CITY OF TEMISKAMING SHORES
NEW WASTE MANAGEMENT CAPACITY
ENVIRONMENT STUDY REPORT
TECHNICAL SUPPORT DOCUMENT:

HYDROGEOLOGY

Submitted to:

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FOREWORD

As of January 1, 2015, we have changed our company name from AMEC Environment & Infrastructure, a Division of AMEC Americas Limited to Amec Foster Wheeler Environment & Infrastructure, a Division of Amec Foster Wheeler Americas Limited (Amec Foster Wheeler). This reflects the combination of our parent company, AMEC plc, and Foster Wheeler AG. This name change is administrative in nature and we assure you that we will continue to maintain the current resources, contracts or other existing services you have with Amec Foster Wheeler. We will continue to provide the same quality of services and the same dedicated team of consultants, project managers, engineers and scientists. Our focus remains on delivering projects safely and successfully for you. You can find more information on Amec Foster Wheeler at www.amecfw.com.

EXECUTIVE SUMMARY

Amec Foster Wheeler Environment & Infrastructure, a Division of Amec Foster Wheeler Americas Limited (Amec Foster Wheeler), was retained by the City of Temiskaming Shores (the City) to complete a hydrogeological characterization of the New Liskeard Waste Disposal Site (the Site), in support of the Waste Management Capacity Project Environmental Assessment. The Site is located approximately 3 kilometres (km) west of New Liskeard, Ontario, west ½ of Lot 5, Concession 2, within the City of Temiskaming Shores, in the District of Temiskaming, on the north side of Rockley Road.

This Site is an expansion of the former New Liskeard Landfill, which reached its approved landfill capacity in June 2009, and is currently no longer accepting waste. The City's only other waste disposal site, the Haileybury Landfill, is now accepting all waste from the City, as well as waste from the Town of Cobalt. Based on waste generation projections, the Haileybury Landfill was expected to reach its approved landfill capacity by mid-2018. The proposed landfill expansion is to be situated immediately east and northeast of the existing waste fill area.

The Site study area encompasses the most immediate area of the project and encompasses the physical location of all activities associated with the landfill, including the access roads, site entrance, and the waste disposal cells. The extended Site study area encompasses the downgradient area and the contaminant attenuation zone (CAZ). The Site vicinity study area is defined as an area that extends downgradient of the Site study area, within the CAZ. The temporal boundaries of the Environmental Assessment will span all phases of the project, including the construction, operations, closure and post-closure phases. The Effects Assessment Indicators for groundwater are contaminants of concern based on typical landfill-derived leachate plumes, and include concentrations of select analytical parameters deemed significant in terms of downgradient and/or off-Site groundwater concentrations being greater than background water quality conditions.

Five monitoring wells were installed during September 2014 in total, three for this project and two for the annual monitoring program. Of the five monitoring wells installed during September 2014, three were overburden wells, one of which was installed at bedrock contact, and two were bedrock wells, all completed under Amec Foster Wheeler's supervision. Amec Foster Wheeler retained an Ontario licensed well driller, Marathon Drilling Ltd. (Marathon) to carry out the required monitoring well installations. The overburden installations (OW28-14, OW30-I and OW30-II) were completed between 5 and 8 September 2014, and bedrock installations (OW26-14 and OW27-14) were completed between 23 and 26 September 2014.

The monitoring well network for this study was comprised of the network of monitoring wells already established at the Site, including the new multi-level well nest added to the program in the fall of 2014 (i.e., well nest OW-30), as well as the three new wells (OW26-14 through OW28-14) installed by Amec Foster Wheeler in September 2014 to supplement the existing groundwater data for the purpose of this hydrogeological assessment. In order to present the most up to date groundwater conditions, the results of the 2015 annual monitoring program, including supplemental data collected during the fall 2014 monitoring event, have been

compiled and considered for this study. As per previous annual monitoring programs, groundwater was sampled three times annually by Amec Foster Wheeler, during the spring, summer and fall of 2015.

The Site is situated on a topographically elevated, exposed (i.e., little to no overburden) limestone, bedrock ridge. A number of documented fault zones are present in the vicinity of the Site and within the downgradient area. Geological investigations at the Site as determined by the boreholes completed at the Site indicate a thin veneer typically between 2 and 5 metres (m) of very loose to very dense primarily silt glacial till overlying limestone bedrock within the property boundary of the Site and extending east within the CAZ. Overburden deposits increase in thickness east of the Site near the eastern CAZ boundary and the downgradient sentry location to range between 12 and 23 m. The increased overburden deposits are characterized as a very loose to very dense silty sand deposit; underlain by a very stiff and dense to very dense silty clay deposit; which overlies a dense to very dense silty sand deposit over igneous bedrock.

The recorded static groundwater levels indicate groundwater flow across the Site towards the northeast in both the shallow and deep groundwater flow systems. Groundwater elevations in the vicinity of the Site mimic the topography of the area, decreasing to the northeast within the existing fill area, then flattening out across the CAZ, and subsequently decreasing steeply from the northeast corner of the CAZ to Highway 65. Strong downward hydraulic gradients have been reported on the bedrock ridge and below the landfill, indicating that the landfill is located in a groundwater recharge area. This is to be expected since the site is located just east of a presumed groundwater divide at the top of the bedrock ridge. The vertical hydraulic gradients level out to nearly horizontal downgradient of the landfill. At the eastern boundary of the CAZ, upward vertical hydraulic gradients have been observed in some well nests.

Historical hydrogeological studies completed in the vicinity of the Site have not incorporated groundwater quantity assessments, therefore no current or previous information regarding groundwater quantity is available for the purposes of this report. It is not anticipated, however, that any aspects of the landfill expansion project will have an impact on the groundwater quantity at the Site.

The groundwater quality data recorded at the Site to date indicates a landfill-derived impact to groundwater quality in the wells in closest proximity to the existing waste fill area, and a decrease in impact with distance from the landfill, indicating effective natural attenuation at the Site.

