaspikat river that inform the Guide to Eating Ontario Sportfish and analysis of local fish by De Beers pursuant to conditions of their Certificate of Approval) and the reported increases observed in the waters of North and South Granny Creek and in the Pearl Dace of North Granny Creek related to the Victor mine activities, any increase of MeHg in the surface water cannot be tolerated and could make the fish contamination situation worse. Noting that MeHg levels in the discharge water is below the PWQO at 0.2 ug/L (or even that it is below the more stringent PWQG for protection of Aquatic Life – methyl mercury in freshwater at 4 ng/L) is insufficient to ensure that MeHg contamination of fish is not worsening for both wildlife and human consumers, as any additional contributions to the river and creeks have the capacity to bio-accumulate further in these fish, and their predators. It is likely that a root cause analysis will find that a net transport of long resident mercury to the river is occurring as a result of mining activities such as the existing dewatering at the Victor site. Regardless of the cause, these monitoring results should trigger such a root cause analysis as (a) an obligation and priority of the current operation and also (b) as a pre-requisite to any further consideration of project expansion, including additions to the existing works, or additional pits in the vicinity. In our opinion, trigger values adopted as conditions of these industrial works are too unclear to respond predictably to these circumstances. For example: *"If, from the analysis defined in Section 4.5, it appears that measured, or projected, increases in pike flesh mercury concentrations, due to Project-related influences, are likely to increase by greater than 10%, then a comprehensive risk assessment will be undertaken.*	Mitigation measures available for preventing site drainage waters containing sulphate from contacting the local muskeg areas include the development of perimeter interceptor ditches around mine rock and coarse processed kimberlite stockpiles, and directing the collected water to the fine processed kimberlite contain (PKC) facility or to the mine dewatering discharge (where it will not contact muskeg); or generating internal flow gradients towards the centre of these stockpiles by well and pump systems, with collected waters to be pumped to the fine PKC facility. Section 2.3 of the March 2008 "Trigger Values" document requires further investigation if total or methyl mercury concentrations within a surface water system are shown to be significantly different from that of a control system. Section 2.5 of that same document requires further investigation if there are significant differences in (small) fish tissue values. Both conditions have occurred with respect to North Granny Creek and the results have been investigated. The root cause of these differences is believed to be linked to increased sulphate loadings to localized muskeg environments, which are independent of mine dewatering effects. De Beers is taking steps to limit the release of sulphates to the muskeg environment. Also, while these effects have occurred they are very localized, and are not having any adverse effects on either the Nayshkootayaow or Attawapiskat Rivers. Also, while statistically significant differences in methyl mercury have been noted for North Granny Creek compared with South Granny Creek and Tributary 5A, there are no strong temporal trends to the data, as evidenced by Table 12 of the Mercury Performance Monitoring 2012 Annual Report.

