2008

DE BEERS CANADA INC.
VICTOR MINE

MERCURY PERFORMANCE MONITORING
2008 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, Hwy. 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:

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June 2009
TC91501

June 29, 2009
TC91501

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

Chief Theresa Hall
Attawapiskat First Nation
First Nation Office
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Dear Mr. Durocher / Chief Hall:

Re: Mercury Performance Monitoring 2008 Annual Report, Certificate of Approval #3960-7Q4K2G, Conditions 7(5) and 7(6)

Please find enclosed the Annual Mercury Performance Monitoring Report for the Victor Mine for the 2008 reporting period. The report addresses Conditions 7(5) and 7(6) of Certificate of Approval #3960-7Q4K2G, and covers monitoring data relating to peat solids, peat pore water, surface water systems, groundwater (well field) discharge and fish.

All monitoring results are consistent with permit application expectations regarding mine dewatering activities, showing no adverse effects of mine dewatering on area mercury levels in peatlands, surface waters, or fish flesh for the 2008 monitoring period.

We would be pleased to discuss any aspects of the above with the Ministry of the Environment or the Attawapiskat First Nation.

Please contact either myself or Sheila Daniel at 905-568-2929.

Regards,

AMEC Earth & Environmental,
a Division of AMEC Americas Limited
On behalf of De Beers Canada Inc.

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1.0 INTRODUCTION

This report was prepared by AMEC Earth & Environmental 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 first in a series of annual mercury monitoring reports that will be prepared for the Victor Mine. This first annual report summarizes all Victor Mine site mercury monitoring data collected for the year 2008.

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 beyond 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.

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.

The data collected for 2008 thus far support the De Beers position, as described in detail in the sections that follow.

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 one time 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 below;

(c) Monitoring of surface water systems on a monthly or quarterly basis depending on station at the locations identified in Table 3 below;

(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 below.

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, modeling, 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 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. 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

Peat solids samples from the Victor Mine site area were collected in mid-October 2007 from domed bog and ribbed fen sites at the stations and depths listed in Table 1. Sample locations are shown in Figure 1. Samples were collected under the direction of Dr. Brian Branfireun of the University of Toronto, a specialist in peatland mercury hydrodynamics and chemodynamics.

Surface peat samples were taken by directly removing the surficial material and placing into small leak-proof zip-closure bags, which were then rolled to exclude air, double-bagged, labelled and

placed into clean, dark coolers. Deeper peat samples were handled similarly, but were acquired either by cutting out a surface block of peat with a clean blade, while measuring depth intervals and acquiring samples, or by using a Russian peat corer for retrieving deeper samples. Gloves were worn and were changed after collecting each sample. Samples were kept frozen at -15˚C or lower until the analyses could be performed.

Samples were analyzed at Dr. Branfireun's University of Toronto laboratory using standard protocols reported to the Ministry of the Environment (MOE) in the AMEC letter report entitled *"Re: Data Summary and Mercury Monitoring Program, De Beers' Victor Mine – Permit to Take Water, Bedrock Well Field Dewatering"*, dated November 13, 2007.

Analytical results are summarized in Table 1. A total of 171 samples were collected from peat depths ranging from 0 to 2.0 m below surface. Mercury concentrations tended to be highest in samples collected from approximately 0.2 m below surface, and were lowest in samples collected from depths below 1.0. The depth weighted, dry-weight average total mercury concentration over the entire peat mass depth of 2 m was calculated at 42.16 µg/kg (or parts per billion - ppb).

An average dry weight peat solids concentration of 40 µg/kg was used in environmental impact calculations presented in Table 5 of the April 2008 permit application document entitled "*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*". It should be noted that the 20 µg/kg value stated in Note 3 of Table 5 in that document is a typographic error. The tabled calculations are correct and use 40 µg/kg; the note is incorrect and should have read 40 µg/kg.

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 are 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 will be resumed in August / September of 2009 and will include these stations.

Muskeg monitoring program pore water sample results for total and methyl mercury filtered samples are provided in Table 2 for all horizons for 2007, and for the peat layer horizon for 2008. As a general observation, concentrations of total and methyl mercury in the peat horizon water samples tended to be higher in 2008 compared with 2007. However, this trend was evident irrespective of sample station location, including samples collected from reference site stations located well beyond the end-of-2008 Victor Mine dewatering cone of depression in the upper bedrock aquifer shown in Figure 2 (i.e., Station Clusters S-1, S-7, S-9(1), S-9(2), S-13, S-15 and MS-V3). The general increases in mercury concentrations observed between 2007 and 2008 therefore appear to be regional year-to-year seasonal differences, and are not likely to be a result of mine dewatering effects on muskeg mercury chemodynamics. Samples in both years were collected during the August / September period, with the exception of the MS-V series total mercury samples that were collected in November 2007.

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) 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); and,
- Fully treated sewage treatment plant effluent (started 2006 and ongoing).

The Southeast Fen (SEF) and the Northwest (NWF) were set up as control fens for the SWF and the NEF, both having had insignificant amounts of water from excavations discharged to them, none at all since the summer of 2005.

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 for these same systems are presented in Table 5. All results are within applicable federal (and provincial) guidelines for the protection of aquatic life.

Total mercury concentrations were generally comparable between the effluent treatment fen stations (SWF and NEF), and the control fen stations (SEF and NWF). The higher total mercury concentrations noted in winter for the various stations are believed to be a function of: (1) the difficulty in retrieving free water samples from under thick ice conditions within the fens, and (2) the ion exclusion process associated with ice formation (Tables 3 and 4).

Maximum water depths associated with the ribbed fens are typically in the order of 1 to 1.3 m. As a result, broad areas of these fens freeze to bottom, or near bottom, and it is difficult to retrieve samples of free water from beneath the ice after mid-winter without disturbing bottom sediments. The filtered sample results shown in Table 4 are therefore a more reliable indicator of total mercury concentrations in the water column, compared with total mercury concentrations shown in Table 3. Also, as the fen water freezes, the ice crystallization process tends to force ions out of the ice matrix, concentrating them in the small amount of free water below the ice. This process applies to all ions, including mercury ions. As freezing and sampling conditions vary within the different fens, the best measures of comparative water quality between effluent treatment and control fen stations are drawn from open water samples collected during July and October. Results for these months are comparable for the four fen systems (Table 4).

Results for methyl mercury, however, show that while still meeting federal and provincial guidelines for the protection of aquatic life, concentrations of methyl mercury were notably higher in the SWF and NEF compared with either of the two control fens. Complications described above in relation to under ice sampling also apply to methyl mercury, so better comparisons are drawn with open water period sampling during July and August.

Methyl mercury concentrations in both the SWF and the NEF are believed to be elevated as a result of increased sulphate levels. Central Quarry water discharged to the SWF during 2006 contained naturally elevated levels of sulphate from deep groundwater. Sulphate reducing bacteria, which are considered largely responsible for the mercury methylation process, utilize sulphate as a nutrient, and hence higher sulphate levels tend to promote increased rates of conversion from total mercury to methyl mercury (Ullrich et al. 2001).

Sulphate concentrations in the Central Quarry discharge and in the SWF during 2006 ranged from about 15 to 75 mg/L during the open water period. Optimal sulphate concentrations for mercury methylation are in the range of 20 to 50 mg/L (Ullrich et al. 2001). Sulphate concentrations of <10 mg/L start to become limiting for sulphate reducing bacteria, but these bacteria can remain active at even at sulphate concentrations as low as 3 mg/L. Sulphate concentrations in the SWF have declined since the cessation of Central Quarry effluent pumping to background levels (≤1 mg/L); but the residual effects of sulphate loading on mercury methylation are still apparent in the SWF as Central Quarry waters have not as yet been fully flushed from the system. This is

evidenced by the still elevated chloride values (21.9 mg/L in July 2008, and 24.0 mg/L in October 2008) measured in the SWF. Waters discharged to the NEF from the construction site excavations and the more recent mine water treatment pond (Phase 1 Pond) also contained elevated sulphate levels which would stimulate the mercury methylation process. Sulphate concentrations in the NEF during 2008 averaged 47.9 mg/L over the year and 15.7 mg/L for the open water period, which is within or near the optimal range for mercury methylation.

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 (Figure 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 started in mid-2007, and has been carried out since, except where prevented by frozen ground conditions. 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. For the current reporting period, peat pore water samples give a conservative (ie. overestimated) measure of peat surface water quality.

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.

Total and methyl mercury sample results for the ribbed fen stations are shown in Tables 6a and 6b for 2007 and 2008. The data show low concentrations of both total and methyl mercury, with generally comparable results for the two years. All total mercury concentrations were <3 ng/L (or parts per trillion - ppt), with the exception of a 5.56 ng/L value recorded for the May 2008 sample from the MS-2-R (MS-V[1]-R) station. The comparatively elevated May 2008 methyl mercury value for this station may indicate an effect of late winter conditions, as some stations were still frozen at this time. For comparison, the Canadian Environmental Quality Objectives (CEQO) value for total mercury for the protection of aquatic life is 26 ng/L; well above any of the observed values.

Methyl mercury values for nearly all fen piezometer stations were <0.05 ng/L, with the exception of: two values for Station MS-1-R, one value for Station MS-2-R, one value for Station MR-9(2)-R, and one value for Station MS-13-R (Table 6). Only one of these four stations (MS-2-R) is located within the zone of measured mine dewatering influence; the other three stations are remote (Figure 2). Station MS-13-R is located off the map area, approximately 28 km west, northwest of the Mine site. An inspection of associated water quality values for the ribbed fen sites provides no additional insight into the reasons for the slightly elevated methyl mercury values. All stations are similar in

their general chemistry and nutrient conditions with the exception of Station MS-8R, which showed markedly elevated concentrations of chloride and sodium, neutral pH, and elevated sulphate values in 2007 but not 2008 (Table 7). Station MS-8R appears to be representative of a zone of groundwater upwelling. But this upwelling effect, including modestly elevated sulphate levels in 2007, has not affected methyl mercury concentrations which were consistently low at this station. MS-8R sulphate concentrations in 2007 were below the threshold where appreciable enhanced mercury methylation would be expected to occur.

By October 2008, all methyl mercury values in the data set were low; generally ≤0.02 ng/L. For comparison, the CEQO value for methyl mercury for the protection of aquatic life is 4 ng/L.

Taking all of the above into consideration, water quality parameters for the three MS-V series sites were generally similar to those of the other more remote ribbed fen muskeg monitoring sites, indicating that mine site activities were not adversely affecting peatland water chemistry, including mercury values, in areas near to the mine site.

Granny Creek System

Upstream and downstream total and methyl mercury concentration data for the Granny Creek system are provided in Tables 8 through 10. Sampling locations are shown in Figure 3. Average total mercury concentrations varied from 2.75 to 3.42 ng/L for unfiltered samples, and from 2.10 to 2.51 ng/L for filtered samples (Tables 8 and 9). These values are well within the 26 ng/L CEQO value for the protection of aquatic life. The graphs attached to Tables 8 and 9 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, nor upstream and 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 Table 10. The values are again highly variable, depending on seasonal and hydrologic influences. All values were consistently low, with the exception of late winter unfiltered samples for North Granny Creek (upstream and downstream), and for the July 2008 samples (unfiltered and filtered) for downstream North Granny Creek. In both instances methyl mercury values were comparatively elevated, but still well within the CEQO value of 4 ng/L for methyl mercury.

While the data for North Granny Creek are suggestive of trends, statistical analyses of upstream and downstream data (filtered results) for 2008, and for 2007 and 2008 combined, showed that spatial differences were not statistically significant (two-way Analysis of Variance; $\alpha = 0.05$). It is also possible that the downstream North Granny Creek, July 2008 values, which contribute substantively to the observed differences between upstream and downstream average methyl mercury concentrations, are spurious, as the July 2008 downstream results are not consistent with the remainder of the database. Statistical arguments aside, the apparent trends in elevated downstream methyl mercury values in North Granny Creek could be linked to elevated methyl mercury values noted for the NEF described above, and possibly also to drainage associated with

muskeg / overburden stockpiles placed adjacent to North Granny Creek on the north side of the open pit.

Moderately increased methyl mercury values are not believed to be linked to well field dewatering effects, as Mine site area peatlands have thus far remained saturated. Further data collection over the next year or two will help to better identify if there are any underlying concerns regarding North Granny Creek methyl mercury concentrations.

Nayshkootayaow and Attawapiskat Rivers

Total and methyl mercury results for the Nayshkootayaow and Attawapiskat Rivers are shown in Tables 11 and 12. Sample locations are shown in Figure 3. All values are very low, consistent across the stations, and well within CEQG values. Further discussions are provided in Section 4.3.

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 2008 have remained low for both total and methyl mercury, as shown in Table 13. Total and methyl mercury concentrations in the well field discharge have thus far been below background concentrations measured in the Attawapiskat River as shown in Table 11 and 12, and there are no evident temporal trends in the data (Figure 4).

Quarterly total and methyl mercury sampling results for operating individual wells are shown in Tables 14 and 15, respectively. During the period of November 2007 through April 2008, samples were collected monthly as a precautionary measure before switching to quarterly sampling as required by the C. of A. Only filtered samples were collected from wells during November 2007. The October 2008 total mercury values for VDW-11 are markedly elevated and were likely contaminated with sediments, or the results are anomalous (Table 14). The methyl mercury concentrations for the October 2008 VDW-11 sample were quite low in keeping with other samples, which would also suggest sediment or other contamination for the total mercury sample.

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

Small fish (minnow species) are to be collected annually from area receiving waters (Granny Creek, Tributary 5A, Nayshkootayaow River, Attawapiskat River). Large fish species are to be collected at three year intervals from the Nayshkootayaow and Attawapiskat Rivers, and from Monument Channel, with Monument Channel serving as the control station for the Nayshkootayaow River.

Small Fish – Granny Creek System

Small fish (pearl dace) were collected for mercury body burden analysis from the Granny Creek and Tributary 5A systems during August 2008. In total, seven pearl dace were collected from North Granny Creek, five from South Granny Creek, and 30 from Tributary 5A (Figure 5). No trout perch were captured. Tributary 5A is the selected control system for comparisons with Granny Creek. Minnows are not normally directly consumed by humans, but it is noteworthy that wet weight total mercury levels in all small fish samples (Table 16), from all monitoring stations including those of Granny Creek and Tributary 5A, averaging 0.165 mg/kg and 0.059 mg/kg respectively, were below the most stringent human health consumption guideline value of 260 ng/g (0.26 mg/kg).

Single factor Analysis of Variance showed that mercury concentrations in fish from North and South Granny Creek were not statistically different ($\alpha = 0.05$). The Granny Creek samples were therefore pooled and compared with samples from Tributary 5A. Analytical results showed that pearl dace from the Granny Creek system had a significantly higher mercury body burden concentration (average 0.165 mg/kg) compared with fish from Tributary 5A (average 0.059 mg/kg), as shown in Table 16. The ratio of the two average body burden values is 2.80.

A contributing factor may be that pearl dace taken from the Granny Creek system were 4.5 times larger on average than those taken from Tributary 5A, with the average weight of individuals from the Granny Creek system being 5.96 g, compared with an average weight of 1.30 g for small fish taken from Tributary 5A. Mercury body burden versus fish weight data for the two systems are shown in Figure 6. The graphs both show a general increase in body burden mercury concentrations with increasing fish weight (measured as mg total mercury per kg wet body weight), but the correlation r^2 values are weak; and where there is overlap in fish weights between the two systems, the pearl dace from Granny Creek still show substantively higher body burden mercury concentrations compared with fish from Tributary 5A. If the Figure 6 equation developed for Tributary 5A is applied to an average sized fish from Granny Creek (i.e., to a 5.96 g fish), the projected mercury concentration is 0.092 mg/kg. This value compares to a calculated value of 0.165 mg/kg for a similar sized fish actually taken from the Granny Creek system. The ratio of the two values is 1.79. Fish size would therefore appear to explain only a portion of the different body burden mercury between the two systems.

To further assess the basis for observed differentials in small fish mercury body burden concentrations between the two systems, AMEC also compared background methyl mercury water quality concentrations in Granny Creek and Tributary 5A. Methyl mercury is the form of mercury most easily taken up by fish. Data for the Granny Creek system were taken from upstream stations dating back to mid-2006 (Stations G1 and G5, Figure 3). These stations are beyond the potential influence of mine site discharges or well field dewatering effects. Results are shown in Table 17. The data for Granny Creek are variable, responding to seasonal and hydrologic influences, but show no long-term trends, indicating that concentrations have not likely been affected by activities at the Victor Mine. In comparing Granny Creek to Tributary 5A, the average methyl mercury concentration for the Granny Creek system for 2008 was 2.6 times greater than for Tributary 5A for this same period, suggesting that background Granny Creek methyl mercury concentrations are naturally elevated compared with those of Tributary 5A. The differential is in the same order as the

differential observed for fish mercury body burden concentrations (i.e., 2.8 for uncorrected weight values, and approximately 1.8 for weight-corrected values).

Data provided by Orihel et al. (2007) suggest a direct linear relationship between mercury concentrations in water and mercury body burden concentrations in small fish. The differences in background methyl mercury concentrations between the Granny Creek and Tributary 5A systems would therefore appear to be sufficient to account for the observed results. Also, as noted in Section 2.3 above, there is some suggestion of methyl mercury enrichment in downstream Granny Creek waters, even though differences are not statistically significant. Enrichment in this case appears to be linked to elevated sulphate levels in effluent waters discharged to the SWF and the NEF, and possibly also to runoff draining from muskeg stockpiles adjacent to the open pit area (see Section 3.3 for further discussion on this aspect). Granny Creek pearl dace were collected from downstream creek waters, and therefore will have been exposed to potentially higher methyl mercury concentrations.

Another possible explanation for the difference in fish body burden mercury concentrations observed between Granny Creek and Tributary 5A relates to fish age. Even though there is overlap between the sizes of pearl dace from the two systems, it is possible that the fish from the two systems represent different year classes. Further discussion on this aspect is presented below.

Small Fish – Nayshkootayaow and Attawapiskat River Systems

The small fish species collected in the greatest numbers from the Nayshkootayaow and Attawapiskat River systems was the trout perch. This species was thus used to compare fish mercury body burdens between the various river stations. The data and single factor Analysis of Variance for the Nayshkootayaow and Attawapiskat River stations are presented in Table 18. The results show that there are statistically significant differences between the different stations at $\alpha = 0.05$. The two stations showing the lowest mercury body burdens are upstream (US) Attawapiskat River Stations (ATT-US-E1 and ATT-US-E2); each with an average mercury concentration of 0.088 mg/kg. The two stations showing the highest average mercury body burdens are the Attawapiskat River downstream (DS) station (ATT-DS - located just upstream of the community of Attawapiskat) with a value of 0.164 mg/kg, and the Nayshkootayaow River station (NR-E1) with a similar value of 0.176 mg/kg. Attawapiskat River Station ATT-US-E3 shows an intermediate value of 0.113 mg/kg.

The data are shown graphically in Figure 7 for the five stations. The three US Attawapiskat River station data sets are interesting because of data groupings. All three stations are located in the same general area upstream of the Victor Mine (Figure 5). Average fish weights from the ATT-US-E1, ATT-US-E2 and ATT-US-E3 stations were 1.48, 0.37 and 5.86 g, respectively. The data for ATT-US-E3 in particular appear to fall into two or possibly three clusters, with the mean mercury body burden concentration for the smallest cluster (averaging 0.079 mg/kg). This value is the same as that for the smallest cluster for the ATT-US-E1 station (also averaging 0.079 mg/kg), and the entire ATT-US-E2 data set (averaging 0.076 mg/kg if the single outlier is excluded). Similarly, the larger circled cluster at Station ATT-US-E3 (averaging 0.157 mg/kg) is similar to the larger data cluster shown for Station ATT-US-E3 (averaging 0.160 mg/kg). The differing body size

clusters therefore appear to account for the differences in mercury body burden concentrations observed between the ATT-US stations.

Similarly, if the Nayshkootayaow River station data are analyzed by cluster, as per Figure 7, the smaller cluster shows an average mercury body burden concentration of 0.097 mg/kg, and the larger circled cluster shows an average concentration of 0.194 mg/kg. These values are similar to the smaller and larger cluster values observed for Station ATT-US-E3 of 0.079 and 0.157 mg/kg, respectively.