A landfill-derived impact was reported in downgradient well nests; however it cannot be confirmed at this time whether these results are indicative of groundwater impacts at depth, or rather merely a differing water type in the deep aquifer, associated with increased residence time. When plotted on a Piper diagram, water quality at the Site indicates varying groundwater types, dependent on well nest location and well installation depth. Water quality is stable over time, with consistent concentrations of most parameters graphed throughout the monitoring record, as well as low ranges of fluctuation at most monitoring wells. Exceedances of the

Guideline B-7 maximum allowable concentrations were quantified at various locations throughout the Site, however not all exceedances were interpreted to be landfill-derived.

Through an assessment of the existing CAZ, it was determined that natural attenuation is an appropriate means of continued groundwater management at the Site following expansion. Although the CAZ is sufficient for expansion to the east, it is recommended that the existing CAZ be expanded to the north by approximately 50 m to 100 m. Subsequently, the City will be required to obtain approximately 2 to 4 hectares of additional land to ensure a minimum attenuation distance to the northeast.

The contaminating lifespan of the current waste deposits for the various landfill parameters range from 9 years to greater than 25 years. The expansion of the landfill should consider that the contaminating lifespan of the plume will likely exceed 25 years at the waste mound location to reach target concentrations. Chemical and biological processes along with dilution will attenuate the downgradient effects of the leachate plume from the time of closure.

No additional mitigation measures aside from the expansion of the CAZ to the northeast are deemed necessary, at the current time. It is recommended that the existing annual monitoring program be continued; and a deep aquifer background monitoring well be added to the groundwater monitoring program.

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GLOSSARY AND ABBREVIATIONS

$A_{CAZ\ EXP}$	CAZ surface area
$A_{L\ EXP}$	total expanded landfill footprint surface area
A_0	total landfill area
C_0	peak concentration of the contaminant
CALA	Canadian Association for Laboratory Accreditation
CCME	Canadian Council of Ministers of the Environment
CAZ	Contaminant Attenuation Zone
Cl_{DOWN}	maximum downgradient chloride concentration
Cl_{SOURCE}	source chloride concentration
C_t	target concentration of the contaminant
D_{ATT}	attenuation distance between source area and downgradient well
DF	downgradient dilution factor
DOC	dissolved organic carbon
ha	hectare
I_{CAZ}	infiltration rate for the CAZ
I_L	landfill footprint infiltration rate
km	kilometre
m	metres
m^2	square metres
m^3	cubic metres
m/year	metres per year
meq	milli-equivalents
mg/L	milligrams per litre
mm	millimetre
mm/a	millimeters per year
MOECC	Ministry of the Environment and Climate Change
mtc	total mass of the contaminant in the waste
ODWS	Ontario Drinking Water Standards
PVC	polyvinyl chloride
q_0	infiltration rate through the landfill
$Q_{L\ EXP}$	recharge rate within the expanded landfill footprint
$Q_{CAZ\ EXP}$	CAZ recharge rate
RPD	Relative Percent Difference
SOP	Standard Operating Procedure
t	contaminating lifespan in years
TDS	total dissolved solids
µm	micrometre
UTM	Universal Transverse Mercator

1.0 INTRODUCTION AND PROJECT OVERVIEW

Amec Foster Wheeler Environment & Infrastructure (Amec Foster Wheeler) was retained by the City of Temiskaming Shores (the City) to complete a hydrogeological characterization of the New Liskeard Waste Disposal Site (the Site), in support of the Waste Management Capacity Project Environmental Assessment. This report is intended to support groundwater and contaminant migration predictions, and ultimately the proposed landfill expansion design. This report includes, but is not limited to, a summary of the existing hydrogeological conditions at the Site, including a detailed site plan outlining the groundwater monitoring well network, inferred groundwater flow directions, and up to date (i.e., 2014) groundwater quality conditions. In addition, this report provides an assessment of the potential for a groundwater-derived impact downgradient of the Site, through the calculation of the Site's contaminating lifespan and associated assessment of the capacity of the Contaminant Attenuation Zone (CAZ), and in turn an assessment of the suitability of natural attenuation as a means of managing groundwater at the Site following landfill expansion.

The Site is located approximately 3 kilometres (km) west of New Liskeard, Ontario, west ½ of Lot 5, Concession 2, within the City of Temiskaming Shores, in the District of Temiskaming, on the north side of Rockley Road. The location of the Site is presented on Figure 1; this Site is an expansion of the former New Liskeard Landfill. The New Liskeard Landfill reached its approved landfill capacity in June 2009, and is currently no longer accepting waste. The City's only other waste disposal site, the Haileybury Landfill, is now accepting all waste from the City, as well as waste from the Town of Cobalt. Based on waste generation projections, the Haileybury Landfill was expected to reach its approved landfill capacity by mid-2018.

The proposed landfill expansion, illustrated on Figure 2, is to be situated immediately east and northeast of the existing waste fill area. Proposed landfill contours are presented on Figure 2. Various groundwater monitoring wells are already in place in the immediate vicinity of the landfill expansion, as well as downgradient of the expansion throughout the CAZ. A total of 31 historical monitoring wells are currently used for monitoring purposes. Of these, 23 monitoring wells comprise the monitoring network, which is sampled three times annually. These include the following monitoring wells used for groundwater quality testing: OW1R-I, OW1R-III, OW10-I, OW10-II, OW11-I, OW11-II, OW12-I, OW12-II, OW13-I, OW16-I, OW16-II, OW16-III, OW17-I, OW17-II, OW17-III, OW23-I, OW23-II, OW24-I, OW24-II, OW24-III, OW25-I, OW25-II and OW25-III. In addition, nine monitoring wells are used for groundwater level measurements, including: OW1R-II, OW13-II, OW14-I, OW14-II, OW18-I, OW20-I, OW20-II, OW-21 and OW22-I. In September 2014, two additional wells were installed for annual monitoring purposes, and incorporated into the annual monitoring program (OW30-I and OW30-II). The annual monitoring network therefore now consists of 25 wells used for groundwater quality testing.