#	COMMENT	De Beers RESPONSE
	This trigger employs too many criteria to provide clarity to any user. It could be suggested now that the available evidence projects a substantial likelihood that Pike will assume at least 10% additional body burden, but it would of course assume many things including time lags which are not identified in this criteria at all (we could perhaps assume the "long-term" general purpose criteria of the OWRA as a stand-in). Our point is that these triggers are demonstrably not responsive to (a) the current context of mercury and the risks it presents as a baseline, (b) the additionality of effluent contributions relative to any management goal, (c) the cumulative nature of past, current, and future activities (including the proposed expansion to a new pit in the same vicinity), nor (d) the full provisions and advice provided in the often-cited 2003 CCME guidelines for direct exposure of aquatic life (see further below for more commentary on this). That Pike was selected as an indicator species helps to illustrate the intrinsic bio-accumulation obligation of these triggers, as their pathway to exposure as a predator species is well understood. Their tissue will likely be responsive to elevated levels in their prey, and their prey to elevated levels in their habitat.	
4	*Dilution not an acceptable mitigation solution for Mercury* Of particular concern to us is the ongoing reliance on dilution into the Attawapiskat River for mitigating the net contributions of bio-accumulating mercury to this already over-saturated receiving water. While dilution is often relied upon for mitigation of industrial discharge, there are circumstances where it is not appropriate. To us, one of these circumstances is certainly when (a) considering a net addition of a bio-accumulating contaminant into (b) a receiving waterbody which demonstrably poses risks to aquatic, avian, mammal, and human health at background levels. Fish consumption advisories established for this river, particularly those of higher trophic levels, already clearly indicate human health concerns. The river is variably reported as having a baseline Hg load of 1-2 ng/L THg, with at least .05 ng/L being attributed to MeHg. The 2003 CCME guide advises that: *"From conservative assumptions, concentrations of MeHg below 0.007 ng/L may be required to protect all wildlife species in Canada while concentrations above 0.2 ng/L may pose a risk to wildlife species. MeHg concentrations in water between these limits may be hazardous to some wildlife depending on their feeding habits (preferred prey items, and the trophic level and BAFs of these prey items)."* It is difficult to imagine that these discharge authorizations would be issued, or	The data in attached Tables 1, 2 and 3 demonstrate that upstream and downstream concentrations of total and methyl mercury, for filtered and unfiltered samples, are essentially the same for both the Nayshkootayaow and Attawapiskat Rivers (i.e., river mercury concentrations have not been affected by the well field discharge); and that well field mercury concentrations for both total and methyl mercury, for filtered and unfiltered samples, continue to be less than comparable background values measured for the river. Well field discharges are therefore not having any measurable impact on mercury concentrations of either species (total or methyl) in the river. Consequently there is no reason to believe that fish inhabiting the Nayshkootayaow or Attawapiskat Rivers would be subject to any additional mercury stresses as a result of well field discharges to the Attawapiskat River. Comments regarding reliance on dilution are not in keeping with the well field discharge data, which show lower total and methyl mercury concentrations than those observed in the Attawapiskat River baseline condition.

#	COMMENT	De Beers RESPONSE
	tolerated, in a similar circumstance in a developed watershed, in southern Ontario for example. Methyl mercury is the dominant species of concern in the bio-accumulation of mercury, with usually 95% of the total mercury body burden existing, and being accumulated in this form. The guideline being relied upon for methyl mercury (CCME, 2003) is quite clear on its application: "*This guideline is recommended for the protection of low trophic level freshwater life (i.e., generally trophic levels 1-2) against the adverse affects of direct exposure to methyl mercury through water. This guideline may not protect high trophic level aquatic life (i.e., generally trophic levels 3 and 4) which are exposed to methyl mercury primarily through food. Nor may it prevent the accumulation of methyl mercury in aquatic life which could cause the tissue residue guideline (33μg·kg-1 diet ww) for the protection of wildlife consumers of aquatic biota to be exceeded (Environment Canada 2002).*" Despite this, the 4 ng/L limit for direct exposure to methyl mercury (and the 26 ng/L limit for THg) is treated like the acceptable loading of the Attawapiskat River by this proponent to date. It is referenced extensively in all associated authorizations for this project. Also, in the 2012 mercury performance report submitted to MOE in June 2012, effluent was reported with total mercury concentrations which averaged 1.65, 1.12 and 2.07 ng/L in 2009, 2010 and 2011, respectively with some reported values exceeding 4 ng/L. The important perspective is that, as these numbers are generally higher than the reported background values of the river (1.4-1.5 ng/L Thg), a net loading is occurring. For a bio-accumulating contaminant, this means that additional risks to VECs are being increasingly contributed to the system by the proponent. It is our understanding that these are not mitigated by diluting one high concentration of a contaminant into another already high receiving body. Pretending that the river has more assimilative capacity by misusing a guideline intended for another purpose does not seem appropriate to us. We do not concur with the proponent's simplistic interpretation of the 2003 CCME Guideline for mercury exposure, nor the current use of dilution as a mitigation approach to the additional loadings (see more below on our position on the misinterpretation of this guideline).	