The Attawapiskat River downstream Station ATT-DS data in Figure 7 also show two distinct clusters, but the respective average mercury body burden cluster concentrations of 0.149 and 0.180 mg/kg, are somewhat larger compared with those of the other stations. The ATT-DS station is located at UTM coordinates NAD 83, Zone 17 402356E, 5861046N just upstream of the community of Attawapiskat. This area is within the tidal zone influence of James Bay, and therefore exhibits a different water quality regime compared with the upstream Attawapiskat River stations.

As a general observation, and with the exception of the ATT-DS station, inspection of Tables 11, 12, 19c and 19d shows no differences in either total or methyl mercury concentrations in waters of the Attawapiskat and Nayshkootayaow Rivers at the different water quality stations. As such, the observed small fish mercury body burden concentrations shown in Table 18 and in Figure 7 are considered representative of background conditions, and are not in any way influenced by activities at the Victor Mine. Major differences in mercury body burden levels observed in trout perch from the different stations appear to be largely a function of fish body sizes, and in the case of Station ATT-DS the added effects of James Bay tidal influences.

Large Fish

Large fish (northern pike, walleye, common white sucker, longnose sucker, lake whitefish, cisco, brook trout and lake sturgeon) were collected from area receiving waters (Nayshkootayaow and Attawapiskat Rivers) and from Monument Channel (the Nayshkootayaow River control site near Attawapiskat) during 2007 and 2008. These fish collections are intended to provide a baseline reference for assessing future trends in mercury body burden concentrations, should these occur.

Table 4 of C. of A. #3960-7Q4K2G describes large fish sampling requirements. AMEC made best efforts to collect the requisite numbers of samples, but it was not always possible to do so despite considerable effort. However, sufficient numbers of fish were collected to reasonably characterize the baseline condition (Table 20).

Most of the large fish were taken in 2007. The 2008 efforts were directed at trying to increase sample sizes from areas where 2007 sample sizes were considered insufficient.

Baseline mercury data for northern pike and walleye are graphed in Figures 8 and 9. These figures provide an update on data provided in the May 9, 2008 response to questions posed by the Attawapiskat First Nation (*Re: Response to Attawapiskat First Nation Memo of May 2, 2009*). The data indicate that mercury consumption guidelines, at various levels, are frequently exceeded in the

baseline condition for the larger fish specimens. The data also show a broad range of natural variation (scatter) in mercury body burdens for fish of similar size. Virtually all of the larger pike were taken from the Attawapiskat River near the Victor Mine site, which may be an indication of stronger harvest pressures closer to the community.

The data for sucker (common white sucker and longnose sucker) and whitefish are presented in Figures 10 and 11, respectively. Mercury body burden concentrations for these species rarely exceeded the lowest, human consumption guideline threshold of 260 ng/g (wet weight) for mercury. This is expected, as mercury tends to bioaccumulate in those fish species such as pike and walleye that consume other fish.

Future large fish mercury body burden measurements, based on sampling at three year intervals, will be compared against the baseline data set to determine whether or not there have been any changes in mercury levels that could potentially be attributable to Victor Mine dewatering activities. Total and methyl mercury concentrations were consistent across all Attawapiskat and Nayshkootayaow River water quality stations in 2008 (Tables 11 and 12), indicating that large fish mercury data collected in 2007 and 2008 are representative of background conditions.

4.0 REPORTING – CONDITION 6(9) DATA

4.1 Annual Analysis of Peat Pore Water

Statistical analysis of total and methyl mercury peat pore water concentrations is presented in Table 21 for the S-1 stations (Table 21a), the S-2 stations (Table 21b), the S-7 stations (Table 21c), the S-8 stations (Table 21d), the S-9(1) stations (Table 21e), the S-9(2) stations (Table 21f), and the S-V stations (Table 21g). None of the results were significantly different for location effect compared with the S-13 / S-15 background control stations using Two-Way Analysis of Variance at $\alpha = 0.05$, for either total or methyl mercury. In nearly all cases methyl mercury concentrations (the parameter of greatest interest) were slightly higher at the S-13 / S-15 control stations, than for stations closer to the Victor Mine site.

IKONOS satellite imagery obtained from the Victor Mine site area in August 2008, and general site inspections and flyovers, showed no evidence of any meaningful peatland "drying out", in the area of well field induced depressurization of the underlying upper bedrock aquifer. Area surface peats remained completely saturated throughout the period, with the possible exception of small zones immediately adjacent to exposed bioherms and near-surface bedrock subcrop areas, where the Natural Sciences and Engineering Research Council (NSERC) research program early results suggest the potential for very localized effects on peat saturation levels (Appendix A).

4.2 Annual Analysis of Mineral Soil Pore Water

Due to confusion at the Victor Mine over sampling requirements, mineral soil pore water samples were not collected in 2008 (Table 2) in the brief period between the issue of the revised permit and

freeze-up of the peat. The oversight has been noted, and samples will be collected during the late summer of 2009 as per C. of A. requirements.

4.3 Annual Analysis of Surface Waters

Statistical analyses of total and methyl mercury concentrations in surface water samples are presented in Table 19. Monthly analyses of North and South Granny Creek total mercury concentrations for upstream and downstream samples show no statistical differences (Table 19a).

Methyl mercury concentrations in upstream, mid-stream and downstream reaches of North and South Granny Creeks were also not statistically significant, due to high data variability and small sample sizes, but the data are suggestive of a downstream increase in concentrations (Table 19b). Mid-stream and downstream North Granny Creek station average methyl mercury concentrations were higher than for the upstream station; and downstream average methyl mercury concentrations in South Granny Creek were higher than for mid and upstream stations. As indicated in Section 2.3, effluents containing elevated sulphate values discharged to both the SWF and the NEF have likely stimulated methyl mercury production in the fen waters. There is also the potential that downstream Granny Creek waters are being affected by drainage from peat stockpiles and excavations associated with the diversion of South Granny Creek, but relationships here are less clear. Further data collection in 2009 will improve the power of this analysis.

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 19c and 19d).

4.4 Trend Analysis of Well Field Water Discharge

Monthly well field data are presented in Table 13 and are graphed in Figure 4. Concentrations of both total and methyl mercury are lower than for comparable Attawapiskat River background water concentrations (Tables 11 and 12), and there are no evident trends in the data (Figure 4).

4.5 Annual Analysis of Fish Mercury Body Burdens

For discussions on this aspect, refer to Section 2.5.

5.0 CONCLUSIONS

Peat Solids

- Mercury concentrations in area peat solids are low, showing an average dry weight concentration of 42.2 µg/kg averaged over the entire peat thickness of approximately 2 m.

Peat Pore Waters

- Total and methyl mercury concentrations in peat pore waters are considerably lower than the respective CEQG values of 26 ng/L for total mercury and 4 ng/L for methyl mercury. While concentrations of both total and methyl mercury tended to be higher in peat pore water in 2008 compared with 2007, this trend was evident throughout the broader area including at stations located several kilometres beyond any possible influence of the Victor Mine.

- 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.

Surface Waters

- Total mercury concentrations measured in proximal area fen systems (SWF, NEF, SEF and HgCon) showed no evident overall trends.

- 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 sulphate-rich effluent waters which stimulate the mercury methylation process, and are not a function of well field dewatering effects.

- Total mercury concentrations measured in area surface waters (Granny Creek, the Nayshkootayaow River and the Attawapiskat River) show mercury concentrations well below the applicable CEQG value of 26 ng/L, and there are no evident long-term trends in the data.

- Though not statistically significant, there is the suggestion of a trend to higher concentrations of methyl mercury in downstream Granny Creek waters, compared with upstream background conditions. Methyl mercury enrichment in this instance is believed to be related to sulphate-rich mine effluent waters discharged to the SWF and the NEF, as well as possibly to drainage from stockpiled peat materials adjacent to the open pit, and to shallow excavations associated with the diversion of South Granny Creek. There has been no evident "drying out" of area peatlands in relation to well field dewatering, and methyl mercury concentrations measured in Granny Creek are still well below the CEQG value of 4 ng/L.

- Methyl mercury concentrations measured in the Nayshkootayaow and Attawapiskat Rivers show mercury concentrations well below the applicable CEQG value of 4 ng/L and there are no evident long-term trends in the data.

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

Fish Mercury Body Burdens

- Small fish (pearl dace) samples collected from the Granny Creek system show statistically significant, elevated concentrations of mercury compared with pearl dace collected from the Tributary 5A reference station. The difference in body burden mercury concentrations between the two systems is believed to be primarily a function of naturally higher methyl mercury levels in Granny Creek water, possibly aggravated by mine-related methyl mercury increases in Granny Creek downstream waters as described above. Fish body size differentials in the samples also appear to be a contributing factor.

- When allowances are made for small fish body size clusters, there are no apparent differences in fish mercury body burdens between small fish taken from the Attawapiskat and Nayshkootayaow River stations, with the possible exception of fish from the Attawapiskat River downstream station which is subject to James Bay tidal influences, and therefore a different water quality regime.

- Large fish data show that baseline body burden mercury concentrations in northern pike and walleye frequently exceed recommended human consumption guideline thresholds for the larger fish specimens. This is consistent with historical sampling by the Ontario Ministry of Natural Resources.

- Body burden mercury concentrations in non-piscivorous fish species (sucker and whitefish) are generally below the most conservative recommended human consumption guideline thresholds even for larger individual fish.

6.0 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 with the following amendments:

- Summer and fall seepage water samples should be collected from approximately 10 representative areas surrounding peat stockpiles, if these can be identified, and in the immediate vicinity of the South Granny Creek diversion to determine if these features are influencing Granny Creek water quality; and,

- Small fish in the Attawapiskat River should also be collected from the downstream well field discharge mixing area, within the range of 1 to 3 km from the discharge outfall.

7.0 REFERENCES

Orihel et al. (2007). Experimental Evidence of a Linear Relationship between Inorganic Mercury Loading and Methylmercury Accumulation by Aquatic Biota. Environmental Science and Technology. 41(14): 4925 - 4958.

Ullrich, S.M., T.W. Tanton and S.A. Abdrashitova. 2001. Mercury in the Aquatic Environment: A Review of Factors Affecting Methylation. Critical Reviews in Environmental Science and Technology 31(3): 241-293.

TABLE 1
MUSKEG MONITORING PROGRAM 2007 - TOTAL MERCURY CONCENTRATION IN PEAT SOLIDS
(data expressed as µg/kg or parts per billion dry weight)

Cluster Location	Site Name	Sample ID	Depth Below Surface (m)								
			0.0	0.1	0.2	0.3	0.4	0.5	0.5-1.0	1.0-1.5	1.5-2.0
S-1	MS-1-D	ES-1D	142.34	120.74	45.54	41.35	34.30	62.08	51.00	12.46	35.95
	MS-1-R	ES-1R	40.97	71.21	76.62	80.09	72.69	70.65	69.89	21.20	-
S-2	MS-2-D	ES-2D	34.40	63.08	117.02	75.91	40.58	32.90	17.92	27.29	31.18
	MS-2-R	ES-2R	29.24	106.81	103.84	89.56	79.22	85.97	93.17	46.67	-
S-7	MS-7-D	NS-7D	34.71	79.06	74.63	37.71	27.35	33.19	37.77	27.19	18.86
	MS-7-R	NS-7R	28.80	48.57	93.54	30.05	32.42	39.18	45.48	46.05	-
S-8	MS-8-D	NS-8-1D	33.39	55.51	154.06	65.48	75.77	60.41	51.17	12.78	-
	MS-8-R	NS-8-1R	27.67	39.14	44.56	22.67	32.10	33.89	41.83	28.73	-
S-9(1)	MS-9(1)-D	SS-9-1D	33.01	39.74	49.77	64.02	44.33	45.20	41.02	12.41	29.86
	MS-9(1)-R	SS-9-1R	30.69	58.17	56.19	97.34	42.08	37.08	36.01	32.51	26.93
S-9(2)	MS-9(2)-D	SS-9-2D	40.37	42.49	65.26	62.98	36.78	23.59	29.22	30.49	-
	MS-9(2)-R	SS-9-2R	26.63	75.05	165.21	53.48	47.29	79.56	41.77	41.40	28.72
S-13	MS-13-D	WS-13D	35.12	55.39	270.21	30.38	24.18	31.46	27.48	28.56	-
	MS-13-R	WS-13R	73.86	167.39	170.32	110.58	43.55	64.19	33.26	20.25	21.30
S-15	MS-15-D	WS-15D	28.60	196.97	299.49	27.23	83.86	89.81	61.93	25.64	-
	MS-15-R	WS-15R	34.28	109.90	275.71	238.75	120.40	76.46	81.75	-	-
S-V1	MS-V(1)-D	SV-1D	22.89	46.51	80.43	61.19	-	74.60	34.41	28.23	35.32
	See MS-2-R	-	-	-	-	-	-	-	-	-	-
S-V2	MS-V(2)-D	SV-2D	34.83	82.09	175.01	132.33	26.18	15.35	21.67	-	-
	MS-V(2)-R	SV-2R	30.89	107.35	77.58	23.00	23.68	61.43	46.05	-	-
S-V3	MS-V(3)-D	SV-3D	50.91	69.64	89.63	35.00	28.29	21.22	21.84	21.14	-
	MS-V(3)-D	SV-3R	27.18	74.46	63.42	21.03	61.20	46.38	51.17	-	-
Mean (per depth unit)			**40.04**	**81.39**	**121.33**	**66.67**	**48.81**	**51.65**	**44.56**	**27.23**	**28.52**
Mean (weighted over all depths)							**42.16**				

Note: Samples collected under the direction of Dr. Brian Branfireun and analyzed at Dr. Branfireun's laboratory

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TABLE 2

MUSKEG MONITORING PROGRAM - ANNUAL MERCURY RESULTS - 2007

(Sampling August / September, Except for S-V Series collected in November - Data in ng/L or parts per trillion)

Cluster Location	Substrate/Condition	Well Name	GPS Code	Sample Code	Total Mercury (Filtered)		Methyl Mercury (Filtered)	
					2007	2008	2007	2008
S-1	Bedrock (Bioherm)	MS-1-BR	ES1-BR	ES1BDR	1.30	ns	0.01	ns
	Clay - Deep	MS-1-CL(1)	ES1-BR	ES1CLD	1.47	ns	ns	ns
	Clay - Shallow	MS-1-CL(2)	ES1-BR	ES1CLS	0.27	ns	0.01	ns
	Peat - Domed Bog	MS-1-D	ES1D	ES1D	2.22	1.93	0.02	0.07
	Peat - Flat Bog	MS-1-F	ES1F	ES1F	2.73	3.04	0.01	0.18
	Peat - Horizontal Fen	MS-1-H	ES1H	ES1H	na	1.77	na	
	Peat - Ribbed Fen	MS-1-R	ES1R	ES1R	1.81	2.27	0.02	0.07
S-2	Bedrock (Bioherm)	DAS-1	EDAS-1	EDAS-1	0.23	ns	0.00	ns
		MS-2BR	ES2-BR	ES2BR	0.68	ns	0.00	ns
	Clay - Deep	MS-2-CL(1)	ES2-BR	ES2CLD	ns	ns	ns	ns
	Clay - Shallow	MS-2-CL(2)	ES2-BR	ES2CLS	0.98	ns	0.00	ns
	Peat - Domed Bog	MS-2-D	ES2D	ES2D	1.98	2.15	0.00	0.02
	Peat - Flat Bog	MS-2-F	ES2F	ES2F	3.12	3.05	0.00	0.10
	Peat - Ribbed Fen	MS-2-R	ES2R	ES2R	1.56	2.02	0.00	0.04
S-7	BR Shallow		NS7-BR	NS7BRS	1.02	ns	0.09	ns
	BR Intermediate		NS7-BR	NS7BRI	1.93	ns	0.04	ns
	BR Deep		NS7-BR	NS7BRD	2.34	ns	0.03	ns
	Clay - Deep	MS-7-CL(1)	NS7-CL	NS7-CLD	0.59	ns	0.00	ns
	Clay - Intermediate		NS7-CL	NS7-CLI	0.41	ns	0.02	ns
	Clay - Shallow	MS-7-CL(2)	NS7-CL	NS7-CLS	0.70	ns	0.01	ns
	Peat - Domed Bog	MS-7-D	NS-7D	NS-7D	0.72	1.04	0.01	0.01
	Peat - Flat Bog	MS-7-F	NS-7F	NS-7F	1.23	1.61	0.01	0.00
	Peat - Horizontal Fen	MS-7-H	NS-7H	NS-7H	1.24	2.18	0.02	0.06
	Peat - Ribbed Fen	MS-7-R	NS-7R	NS-7R	0.62	0.52	0.01	0.01
S-8	Bedrock (Bioherm)	MS-8-BR(1)	NS8BR1	NS8B1S	7.46	ns	0.03	ns
	Bedrock (Bioherm)	MS-8-BR(2)	NS8BR1	NS8B1I	4.36	ns	0.00	ns
			NS8BR1	NS8B1D	1.83	ns	0.00	ns
	Clay - Deep	MS-8-CL(1)	NS8CL1	NS8C1D	0.31	ns	0.01	ns
	Clay - Middle	MS-8-CL(2)	NS8CL1	NS8C1I	ns	ns	ns	ns
	Clay - Shallow	MS-8-CL(3)	NS8CL1	NS8C1S	0.89	ns	0.03	ns
	Clay - Deep	MS-8-CL(4)	NS8CL2	NS8C2D	0.14	ns	0.01	ns
	Clay - Middle	MS-8-CL(5)	NS8CL2	NS8C2I	0.49	ns	0.00	ns
	Clay - Shallow	MS-8-CL(6)	NS8CL2	NS8C2S	0.33	ns	0.08	ns
	Peat - Domed Bog	MS-8-D	NS8-1D	NS8-1D	1.13	1.49	0.00	0.01
	Peat - Flat Bog	MS-8-F	NS8-1F	NS8-1F	1.91	2.85	0.00	0.08
	Peat - Horizontal Fen	MS-8-H	NS8-1H	NS8-1H	0.56	0.55	0.01	0.01
	Peat - Ribbed Fen	MS-8-R	NS8-1R	NS8-1R	1.00	0.98	0.00	0.01
S-9(1)	Bedrock (Bioherm)	MS-9(1)-BR			ns	ns	ns	ns
	Clay - Deep	MS-9(1)-CL(1)	SS9CL1	SS9C1D	0.66	ns	0.01	ns
	Clay - Shallow	MS-9(1)-CL(2)	SS9CL1	SS9C1S	1.03	ns	0.01	ns
	Peat - Domed Bog	MS-9(1)-D	SS9-1D	SS9-1D	0.77	0.77	0.01	0.00
	Peat - Flat Bog	MS-9(1)-F	SS9-1F	SS9-1F	2.53	1.74	0.01	0.04
	Peat - Horizontal Fen	MS-9(1)-H	SS9-1H	SS9-1H	2.65	2.06	0.02	0.05
	Peat - Ribbed Fen	MS-9(1)-R	SS9-1R	SS9-1R	0.72	1.26	0.02	0.03
S-9(2)	Bedrock (Bioherm)	MS-9(2)-BR			ns	ns	ns	ns
	Clay - Deep	MS-9(2)-CL(1)	SS9CL2	SS9C2D	1.09	ns	0.01	ns
	Clay - Shallow	MS-9(2)-CL(2)	SS9CL2	SS9C2S	0.44	ns	0.00	ns
	Peat - Domed Bog	MS-9(2)-D	SS9-2D	SS9-2D	1.72	1.89	0.01	0.02
	Peat - Flat Bog	MS-9(2)-F	SS9-2F	SS9-2F	1.10	1.27	0.00	0.06
	Peat - Horizontal Fen	MS-9(2)-H	SS9-2H	SS9-2H	0.80	0.59	0.00	0.01
	Peat - Ribbed Fen	MS-9(2)-R	SS9-2R	SS9-2R	1.29	0.90	0.00	0.06
S-13	Bedrock (Bioherm)	MS-13-BR	WS13BR	WS13BS	2.57	ns	0.00	ns
			WS13BR	WS13BD	1.19	ns	0.00	ns
	Clay - Deep	MS-13-CL(1)	WS13CL	WS13CD	0.42	ns	0.03	ns
			WS13CL	WS13CI	1.48	ns	0.04	ns
	Clay - Shallow	MS-13-CL(2)	WS13CL	WS13CS	0.50	ns	0.02	ns
	Peat - Domed Bog	MS-13-D	WS13-D	WS13-D	2.81	2.68	0.03	0.12
	Peat - Flat Bog	MS-13-F	WS13-F	WS13-F	1.60	2.79	0.07	0.24
	Peat - Horizontal Fen	MS-13-H	WS13-H	WS13-H	ns	0.57	0.02	0.01
	Peat - Ribbed Fen	MS-13-R	WS13-R	WS13-R	0.40	0.95	0.13	0.00
S-15	Bedrock (Bioherm)	MS-15-BR	WS15BR	WS15BS	2.00	ns	0.01	ns
			WS15BR	WS15BD	0.58	ns	0.01	ns
	Clay - Deep	MS-15-CL(1)	WS15CL	WS15CD	is	ns	0.01	ns
			WS15CL	WS15CI	1.70	ns	0.00	ns
	Clay - Shallow	MS-15-CL(2)	WS15CL	WS15CS	0.69	ns	0.01	ns
	Peat - Domed Bog	MS-15-D	WS15-D	WS15-D	1.35	1.89	0.01	0.04
	Peat - Flat Bog	MS-15-F	WS15-F	WS15-F	2.66	2.55	0.00	0.07
	Peat - Horizontal Fen	MS-15-H	WS15-H	WS15-H	0.99	0.90	ns	0.01
	Peat - Ribbed Fen	MS-15-R	WS15-R	WS15-R	0.43	0.92	0.02	0.02
S-V1	Peat - Domed Bog	MS-V(1)-D	-	NS-V-1D	1.96	0.60	ns	0.01
	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
S-V2	Peat - Domed Bog	MS-V(2)-D	-	SS-V-2D	1.97	1.16	ns	0.01
	Peat - Ribbed Fen	MS-V(2)-R	-	SS-V(2)-R	0.59	0.60	ns	0.00
S-V3	Peat - Domed Bog	MS-V(3)-D	-	SS-V-3D	0.72	0.61	ns	0.10
	Peat - Ribbed Fen	MS-V(3)-R	-	SS-V(3)-R	1.08	1.69	ns	0.02