The current hydrogeological study was undertaken using the above-described annual monitoring network comprised of 25 monitoring wells, as well as an additional three monitoring wells, installed in September 2014 solely for the purposes of this investigation (i.e., 28 wells in total). These three additional project-specific monitoring well installations were intended to supplement the available historical annual groundwater monitoring database. The locations of

all historical and recently installed groundwater monitoring wells, with respect to the locations of the existing landfill area and the proposed landfill expansion, are presented on Figure 3.

2.0 METHODOLOGY

2.1 Spatial Boundaries

The Site study area encompasses the most immediate area of the project. It corresponds to the direct footprint of the on-Site project components. The Site study area covers a total area of approximately 32 hectares (ha), which encompasses the physical location of all activities associated with the landfill, including the access roads, site entrance, and the waste disposal cells. The extended Site study area encompasses the downgradient area and CAZ. It is not expected that the effects of the project would be measurable beyond the extended study area. The Site vicinity study area generally corresponds to the area in the vicinity of the project where the potential groundwater impacts are expected to occur, and can be predicted or measured with a reasonable degree of accuracy. The Site vicinity study area is defined as an area that extends downgradient of the Site study area, within the CAZ.

2.2 Temporal Boundaries

The temporal boundaries of the Environmental Assessment will span all phases of the project, including the operations, closure and post-closure phases, as follows:

Phase 1: Construction (Year 1)

- Construction of Cell 1 base and associated perimeter access roads/drainage ditches.

Phase 2: Operations (Years 2 to 20)

- Landfilling of active cells (1 through 5) coupled with development of cells 2 through 5
- Progressive closure of cells (1 through 4).

Phase 3: Closure (Years 20 to 21)

- Closure of cell 5 and final capping and cover.

Phase 4: Post-closure (Years 21 to 45)

- Post-closure monitoring.

2.3 Selection of Effects Assessment Indicators

The Effects Assessment Indicators for groundwater are outlined below. The indicators are contaminants of concern based on typical landfill-derived leachate plumes, and include concentrations of select analytical parameters deemed significant in terms of downgradient and/or off-Site groundwater concentrations being greater than background water quality conditions. The Effects Assessment Indicators include the following parameters:

- Arsenic;

- Barium;
- Boron;
- Cadmium;
- Chloride;
- Copper;
- Chromium;
- Dissolved Organic Carbon (DOC);
- Lead;
- Nitrate;
- Nitrite;
- Sodium;
- Sulphate;
- Total Dissolved Solids (TDS); and
- Zinc.

2.4 Prediction of Effects

Amec Foster Wheeler has completed an assessment of the potential groundwater quality effects of this proposed landfill expansion project in accordance with generally accepted groundwater assessment methodologies, as outlined below.

2.4.1 Monitoring Well Installations

As discussed above, three project-specific monitoring wells were installed by Amec Foster Wheeler solely for the purposes of this investigation, to supplement the existing annual monitoring well network, specifically in the immediate vicinity of the proposed landfill expansion. In addition, two annual monitoring wells were installed by Amec Foster Wheeler for the purposes of expanding the existing annual monitoring network. Five monitoring wells were installed during September 2014 in total, three for this project and two for the annual monitoring program.

Of the five monitoring wells installed during September 2014, three were overburden wells, one of which was installed at bedrock contact, and two were bedrock wells, all completed under Amec Foster Wheeler's supervision. Amec Foster Wheeler retained an Ontario licensed well driller, Marathon Drilling Ltd. (Marathon) to carry out the required monitoring well installations. The overburden installations (OW28-14, OW30-I and OW30-II) were completed between 5 and 8 September 2014, and bedrock installations (OW26-14 and OW27-14) were completed between 23 and 26 September 2014. The Universal Transverse Mercator (UTM) coordinates of each installation are provided on the associated borehole logs provided in Appendix A; a monitoring well location plan is presented on Figure 3. Soil profiles were recorded on preliminary field logs, and included observations of soil moisture content. A detailed description of the stratigraphic conditions encountered in each borehole is provided in Appendix A.

The overburden wells were installed using a track mounted soils drill rig and a standard soils auger drilling technique, with 200 millimeter (mm) hollow stem augers and rods advanced to either predetermined depths (OW30-I and OW30-II) or refusal on presumed bedrock (OW28-14). Soil samples were collected from the augers for the entire borehole depth. Amec Foster Wheeler logged the encountered stratigraphy, noting geological material, texture and colour. The drilling rods were subsequently removed and the wells installed within the augers at depths of 3.3 m, 7.8 m and 20.2 m for OW-28-14, OW30-II and OW30-I, respectively, using environmental standard 50 mm threaded Schedule 40 polyvinyl chloride (PVC) monitoring well materials with 3 m of #10 machine slotted screen at the base. The screened interval of each well was then backfilled with imported #2 silica sand pack, with the remainder of the well annulus backfilled with a bentonite grout mixture using a tremie line and the positive displacement grouting method to within 3 m of ground surface. The hollow stem augers were then removed allowing the native material to collapse around the installed monitoring well. The upper 1 m of each hole was completed with a bentonite seal. The monitoring wells were extended above grade and completed with lockable, protective steel casings.

Bedrock wells were completed via HQ coring (i.e., 50 mm hole diameter), with wells installed at depths of 11.6 m and 13.7 m for OW26-14 and OW27-14, respectively. Bedrock well installations were completed in a manner identical to that of the overburden well, using environmental standard 50 mm threaded Schedule 40 PVC monitoring well materials, as described above.