#	COMMENT	De Beers RESPONSE
5	*Potential for further mercury methylation from projected sump-assisted drainage of open pit* DeBeers predicts that the drawdown cone is not expected to increase because deeper groundwater is being encountered as pit is excavated deeper, and shallower peat systems surrounding pit appear to be "perched". *"Groundwater data for all four cluster sites show that water levels have been holding at baseline values for the muskeg (peat) horizon (Figures 8, 9, 10 and 11), demonstrating thus far, as predicted in the federal EA and in the 2007 and 2008 PTTW application support documents, that the muskeg systems are is essentially perched and not prone to well field dewatering effects except in the immediate vicinity of bioherms where the insulating (aquitard) effects of the marine sediments are more limited or absent.* In its earlier assertions that elevated MeHg levels was not a result of peat dewatering, DeBeers previously attributed sulphate-rich deep groundwater from excavations into bedrock as a contributing factor. *"Methyl mercury concentrations in the SWF and the NEF, both of which receive (or received) effluents from excavations into bedrock, showed elevated methyl mercury concentrations compared with the control fens (SEF and HgCon). The elevated methyl mercury concentrations in both instances are attributed to suphate-rich effluent waters which stimulate the mercury methylation process, and are not a function of well-field dewatering effects.* Now it is establishing that their operations will be increasingly dewatering deeper bedrock groundwater, as the pit is dug further. *"RPI is expected to occur at the point where the depth of the pit in relation to well pump positions is such that the dewatering wells will no longer be capable of fully dewatering the pit. At this point a portion of the groundwater will begin to bypass the well draw points and seep into the pit. This bypass seepage (RPI) will have to be pumped from the pit. This condition could be avoided by developing deeper wells, but economics and environmental conditions related to higher chloride concentrations at greater depths do not support the deep well option."* If in fact their original assertions are correct, the possibility of increased methylation seems much greater as a result of this operational shift to deeper excavation.	The design depth of the Victor pit has not changed since what was assessed in the comprehensive environmental assessment (CSEA 2005). The mine is simply progressing according to plan. Mercury concentrations in the well field discharge water are not expected to change as the open pit continues to deepen, as evidenced by the year to year summary data at the bottom of attached Table 3. All values in the table are very low, and there are no temporal trends to the data.
6	*Inappropriate reliance on the Canadian Water Quality Guidelines for the Protection of Aquatic Life "direct" values for mercury*	As per the response to Comments #4 and #5 above, there has been no change to total or methyl mercury concentrations in the Nayshkootayaow or Attawapiskat Rivers, and