Notes na - not accessible
is - insufficient sample
ns - no sample

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

Unfiltered Samples				
Date	**Southwest Fen (SWF/F)**	**Northeast Fen (NEF/F)**	**Southeast Fen (SEF/F)**	**Northwest Control (HgCON)**
1-May-06	0.77	0.62	-	-
5-Jun-06	2.44	1.72	-	-
3-Jul-06	2.49	1.26	2.51	2.64
21-Aug-06	1.86	0.83	-	-
17-Sep-06	1.29	1.25	-	-
3-Oct-06	1.59	0.53	1.09	1.70
4-Dec-06	4.65	1.08	-	-
8-Jan-07	3.01	0.86	1.51	2.77
11-Feb-07	2.84	0.99	-	-
13-Mar-07	Frozen	3.14	-	-
16-Apr-07	Frozen	2.34	-	-
7-May-07	2.07	1.31	1.43	1.25
11-Jun-07	1.96	1.21	-	-
2-Jul-07	2.40	0.87	1.57	2.87
6-Aug-07	3.85	1.30	-	-
12-Sep-07	2.28	1.32	-	-
1-Oct-07	3.74	1.12	3.57	4.51
5-Nov-07	2.86	0.68	-	-
3-Dec-07	3.42	1.41	-	-
27-Jan-08	6.55	3.33	13.30	4.36
4-Feb-08	5.70	3.52	-	-
10-Mar-08	9.79	4.64	-	-
7-Apr-08	16.30	5.67	Frozen	2.80
5-May-08	1.78	1.33	-	-
2-Jun-08	2.37	1.11	-	-
7-Jul-08	3.19	1.54	2.42	3.47
4-Aug-08	2.98	2.51	-	-
1-Sep-08	2.76	2.22	-	-
6-Oct-08	1.84	1.02	1.44	1.60
3-Nov-08	1.80	0.76	-	-
1-Dec-08	2.19	0.92	-	-
Average	3.47	1.69	3.20	2.80

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

Filtered Samples				
Date	**Southwest Fen (SWF/F)**	**Northeast Fen (NEF/F)**	**Southeast Fen (SEF/F)**	**Northwest Control (HgCON)**
1-May-06	0.64	0.48	-	-
5-Jun-06	2.32	-	-	-
3-Jul-06	1.96	0.86	1.38	1.82
21-Aug-06	1.34	0.72	-	-
17-Sep-06	1.11	0.61	-	-
3-Oct-06	0.85	0.44	0.94	1.19
4-Dec-06	3.05	0.59	-	-
8-Jan-07	1.86	0.47	1.01	1.73
11-Feb-07	1.90	0.48	-	-
13-Mar-07	Frozen	3.03	-	-
16-Apr-07	Frozen	1.69	-	-
7-May-07	1.31	1.41	0.89	1.03
11-Jun-07	1.24	1.05	-	-
2-Jul-07	1.74	0.70	1.48	1.70
6-Aug-07	2.45	0.98	-	-
12-Sep-07	1.87	0.69	-	-
1-Oct-07	2.89	1.04	3.11	3.92
5-Nov-07	2.66	0.60	-	-
3-Dec-07	3.22	1.00	-	-
27-Jan-08	4.86	2.10	2.21	3.07
4-Feb-08	5.40	2.32	-	-
10-Mar-08	3.79	3.41	-	-
7-Apr-08	6.72	2.41	Frozen	2.41
5-May-08	1.22	1.01	-	-
2-Jun-08	1.63	1.11	-	-
7-Jul-08	2.87	1.38	2.02	2.88
4-Aug-08	2.55	1.81	-	-
1-Sep-08	2.07	1.90	-	-
6-Oct-08	1.71	1.04	1.12	1.33
3-Nov-08	1.77	0.66	-	-
1-Dec-08	2.02	0.86	-	-
Average	2.38	1.23	1.57	2.11

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

Unfiltered Samples				
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	-	-	1.07	0.34
Feb-08	5.58	1.72	-	-
Mar-08	Frozen	2.07	Frozen	Frozen
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

Filtered Samples				
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	-	-	0.39	0.17
Feb-08	3.48	1.29	-	-
Mar-08	Frozen	1.34	Frozen	Frozen
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

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 Mar 13, 2009

TABLE 6a
TOTAL MERCURY - RIBBED FEN SURFACE WATERS (Sampled as Peat Pore Water)
(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	-	-
Nov-07	1.67	2.30	0.82	1.36	1.11	1.01	1.70	1.11	2.30	-	-
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
Average	2.03	2.50	0.67	1.10	0.98	0.98	0.94	0.64	2.50	0.51	1.51

TABLE 6b
METHYL MERCURY - RIBBED FEN SURFACE WATERS (Sampled as Peat Pore Water)
(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	0.00	0.01	0.00	0.02	0.00	**0.13**	0.02	0.00	-	-
Nov-07	0.02	0.00	0.01	0.01	0.00	0.02	0.00	0.01	0.00	-	-
May-08	**0.11**	**0.07**	F	0.00	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**	0.00	0.02	0.04	0.00	0.02
Oct-08	0.02	0.01	0.01	0.01	0.02	0.04	0.01	0.02	0.01	0.00	0.01
Average	0.05	0.02	0.01	0.01	0.02	0.03	0.03	0.02	0.02	0.00	0.02

Notes:

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

CCME Protection of Aquatic Life Guideline - 26 ng/L

TABLE 7
MUSKEG SYSTEM RIBBED FEN PORE WATER GENERAL CHEMISTRY RESULTS - ALL YEARS

Station	Year	Number of Samples	Parameter										
			Cl (mg/L)	Cond (us/cm)	Nitrate (mg/L)	DOC (mg/L)	pH (units)	SO4 (mg/L)	TP (mg/L)	Ca-D (mg/L)	Fe-D (mg/L)	Mg-D (mg/L)	Na-D (mg/L)
MS-1V-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
MS-2V-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
MS-3V-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
MS-1R	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
MS-7R	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
MS-8R	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**
MS-9(1)R	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
MS-9(2)R	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
MS-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
MS-15R	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

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

TABLE 8
TOTAL MERCURY - GRANNY CREEK
(unfiltered; concentrations in ng/L)

Date	N. Granny Cr. Upstream (NGC/UP/NWF)	N. Granny Cr. Downstream (NGC/DN/NEF)	S. Granny Cr. Upstream (SGC/UP/SWF)	S. Granny Cr. Downstream (SGC/DS/SWF)
1-May-06	1.18	1.66	0.86	1.26
5-Jun-06	3.55	-	3.37	3.16
3-Jul-06	2.92	2.8	2.72	3.08
24-Aug-06	4.21	3.77	2.57	2.6
17-Sep-06	2.37	2.26	2.28	2.74
3-Oct-06	-	1.61	1.34	1.3
4-Dec-06	2.53	4.58	2.23	2.08
8-Jan-07	2.02	2.35	16.2	4.52
11-Feb-07	-	2.02	3.57	3.16
13-Mar-07	7.17	Frozen	Frozen	7.43
16-Apr-07	8.82	5.87	3.72	3.76
7-May-07	3.01	3.02	2.46	2.08
11-Jun-07	3.34	2.99	2.49	3.04
2-Jul-07	3.16	2.23	2.73	2.03
6-Aug-07	3.1	1.94	-	2.17
12-Sep-07	1.96	2.04	4.41	1.61
1-Oct-07	5.91	5.67	5.16	3.79
5-Nov-07	3.19	3.00	2.74	2.49
3-Dec-07	2.42	2.60	2.67	2.61
26-Jan-08	2.95	2.42	2.97	2.94
4-Feb-08	2.19	2.29	3.76	2.91
10-Mar-08	0.46	2.66	3.06	3.35
7-Apr-08	11.90	Frozen	2.19	2.91
5-May-08	3.54	3.73	3.37	3.42
2-Jun-08	3.06	3.08	2.55	2.81
16-Jul-08	3.28	1.61	3.60	2.68
4-Aug-08	2.71	2.69	2.63	2.38
1-Sep-08	1.76	2.32	1.94	2.78
8-Oct-08	1.37	1.57	2.14	1.83
3-Nov-08	3.20	2.39	-	1.81
1-Dec-08	1.82	1.83	1.84	1.88
Average	3.42	2.75	3.27	2.79

Note: May 7, 2007 US Granny Cr. values are for DS of NW Fen

Note : Very heavy rains in Sep and Oct 2007

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

Date	N. Granny Cr. Upstream (NGC/UP/NWF)	N. Granny Cr. Downstream (NGC/DN/NEF)	S. Granny Cr. Upstream (SGC/UP/SWF)	S. Granny Cr. Downstream (SGC/DS/SWF)
1-May-06	0.87	0.90	0.55	0.90
5-Jun-06	2.91	-	-	2.83
3-Jul-06	2.33	2.22	2.07	1.94
24-Aug-06	3.43	3.03	2.07	1.94
17-Sep-06	1.64	1.70	1.34	2.11
3-Oct-06	-	1.30	1.11	0.97
4-Dec-06	1.98	3.98	1.92	1.58
8-Jan-07	1.06	1.40	2.01	3.37
11-Feb-07	-	0.75	0.79	1.90
13-Mar-07	7.05	Frozen	Frozen	2.92
16-Apr-07	4.19	2.50	1.96	1.84
7-May-07	2.40	2.56	2.40	1.83
11-Jun-07	2.51	2.64	2.26	1.79
2-Jul-07	2.96	2.10	2.32	2.01
6-Aug-07	1.52	1.81	-	1.70
12-Sep-07	1.96	1.75	3.87	1.49
1-Oct-07	5.19	5.60	4.76	3.42
5-Nov-07	2.91	2.74	2.45	2.16
3-Dec-07	2.05	2.18	2.35	2.61
26-Jan-08	1.42	1.63	2.21	2.33
4-Feb-08	1.91	1.60	2.24	2.08
10-Mar-08	1.76	1.63	1.76	1.98
7-Apr-08	1.84	Frozen	1.63	2.06
5-May-08	3.16	3.21	2.90	2.97
2-Jun-08	2.74	2.72	2.29	2.36
7-Jul-08	2.95	1.49	2.84	2.32
4-Aug-08	2.39	2.34	2.23	2.06
1-Sep-08	1.35	1.88	1.62	1.60
8-Oct-08	1.19	1.40	1.88	1.27
3-Nov-08	2.28	2.15	-	1.73
1-Dec-08	1.30	1.65	1.77	1.71
Average	2.51	2.22	2.19	2.10

Note: May 7, 2007 US Granny Cr. values are for DS of NW Fen

Note : Very heavy rains in Sep and Oct 2007

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

South Granny Creek				
Date	**Upstream SGC/UP/SWF**		**Downstream SGC/DS/SWF**	
	Unfiltered	**Filtered**	**Unfiltered**	**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
Mean	0.06	0.05	0.08	0.06

North Granny Creek				
Date	**Upstream NGC/UP/NWF**		**Downstream NGC/DN/NEF**	
	Unfiltered	**Filtered**	**Uunfiltered**	**Filtered**
Jul-06	0.11	0.05	0.10	0.08
Oct-06	-	-	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	-	-	0.26	0.15
Feb-08	0.09	0.06	-	-
Mar-08	-	-	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
Mean	0.13	0.07	0.18	0.14

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

Quarterly sampling in accordance with Amended C. of A. #3960-7Q4K2G, dated Mar 13, 2009

TABLE 11a
TOTAL 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	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
Average	**2.52**	**2.63**	**3.36**	**1.99**	**4.00**	**2.35**	**4.49**	**2.36**

TABLE 11b
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-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
Average	**1.83**	**1.83**	**2.11**	**1.67**	**2.04**	**1.87**	**1.86**	**1.87**

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 12a
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
Average	**0.05**	**0.05**	**0.07**	**0.08**	**0.08**	**0.04**	**0.08**	**0.04**

TABLE 12b
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
Average	**0.03**	**0.03**	**0.04**	**0.06**	**0.03**	**0.03**	**0.03**	**0.03**

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

TABLE 13
MERCURY CONTENT IN WELL FIELD DISCHARGE
(ng/L)

Date	Total Mercury		Methyl Mercury		Wells in Production
	Unfiltered	Filtered	Unfiltered	Filtered	
5-Nov-07	1.33	1.32	0.00	0.00	VDW-6, 11 and 22
3-Dec-07	1.33	0.95	0.01	0.01	VDW-6, 11 and 22
6-Jan-08	0.87	0.61	0.01	0.01	VDW-6, 11, 15, 17 and 22
3-Feb-08	1.55	1.27	0.00	0.01	VDW-6, 11 and 22
2-Mar-08	0.70	0.69	0.00	0.01	VDW-6, 11, 15, 17 and 22
7-Apr-08	0.84	0.69	0.02	0.02	VDW-7, 11, 15, 17 and 22
5-May-08	0.78	0.63	0.00	0.00	VDW-7, 11, 15, 17 and 22
2-Jun-08	0.72	0.60	-	-	VDW-7, 11, 15, 17 and 22
7-Jul-08	0.65	0.47	0.01	0.01	VDW-6, 11, 15, 17 and 22
3-Aug-08	2.63	0.99	-	-	VDW-6, 11, 15, 17 and 22
1-Sep-08	0.67	0.57	-	-	VDW-6, 11, 15, 17 and 22
13-Oct-08	2.20	2.01	0.00	0.00	VDW-3, 6, 7, 11, 15, 17 and 22
7-Nov-08	1.00	0.92	0.00	0.00	VDW-3, 6, 7, 11, 15, 17 and 22
1-Dec-08	1.34	1.07	0.01	0.01	VDW-3, 6, 7, 11, 15, 17 and 22
Average	1.19	0.91	0.005	0.007	

CEQG-PAL: Total mercury - 26 ng/L; methyl mercury - 4 ng/L

TABLE 14a
TOTAL MERCURY - INDIVIDUAL MINE DEWATERING WELLS
(unfiltered; concentrations in ng/L)

Date	VDW-3	VDW-6	VDW-7	VDW-11	VDW-15	VDW-17	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	**38.60**	0.07	0.06	6.52
Average	**0.03**	**0.13**	**0.42**	**7.14**	**0.28**	**0.19**	**3.74**

TABLE 14b
TOTAL MERCURY - INDIVIDUAL MINE DEWATERING WELLS
(filtered; concentrations in ng/L)

Date	VDW-3	VDW-6	VDW-7	VDW-11	VDW-15	VDW-17	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	**17.40**	0.09	0.06	6.09
Average	**0.05**	**0.11**	**0.41**	**3.07**	**0.12**	**0.18**	**2.97**

Notes: CCME Protection of Aquatic Life Guideline - 26 ng/L
Average values for VDW-11 exclude the anomalous Oct 2008 value
Sampling locations and frequency governed by Amended C. of A. #3960-7Q4K2G, dated March 13, 2009

TABLE 15a
METHYL MERCURY - INDIVIDUAL MINE DEWATERING WELLS
(unfiltered; concentrations in ng/L)

Date	VDW-3	VDW-6	VDW-7	VDW-11	VDW-15	VDW-17	VDW-22
Nov-07	-	-	-	-	-	-	-
Dec-07	-	0.00	-	0.01	-	-	0.01
Jan-08	-	0.01	-	0.01	0.01	0.01	0.01
Feb-08	-	0.00	-	0.00	-	-	0.00
Mar-08	-	0.02	-	0.02	0.02	0.01	0.02
Apr-08	-	-	-	0.01	0.01	0.00	0.00
Jul-08	-	0.01	-	0.02	0.02	0.02	0.01
Oct-08	0.00	0.01	0.01	0.01	0.00	0.01	0.01
Average	**0.00**	**0.01**	**0.01**	**0.01**	**0.01**	**0.01**	**0.01**

TABLE 15b
METHYL MERCURY - INDIVIDUAL MINE DEWATERING WELLS
(filtered; concentrations in ng/L)

Date	VDW-3	VDW-6	VDW-7	VDW-11	VDW-15	VDW-17	VDW-22
Nov-07	-	0.01	-	0.01	-	-	0.00
Dec-07	-	0.01	-	0.00	-	-	0.01
Jan-08	-	0.01	-	0.01	0.01	0.01	0.01
Feb-09	-	0.01	-	0.01	-	-	0.01
Mar-09	-	0.00	-	0.01	0.01	0.01	0.02
Apr-08	-	-	-	0.01	0.02	0.01	0.02
Jul-08	-	0.02	-	0.00	0.01	0.01	0.02
Oct-08	0.01	0.00	0.00	0.00	0.01	0.01	0.01
Average	**0.01**	**0.01**	**0.00**	**0.01**	**0.01**	**0.01**	**0.01**

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

TABLE 16
SMALL FISH MERCURY ANALYSIS - GRANNY CREEK vs TRIBUTARY 5A
(Pearl Dace)

Location	Granny Creek		Tributary 5A	
Condition	Concentrations (mg/kg - ww)	Concentrations Squared	Concentrations (mg/kg - ww)	Concentrations Squared
Values	**0.2258**	0.0510	**0.0714**	0.0051
	0.1827	0.0334	**0.0947**	0.0090
	0.1078	0.0116	**0.0738**	0.0055
	0.1970	0.0388	**0.0436**	0.0019
	0.1471	0.0216	**0.0688**	0.0047
	0.1868	0.0349	**0.1076**	0.0116
	0.1433	0.0205	**0.0524**	0.0027
	0.1550	0.0240	**0.0540**	0.0029
	0.1936	0.0375	**0.0476**	0.0023
	0.1464	0.0214	**0.0701**	0.0049
	0.1150	0.0132	**0.0631**	0.0040
	0.1820	0.0331	**0.0502**	0.0025
			0.0498	0.0025
			0.0620	0.0038
			0.0552	0.0031
			0.0513	0.0026
			0.0540	0.0029
			0.0606	0.0037
			0.0298	0.0009
			0.0459	0.0021
			0.0415	0.0017
			0.0852	0.0073
			0.0689	0.0047
			0.0913	0.0083
			0.0602	0.0036
			0.0319	0.0010
			0.0267	0.0007
			0.0218	0.0005
			0.0716	0.0051
			0.0719	0.0052
Average	**0.1652**		**0.0592**	
Sum	1.983	0.341	1.777	0.117