2.4.2 Groundwater Sampling

2.4.2.1 Groundwater Monitoring Program

As discussed above, the monitoring well network for this study was comprised of the network of monitoring wells already established at the Site, including the new multi-level well nest added to the program in the fall of 2014 (i.e., well nest OW-30), as well as the three new wells (OW26-14 through OW28-14) installed by Amec Foster Wheeler in September 2014 to supplement the existing groundwater data for the purpose of this hydrogeological assessment. In order to present the most up to date groundwater conditions, the results of the 2015 annual monitoring program, including supplemental data collected during the fall 2014 monitoring event, have been compiled and considered for this study.

As per previous annual monitoring programs, groundwater was sampled three times annually by Amec Foster Wheeler, during the spring, summer and fall of 2015. Sampling events occurred on the following dates:

- Spring – 21 May 2015;
- Summer – 22 July 2015; and
- Fall – 20-21 September 2015.

According to the groundwater elevation data collected to date (discussed in detail in Section 4.2), well nest OW-10 (comprised of wells OW10-I and OW10-II, installed in shallow bedrock and overburden, respectively) is considered unlikely to be impacted by landfill leachate since it is located north of the Site (i.e., crossgradient). Based on this conclusion, well nest OW-10 has historically been considered to be representative of background (i.e., non-impacted) water quality conditions, and allows a detailed evaluation of the Site to be undertaken with respect to Ministry of the Environment and Climate Change (MOECC) Guideline B-7.

OW13-I is situated immediately upgradient of the fill area, however this location is not appropriate for use as a background monitoring location given its close proximity to the waste deposits. Recently installed monitoring well OW26-14 is situated west of the existing waste deposits, and was installed to provide true upgradient water quality results and potentially characterization of background groundwater quality once a statistically valid database has been compiled (i.e., a minimum of eight to ten data points over a period of no less than two years).

Well nest OW-1R is situated immediately downgradient of the current fill area, and wells OW-1R-I and OW1R-III are therefore considered to be source monitoring locations. Well nests OW-11 and OW-12 are situated just east of the historical downgradient property boundary, prior to the establishment of the CAZ. Recently installed wells OW27-14 and OW28-14 are situated on the west side of this boundary, and are staggered with nests OW-11 and OW-12. These monitoring wells are all representative of downgradient groundwater quality, however additional property is available downgradient of these wells for continued natural attenuation.

The downgradient CAZ boundary is monitored by a variety of multi-level well nests, including OW-30, OW-25, OW-16 and OW-24, which are situated at slightly increasing distances from the fill area. Well nest OW-17 is situated slightly further downgradient from OW-24, and is outside of the CAZ, immediately south of the hydro corridor. An additional well nest, OW-23, is situated further downgradient, much outside of the CAZ, and is intended to be a downgradient sentinel monitoring well nest, as it is situated upgradient of Highway 65.

2.4.2.2 Monitoring Procedures and Methods

Monitoring procedures and methods are outlined in detail in the Standard Operating Procedure (SOP) provided in Appendix B. Static groundwater levels were recorded initially, and each groundwater monitoring well was then purged prior to sampling (up to three standing well volumes or to dryness) to ensure the sample was representative of the formation water. Dedicated well instrumentation (Waterra Tube and foot valve system) was used to obtain water samples from the groundwater monitoring wells, and samples were immediately transferred to laboratory-prepared sample vials and bottles. In accordance with industry standards, the components of the collected groundwater samples identified for heavy metals analysis were field-filtered using a single use 0.45 micrometer (µm) filter unit, and the remaining samples were preserved following standard laboratory protocols as established in the MOECC "*Guidance on Sampling for Use at Contaminated Sites in Ontario*" (revised December 1996) and the above-noted SOP.

Samples were submitted under chain of custody, in a temperature controlled setting (i.e., in a cooler, on ice) to a Canadian Association for Laboratory Accreditation (CALA) accredited laboratory sub-contractor, AGAT Laboratories (AGAT), in Mississauga for analysis. The analytical results were subsequently forwarded to Amec Foster Wheeler. Laboratory analytical reports are provided in Appendix B. Geochemical analyses for general chemistry, metals and nitrogen cycle parameters were completed on all samples collected. A detailed list of laboratory parameters is included in Appendix C. Field parameters comprised temperature, pH, conductivity and dissolved solids. Static water level measurements were also recorded. All field equipment was maintained and calibrated appropriately prior to each use.

The groundwater monitoring data were reviewed by comparison to the current MOECC Ontario Drinking Water Standards (ODWS), revised June 2003.

2.4.2.3 Quality Assurance for Sampling and Analysis

Amec Foster Wheeler uses recognized industry standards, including the Canadian Council of Ministers of the Environment (CCME) *Subsurface Assessment Handbook for Contaminated Sites* and MOECC's manual *Guidance on Sampling and Analytical Methods for Use at Contaminated Sites in Ontario* for conducting environmental assessments. For quality assurance, all work is supervised and internally reviewed by senior staff members.

Field sampling equipment decontamination was completed in accordance with accepted protocols. As a minimum, sampling equipment was washed with detergent solution and rinsed with distilled water between sampling. Decontamination procedures were undertaken to prevent any cross-contamination between monitoring locations and sampling sites. Screening instruments were calibrated prior to each use.

As a minimum, for every ten groundwater samples collected, one field duplicate sample was collected and included in the laboratory submission for analysis. Three field duplicate samples were collected during each monitoring event. Samples were submitted to a CALA accredited laboratory that is MOECC certified for the analysis of drinking water samples. Laboratory blanks and duplicates were used to ensure sample integrity. Relative Percent Differences (RPDs) were calculated and discussed where applicable. Samples were placed in appropriate sample containers provided by the laboratory and preserved (as required based on type of analysis) until delivered (shipped by courier) to the laboratory for analysis. A chain of custody form accompanied samples at all points of handling.