#	COMMENT	De Beers RESPONSE
	The proponent relies upon the direct exposure guideline values for THg and MeHg presented in the 2003 guideline: 26 ng/L and 4ng/L respectively. The purpose of these guides is for direct lethal exposure. It is explicitly not to protect aquatic, avian, mammals, and humans from indirect effects, such as bio-accumulation in the food chain: *"The protocol does not address exposure through food or bioaccumulation to higher trophic levels. As such, aquatic life that are exposed to methyl mercury primarily through food (e.g., piscivorous fish) may not be adequately protected. Moreover, these WQGs for mercury may not prevent the accumulation of methyl mercury in aquatic life; therefore, through this process the tissue residue guideline (TRG; 33 µg MeHg/kgww) for the protection of wildlife that consume aquatic life may be exceeded (Environment Canada 2002). Thus, if the ultimate management objective for mercury is to protect high trophic level aquatic life and/or those wildlife that prey on aquatic life, more stringent site-specific application of these water quality guidelines may be necessary (see Additional Considerations).* Additionally, it (a) identifies the 4 ng/L for MeHg as being an "interim guideline", and (b) one that "may not protect fully high trophic level fish". Clearly the authors intended a substantial amount of caution be used with this application. The guideline also stipulates that: *"To attain the highest degree of environmental protection, all Canadian Environmental Quality Guidelines for mercury (water, sediment, tissue, and soil) should be applied concurrently."* This means that the authors expected that the 2000 CCME MeHg tissue guideline for wildlife consumers of aquatic biota would also be respected. This latter guideline recommends 33 µg/kgww, as the Canadian tissue residue guideline for MeHg for the protection of wildlife that consume freshwater, marine and estuarine biota. In the absence of other established guidelines, this guideline also identifies the 1997 US EPA water concentrations as being intended to protect avian and semi-aquatic mammal wildlife from ingesting more than their safe doses of mercury: *"Recommended water concentrations of 50 pg MeH/L and 641 pg THg/L are intended to protect avian wildlife from ingesting more than the safe daily dosage, or Reference Dose (RfD) of 21 µg/kgbw per day and to protect semi-aquatic mammals from ingesting more than 18 µg/kg per day."*	the well field discharge total and methyl mercury concentrations continue to be less than background for these two rivers. There is consequently no adverse mercury effect to either river, or to their aquatic biota. Methyl mercury concentrations in the well field discharge are at or below the bioaccumulation threshold of 0.05 ng/L referenced by the reviewer, as per attached Table 3. It is acknowledged that current mercury body burdens in walleye and northern pike from the Nayshkootayaow and Attawapiskat Rivers exceed consumption guidelines for a portion of the population, for larger members of the two fish species; but this condition is not related to mine dewatering at the Victor Diamond Mine. It is a natural background condition, as observed during the predevelopment environmental baseline studies by De Beers, and historically in fish collected decades earlier by the Ontario government. With regard to the values of 0.641 ng/L for total mercury and 0.05 ng/L for methyl mercury cited by the reviewer to protect fish and wildlife, compared with the CEQG values of 26 ng/L and 4 ng/L used by De Beers, these values derive from US EPA recommended values to protect certain fish-eating wildlife species for the long-term bioaccumulation of mercury (US EPA 1997). The 0.05 ng/L value for filtered methyl mercury is derived from direct measurements. The 0.641 ng/L value for filtered total mercury is a calculated value based on an assumed typical, filtered methyl to total mercury proportional value of 0.078 (i.e., 0.05 / .078 = 0.641), (US EPA 1997). The 0.05 ng/L methyl mercury value derived from the US EPA data is in fact generally met in the current condition for all years in the Nayshkootayaow and Attawapiskat Rivers at all stations, both upstream and downstream of the Victor Diamond Mine (VDM) site, with essentially no difference in methyl mercury concentrations between upstream and downstream stations (Table 2). Total mercury values for the Nayshkootayaow and Attawapiskat Rivers are also essentially the same both upstream and downstream of the VDM site, indicating that water discharges from the VDM have not influenced Nayshkootayaow and Attawapiskat River total mercury concentrations (Table 1). With regard to the applicability of the 0.641 ng/L filtered, total mercury value to the Attawapiskat and Nayshkootayaow Rivers, this value is not applicable to these rivers as the proportions of filtered methyl mercury to filtered total mercury for the Nayshkootayaow and Attawapiskat Rivers are considerably less than the US EPA value of 0.078. The comparable average proportional values for these two rivers are

#	COMMENT	De Beers RESPONSE
	This reference translates into 0.641 ng/L of THg and 0.05 ng/L MeHg, both measures which are currently already exceeded in the Attawapiskat River baseline. While these reference numbers have no legal applicability to this jurisdiction, they represent the most relevant level of protection from an ecosystem perspective. In the absence of an equivalent, more regionally specific reference intended for the same purpose, it is our position that this type of approach is the appropriate one to consider for assessing loading risks from this type of application. If the 2003 direct exposure guideline is to be relied upon so heavily by the proponent, it is critical that all aspects of it be considered as written. To be citing adherence to direct exposure guidelines cannot be expected to protect the Valued Ecosystem Components within this system, and ignoring the extensive provisos included in the guideline intended to warn about this is not acceptable to us. It is our position that considering only direct exposure limits to aquatic life is not appropriately protective to this particular context. We recommend a revisiting of all authorizations associated with this project through the lens of responsible protection of all trophic levels of fish, avian, mammal, and human life associated with the food chain of the Attawapiskat River. It is appropriate to do this at this time, as the proponent is just now considering (a) deepening the pit and relying upon additional sewage works, and (b) expanding the life of the site by digging additional pits in the vicinity (see CEAA for details of the proposed Victor expansion project, not mentioned anywhere in this application).	0.034 and 0.026, respectively (Table 4). The resultant calculated filtered total mercury values to protect fish-eating birds and mammals in the Nayshkootayaow and Attawapiskat Rivers are 1.471 ng/L and 1.923 ng/L, respectively. These values were met for all years in both rivers (Table 4). Monument Channel, shown in Tables 1 and 2, and in Table 4, is a control station located downstream near to the community of Attawapiskat. This river drains to the Attawapiskat River and is not subject to drainage influences of either the Nayshkootayaow or Attawapiskat Rivers. Total and methyl mercury values for the control station averaged higher than for either the Attawapiskat or Nayshkootayaow Rivers.