ANALYSIS OF VARIANCE TABLES

Total SS	0.121507823
Group SS	0.096289815
Within SS	0.025218008

Source Variation	df	SS	MS	F_{cal}	F_{tab}
Among Groups	1	0.0963	0.0963	**156.55**	**4.08**
Within Groups	41	0.0252	0.0006		
Total	42	0.1215			

Location Effect is **Highly Significant**

TABLE 17
Granny Creek and Tributary 5A Background Methyl Mercury Water Quality Concentrations
(filtered, ng/L)

Date	North Granny Creek US	South Granny Creek US	Tributary 5A
Jul-06	0.05	0.05	-
Oct-06	-	0.03	-
Jan-07	0.08	0.08	-
May-07	0.06	0.04	-
Jul-07	0.06	0.05	-
Oct-07	0.09	0.04	-
Jan / Feb	0.06	0.10	0.02
Apr-08	0.08	0.04	0.02
Jul-08	0.09	0.04	0.03
Oct-08	0.05	0.02	0.02
Average	**0.069**	**0.049**	**0.023**

TABLE 18
SMALL FISH MERCURY ANALYSIS - NAYSHKOOTAYAOW AND ATTAWAPISKAT RIVERS
(Trout Perch)

Location	Nayshkootayaow River (NR-E1)		Attawapiskat River (ATT-US-E1)		Attawapiskat River (ATT-US-E2)		Attawapiskat River (ATT-US-E3)		Attawapiskat River (ATT-DS)	
Condition	Concentrations (mg/kg - ww)	Concentrations Squared	Concentrations (mg/kg - ww)	Concentrations Squared	Concentrations (mg/kg - ww)	Concentrations Squared	Concentrations (mg/kg - ww)	Concentrations Squared	Concentrations (mg/kg - ww)	Concentrations Squared
Values	0.208	0.0433	0.158	0.0248	0.218	0.0476	0.184	0.0338	0.167	0.0279
	0.216	0.0468	0.096	0.0093	0.088	0.0078	0.175	0.0308	0.182	0.0330
	0.167	0.0280	0.160	0.0257	0.070	0.0050	0.164	0.0269	0.197	0.0386
	0.358	0.1285	0.105	0.0111	0.102	0.0105	0.122	0.0149	0.248	0.0616
	0.177	0.0312	0.074	0.0055	0.095	0.0090	0.154	0.0236	0.122	0.0148
	0.271	0.0737	0.072	0.0052	0.075	0.0056	0.202	0.0407	0.200	0.0400
	0.258	0.0667	0.072	0.0051	0.069	0.0048	0.167	0.0280	0.161	0.0261
	0.263	0.0693	0.093	0.0087	0.065	0.0042	0.112	0.0125	0.186	0.0344
	0.258	0.0666	0.074	0.0055	0.075	0.0056	0.139	0.0193	0.177	0.0315
	0.240	0.0575	0.058	0.0033	0.077	0.0059	0.075	0.0057	0.170	0.0288
	0.199	0.0396	0.071	0.0050	0.083	0.0069	0.098	0.0096	0.112	0.0124
	0.295	0.0869	0.067	0.0044	0.041	0.0017	0.066	0.0044	0.134	0.0179
	0.092	0.0085	0.049	0.0024			0.080	0.0064	0.211	0.0445
	0.221	0.0488	0.101	0.0102			0.091	0.0083	0.244	0.0594
	0.148	0.0218	0.048	0.0023			0.081	0.0065	0.130	0.0169
	0.263	0.0693	0.105	0.0109			0.062	0.0038	0.106	0.0112
	0.190	0.0360	0.065	0.0042			0.084	0.0071	0.162	0.0262
	0.143	0.0205	0.085	0.0072			0.079	0.0062	0.106	0.0113
	0.165	0.0273	0.075	0.0056			0.080	0.0064	0.180	0.0326
	0.183	0.0333	0.212	0.0450			0.067	0.0044	0.166	0.0274
	0.118	0.0138	0.070	0.0049			0.082	0.0067	0.153	0.0234
	0.125	0.0157	0.116	0.0134					0.163	0.0265
	0.165	0.0273	0.071	0.0050					0.129	0.0166
	0.191	0.0365	0.066	0.0043					0.125	0.0157
	0.106	0.0113	0.093	0.0086						
	0.090	0.0082	0.089	0.0079						
	0.094	0.0089	0.097	0.0094						
	0.115	0.0131	0.068	0.0046						
	0.072	0.0052	0.069	0.0047						
	0.125	0.0157	0.076	0.0058						
	0.107	0.0115								
	0.089	0.0080								
	0.099	0.0098								
Count	33		30		12		21		24	
Average	0.1762		0.0884		0.0882		0.1125		0.1637	
Sum	5.518	1.159	2.653	0.270	1.059	0.114	2.363	0.306	3.929	0.679

ANALYSIS OF VARIANCE TABLES

Total SS	0.5208
Group SS	0.1521
Within SS	0.3688

Source Variation	df	SS	MS	F_{cal}	F_{tab}
Among Groups	4	0.1521	0.0380	**12.27**	**2.45**
Within Groups	119	0.3688	0.0031		
Total	123	0.5208			

Location Effect is **Significant**

TABLE 19a
GRANNY CREEK - STATISTICAL ANALYSIS - TOTAL MERCURY - 2008
(filtered samples, concentrations in ng/L)

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

Date	US NWF	DS NEF	Sum r.
Jan	1.42	1.63	3.05
Feb	1.91	1.60	3.51
Mar	1.76	1.63	3.39
May	3.16	3.21	6.37
Jun	2.74	2.72	5.46
Jul	2.95	1.49	4.44
Aug	2.39	2.34	4.73
Sep	1.35	1.88	3.23
Oct	1.19	1.40	2.59
Nov	2.28	2.15	4.43
Dec	1.30	1.65	2.95
Sum c.	22.45	21.70	44.15

Total SS	8.307
Treat SS	0.026
Block SS	6.928
Error SS	1.354

ANOVA Table					
Source V.	d.f.	SS	MS	F_{cal}	F_{tab} 0.05
Total	21	8.307	-		
Treatment	1	0.026	0.026	**0.19**	**4.96**
Block	10	6.928	0.693	5.12	2.98
Error	10	1.354	0.135		

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

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

Date	US SWF	DS SWF	Sum r.
Jan	2.21	2.33	4.54
Feb	2.24	2.08	4.32
Mar	1.76	1.98	3.74
May	1.63	2.06	3.69
Jun	2.90	2.97	5.87
Jul	2.29	2.36	4.65
Aug	2.84	2.32	5.16
Sep	2.23	2.06	4.29
Oct	1.62	1.60	3.22
Nov	1.88	1.27	3.15
Dec	1.77	1.71	3.48
Sum c.	23.37	22.74	46.11

Total SS	4.031
Treat SS	0.018
Block SS	3.552
Error SS	0.461

ANOVA Table					
Source V.	d.f.	SS	MS	F_{cal}	F_{tab} 0.05
Total	21	4.031	-		
Treatment	1	0.018	0.018	**0.39**	**4.96**
Block	10	3.552	0.355	7.70	2.98
Error	10	0.461	0.046		

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

TABLE 19b
GRANNY CREEK - STATISTICAL ANALYSIS - METHYL MERCURY - 2008
(filtered samples, concentrations in ng/L)

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

Habitat	US NWF	DS NEF	US CONF	Sum r.
Jan / Feb	0.06	0.15	0.13	0.34
Apr	0.08	0.05	0.05	0.18
Jul	0.09	0.49	0.48	1.06
Oct	0.05	0.11	0.15	0.31
Sum c.	0.28	0.80	0.81	1.89

Total SS	0.272
Treat SS	0.046
Block SS	0.158
Error SS	0.068

ANOVA Table

Source V.	d.f.	SS	MS	F_{cal}	F_{tab} 0.05
Total	11	0.272	-		
Treatment	2	0.046	0.023	**2.02**	**5.14**
Block	3	0.158	0.053	4.64	4.76
Error	6	0.068	0.011		

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

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

Habitat	US SWF	DS SWF	US CONF	Sum r.
Jan / Feb	0.10	0.07	0.09	0.26
Apr	0.04	0.09	0.20	0.33
Jul	0.04	0.06	0.30	0.40
Oct	0.02	0.03	0.06	0.11
Sum c.	0.20	0.25	0.65	1.10

Total SS	0.072
Treat SS	0.030
Block SS	0.015
Error SS	0.026

ANOVA Table

Source V.	d.f.	SS	MS	F_{cal}	F_{tab} 0.05
Total	11	0.072	-		
Treatment	2	0.030	0.015	**3.49**	**5.14**
Block	3	0.015	0.005	1.17	4.76
Error	6	0.026	0.004		

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

TABLE 19c
NAYSHKOOTAYAOW RIVER - STATISTICAL ANALYSIS - MERCURY - 2008
(filtered samples, concentrations in ng/L)

TOTAL MERCURY DATA AND TWO-WAY ANALYSIS OF VARIANCE TABLES

Habitat	Nash R. US	Nash R. M	Nash R. DS	Sum r.
Jan / Feb	1.15	1.12	2.31	4.58
Apr	2.71	2.71	2.35	7.77
Jul	1.66	1.71	1.89	5.26
Oct	1.79	1.79	1.90	5.48
Sum c.	7.31	7.33	8.45	23.09

Total SS	2.965
Treat SS	0.213
Block SS	1.920
Error SS	0.832

ANOVA Table					
Source V.	d.f.	SS	MS	F_{cal}	F_{tab} 0.05
Total	11	2.965	-		
Treatment	2	0.213	0.106	**0.77**	**5.14**
Block	3	1.920	0.640	4.62	4.76
Error	6	0.832	0.139		

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

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

METHYL MERCURY DATA AND TWO-WAY ANALYSIS OF VARIANCE TABLES

Habitat	Nash R. US	Nash R. M	Nash R. DS	Sum r.
Jan / Feb	0.03	0.02	0.03	0.08
Apr	0.01	0.03	0.02	0.06
Jul	0.05	0.05	0.06	0.16
Oct	0.03	0.02	0.03	0.08
Sum c.	0.12	0.12	0.14	0.38

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

ANOVA Table					
Source V.	d.f.	SS	MS	F_{cal}	F_{tab} 0.05
Total	11	0.002	-		
Treatment	2	0.000	0.000	**0.60**	**5.14**
Block	3	0.002	0.001	11.80	4.76
Error	6	0.000	0.000		

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

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

TABLE 19d
ATTAWAPISKAT RIVER - STATISTICAL ANALYSIS - MERCURY - 2008
(filtered samples, 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 / Feb	2.36	2.12	1.73	1.97	8.18
Apr	2.62	2.58	2.80	2.64	10.64
Jul	1.57	1.53	1.53	1.49	6.12
Oct	1.60	1.24	1.39	1.39	5.62
Sum c.	8.15	7.47	7.45	7.49	30.56

Total SS	4.227
Treat SS	0.087
Block SS	3.921
Error SS	0.220

ANOVA Table

Source V.	d.f.	SS	MS	F_{cal}	F_{tab} 0.05
Total	15	4.227	-		
Treatment	3	0.087	0.029	**1.19**	**3.86**
Block	3	3.921	1.307	53.54	3.86
Error	9	0.220	0.024		

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

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

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 / Feb	0.04	0.05	0.03	0.04	0.16
Apr	0.01	0.03	0.02	0.03	0.09
Jul	0.04	0.02	0.03	0.03	0.12
Oct	0.03	0.02	0.02	0.02	0.09
Sum c.	0.12	0.12	0.10	0.12	0.46

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	15	0.002	-		
Treatment	3	0.000	0.000	**0.33**	**3.86**
Block	3	0.001	0.000	3.67	3.86
Error	9	0.001	0.000		

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

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

TABLE 20
RECEIVING WATERS AND CONTROL STATIONS (2007 / 2008)

Waterbody	N. Pike	Walleye	Sucker	Whitefish	Sturgeon
Target Number	30-35	10	10	10	5
Nayshkootayaow River	22	23	31	7	-*
Attawapiskat River US	23	11	6	3	1
Attawapiskat River DS	39	9	10	11	-
Monument Channel	43	2*	13	19	-*

Notes: * = areas where fish species not expected in sufficient numbers to allow sample collection

TABLE 21a
MUSKEG MONITORING PROGRAM - STATISTICAL ANALYSIS OF CLUSTER PEAT HORIZON MERCURY PORE WATERS
ANNUAL SAMPLING PROGRAM AUGUST / SEPTEMBER 2008 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	1.93	0.07
	Peat - Flat Bog	MS-1-F	3.04	0.18
	Peat - Horizontal Fen	MS-1-H	1.77	0.01
	Peat - Ribbed Fen	MS-1-R	2.27	0.07
S-2	Peat - Domed Bog	MS-2-D	2.15	0.02
	Peat - Flat Bog	MS-2-F	3.05	0.10
	Peat - Ribbed Fen	MS-2-R	2.02	0.04
S-7	Peat - Domed Bog	MS-7-D	1.04	0.01
	Peat - Flat Bog	MS-7-F	1.61	0.00
	Peat - Horizontal Fen	MS-7-H	2.18	0.06
	Peat - Ribbed Fen	MS-7-R	0.52	0.01
S-8	Peat - Domed Bog	MS-8-D	1.49	0.01
	Peat - Flat Bog	MS-8-F	2.85	0.08
	Peat - Horizontal Fen	MS-8-H	0.55	0.01
	Peat - Ribbed Fen	MS-8-R	0.98	0.01
S-9(1)	Peat - Domed Bog	MS-9(1)-D	0.77	0.00
	Peat - Flat Bog	MS-9(1)-F	1.74	0.04
	Peat - Horizontal Fen	MS-9(1)-H	2.06	0.05
	Peat - Ribbed Fen	MS-9(1)-R	1.26	0.03
S-9(2)	Peat - Domed Bog	MS-9(2)-D	1.89	0.02
	Peat - Flat Bog	MS-9(2)-F	1.27	0.06
	Peat - Horizontal Fen	MS-9(2)-H	0.59	0.01
	Peat - Ribbed Fen	MS-9(2)-R	0.90	0.06
S-13	Peat - Domed Bog	MS-13-D	2.68	0.12
	Peat - Flat Bog	MS-13-F	2.79	0.24
	Peat - Horizontal Fen	MS-13-H	0.57	0.01
	Peat - Ribbed Fen	MS-13-R	0.95	0.00
S-15	Peat - Domed Bog	MS-15-D	1.89	0.04
	Peat - Flat Bog	MS-15-F	2.55	0.07
	Peat - Horizontal Fen	MS-15-H	0.90	0.01
	Peat - Ribbed Fen	MS-15-R	0.92	0.02
S-V1	Peat - Domed Bog	MS-V(1)-D	0.6	0.01
	Peat - Ribbed Fen	MS-V(1)-R	2.02	0.04
S-V2	Peat - Domed Bog	MS-V(2)-D	1.16	0.01
	Peat - Ribbed Fen	MS-V(2)-R	0.6	0.00
S-V3	Peat - Domed Bog	MS-V(3)-D	0.61	0.10
	Peat - Ribbed Fen	MS-V(3)-R	1.69	0.02

TWO-WAY ANALYSIS OF VARIANCE TABLES

TOTAL MERCURY

Habitat	Control Mean (S13+S15)	S-1	Sum r.
D. Bog	2.29	1.93	4.215
F. Bog	2.67	3.04	5.710
H. Fen	0.74	1.77	2.505
R. Fen	0.94	2.27	3.205
Sum c.	6.625	9.010	15.635

Total SS	4.460
Treat SS	0.711
Block SS	2.902
Error SS	0.847

ANOVA Table					
Source V.	d.f.	SS	MS	F_{cal}	F_{tab} 0.05
Total	7	4.460	-		
Treatment	1	0.711	0.711	**2.52**	10.1
Block	3	2.902	0.967	3.43	9.28
Error	3	0.847	0.282		

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	0.08	0.07	0.150
F. Bog	0.16	0.18	0.335
H. Fen	0.01	0.01	0.020
R. Fen	0.01	0.07	0.080
Sum c.	0.255	0.330	0.585

Total SS	0.030
Treat SS	0.001
Block SS	0.028
Error SS	0.001

ANOVA Table					
Source V.	d.f.	SS	MS	F_{cal}	F_{tab} 0.05
Total	7	0.030	-		
Treatment	1	0.001	0.001	**1.45**	10.1
Block	3	0.028	0.009	19.18	9.28
Error	3	0.001	0.000		

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

TABLE 21b
MUSKEG MONITORING PROGRAM - STATISTICAL ANALYSIS OF CLUSTER PEAT HORIZON MERCURY PORE WATERS
ANNUAL SAMPLING PROGRAM AUGUST / SEPTEMBER 2008 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	1.93	0.07
	Peat - Flat Bog	MS-1-F	3.04	0.18
	Peat - Horizontal Fen	MS-1-H	1.77	0.01
	Peat - Ribbed Fen	MS-1-R	2.27	0.07
S-2	Peat - Domed Bog	MS-2-D	2.15	0.02
	Peat - Flat Bog	MS-2-F	3.05	0.10
	Peat - Ribbed Fen	MS-2-R	2.02	0.04
S-7	Peat - Domed Bog	MS-7-D	1.04	0.01
	Peat - Flat Bog	MS-7-F	1.61	0.00
	Peat - Horizontal Fen	MS-7-H	2.18	0.06
	Peat - Ribbed Fen	MS-7-R	0.52	0.01
S-8	Peat - Domed Bog	MS-8-D	1.49	0.01
	Peat - Flat Bog	MS-8-F	2.85	0.08
	Peat - Horizontal Fen	MS-8-H	0.55	0.01
	Peat - Ribbed Fen	MS-8-R	0.98	0.01
S-9(1)	Peat - Domed Bog	MS-9(1)-D	0.77	0.00
	Peat - Flat Bog	MS-9(1)-F	1.74	0.04
	Peat - Horizontal Fen	MS-9(1)-H	2.06	0.05
	Peat - Ribbed Fen	MS-9(1)-R	1.26	0.03
S-9(2)	Peat - Domed Bog	MS-9(2)-D	1.89	0.02
	Peat - Flat Bog	MS-9(2)-F	1.27	0.06
	Peat - Horizontal Fen	MS-9(2)-H	0.59	0.01
	Peat - Ribbed Fen	MS-9(2)-R	0.90	0.06
S-13	Peat - Domed Bog	MS-13-D	2.68	0.12
	Peat - Flat Bog	MS-13-F	2.79	0.24
	Peat - Horizontal Fen	MS-13-H	0.57	0.01
	Peat - Ribbed Fen	MS-13-R	0.95	0.00
S-15	Peat - Domed Bog	MS-15-D	1.89	0.04
	Peat - Flat Bog	MS-15-F	2.55	0.07
	Peat - Horizontal Fen	MS-15-H	0.90	0.01
	Peat - Ribbed Fen	MS-15-R	0.92	0.02
S-V1	Peat - Domed Bog	MS-V(1)-D	0.6	0.01
	Peat - Ribbed Fen	MS-V(1)-R	2.02	0.04
S-V2	Peat - Domed Bog	MS-V(2)-D	1.16	0.01
	Peat - Ribbed Fen	MS-V(2)-R	0.6	0.00
S-V3	Peat - Domed Bog	MS-V(3)-D	0.61	0.10
	Peat - Ribbed Fen	MS-V(3)-R	1.69	0.02

TWO-WAY ANALYSIS OF VARIANCE TABLES

TOTAL MERCURY

Habitat	Control Mean (S13+S15)	S-2	Sum r.
D. Bog	2.29	2.15	4.435
F. Bog	2.67	3.05	5.720
R. Fen	0.94	2.02	2.955
Sum c.	5.89	7.220	13.110

Total SS	2.584
Treat SS	0.295
Block SS	1.914
Error SS	0.375

ANOVA Table

Source V.	d.f.	SS	MS	F_{cal}	F_{tab} 0.05
Total	5	2.584	-		
Treatment	1	0.295	0.295	**1.57**	18.5
Block	2	1.914	0.957	5.10	19.0
Error	2	0.375	0.188		

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	0.08	0.02	0.100
F. Bog	0.16	0.10	0.255
R. Fen	0.01	0.04	0.050
Sum c.	0.245	0.160	0.405