2.4.2.4 Contaminant Attenuation Zone and Contaminating Lifespan Assessments

The proposed landfill expansion design has assumed that the Site will continue to be operated as a natural attenuation landfill following expansion. Various historical assessments have been undertaken by Amec Foster Wheeler in order to confirm that the existing CAZ will be sufficient to manage any additional impacts introduced by the landfill expansion, as designed. Assessments of the dilution capacity of the CAZ have been undertaken using chloride concentrations as a leachate indicator.

In addition, the contaminating lifespan of the existing waste mound was predicted based on the historical data provided. The leachate strength and attenuation was examined in greater detail to determine the observed contaminating lifespan of the representative leachate well. This evaluation was completed utilizing the statistical procedures as presented in Gilbert R.O., (1987) *Statistical Methods for Environmental Pollution Monitoring*. New York: Van Nostrand Reinhold. Primary leachate parameters will be evaluated to make a determination on the existing contaminating lifespan and its association to the expansion.

3.0 EXISTING ENVIRONMENTAL CONDITIONS

3.1 Topography & Site Drainage

The Site is situated on the east side of a limestone ridge which forms a watershed divide separating the South Wabi Creek catchment, located west of the Site, from the Wabi Creek catchment, located east of the Site. The topography within the Site boundary is dominated by the waste mound producing a radial drainage pattern, the surrounding features provides increased perimeter infiltration and conveys runoff east around the waste mound. East of the waste deposit the topography flattens across the CAZ, this area is characterized with high infiltration rates and low surface water runoff. East of the CAZ boundary the topography steepens significantly which reduces the infiltration potential and forms ephemeral watercourses which transition into intermittent channels. Two primary intermittent channels along the steep valley slopes with substrates comprised of erodible mineral soils have been identified east of the CAZ boundary. They deposit into the roadside ditch of HWY 65 which conveys surface water approximately 2 km downstream to Wabi Creek. The intermittent channels are likely seasonally limited to the spring freshet and during larger rainstorms.

The proposed landfill contours and topographic features of the Site are presented on Figure 2 and a cross sectional profile provided in Figure 4. There is no surface water on-site or in the immediate vicinity of the Site the overall drainage for the Site is directed northeast.

The adjacent solar farm project had completed an assessment on the impacts of drainage within the CAZ and determined the impervious surfaces do not impact the characteristics of the CAZ drainage (DCL, December 2011). There may be a temporary alteration to the CAZ drainage characteristics during the construction phase of the solar farm project which can be mitigated with standard erosion control measures. The overall change in surface water runoff peak flows as a result of the solar farm project is considered insignificant (DCL, December 2011).

3.2 Geological Conditions

The geological conditions at the Site as determined by the boreholes completed at the Site indicate a thin veneer typically between 2 and 5 m of very loose to very dense primarily silt glacial till overlying limestone bedrock within the property boundary of the Site and extending east within the CAZ. Overburden deposits increase in thickness east of the Site near the eastern CAZ boundary and the downgradient sentry location to range between 12 and 23 m. The increased overburden deposits are characterized as a very loose to very dense silty sand

deposit; underlain by a very stiff and dense to very dense silty clay deposit; which overlies a dense to very dense silty sand deposit over igneous bedrock. A geological cross section from the Site to downgradient of the CAZ (i.e., a conceptual model) is presented in Figure 4 with detailed stratigraphic and instrumentation borehole logs provided in Appendix A.

3.3 Hydrostratigraphic Characterization

The Site is situated on a topographically elevated, exposed (i.e., little to no overburden) limestone, bedrock ridge. A number of documented fault zones are present in the vicinity of the Site and within the downgradient area. Geological investigations in this area indicate a thin veneer overburden within the Site boundary and extending east into the CAZ with depths typically ranging from 2 to 5 m. As this area is on a topographic high near an inferred groundwater divide there are strong downward gradients within nested wells indicating a recharging aquifer. The absence of a significant low permeability confining layer overlying the limestone bedrock in this area means that there is a high susceptibility for contaminant migration to the bedrock aquifer and the faults. It is anticipated that the limestone bedrock has similar hydraulic properties to the overburden deposits and that the two stratigraphic units generally form one aquifer.

Overburden thickness increase at the east boundary of the CAZ to range from 12 to 23 m. The increased overburden deposits form a very stiff and dense to very dense silty clay deposit which divides the overlying and underlying silty sand deposits. This area of the drainage basin is followed by a steep downward topographic change. Upward vertical groundwater gradients observed in the instrumented monitoring well nests indicate a discharging groundwater condition. The silty clay deposit is inferred to have a lower permeability than the overlying silty sand deposit and forms a hydraulic barrier to produce a shallow overburden aquifer within the silty sand deposit. Bedrock near the CAZ boundary, and further to the northeast is characterized as assumed mafic igneous (JHL, 2008). It is anticipated the igneous mafic bedrock has a lower permeability forming a barrier to contaminant migration and produces a confined deep overburden aquifer. As a result of the low permeability igneous mafic bedrock the confined deep overburden aquifer is producing upward vertical hydraulic gradients as observed in the nested wells in this area.

3.4 Groundwater Flow

Static water levels were recorded by Amec Foster Wheeler at each of the wells during the spring, summer and fall 2015 groundwater monitoring events. Appendix D presents the groundwater elevations measured during the 2015 groundwater monitoring events, as well as historical groundwater elevations measured during previous annual monitoring programs. Figures 5A through 5F present the inferred groundwater elevation contours and groundwater flow directions for 2015 for the shallow and deep aquifers, respectively. In general, the recorded static groundwater levels indicate groundwater flow across the Site towards the northeast in both the shallow and deep groundwater flow systems. Groundwater elevations in the vicinity of the Site mimic the topography of the area, decreasing to the northeast within the existing fill

area, then flattening out across the CAZ, and subsequently decreasing steeply from the northeast corner of the CAZ to Highway 65.