References:

US EPA. 1997. Mercury Study Report to Congress. Volume 6: An Ecological Assessment for Anthropogenic Mercury Emissions in the United States

TABLE 2b
METHYL MERCURY - NAYSHKOOTAYAOW AND ATTAWAPISKAT RIVERS (Filtered)
(concentrations in ng/L)

Date	Naysh. R. Upstream (Naysh Riv Up)	Naysh. R. Middle (Naysh Riv DN)	Naysh. R. Downstream (Naysh Riv up Att Riv)	Monument Channel (Naysh Riv Control)	Attawapiskat R. A-1 (Att Riv up 2)	Attawapiskat R. A-2 (Att Riv up A2-1)	Attawapiskat R. A-3 (Att Riv dn A3-1)	Attawapiskat R. A-4 (Att Riv dn Naysh Riv)
Feb-08	0.03	0.02	0.03	0.03	0.04	0.05	0.03	0.04
May-08	0.01	0.03	0.02	0.06	0.01	0.03	0.02	0.03
Aug-08	0.05	0.05	0.06	0.10	0.04	0.02	0.03	0.03
Oct-08	0.03	0.02	0.03	0.04	0.03	0.02	0.02	0.02
Jan-09	0.03	0.03	0.03	0.02	0.02	0.02	0.02	0.02
Feb-09	-	-	-	-	-	-	-	-
Apr-09	-	0.01	0.01	0.01	0.02	0.02	0.03	0.01
May-09	0.09	-	-	-	-	0.03	0.03	-
Jun-09	-	-	-	-	-	0.03	0.03	-
Jul-09	0.04	0.10	0.11	0.07	0.15	0.03	0.02	0.03
Aug-09	-	-	-	-	-	0.05	0.03	-
Oct-09	0.07	0.04	0.06	0.04	0.04	0.05	0.06	0.07
Nov-09	-	-	-	-	-	0.03	0.15	-
Dec-09	-	-	-	-	-	0.08	0.09	-
Jan-10	-	-	-	-	-	0.01	0.04	-
Feb-10	0.01	0.05	0.09	0.03	0.04	0.07	0.05	0.04
Mar-10	-	-	-	-	-	0.05	0.03	-
Apr-10	-	-	-	0.05	-	0.04	0.03	-
May-10	0.04	0.12	0.04	-	0.05	0.03	0.04	0.05
Jun-10	-	-	-	-	-	0.01	0.02	-
Jul-10	0.05	0.06	0.03	0.07	<0.01	0.03	0.04	0.04
Aug-10	-	-	-	-	-	0.04	0.05	-
Sep-10	-	-	-	-	-	0.03	0.02	-
Oct-10	0.05	0.04	0.05	0.10	0.04	0.03	0.04	0.03
Nov-10	-	-	-	-	-	0.02	<0.01	-
Dec-10	-	-	-	-	-	0.04	0.02	-
Jan-11	0.01	0.01	<0.01	0.03	0.02	<0.01	0.02	0.01
Feb-11	-	-	-	-	-	<0.01	0.01	-
Mar-11	-	-	-	-	-	0.01	0.01	-
Apr-11	-	-	-	-	-	0.01	0.01	-
May-11	-	-	-	-	-	0.02	0.01	-
Jun-11	-	-	-	-	-	0.01	0.02	-
Jul-11	0.04	0.05	0.05	0.03	0.02	0.02	0.02	0.03
Aug-11	-	-	-	-	-	0.07	0.07	-
Sep-11*	-	-	-	-	-	-	-	-
Oct-11	0.06	0.06	0.07	0.11	0.05	0.06	0.04	0.04
Nov-11	-	-	-	-	-	0.04	0.04	-
Dec-11	-	-	-	-	-	0.01	0.03	-
Jan-12	0.01	0.02	<0.04	0.08	0.01	<0.04	0.05	0.02
Feb-12	-	-	-	-	-	<0.05	0.01	-
Mar-12	-	-	-	-	-	0.02	0.03	-
Apr-12	-	-	-	-	-	-	-	-
May-12	0.04	0.02	0.04	0.08	0.03	0.04	0.02	0.02
Jun-12	-	-	-	-		0.02	0.04	-
Jul-12	0.04	0.05	0.05	0.09	0.03	0.05	0.02	0.02
Aug-12	-	-	-	-	-	0.04	0.03	-
Sep-12	-	-	-	-	-	0.03	0.03	-
Oct-12	0.02	0.02	0.04	0.04	0.02	0.03	0.01	0.02
Nov-12	-	-	-	-	-	-	-	-
Dec-12	-	-	-	-	-	0.06	0.04	-
Average 2009	**0.06**	**0.05**	**0.05**	**0.03**	**0.06**	**0.04**	**0.05**	**0.03**
Average 2010	**0.04**	**0.07**	**0.05**	**0.06**	**0.03**	**0.03**	**0.03**	**0.04**
Average 2011	**0.04**	**0.04**	**0.04**	**0.06**	**0.03**	**0.03**	**0.03**	**0.03**
Average 2012	**0.03**	**0.03**	**0.04**	**0.07**	**0.02**	**0.04**	**0.03**	**0.02**
Average All Years	**0.04**	**0.04**	**0.05**	**0.06**	**0.03**	**0.03**	**0.03**	**0.03**