Total SS	0.015
Treat SS	0.001
Block SS	0.011
Error SS	0.003

ANOVA Table

Source V.	d.f.	SS	MS	F_{cal}	F_{tab} 0.05
Total	5	0.015	-		
Treatment	1	0.001	0.001	**0.94**	18.5
Block	2	0.011	0.006	4.47	19.0
Error	2	0.003	0.001		

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

TABLE 21c
MUSKEG MONITORING PROGRAM - STATISTICAL ANALYSIS OF CLUSTER PEAT HORIZON MERCURY PORE WATERS
ANNUAL SAMPLING PROGRAM AUGUST / SEPTEMBER 2008 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	1.93	0.07
	Peat - Flat Bog	MS-1-F	3.04	0.18
	Peat - Horizontal Fen	MS-1-H	1.77	0.01
	Peat - Ribbed Fen	MS-1-R	2.27	0.07
S-2	Peat - Domed Bog	MS-2-D	2.15	0.02
	Peat - Flat Bog	MS-2-F	3.05	0.10
	Peat - Ribbed Fen	MS-2-R	2.02	0.04
S-7	Peat - Domed Bog	MS-7-D	1.04	0.01
	Peat - Flat Bog	MS-7-F	1.61	0.00
	Peat - Horizontal Fen	MS-7-H	2.18	0.06
	Peat - Ribbed Fen	MS-7-R	0.52	0.01
S-8	Peat - Domed Bog	MS-8-D	1.49	0.01
	Peat - Flat Bog	MS-8-F	2.65	0.08
	Peat - Horizontal Fen	MS-8-H	0.55	0.01
	Peat - Ribbed Fen	MS-8-R	0.98	0.01
S-9(1)	Peat - Domed Bog	MS-9(1)-D	0.77	0.00
	Peat - Flat Bog	MS-9(1)-F	1.74	0.04
	Peat - Horizontal Fen	MS-9(1)-H	2.06	0.05
	Peat - Ribbed Fen	MS-9(1)-R	1.26	0.03
S-9(2)	Peat - Domed Bog	MS-9(2)-D	1.89	0.02
	Peat - Flat Bog	MS-9(2)-F	1.27	0.06
	Peat - Horizontal Fen	MS-9(2)-H	0.59	0.01
	Peat - Ribbed Fen	MS-9(2)-R	0.90	0.06
S-13	Peat - Domed Bog	MS-13-D	2.68	0.12
	Peat - Flat Bog	MS-13-F	2.79	0.24
	Peat - Horizontal Fen	MS-13-H	0.57	0.01
	Peat - Ribbed Fen	MS-13-R	0.95	0.00
S-15	Peat - Domed Bog	MS-15-D	1.89	0.04
	Peat - Flat Bog	MS-15-F	2.55	0.07
	Peat - Horizontal Fen	MS-15-H	0.90	0.01
	Peat - Ribbed Fen	MS-15-R	0.92	0.02
S-V1	Peat - Domed Bog	MS-V(1)-D	0.6	0.01
	Peat - Ribbed Fen	MS-V(1)-R	2.02	0.04
S-V2	Peat - Domed Bog	MS-V(2)-D	1.16	0.01
	Peat - Ribbed Fen	MS-V(2)-R	0.6	0.00
S-V3	Peat - Domed Bog	MS-V(3)-D	0.61	0.10
	Peat - Ribbed Fen	MS-V(3)-R	1.69	0.02

TWO-WAY ANALYSIS OF VARIANCE TABLES

TOTAL MERCURY

Habitat	Control Mean (S13+S15)	S-7	Sum r.
D. Bog	2.29	1.04	3.325
F. Bog	2.67	1.61	4.280
H. Fen	0.74	2.18	2.915
R. Fen	0.94	0.52	1.455
Sum c.	6.625	5.350	11.975

Total SS	4.536
Treat SS	0.203
Block SS	2.069
Error SS	2.264

ANOVA Table

Source V.	d.f.	SS	MS	F_{cal}	F_{tab} 0.05
Total	7	4.536	-		
Treatment	1	0.203	0.203	**0.27**	10.1
Block	3	2.069	0.690	0.91	9.28
Error	3	2.264	0.755		

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	0.08	0.01	0.090
F. Bog	0.16	0.00	0.155
H. Fen	0.01	0.06	0.070
R. Fen	0.01	0.01	0.020
Sum c.	0.255	0.080	0.335

Total SS	0.020
Treat SS	0.004
Block SS	0.005
Error SS	0.012

ANOVA Table

Source V.	d.f.	SS	MS	F_{cal}	F_{tab} 0.05
Total	7	0.020	-		
Treatment	1	0.004	0.004	**0.97**	10.1
Block	3	0.005	0.002	0.39	9.28
Error	3	0.012	0.004		

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

TABLE 21d
MUSKEG MONITORING PROGRAM - STATISTICAL ANALYSIS OF CLUSTER PEAT HORIZON MERCURY PORE WATERS
ANNUAL SAMPLING PROGRAM AUGUST / SEPTEMBER 2008 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	1.93	0.07
	Peat - Flat Bog	MS-1-F	3.04	0.18
	Peat - Horizontal Fen	MS-1-H	1.77	0.01
	Peat - Ribbed Fen	MS-1-R	2.27	0.07
S-2	Peat - Domed Bog	MS-2-D	2.15	0.02
	Peat - Flat Bog	MS-2-F	3.05	0.10
	Peat - Ribbed Fen	MS-2-R	2.02	0.04
S-7	Peat - Domed Bog	MS-7-D	1.04	0.01
	Peat - Flat Bog	MS-7-F	1.61	0.00
	Peat - Horizontal Fen	MS-7-H	2.18	0.06
	Peat - Ribbed Fen	MS-7-R	0.52	0.01
S-8	Peat - Domed Bog	MS-8-D	1.49	0.01
	Peat - Flat Bog	MS-8-F	2.85	0.08
	Peat - Horizontal Fen	MS-8-H	0.55	0.01
	Peat - Ribbed Fen	MS-8-R	0.98	0.01
S-9(1)	Peat - Domed Bog	MS-9(1)-D	0.77	0.00
	Peat - Flat Bog	MS-9(1)-F	1.74	0.04
	Peat - Horizontal Fen	MS-9(1)-H	2.06	0.05
	Peat - Ribbed Fen	MS-9(1)-R	1.26	0.03
S-9(2)	Peat - Domed Bog	MS-9(2)-D	1.89	0.02
	Peat - Flat Bog	MS-9(2)-F	1.27	0.06
	Peat - Horizontal Fen	MS-9(2)-H	0.59	0.01
	Peat - Ribbed Fen	MS-9(2)-R	0.90	0.06
S-13	Peat - Domed Bog	MS-13-D	2.68	0.12
	Peat - Flat Bog	MS-13-F	2.79	0.24
	Peat - Horizontal Fen	MS-13-H	0.57	0.01
	Peat - Ribbed Fen	MS-13-R	0.95	0.00
S-15	Peat - Domed Bog	MS-15-D	1.89	0.04
	Peat - Flat Bog	MS-15-F	2.55	0.07
	Peat - Horizontal Fen	MS-15-H	0.90	0.01
	Peat - Ribbed Fen	MS-15-R	0.92	0.02
S-V1	Peat - Domed Bog	MS-V(1)-D	0.6	0.01
	Peat - Ribbed Fen	MS-V(1)-R	2.02	0.04
S-V2	Peat - Domed Bog	MS-V(2)-D	1.16	0.01
	Peat - Ribbed Fen	MS-V(2)-R	0.6	0.00
S-V3	Peat - Domed Bog	MS-V(3)-D	0.61	0.10
	Peat - Ribbed Fen	MS-V(3)-R	1.69	0.02

TWO-WAY ANALYSIS OF VARIANCE TABLES

TOTAL MERCURY

Habitat	Control Mean (S13+S15)	S-8	Sum r.
D. Bog	2.29	1.49	3.775
F. Bog	2.67	2.85	5.520
H. Fen	0.74	0.55	1.285
R. Fen	0.94	0.98	1.915
Sum c.	6.625	5.870	12.495

Total SS	5.854
Treat SS	0.071
Block SS	5.504
Error SS	0.279

ANOVA Table

Source V.	d.f.	SS	MS	F_{cal}	F_{tab} 0.05
Total	7	5.854	-		
Treatment	1	0.071	0.071	**0.77**	10.1
Block	3	5.504	1.835	19.72	9.28
Error	3	0.279	0.093		

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	0.08	0.01	0.090
F. Bog	0.16	0.08	0.235
H. Fen	0.01	0.01	0.020
R. Fen	0.01	0.01	0.020
Sum c.	0.255	0.110	0.365

Total SS	0.021
Treat SS	0.003
Block SS	0.015
Error SS	0.003

ANOVA Table

Source V.	d.f.	SS	MS	F_{cal}	F_{tab} 0.05
Total	7	0.021	-		
Treatment	1	0.003	0.003	**2.99**	10.1
Block	3	0.015	0.005	5.85	9.28
Error	3	0.003	0.001		

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

TABLE 21e
MUSKEG MONITORING PROGRAM - STATISTICAL ANALYSIS OF CLUSTER PEAT HORIZON MERCURY PORE WATERS
ANNUAL SAMPLING PROGRAM AUGUST / SEPTEMBER 2008 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	1.93	0.07
	Peat - Flat Bog	MS-1-F	3.04	0.18
	Peat - Horizontal Fen	MS-1-H	1.77	0.01
	Peat - Ribbed Fen	MS-1-R	2.27	0.07
S-2	Peat - Domed Bog	MS-2-D	2.15	0.02
	Peat - Flat Bog	MS-2-F	3.05	0.10
	Peat - Ribbed Fen	MS-2-R	2.02	0.04
S-7	Peat - Domed Bog	MS-7-D	1.04	0.01
	Peat - Flat Bog	MS-7-F	1.61	0.00
	Peat - Horizontal Fen	MS-7-H	2.18	0.06
	Peat - Ribbed Fen	MS-7-R	0.52	0.01
S-8	Peat - Domed Bog	MS-8-D	1.49	0.01
	Peat - Flat Bog	MS-8-F	2.85	0.08
	Peat - Horizontal Fen	MS-8-H	0.55	0.01
	Peat - Ribbed Fen	MS-8-R	0.98	0.01
S-9(1)	Peat - Domed Bog	MS-9(1)-D	0.77	0.00
	Peat - Flat Bog	MS-9(1)-F	1.74	0.04
	Peat - Horizontal Fen	MS-9(1)-H	2.06	0.05
	Peat - Ribbed Fen	MS-9(1)-R	1.26	0.03
S-9(2)	Peat - Domed Bog	MS-9(2)-D	1.89	0.02
	Peat - Flat Bog	MS-9(2)-F	1.27	0.06
	Peat - Horizontal Fen	MS-9(2)-H	0.59	0.01
	Peat - Ribbed Fen	MS-9(2)-R	0.90	0.06
S-13	Peat - Domed Bog	MS-13-D	2.68	0.12
	Peat - Flat Bog	MS-13-F	2.79	0.24
	Peat - Horizontal Fen	MS-13-H	0.57	0.01
	Peat - Ribbed Fen	MS-13-R	0.95	0.00
S-15	Peat - Domed Bog	MS-15-D	1.89	0.04
	Peat - Flat Bog	MS-15-F	2.55	0.07
	Peat - Horizontal Fen	MS-15-H	0.90	0.01
	Peat - Ribbed Fen	MS-15-R	0.92	0.02
S-V1	Peat - Domed Bog	MS-V(1)-D	0.6	0.01
	Peat - Ribbed Fen	MS-V(1)-R	2.02	0.04
S-V2	Peat - Domed Bog	MS-V(2)-D	1.16	0.01
	Peat - Ribbed Fen	MS-V(2)-R	0.6	0.00
S-V3	Peat - Domed Bog	MS-V(3)-D	0.61	0.10
	Peat - Ribbed Fen	MS-V(3)-R	1.69	0.02

TWO-WAY ANALYSIS OF VARIANCE TABLES

TOTAL MERCURY

Habitat	Control Mean (S13+S15)	S-9(1)	Sum r.
D. Bog	2.29	0.77	3.055
F. Bog	2.67	1.74	4.410
H. Fen	0.74	2.06	2.795
R. Fen	0.94	1.26	2.195
Sum c.	6.625	5.830	12.455

Total SS	3.825
Treat SS	0.079
Block SS	1.315
Error SS	2.432

ANOVA Table

Source V.	d.f.	SS	MS	F_{cal}	F_{tab} 0.05
Total	7	3.825	-		
Treatment	1	0.079	0.079	**0.10**	10.1
Block	3	1.315	0.438	0.54	9.28
Error	3	2.432	0.811		

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	0.08	0.00	0.080
F. Bog	0.16	0.04	0.195
H. Fen	0.01	0.05	0.060
R. Fen	0.01	0.03	0.040
Sum c.	0.255	0.120	0.375

Total SS	0.018
Treat SS	0.002
Block SS	0.007
Error SS	0.009

ANOVA Table

Source V.	d.f.	SS	MS	F_{cal}	F_{tab} 0.05
Total	7	0.018	-		
Treatment	1	0.002	0.002	**0.80**	10.1
Block	3	0.007	0.002	0.85	9.28
Error	3	0.009	0.003		

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

TABLE 21f
MUSKEG MONITORING PROGRAM - STATISTICAL ANALYSIS OF CLUSTER PEAT HORIZON MERCURY PORE WATERS
ANNUAL SAMPLING PROGRAM AUGUST / SEPTEMBER 2008 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	1.93	0.07
	Peat - Flat Bog	MS-1-F	3.04	0.18
	Peat - Horizontal Fen	MS-1-H	1.77	0.01
	Peat - Ribbed Fen	MS-1-R	2.27	0.07
S-2	Peat - Domed Bog	MS-2-D	2.15	0.02
	Peat - Flat Bog	MS-2-F	3.05	0.10
	Peat - Ribbed Fen	MS-2-R	2.02	0.04
S-7	Peat - Domed Bog	MS-7-D	1.04	0.01
	Peat - Flat Bog	MS-7-F	1.61	0.00
	Peat - Horizontal Fen	MS-7-H	2.18	0.06
	Peat - Ribbed Fen	MS-7-R	0.52	0.01
S-8	Peat - Domed Bog	MS-8-D	1.49	0.01
	Peat - Flat Bog	MS-8-F	2.85	0.08
	Peat - Horizontal Fen	MS-8-H	0.55	0.01
	Peat - Ribbed Fen	MS-8-R	0.98	0.01
S-9(1)	Peat - Domed Bog	MS-9(1)-D	0.77	0.00
	Peat - Flat Bog	MS-9(1)-F	1.74	0.04
	Peat - Horizontal Fen	MS-9(1)-H	2.06	0.05
	Peat - Ribbed Fen	MS-9(1)-R	1.26	0.03
S-9(2)	Peat - Domed Bog	MS-9(2)-D	1.89	0.02
	Peat - Flat Bog	MS-9(2)-F	1.27	0.06
	Peat - Horizontal Fen	MS-9(2)-H	0.59	0.01
	Peat - Ribbed Fen	MS-9(2)-R	0.90	0.06
S-13	Peat - Domed Bog	MS-13-D	2.68	0.12
	Peat - Flat Bog	MS-13-F	2.79	0.24
	Peat - Horizontal Fen	MS-13-H	0.57	0.01
	Peat - Ribbed Fen	MS-13-R	0.95	0.00
S-15	Peat - Domed Bog	MS-15-D	1.89	0.04
	Peat - Flat Bog	MS-15-F	2.55	0.07
	Peat - Horizontal Fen	MS-15-H	0.90	0.01
	Peat - Ribbed Fen	MS-15-R	0.92	0.02
S-V1	Peat - Domed Bog	MS-V(1)-D	0.6	0.01
	Peat - Ribbed Fen	MS-V(1)-R	2.02	0.04
S-V2	Peat - Domed Bog	MS-V(2)-D	1.16	0.01
	Peat - Ribbed Fen	MS-V(2)-R	0.6	0.00
S-V3	Peat - Domed Bog	MS-V(3)-D	0.61	0.10
	Peat - Ribbed Fen	MS-V(3)-R	1.69	0.02

TWO-WAY ANALYSIS OF VARIANCE TABLES

TOTAL MERCURY

Habitat	Control Mean (S13+S15)	S-9(2)	Sum r.
D. Bog	2.29	1.89	4.175
F. Bog	2.67	1.27	3.940
H. Fen	0.74	0.59	1.325
R. Fen	0.94	0.90	1.835
Sum c.	6.625	4.650	11.275

Total SS	4.217
Treat SS	0.488
Block SS	3.148
Error SS	0.582

ANOVA Table					
Source V.	d.f.	SS	MS	F_{cal}	F_{tab} 0.05
Total	7	4.217	-		
Treatment	1	0.488	0.488	**2.52**	10.1
Block	3	3.148	1.049	5.41	9.28
Error	3	0.582	0.194		

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	0.08	0.02	0.100
F. Bog	0.16	0.06	0.215
H. Fen	0.01	0.01	0.020
R. Fen	0.01	0.06	0.070
Sum c.	0.255	0.150	0.405

Total SS	0.018
Treat SS	0.001
Block SS	0.010
Error SS	0.006

ANOVA Table					
Source V.	d.f.	SS	MS	F_{cal}	F_{tab} 0.05
Total	7	0.018	-		
Treatment	1	0.001	0.001	**0.67**	10.1
Block	3	0.010	0.003	1.66	9.28
Error	3	0.006	0.002		

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

TABLE 21g
MUSKEG MONITORING PROGRAM - STATISTICAL ANALYSIS OF CLUSTER PEAT HORIZON MERCURY PORE WATERS
ANNUAL SAMPLING PROGRAM AUGUST / SEPTEMBER 2008 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	1.93	0.07
	Peat - Flat Bog	MS-1-F	3.04	0.18
	Peat - Horizontal Fen	MS-1-H	1.77	0.01
	Peat - Ribbed Fen	MS-1-R	2.27	0.07
S-2	Peat - Domed Bog	MS-2-D	2.15	0.02
	Peat - Flat Bog	MS-2-F	3.05	0.10
	Peat - Ribbed Fen	MS-2-R	2.02	0.04
S-7	Peat - Domed Bog	MS-7-D	1.04	0.01
	Peat - Flat Bog	MS-7-F	1.61	0.00
	Peat - Horizontal Fen	MS-7-H	2.18	0.06
	Peat - Ribbed Fen	MS-7-R	0.52	0.01
S-8	Peat - Domed Bog	MS-8-D	1.49	0.01
	Peat - Flat Bog	MS-8-F	2.85	0.08
	Peat - Horizontal Fen	MS-8-H	0.55	0.01
	Peat - Ribbed Fen	MS-8-R	0.98	0.01
S-9(1)	Peat - Domed Bog	MS-9(1)-D	0.77	0.00
	Peat - Flat Bog	MS-9(1)-F	1.74	0.04
	Peat - Horizontal Fen	MS-9(1)-H	2.06	0.05
	Peat - Ribbed Fen	MS-9(1)-R	1.26	0.03
S-9(2)	Peat - Domed Bog	MS-9(2)-D	1.89	0.02
	Peat - Flat Bog	MS-9(2)-F	1.27	0.06
	Peat - Horizontal Fen	MS-9(2)-H	0.59	0.01
	Peat - Ribbed Fen	MS-9(2)-R	0.90	0.06
S-13	Peat - Domed Bog	MS-13-D	2.68	0.12
	Peat - Flat Bog	MS-13-F	2.79	0.24
	Peat - Horizontal Fen	MS-13-H	0.57	0.01
	Peat - Ribbed Fen	MS-13-R	0.95	0.00
S-15	Peat - Domed Bog	MS-15-D	1.89	0.04
	Peat - Flat Bog	MS-15-F	2.55	0.07
	Peat - Horizontal Fen	MS-15-H	0.90	0.01
	Peat - Ribbed Fen	MS-15-R	0.92	0.02
S-V1	Peat - Domed Bog	MS-V(1)-D	0.6	0.01
	Peat - Ribbed Fen	MS-V(1)-R	2.02	0.04
S-V2	Peat - Domed Bog	MS-V(2)-D	1.16	0.01
	Peat - Ribbed Fen	MS-V(2)-R	0.6	0.00
S-V3	Peat - Domed Bog	MS-V(3)-D	0.61	0.10
	Peat - Ribbed Fen	MS-V(3)-R	1.69	0.02