Groundwater flows through the overburden and upper bedrock from the landfill to the northeast. JHL reported that highly fractured bedrock extended to 10 m below ground surface at well nest OW-1R (situated immediately northeast of the existing waste footprint), which corresponds to approximately the upper 7 m of the limestone bedrock (JHL, 2008). Other boreholes indicated more fractured bedrock in the upper 1 to 2 m of bedrock relative to deeper bedrock, including OW27-14.

Strong downward hydraulic gradients have been reported on the bedrock ridge and below the landfill, indicating that the landfill is located in a groundwater recharge area. This is to be expected since the site is located just east of a presumed groundwater divide at the top of the bedrock ridge. The vertical hydraulic gradients level out to nearly horizontal downgradient of the landfill. At the eastern boundary of the CAZ, upward vertical hydraulic gradients have been observed in some well nests. As indicated above in section 3.1 two intermittent channels are present east of the CAZ and are seasonally limited to the spring freshet and during heavy rainstorm. This indicates there is likely a seasonal groundwater discharge of locally recharged groundwater resources obtained from snow melt and heavy rainstorms and not discharging potentially impacted groundwater resources.

The CAZ, owned by the City, extends approximately 400 m downgradient of the northeast edge of the existing waste footprint. Average groundwater flow velocity in the plains area northeast of the landfill was reported by JHL to be approximately 1.9 m per year (m/year) in overburden and ranging from 0.6 to 5.7 m/year in shallow bedrock (JHL, 2008).

3.5 Groundwater Quantity

Historical hydrogeological studies completed in the vicinity of the Site have not incorporated groundwater quantity assessments, therefore no current or previous information regarding groundwater quantity is available for the purposes of this report. It is not anticipated, however, that any aspects of the landfill expansion project will have an impact on the groundwater quantity at the Site.

As stated above the adjacent solar farm impervious surfaces do not impact the characteristics of the solar farm property drainage (DCL, December 2011). Therefore there is no anticipated effect on the amount of groundwater quantity in the CAZ for the landfill expansion project.

3.6 Groundwater Quality

The Site ceased accepting waste in 2009 as a result the source strength of the contamination is inferred to be degrading without the additional input. The subsequent closure activities are inferred to have produced a truncated plume with peak contaminant concentrations detached from the source. The groundwater quality at the Site and within the CAZ is therefore inferred to be improving with the closure of the Site.

There is no expected negative effect on surrounding well water as a result of the adjacent solar farm project and on-site monitoring wells were not required (MPCE, January 2012). Therefore there is no anticipated cumulative effect on the groundwater quality in the CAZ for the landfill expansion project.

Samples were collected from all applicable wells during all three 2015 monitoring events, with the exception of OW-17-III, which was dry during the fall monitoring event. The condition of each monitoring well was confirmed during each 2015 monitoring event, with no noticeable requirement for maintenance or repair.

3.6.1 Data Quality Evaluation

The analytical laboratory employed to perform the laboratory analyses (AGAT) is accredited by the Standards Council of Canada/Canadian Association for Laboratory Accreditation in accordance with ISO/IEC 17025:1999 – "*General Requirements for the Competence of Testing and Calibration Laboratories*" for the tested parameters and has met the standards for proficiency testing developed by the Standards Council of Canada for parameters set out in the Soil, Ground Water and Sediment Standards.

Sample analysis dates provided on the laboratory analytical reports issued by AGAT indicate that all sample analyses were performed within the required sample/extract hold times, as indicated by the dates presented in columns for each sample parameter on the analytical report. The laboratory minimum detection limits were reported to be at or lower than the required MOECC reporting detection limits for the parameters analyzed. A comparison of the internal laboratory duplicate samples indicates that all samples and the respective duplicates are within acceptable limits.

As a quality control measure, groundwater duplicate samples were collected during each sampling event. All duplicate data are provided in Appendix C and are summarized in Appendix E. Duplicate samples were collected from OW-16-I, OW-25-III, OW-23-II and WS-8 during the spring monitoring event, from OW-25-I, OW-17-I and OW-23-II during the summer monitoring event and from OW-24-I, OW-17-I and OW-1R-III during the fall monitoring event.

When compared to concentrations reported in the original samples, duplicate water quality data reported that all parameters were within an acceptable range with respect to relative percent difference (i.e., the industry standard of less than 50%), with the exception of aluminum in duplicate sample NL GW DUP-1 during the spring monitoring event, organic nitrogen in NL GW DUP-1 during the summer monitoring event, ammonia in NL GW DUP-2 during the summer event, aluminum and chromium in NL GW DUP-3 during the summer monitoring event and aluminum and iron in NL GW DUP-1 during the fall monitoring event. It should be noted that the majority of the duplicate analysis that presents a relative percent difference beyond the 50% range is a result of the concentrations being near the laboratory detection limit, where accuracy of the laboratory analysis begins to decrease, and is not attributable to either laboratory or sampling error.

3.6.2 Background Water Quality

Background water quality at the Site has historically been represented by well nest OW-10, situated crossgradient to the fill area, as discussed above. This multi-level well nest is comprised of a moderate depth limestone bedrock installation (OW10-I) and a shallow overburden installation (OW10-II). Groundwater quality in this well nest is the same in both the shallow and the deep installations, and is characterized by low concentrations of chloride and most metals parameters, moderate concentrations of alkalinity, DOC and sulphate, and high concentrations of hardness and TDS, in comparison to the ODWS. In accordance with the inferred groundwater flow direction, concentrations of landfill indicator parameters quantified at this location are considered to be representative of regional background water quality in the aquifers intersected by the well screens. ODWS exceedances quantified during 2015 included hardness, organic nitrogen and TDS in both wells, as well as iron in OW-10-I, shown as bold entries in the associated geochemical summary tables (Appendix E).