Notes:
CCME Protection of Aquatic Life Guideline - 4 ng/L (unfiltered)
Sampling locations and frequency governed by Ammended C. of A. #3960-7Q4K2G, dated March 13, 2009
* Samples discarded as a result of lab miscommunication
Bracketted sampling notations are field identifications

TABLE 3
MERCURY CONTENT IN WELL FIELD DISCHARGE
(concentrations in ng/L)

Date	Total Mercury		Methyl Mercury		Wells in Production
	Unfiltered	Filtered	Unfiltered	Filtered	
TABLE 14 (Continue	1.33	1.32	<0.01	<0.01	VDW-6, 11 and 22
Dec-07	1.33	0.95	0.01	0.01	VDW-6, 11 and 22
Jan-08	0.87	0.61	0.01	0.01	VDW-6, 11, 15, 17 and 22
Feb-08	1.55	1.27	<0.01	0.01	VDW-6, 11 and 22
Mar-08	0.70	0.69	<0.01	0.01	VDW-6, 11, 15, 17 and 22
Apr-08	0.84	0.69	0.02	0.02	VDW-7, 11, 15, 17 and 22
May-08	0.78	0.63	<0.01	<0.01	VDW-7, 11, 15, 17 and 22
Jun-08	0.72	0.60			VDW-7, 11, 15, 17 and 22
Jul-08	0.65	0.47	0.01	0.01	VDW-6, 11, 15, 17 and 22
Aug-08	2.63	0.99			VDW-6, 11, 15, 17 and 22
Sep-08	0.67	0.57			VDW-6, 11, 15, 17 and 22
Oct-08	2.20	2.01	<0.01	<0.01	VDW-3, 6, 7, 11, 15, 17 and 22
Nov-08	1.00	0.92	<0.01	<0.01	VDW-3, 6, 7, 11, 15, 17 and 22
Dec-08	1.34	1.07	0.01	0.01	VDW-3, 6, 7, 11, 15, 17 and 22
Jan-09	1.43	1.14			VDW-3, 6, 7, 11, 15, 17 and 22
Feb-09	1.71	1.54			VDW-3, 6, 7, 11, 15, 17 and 22
Mar-09	1.73	1.57			VDW-3, 6, 7, 11, 15, 17 and 22
Apr-09	2.42	2.24	0.01	0.01	VDW-3, 6, 7, 11, 15, 17 and 22
May-09	2.53	0.94		0.02	VDW-3, 6, 7, 11, 15, 17 and 22
Jun-09	0.72	1.78	0.04		VDW-3, 6, 7, 11, 15, 17 and 22
Jul-09	1.69	0.75	0.09	0.01	VDW-3, 6, 7, 11, 15, 17 and 22
Aug-09	4.22	2.09	0.01		VDW-3, 6, 7, 11, 15, 17 and 22
Sep-09	0.77	1.32			VDW-3, 6, 7, 11, 15, 17 and 22
Oct-09	0.63	0.23	0.02	0.01	VDW-3, 6, 7, 11, 15, 17 and 22
Nov-09				0.02	VDW-3, 6, 7, 11, 15, 17 and 22
Dec-09	0.34	0.15	0.08	0.122	VDW-3, 6, 7, 11, 15, 17 and 22
Jan-10	1.09	<0.01	0.06	0.03	VDW-3, 6, 7, 11, 14, 15, 17 and 22
Feb-10	1.54	0.37			VDW-3, 6, 7, 11, 14, 15, 17 and 22
Mar-10	1.20	0.56			VDW-3, 6, 7, 11, 14, 15, 17 and 22
Apr-10	1.03	0.01	0.01	<0.01	VDW-3, 6, 7, 11, 14, 15, 17 and 22
May-10	1.03	0.46			VDW-3, 6, 7, 11, 14, 15, 17 and 22
Jun-10	0.62	0.01			VDW-3, 6, 7, 11, 14, 15, 17 and 22