TWO-WAY ANALYSIS OF VARIANCE TABLES

TOTAL MERCURY

Habitat	Control Mean (S13+S15)	S-V1	S-V2	S-V3	Sum r.
D. Bog	2.29	0.60	1.16	0.61	4.66
R. Fen	0.94	2.02	0.60	1.69	5.25
Sum c.	3.22	2.62	1.76	2.30	9.90

Total SS	3.218
Treat SS	0.559
Block SS	0.044
Error SS	2.616

ANOVA Table					
Source V.	d.f.	SS	MS	F_{cal}	F_{tab} 0.05
Total	7	3.218	-		
Treatment	3	0.559	0.186	**0.21**	**9.28**
Block	1	0.044	0.044	0.05	10.1
Error	3	2.616	0.872		

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

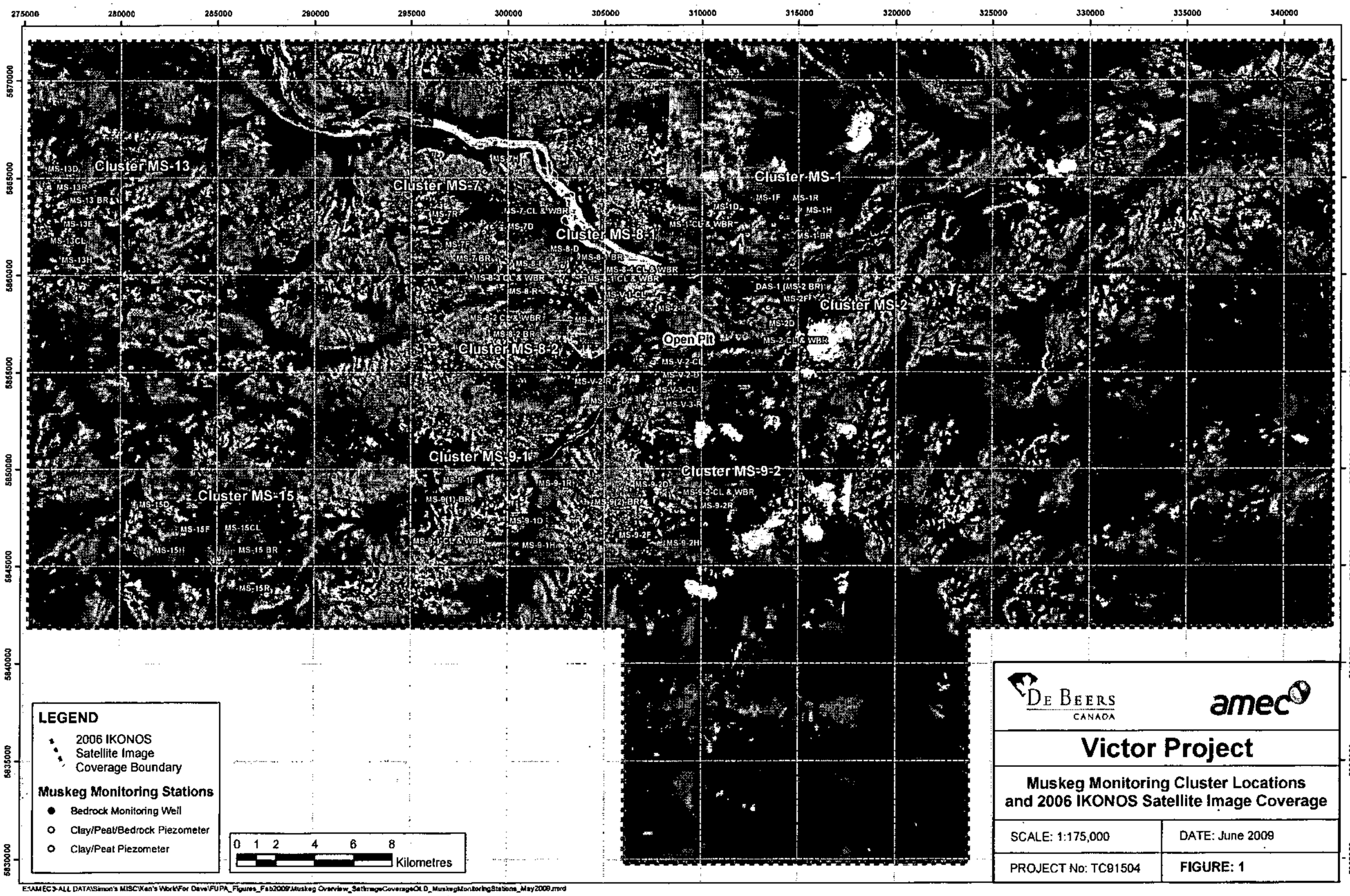
METHYL MERCURY

Habitat	Control Mean (S13+S15)	S-V1	S-V2	S-V3	Sum r.
D. Bog	0.08	0.01	0.01	0.10	0.20
R. Fen	0.01	0.04	0.00	0.02	0.07
Sum c.	0.09	0.05	0.01	0.12	0.27

Total SS	0.010
Treat SS	0.003
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	3	0.003	0.001	**0.85**	**9.28**
Block	1	0.002	0.002	1.57	10.1
Error	3	0.004	0.001		

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



DE BEERS CANADA

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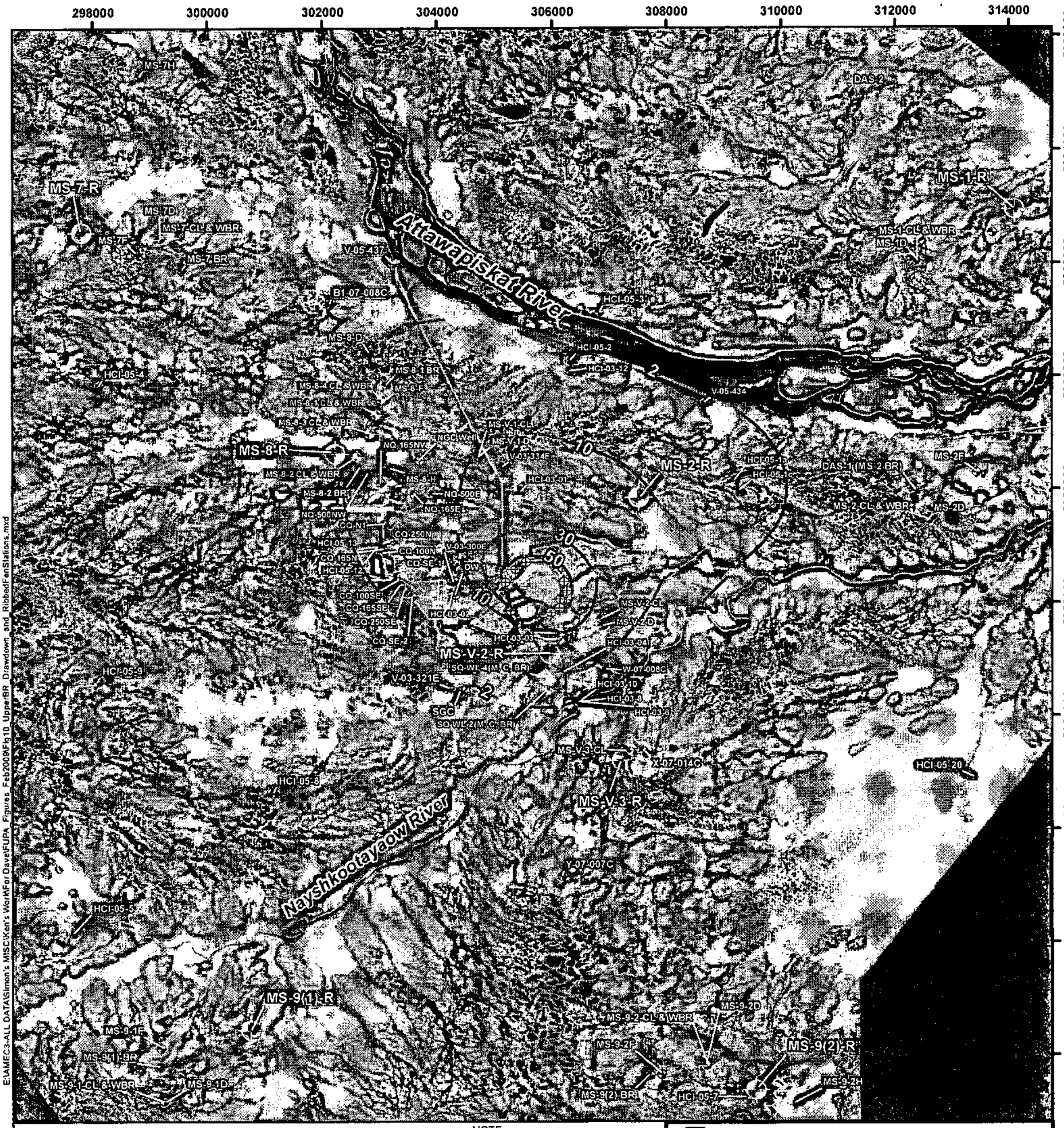
Victor Project

Muskeg Monitoring Cluster Locations and 2006 IKONOS Satellite Image Coverage

SCALE: 1:175,000	DATE: June 2009
PROJECT No: TC91504	FIGURE: 1



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LEGEND

Monitoring Locations

- Pumping Wells
- Bedrock Monitoring Well
- Clay/Peat Piezometer
- Clay/Peat/Bedrock Piezometer
- Ribbed Fen Station (Clay/Peat Piezometer)

Drawdown in Upper Bedrock (m)

0 0.5 1 2 3 4 5
Kilometres

NOTE:
- IKONOS Satellite imagery scene date is August 27, 2008

Datum: NAD83
Projection: UTM Zone 17N

N
W E
S

De Beers Canada

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VICTOR MINE

Interpreted Drawdown in the Upper Bedrock Aquifer and Peat Horizon Ribbed Fen Stations

SCALE: 1:90,000	DATE: June 2009
PROJECT No: TC91504	FIGURE: 2

000241

300000 305000 310000 315000 320000 325000

5865000 5860000 5855000 5850000

0 2 4 8 Kilometres

Attawapiskat River

North Granny Creek

South Granny Creek

Nayshkootayaow River

A-1 A-2 A-3 A-4 N-3 S-4 G-1 G-2 G-3 S-2 G-7 G-4 G-8 S-1 G-6 S-3 N-2 G-5 N-1

Legend

Surface Water Monitoring Station Location

- Attawapiskat River
- Nayshkootayaow River
- Granny Creek
- Fens

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	Nayshkootaysow River	upstream of site	Quarterly
N-2	Nayshkootaysow 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

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VICTOR PROJECT

Surface Water Monitoring Stations

SCALE: As Shown (NAD83 UTM Zone17N)	DATE: February 2009
PROJECT No: TC91504	FIGURE: 3

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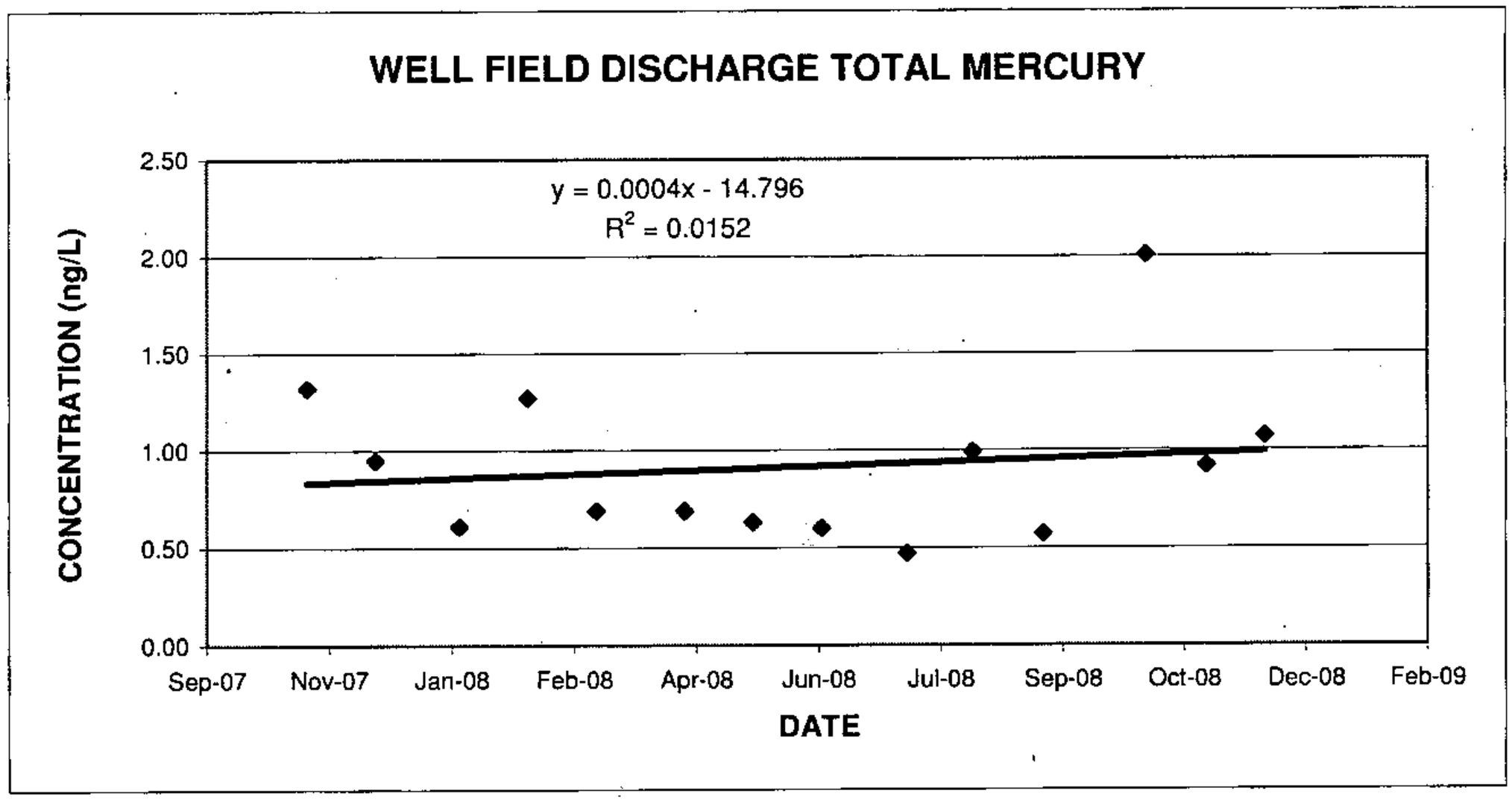
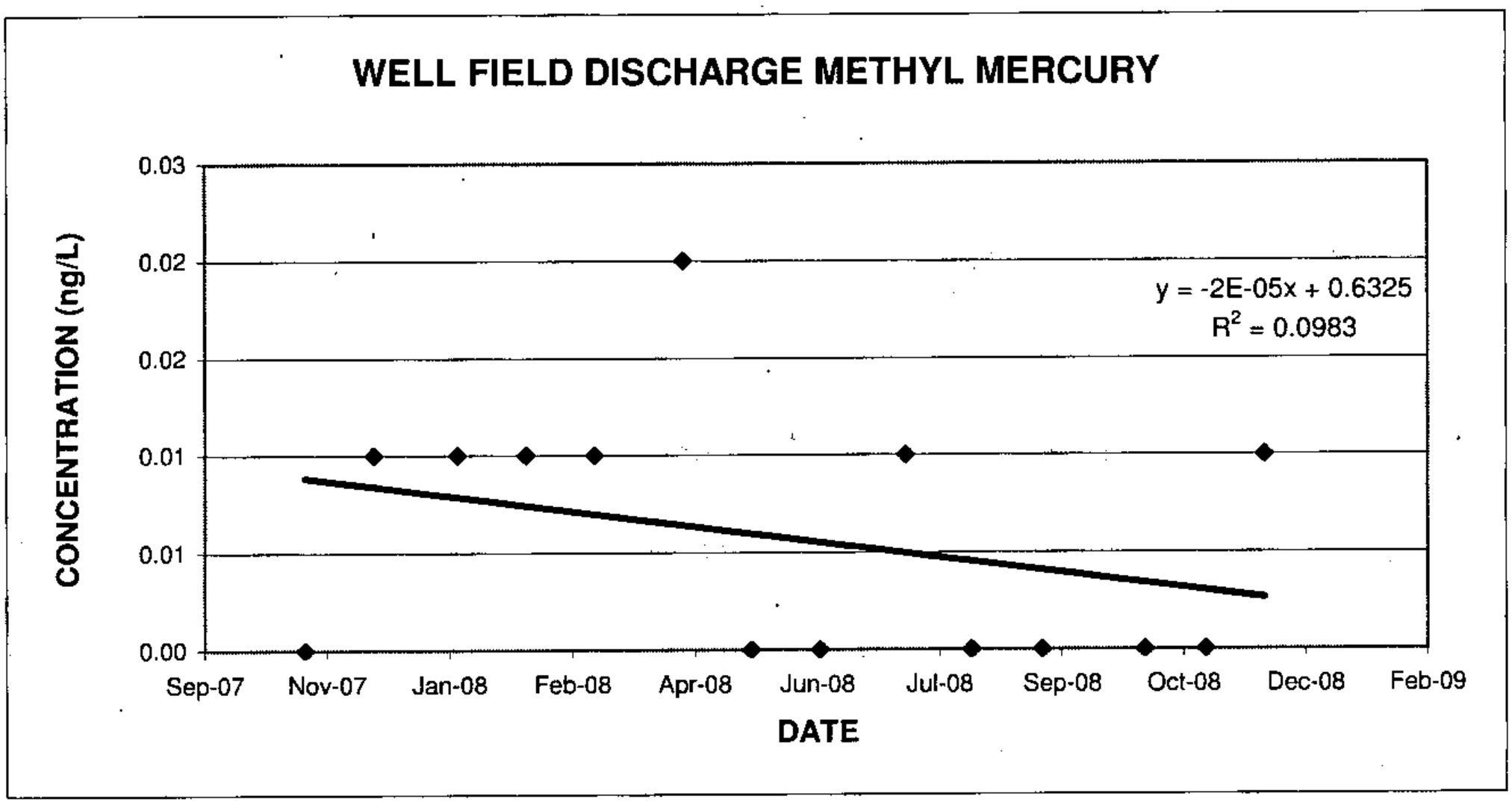
FIGURE 4
WELL FIELD TOTAL AND METHYL MERCURY CONCENTRATIONS
(filtered samples; ng/L)