Hardness and organic nitrogen are operational guidelines, intended to ensure efficient and effective treatment and distribution of water, and to aid in water source selection. TDS and iron are aesthetic objectives and have been established to assess potential taste, odour or colour problems that may interfere with good water quality control practices. Exceedances of these parameters do not constitute a health hazard, and can likely be attributed to elevated compounds produced by natural processes occurring in the aquifer.

3.6.3 Upgradient Water Quality

The 2015 groundwater quality in OW-13-I, situated upgradient of, but immediately adjacent to, the waste fill area, is characterized by concentrations of most parameters at levels similar to background, with the exceptions of alkalinity and barium, which are slightly elevated in compared to background water quality. Exceedances of the ODWS in OW-13-I are shown as bold entries in the associated table in Appendix E, and included hardness and organic nitrogen.

Recently installed monitoring well OW26-14 is situated upgradient of the Site and could potentially be used as a deep background monitor once a statistically valid database is established for this monitoring location (i.e., at least eight data points over a minimum of two years). Limited samples have been collected at this well to date, well nest OW-10 will continue to be considered background for the purposes of compliance determination, until groundwater quality in OW26-14 can be confirmed by additional sampling. A sample for the groundwater quality in OW26-14 was obtained during the fall 2014 monitoring event and is characterized by elevated concentrations of most parameters, when compared to background water quality, particularly chloride, DOC, sulphate, nitrogen cycle parameters, conductivity, TDS, barium, boron, manganese and sodium. Concentrations of parameters including alkalinity, hardness, calcium, iron and magnesium were quantified at levels lower than those reported at background. Exceedances of the ODWS quantified in OW26-14 during September 2014 included DOC, hardness, organic nitrogen and TDS, as shown as bold entries in the associated data table in Appendix E.

It is noted that OW26-14 is installed in the deep bedrock aquifer, whereas the deepest installation at well nest OW-10 monitors the shallow bedrock aquifer and mimics the shallow overburden aquifer at that location, likely as a result of increased fracturing near the bedrock surface. The available water quality data appear to indicate a different water type in OW26-14, as compared to well nest OW-10, indicating a different water type in bedrock at depth. This is discussed in greater detail in Section 3.6.9.

3.6.4 Source Strength Water Quality

Source groundwater quality conditions are measured by monitoring wells OW-1R-I and OW-1R-III, situated immediately downgradient of the waste fill area. Similar groundwater quality is reported in both the shallow (OW-1R-III) and deep (OW-1R-I) wells, and is characterized by significantly elevated concentrations of most analytical parameters, when compared to background concentrations. ODWS exceedances included alkalinity, chloride, DOC, hardness, organic nitrogen, TDS and manganese in both wells, as well as sodium in OW-1R-III (Appendix E).

3.6.5 Mid-Site Downgradient Water Quality

As discussed above, well nests OW-11 and OW-12, formerly representative of the downgradient property boundary, are now situated mid-Site with respect to the CAZ. Multi-level well nests at both locations are comprised of a shallow installation (OW11-II and OW12-II) and a deep installation (OW11-I and OW12-I), instrumented similarly to background well nest OW-10 (i.e., shallow overburden and shallow limestone aquifer). Groundwater quality in the shallow installations is noticeably degraded in comparison to the deep installations at both locations. In addition, OW-12 indicates a slightly greater impact in both the shallow and deep wells, as compared to OW-11.

Groundwater quality in both shallow wells is characterized by elevated concentrations of alkalinity, chloride, DOC, hardness, TDS, organic nitrogen and boron, and low concentrations of sulphate, in comparison to background water quality. Barium is elevated in OW-12-II, but similar to background levels in OW-11-II. Groundwater quality in both deep wells is characterized by elevated concentrations of chloride, barium, boron, potassium and sodium, concentrations of alkalinity, DOC and magnesium similar to those quantified at background, and concentrations of sulphate, hardness, TDS and calcium lower than background. Similar to the shallow wells, concentrations of all indicator parameters are slightly higher in OW-12-I than OW-11-I. An anomalous alkalinity concentration is noted in OW-12-I during the summer monitoring event.

Exceedances of the ODWS included hardness and organic nitrogen in both OW-11-I and OW-12-I, as well as alkalinity in OW-12-I, while exceedances reported in OW-11-II and OW-12-II included DOC, hardness, organic nitrogen and TDS in both wells, as well as alkalinity and iron in OW-12-II. All exceedances are shown as bold entries in the associated data table provided in Appendix E.

In order to supplement mid-Site groundwater quality data, OW27-14 and OW28-14 were installed a short distance northwest of OW-11 and OW-12, respectively. Water quality in OW28-14 is similar to that of OW11-II, however concentrations of landfill indicator parameters are elevated in OW28-14, in comparison to those quantified in OW11-II. Exceedances of the ODWS in OW28-14 during the September 2014 monitoring event were quantified for DOC, hardness, organic nitrogen, TDS and manganese (Appendix E).

Groundwater quality in deep bedrock monitoring well OW27-14 is similar to that reported in OW26-14, described above. Despite the geographic separation of these two wells, one west and upgradient of the Site (OW26-14) and the other northeast and crossgradient of the Site (OW27-14), an almost identical water type is apparent. It is therefore interpreted, based on the only available data set for each well, that the landfill-derived groundwater plume does not impact the deep bedrock aquifer at the location of OW27-14. This is discussed in greater detail in Section 3.6.9.

3.6.6 Downgradient CAZ Boundary Water Quality

Downgradient water quality at the CAZ boundary is measured by multi-level well nests OW-30, OW-25, OW-16 and OW-24, which are considered to be representative of the downgradient property boundary, as well as OW-17, which is situated slightly downgradient of the CAZ boundary. Well nests OW-25, OW-16 and OW-24 are comprised of three wells, installed in the shallow, moderate depth and very deep aquifers; well nest OW-30 is comprised of two wells, installed in the moderate depth and deep aquifers. Given the groundwater flow direction, the OW-25 and OW-30 nests are situated in closest proximity to the waste deposits. The OW-30 well nest was installed in 2014 in order to delineate the southern extent of the landfill-derived groundwater plume at the downgradient CAZ boundary.