Jul-10	0.92	0.23	0.01	0.01	VDW-3, 6, 7, 11, 14, 15, 17 and 22
Aug-10	1.10	0.53			VDW-3, 6, 7, 11, 14, 15, 17 and 22
Sep-10	1.25	0.40			VDW-3, 6, 7, 11, 14, 15, 17 and 22
Oct-10	1.61	0.30	<0.01	<0.01	VDW-3, 6, 7, 11, 14, 15, 17 and 22
Nov-10	1.15	0.42			VDW-3, 6, 7, 11, 14, 15, 17 and 22
Dec-10	0.94	0.46			VDW-3, 6, 7, 11, 14, 15, 17 and 22
Jan-11	1.04	0.41	<0.01	0.05	VDW-6, 7, 11, 12, 14, 15, 17, 18 and 22
Feb-11	1.33	1.21			VDW-6, 7, 11, 12, 14, 15, 17, 18 and 22
Mar-11	1.73	0.63			VDW-6, 7, 11, 12, 14, 15, 17, 18 and 22
Apr-11	1.28	0.62			VDW-6, 7, 11, 12, 14, 15, 17, 18 and 22
May-11	1.48	0.42			VDW-6, 7, 11, 12, 14, 15, 17, 18 and 22
Jun-11	1.64	0.42			VDW -2, 6, 7, 11, 12, 14, 15, 17, 18 and 22
Jul-11	1.41	0.39	0.01	0.01	VDW -2, 6, 7, 11, 12, 14, 15, 17, 18 and 22
Aug-11	1.05	0.31	0.21	<0.01	VDW -2, 7, 11, 12, 14, 15, 17, 18 and 22
Sep-11					VDW -2, 6, 7, 11, 12, 14, 15, 17, 18 and 22
Oct-11	6.36	0.35	0.01	0.01	VDW -2, 6, 7, 11, 12, 14, 15, 17, 18 and 22
Nov-11	4.40	0.32			VDW -2, 6, 7, 11, 12, 14, 15, 17, 18 and 22
Dec-11	1.05	0.23			VDW -2, 6, 7, 12, 14, 15, 17, 18 and 22
Jan-12	0.97	0.43	0.02	0.01	VDW-2, 6, 7, 12, 14, 15, 17, 18, 21 and 22
Feb-12	0.57	0.19	0.01	0.01	VDW-2, 6, 7, 12, 14, 15, 17, 18, 21 and 22
Mar-12	0.31	0.12	<0.01	<0.01	VDW-2, 6, 7, 12, 14, 15, 17, 18, 21 and 22
Apr-12	0.98	0.52	<0.01	<0.02	VDW-2, 6, 7, 12, 14, 15, 17, 18, 21 and 22
May-12	1.42	0.21	0.27	0.02	VDW-2, 6, 7, 11, 12, 14, 15, 17, 18, 21 and 22
Jun-12	0.66	0.23	<0.02	<0.02	VDW-2, 6, 7, 12, 14, 15, 17, 18, 21 and 22
Jul-12	0.76	0.35	0.02	<0.01	VDW-2, 6, 7, 12, 14, 15, 17, 18, 21 and 22
Aug-12	5.70	0.40			VDW-2, 6, 7, 12, 14, 15, 17, 18, 21 and 22
Sep-12	2.52	0.50			VDW-2, 6, 7, 12, 14, 15, 17, 18, 21 and 22
Oct-12	1.87	0.30	<0.01	<0.01	VDW-2, 6, 7, 12, 14, 15, 17, 18, 21 and 22
Nov-12	0.87	0.31			VDW-2, 6, 7, 12, 14, 15, 17, 18, 21 and 22
Dec-12	2.83	0.84			VDW-2, 6, 7, 12, 14, 15, 17, 18, 21 and 22
Average 2009	**1.65**	**1.25**	**0.04**	**0.01**	
Average 2010	**1.12**	**0.31**	**0.02**	**0.02**	
Average 2011	**2.07**	**0.48**	**0.06**	**0.02**	
Average 2012	**1.62**	**0.37**	**0.05**	**0.01**	
Average All Years	**1.51**	**0.67**	**0.03**	**0.01**	