280000 290000 300000 310000 320000 330000

5870000

5860000

5850000

Datum: NAD83
Projection: UTM Zone 17

Attawapiskat River

ATT-US-E1

ATT-US-E2

ATT-US-E3

North Granny Ck

NGC-E1

Nayshkootayaow River

VICTOR

SGC-E1

South Granny Ck

NR-E1

Nayshkootayaow River

Tributary 5

Tributary 5A

Trib 5A DS-E1

0 5 10 20

Kilometres

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000244

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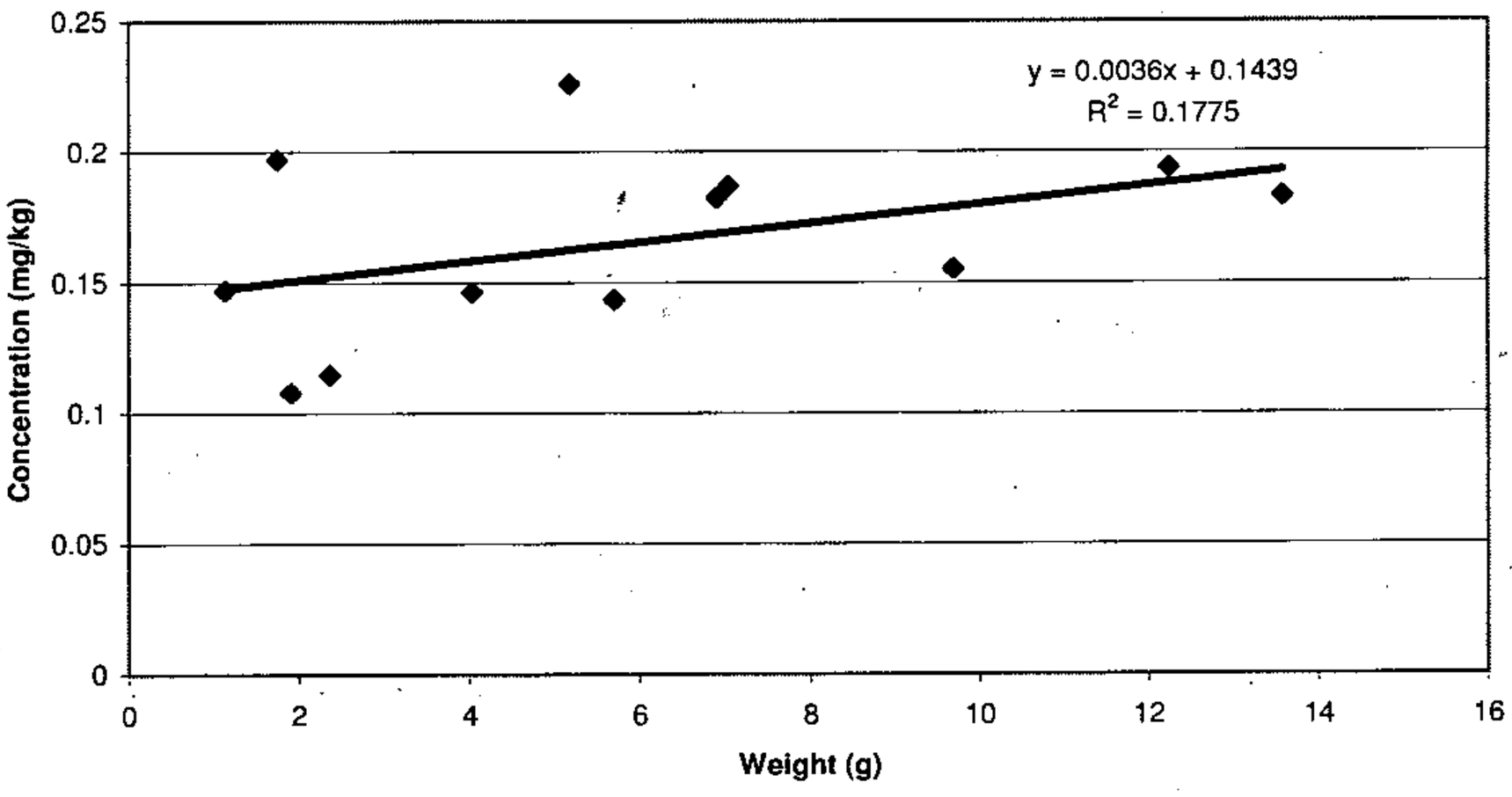
VICTOR PROJECT

Small Fish Sampling Locations (2008)

SCALE: As Shown	DATE: April 2009
PROJECT No: TC91501	FIGURE: 5

FIGURE 6
SMALL FISH (PEARL DACE) MERCURY BODY BURDEN AS A FUNCTION OF BODY WEIGHT



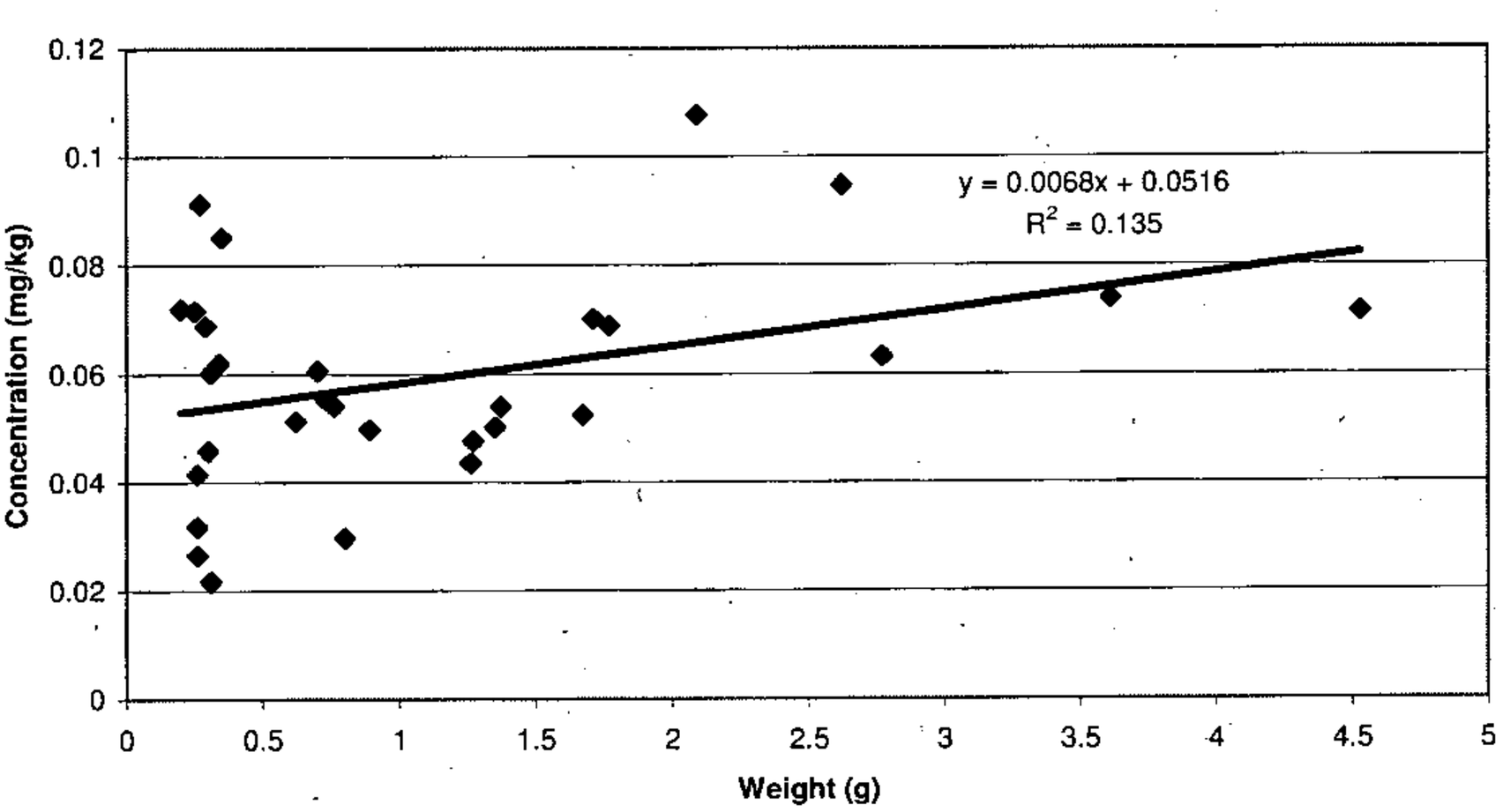
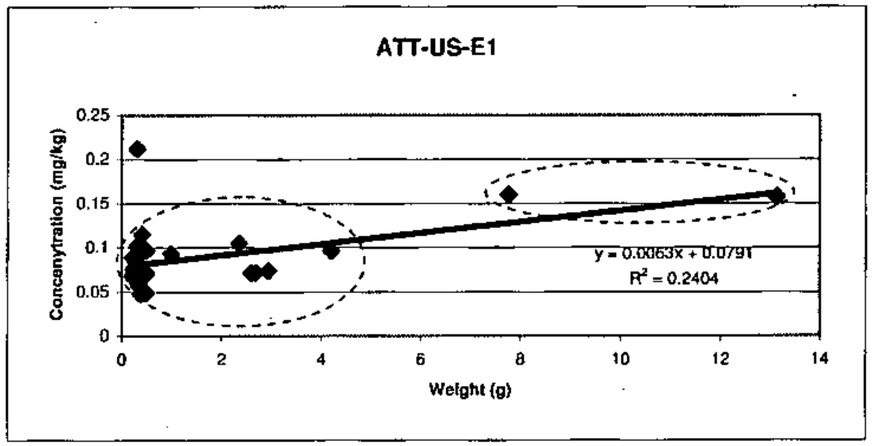
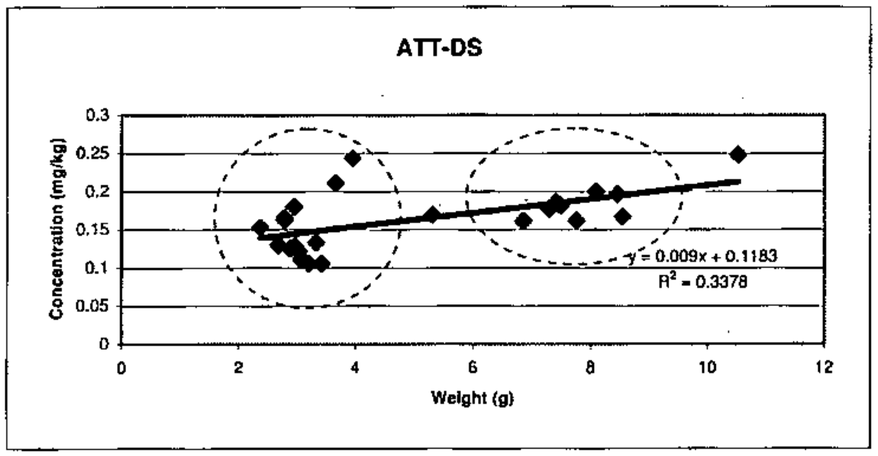
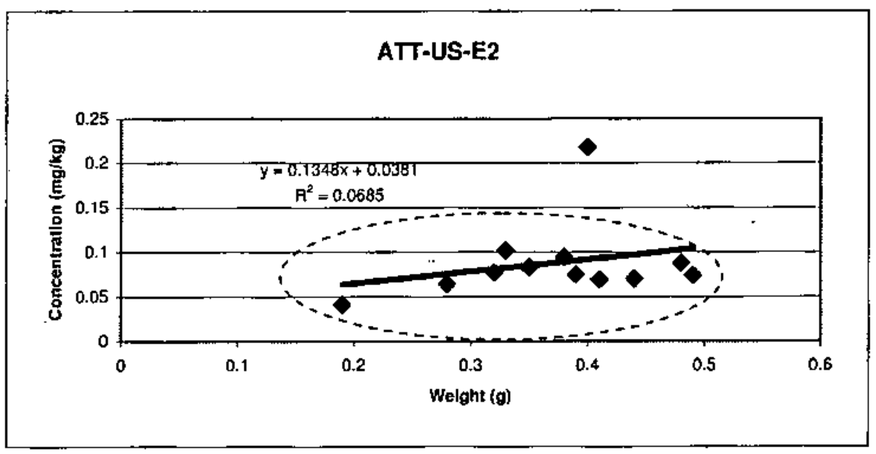
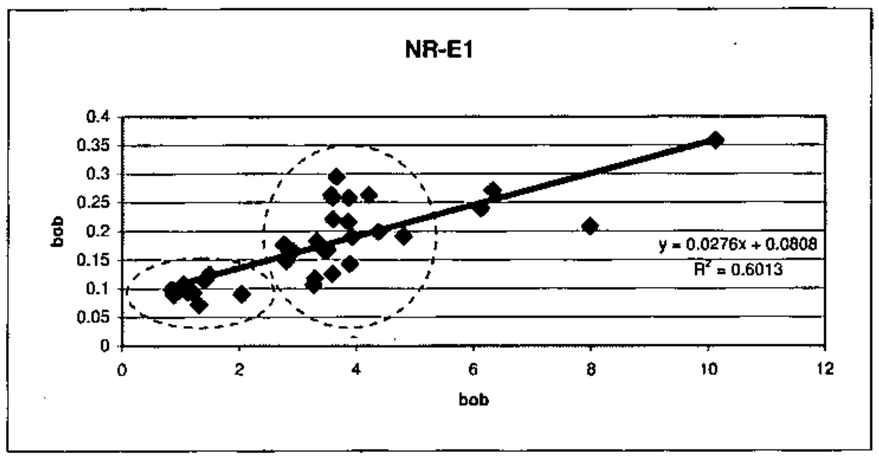


FIGURE 7
SMALL FISH (TROUT PERCH) MERCURY BODY BURDEN AS A FUNCTION OF WEIGHT
(ATTAWAPISKAT AND NAYSHKOOTAYAOW RIVER STATIONS)









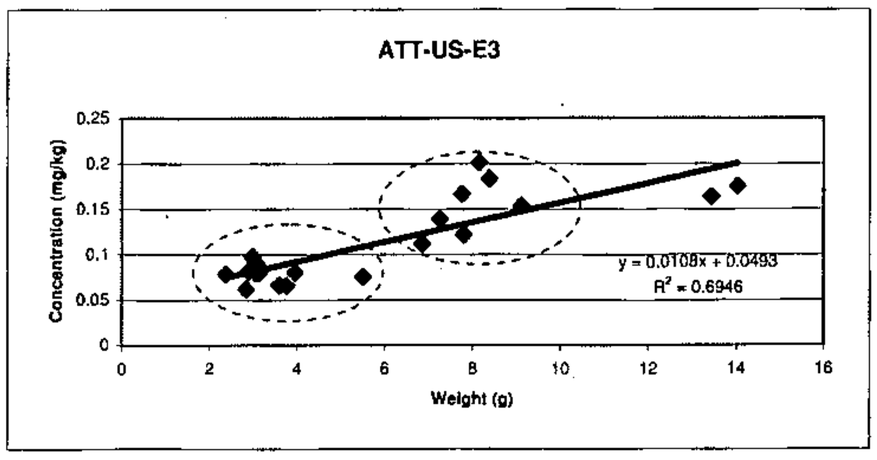


Figure 8
Relationship Between Northern Pike Total Length and Total Mercury Concentration
Nayshkootayaow River, Attawapiskat River and Monument Channel Samples - 2007/2008

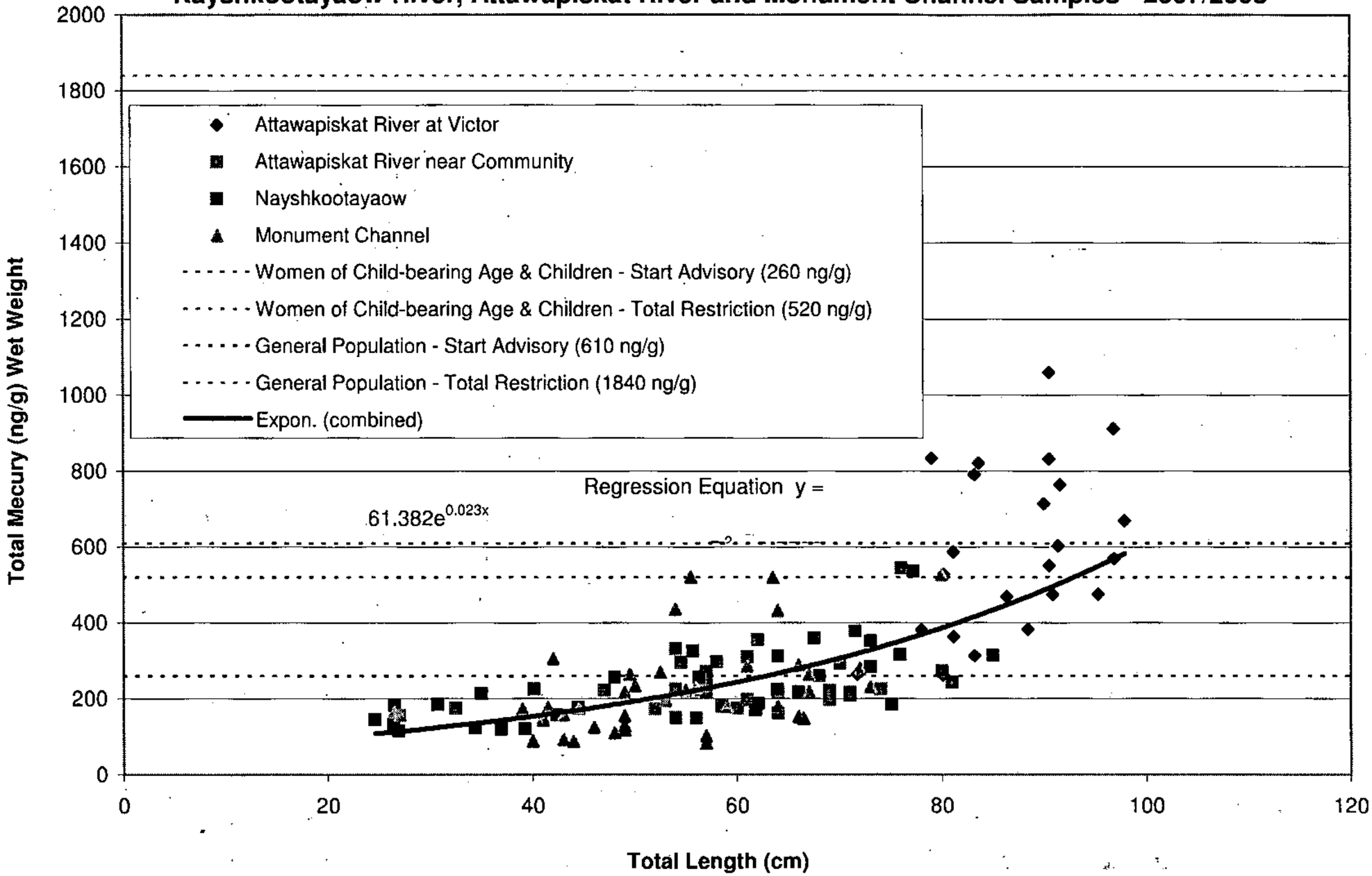


Figure 9
Relationship Between WalleyeTotal Length and Total Mercury Concentration
Nayshkootayaow River, Attawapiskat River and Monument Channel Samples - 2007/2008

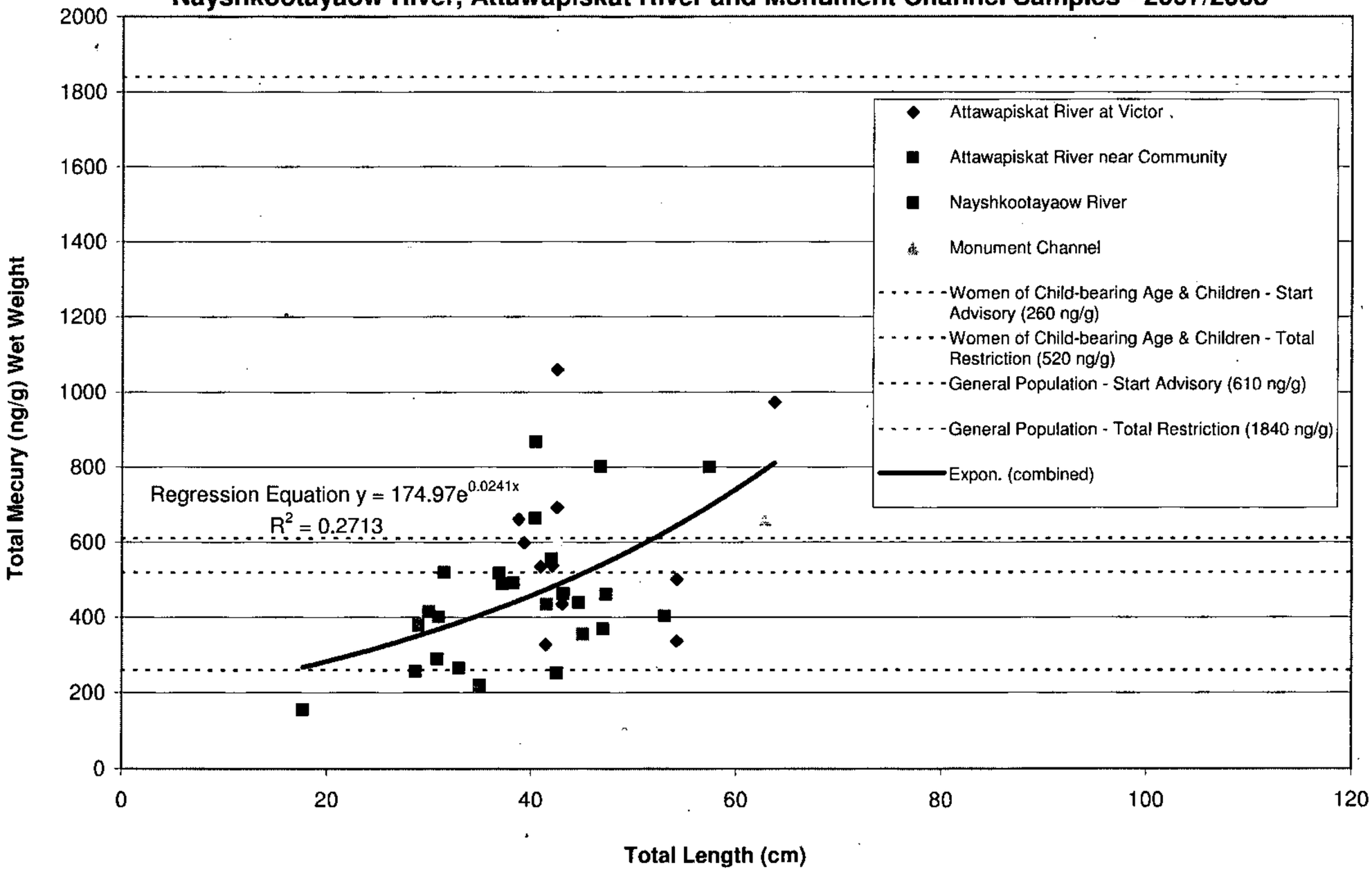


Figure 10
Relationship Between Sucker (White and Longnose) Total Length and Total Mercury Concentration
Nayshkootayaow River, Attawapiskat River and Monument Channel Samples - 2007/2008