CEQG-PAL: Total Mercury - 26 ng/L; Methyl Mercury - 4 ng/L

Table 4: Annual Average Methyl and Total Mercury Concentrations for the Nayshkootayow and Attawapiskat Rivers, and Monument Channel and Applicable Wildlife Criteria to Protect Fish-eating Birds and Mammals (Filtered) (concentrations in ng/L)

Date	Naysh. R. Upstream (Naysh Riv Up)	Naysh. R. Middle (Naysh Riv DN)	Naysh. R. Downstream (Naysh Riv up Att Riv)	Monument Channel (Naysh Riv Control)	Attawapiskat R. A-1 (Att Riv up 2)	Attawapiskat R. A-2 (Att Riv up A2-1)	Attawapiskat R. A-3 (Att Riv dn A3-1)	Attawapiskat R. A-4 (Att Riv dn Naysh Riv)
Methyl Mercury								
2009	**0.058**	0.047	**0.051**	0.035	**0.057**	0.038	**0.052**	0.032
2010	0.035	**0.065**	**0.054**	**0.062**	0.033	0.032	0.031	0.040
2011	0.039	0.039	**0.063**	**0.058**	0.031	0.029	0.027	0.027
2012	0.029	0.029	0.043	**0.072**	0.023	0.038	0.028	0.020
Average	0.038	0.042	0.048	**0.057**	0.035	0.034	0.033	0.030
Total Mercury								
2009	1.413	0.970	1.278	**1.005**	1.408	1.355	1.393	1.378
2010	0.986	1.014	1.042	0.834	1.210	1.205	1.287	1.315
2011	0.950	0.933	1.133	0.885	1.055	1.177	1.102	1.040
2012	1.153	0.923	1.043	**1.238**	0.930	0.939	0.932	0.823
Average	1.266	1.134	1.321	**1.125**	1.328	1.231	1.240	1.286
Ratio Methyl / Total	0.030	0.037	0.036	0.050	0.026	0.027	0.027	0.023
Average River Ratio		0.034		0.050		0.026		

Calculated Wildlife Criteria (WC) for Total Mercury (ng/L)

Nayshkootayaow River	1.471
Attawapiskat River	1.923
Monument Channel	1.000

Notes: - bold values - exceed filtered WC for fish eating birds and mammals for methyl mercury (>0.050 ng/L), or total mercury
- fish-eating birds and mammals are defined as species such as Bald Eagles, Kingfishers and Otter that feed almost exclusively on fish

Reference: US EPA 1997. Mercury Study Report to Congress. Volume 6: An Ecological Assessment for Anthropogenic Mercury Emissions in the United States