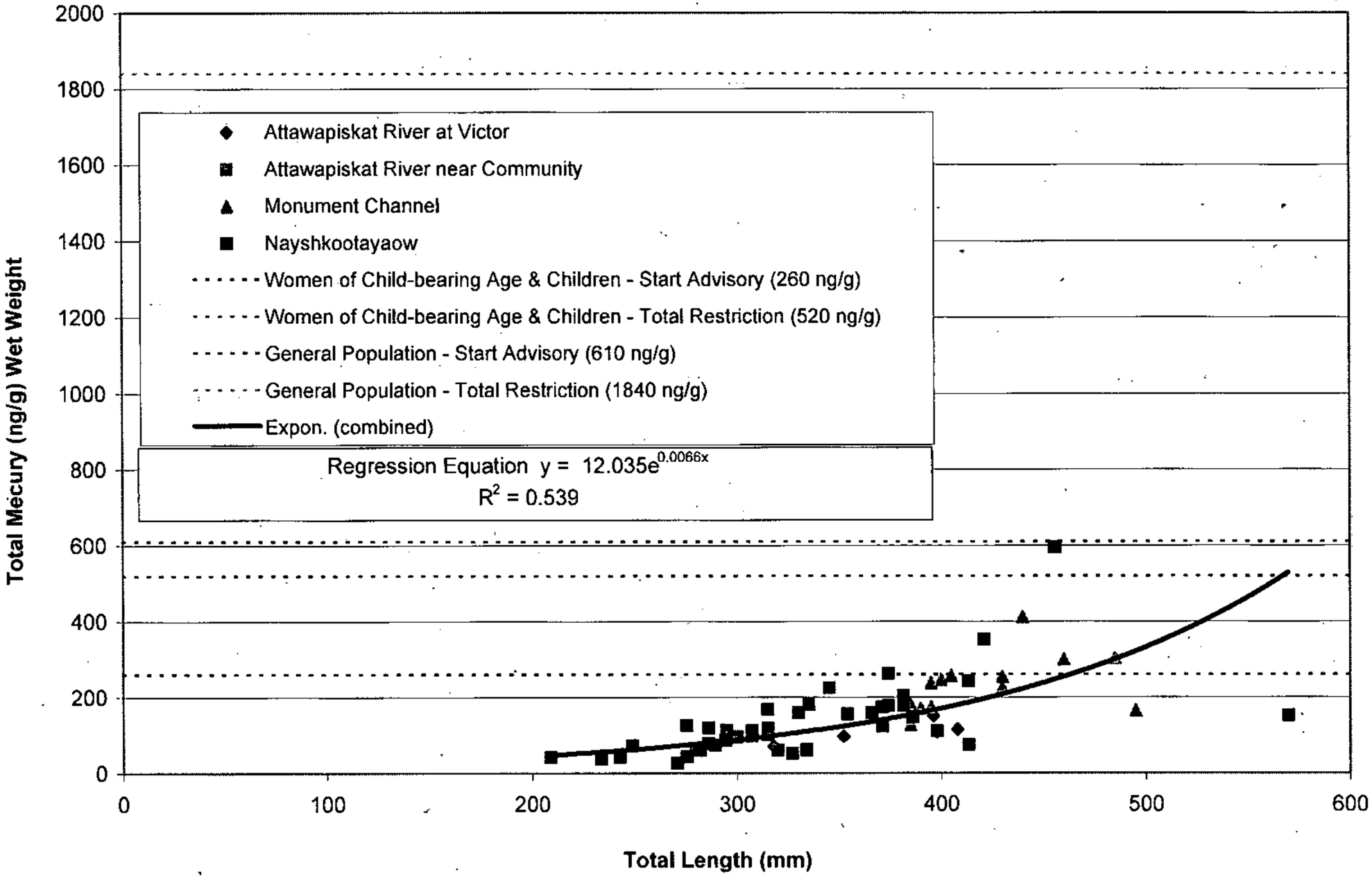
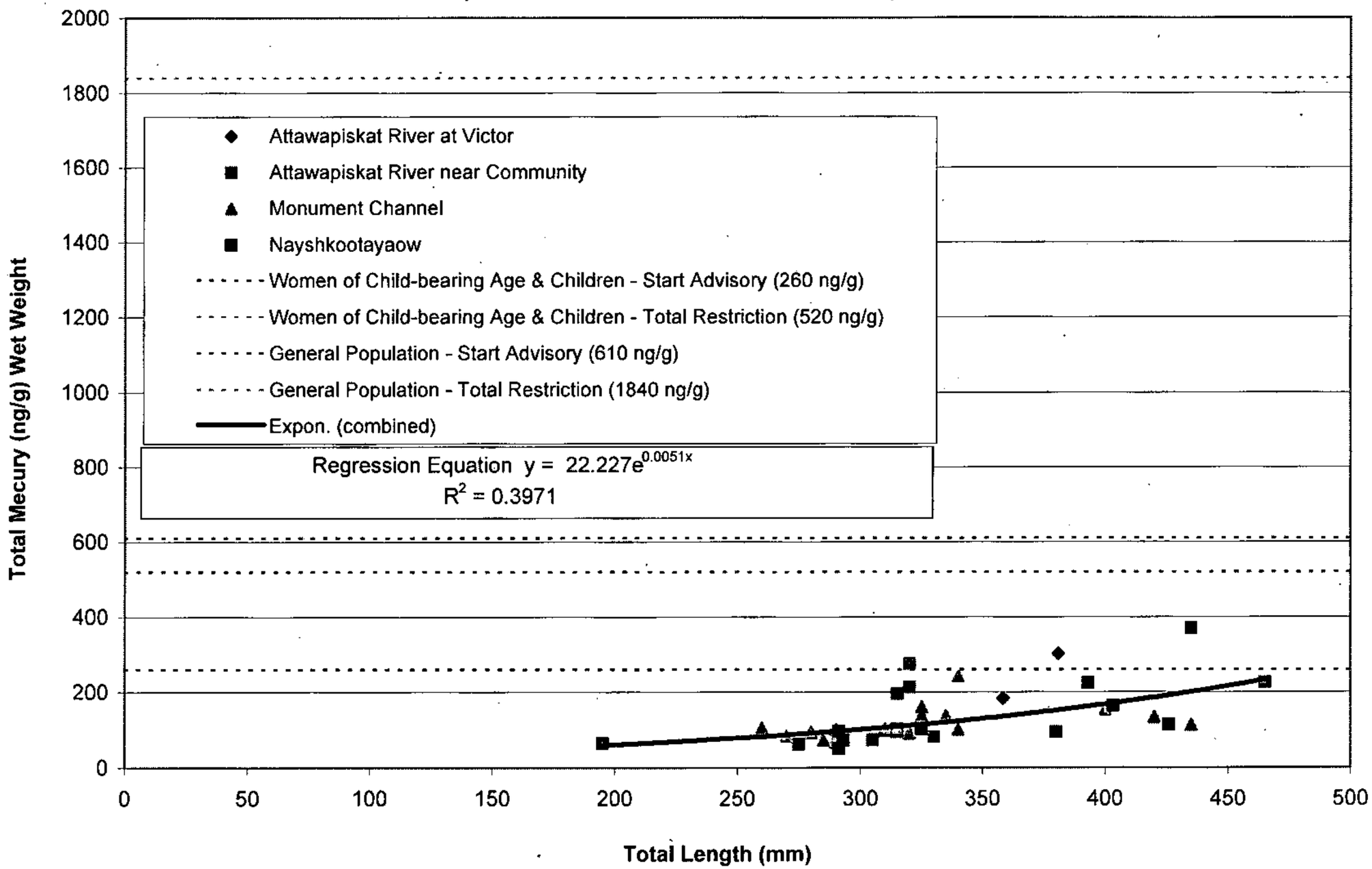


Figure 11
Relationship Between Whitefish Total Length and Total Mercury Concentration Nayshkootayaow River, Attawapiskat River and Monument Channel Samples - 2007/2008



APPENDIX A

NSERC Collaborative Research and Development #360525-07

Muskeg Research Executive Summary: Update June 10, 2009

The Impact of Mine Dewatering on the Hydrology and Mercury Biogeochemistry of Peatlands in the Hudson / James Bay Lowland: The De Beers Victor Diamond Mine

The overall aim of the research project is to explore and document the hydrogeological linkages between the surface peatland (muskeg) and deep (limestone) aquifer systems, and provide detailed information on the peatland hydrodynamic responses to mine dewatering, including an assessment of associated mercury dynamics. The intention of this document is to:

1) Provide De Beers with a brief, executive summary that revisits the original project objectives
2) Outline progress to date
3) Report preliminary results

Objective 1) Identify and characterize the hydrological linkage between upper (peatland) and lower (bedrock) systems and determine the change in recharge and discharge flow pathways resulting from aquifer dewatering.

Between 2007 and 2008 three research locations were identified and instrumented: 1) the main transect, 2) Tributary 5a, and 3) MS 15. The main transect is 1.5 km long, centred approximately 3.5 km northwest of the Victor Open Pit within the MS 8 bioherm zone, crossing over two arms of North Granny Creek. Bioherms anchor the transect at both ends, with additional instrumented bioherms nearby. Tributary 5a is of similar size and landform composition as North Granny Creek and serves as a control basin, since it is expected to be unaffected by pumping. MS 15 serves a control site for peatland and bioherm monitoring, as there are no easily accessible bioherms in Tributary 5A.

Distinct spatial patterns of drainage are anticipated related to the strength of the connection between the upper and lower hydrological systems, notably through bioherms that are scattered over the landscape. The northern section of the transect is located within a suspected enhanced recharge zone where, based on current models, the expected rate of groundwater recharge due to pumping might cause partial drainage of the peatlands in this area due to the presence of many (>6) bioherms. In 2007 and 2008, more than 100 piezometers and wells were installed in peat and the fine-grained substrate, arranged in nests both along the main transect and in small (10-15 m) transects radiating out from 5 additional bioherms. MS 15 was instrumented with 4 nests of piezometers near a bioherm. Tributary 5a also had three nests of piezometers installed.

Initial investigation shows considerable gradients in the piezometers near bioherms. Hydraulic gradients of ~1 have been observed, which are 2-3 orders or magnitude larger than would be expected in peatlands. At the comparison site, MS 15, gradients are <~0.01. This indicates that bioherms within the area impacted by pumping could be providing a 'window' through which downward flow and peatland drainage might occur.

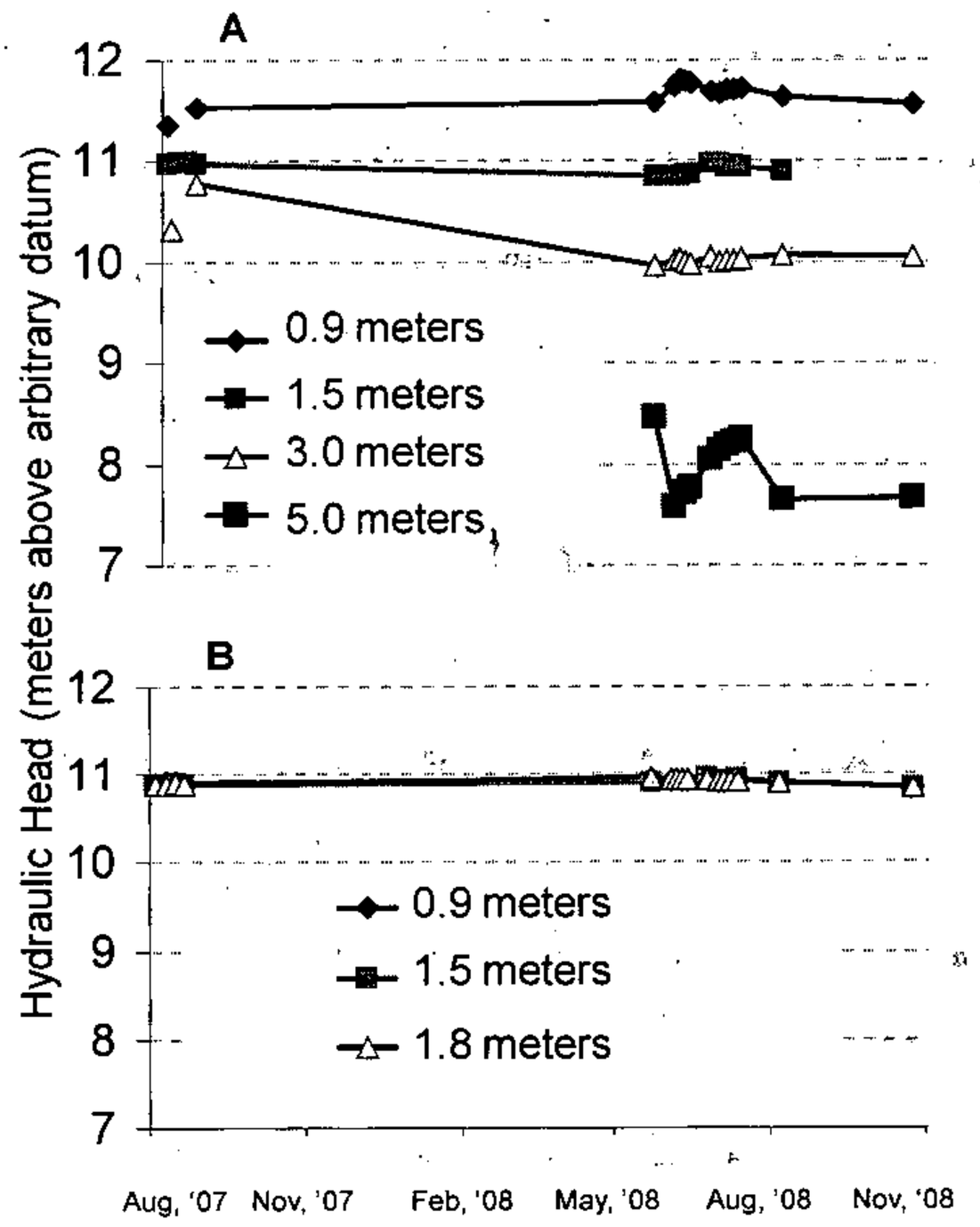


Figure 1. *Hydraulic head measurements from piezometers at two locations along the main transect:* ***1A*** *(top graph) represents conditions about 5 meters away from a bioherm;* ***1B*** *(bottom graph) represents conditions about 500 meters away from the same bioherm. Measurements were made from August 2007 to November 2008. The illustrated change in hydraulic head with depth is indicative of a downward gradient near the bioherm, a trend not present further from the bioherm. Note: the scales are consistent between graphs for sake of comparison.*

Objective 2) Determine the change in the flow pathways and water balance of bog and fen peatlands; especially runoff mechanisms, water storage and surface wetness.

A surface water monitoring program has been initiated within the North Granny Creek subwatershed to quantify and evaluate stream flow characteristics and runoff generation. Parallel measurements (but less frequent) are being made at Tributary 5A for comparison. Measurement stations along both the arms and confluence of the stream quantify discharge at multiple points in the basin. Water samples from various sources (e.g. streams, ponds, surface, and precipitation) are also collected on a regular basis for isotopic analysis to identify connectivity and flowpaths within the peatland. A meteorological station was erected to continuously measure climatic variables to be used in the estimation of seasonal water budgets. Delineation of the boundaries of the catchment has been completed on the basis of the LIDAR data gathered in August 2008 (see objective 5).

Objective 3) Characterize the hydrological parameters of the peatland and underlying systems to identify changes in response to drainage.

Limited undisturbed peat samples were extracted along the transect to determine the hydraulic properties of the muskeg soils. In addition, samples collected at the open pit reveals the varied stratigraphy of the overburden and the variations in depth to bedrock. Clay mineralogy (Summer 2008) indicates that the much of that the key units in the overburden are silt-sized carbonates rather than clay as was originally assumed. This suggests that where the connectivity to the underlying bedrock and pumping is strong, there is much less potential for compaction of these units. Moreover, the hydraulic conductivity may be greater than initially believed. There are however, deeper units within the overburden that appear to dilate (take on water, flow, and experience significantly decreased bearing capacity) when disturbed. The characterization of these units and anticipating their response to drawdown will continue in the summer of 2009.

Temperature probing along the banks of the north and south branches of the North Granny Creek indicated at least one significant groundwater discharge zone. The range of surface water was from 7°C to 20° C. Temperatures of ~ 4° C were assumed to be groundwater, whereas in the vicinity of a palsa, the water temperature was ~ 1° C.
Water samples collected (Summer 2008) from deep piezometers installed in the fine-grained sediments are awaiting isotope analysis, to determine the source of the water (i.e. meteoric or ground water).

Objective 4) Establish the natural distribution and mobility of both inorganic (total) mercury (THg), and methylmercury (MeHg) within the muskeg, and couple changes in the release of THg and MeHg to changes in peatland hydrology.

In June 2008, both surface (-5 cm) and subsurface (-30cm) peat was sampled at 15 locations along the main transect, typically corresponding to the hydrology monitoring locations. Similar sampling was also conducted (approximately one month later) along a transect in Tributary 5A. These peat samples (awaiting analysis in the mercury lab at the University of Toronto) will provide the first data on the distribution of THg and MeHg in peatland soils in the Hudson Bay lowlands. A concurrent surface water sampling program was also conducted, involving weekly sampling within the North Granny Creek subwatershed, as well as lower frequency sampling at Tributary 5A. Much of the water samples (both Hg and isotope) are pending analysis. These samples have been preserved and stored appropriately, and will be analysed in a priority-based sequential manner using the funds allocated in year one. The surface water sampling program will be intensified in 2009, to provide better resolution spatially and temporally. Also, an extensive subsurface water sampling program is being initiated to investigate small-scale variability in natural Hg concentrations in peat soils.

Objective 5) Use remotely sensed data to document changes in surface elevation and vegetation community structure, to provide a broad-scale interpretation of hydrological and biogeochemical change.

Currently, IKONOS satellite imagery (acquired in 2007) is being utilized to delineate and characterize the vegetation communities and peatland complexes around the mine. In

2008, a LIDAR flight mission was completed, covering an area of approximately 500 km^2, representative of the pre-drawdown condition. From this data, we have generated a high resolution digital elevation model that allowed for characterization of the microtopography within the different peatland forms as well as identification of surface flowpaths. Additionally, we are able to delineate our research subcatchments (i.e. North Granny Creek, Tributary 5A) for water budget estimations (Objective 2). Preliminary ground verification of this dataset using a high-resolution differential GPS system (2008) indicates accuracies of approximately ±2.5 to 5cm at 2.5m resolution. Additional ground verification is currently underway. Another set of LIDAR data are to be collected in 2011 to assess broad patterns of surface elevation changes in response to subsidence caused by aquifer depressurization. This will be related to another concurrent set of IKONOS data to assess vegetation change. Coupling the LIDAR digital elevation model with the IKONOS data will be fundamental to comprehension of the interaction between mine activity and the surrounding natural ecosystem.