Differing water quality is apparent in the moderate and deep installations at recently installed well nest OW-30. Groundwater quality in moderate depth well OW30-II is characterized by elevated concentrations of chloride, DOC, aluminum, boron and sodium, and low concentrations of alkalinity, hardness, calcium and magnesium, in comparison to background. Water quality in OW30-I is characterized by elevated concentrations of chloride, sulphate, TDS, aluminum, barium, boron, potassium and sodium, and low concentrations of alkalinity, hardness and calcium, when compared to background water quality. Exceedances of the ODWS were quantified for hardness and organic nitrogen in both wells, as well as fluoride and aluminum in OW30-I (Appendix E).

Groundwater quality in the OW-25 well nest differs between each of the three wells. Water quality in deep well OW-25-I is characterized by concentrations of all parameters at levels similar to, or lower than, background. Parameters quantified at concentrations lower than background include chloride, sulphate, hardness, TDS, calcium and magnesium. Groundwater quality in moderate depth well OW-25-II is characterized by slightly elevated concentrations of chloride, sulphate, aluminum, boron, sodium and potassium, and concentrations of alkalinity, hardness, DOC, calcium and magnesium at levels lower than background. Water quality in shallow well OW-25-III is characterized by slightly elevated concentrations of alkalinity, barium,

magnesium, potassium and sodium, however all remaining parameters were quantified at levels similar to background groundwater quality. Exceedances of the ODWS in well nest OW-25 during 2015 included hardness and organic nitrogen in all three wells, as well as DOC and aluminum in OW-25-II, as indicated in the associated data summary tables provided in Appendix E.

Groundwater quality also differs with depth in the OW-16 well nest. Deep well OW-16-I indicates water quality characterized by elevated concentrations of alkalinity, chloride, DOC, fluoride, organic nitrogen, ammonia, aluminum, boron and sodium, and low concentrations of sulphate, hardness, TDS and calcium, when compared to background water quality. Groundwater quality in OW-16-II is characterized by low concentrations of alkalinity, hardness, TDS, magnesium and calcium, and slightly elevated concentrations of chloride, boron, potassium and sodium, relative to background. Elevated concentrations of alkalinity, barium, iron, manganese and sodium characterize water quality in shallow well OW-16-III. An anomalous selenium concentration is noted at this location during the spring 2015 monitoring event. ODWS exceedances quantified in the OW-16 well nest during 2015 are shown as bold entries in the associated data tables in Appendix F, and included hardness and organic nitrogen in all three wells, DOC and fluoride in OW-16-I, and selenium, iron and manganese in OW-16-III.

Groundwater quality in well nest OW-24 is more consistent with depth, as compared to that discussed above for well nests OW-25 and OW-16. Groundwater quality in shallow, moderate depth and deep wells (OW-24-III, OW-24-II and OW-24-I, respectively) is characterized by low concentrations of sulphate, hardness, TDS and calcium, as compared to background; concentrations of remaining parameters are similar to those reported in well nest OW-10. Concentrations of some parameters, including fluoride, aluminum, boron, iron and manganese, are slightly higher in the deep installation, OW-24-I, as compared to the moderate depth and shallow wells in this nest, and are elevated slightly in comparison to background. Exceedances of the ODWS were quantified for hardness, organic nitrogen and manganese in all three wells, as well as iron in OW-24-I (Appendix E).

Similarly, groundwater quality in well nest OW-17 is characterized by low concentrations of all indicator parameters, as compared to background water quality. Water quality is relatively consistent in all three wells, however concentrations of indicator parameters are slightly higher in OW-17-II, as compared to the shallow and deep wells (OW-17-III and OW-17-I, respectively). Exceedances are shown as bold entries in the tables provided in Appendix E, and included hardness in all three wells, as well as iron in OW-17-I and organic nitrogen in OW-17-III.

3.6.7 Downgradient Sentinel Water Quality

The 2015 groundwater quality in deep well OW-23-I is characterized by low concentrations of chloride, sulphate, hardness, TDS and calcium, and slightly elevated concentrations of boron and sodium, in compared to background water quality. Groundwater quality in shallow well OW-23-II is characterized by low concentrations of hardness, TDS and calcium, and elevated concentrations of chloride, aluminum, boron and sodium, compared to background. It is important to note that this well nest is immediately adjacent to Highway 65, and is likely

impacted by activities on the road, including elevated sodium and chloride as a result of road salt application. Exceedances of the ODWS in are shown as bold entries in the associated table in Appendix E, and included hardness and organic nitrogen in both wells.

3.6.8 Residential Supply Well Monitoring

Samples were collected from six of the seven residential supply wells during the spring 2015 monitoring event. No sample was obtained from WS-9, as no access could be obtained to the residence despite multiple sampling attempts over a two day period. The results of the 2015 monitoring event are summarized and compared to the ODWS, with any exceedances identified by bold entries (Appendix F).

Analytical parameters at the six sampled residential supply wells are generally reported at levels similar to, or lower than, those quantified at the two background wells. Exceedances of the ODWS were quantified for high hardness at six locations and iron at five locations. Additional parameters that have exceeded the ODWS at various locations throughout the historical monitoring record include organic nitrogen and manganese. Fewer ODWS exceedances have been reported at all locations during 2015, as compared to historical results. No atypical data points were recorded during the current monitoring period.

Hardness exceeded the ODWS at the background monitoring well nest OW-10, and at higher concentrations than those reported at the residential supply well locations. Iron is often naturally elevated in groundwater throughout northern Ontario, as are manganese and organic nitrogen. Hardness, iron and organic nitrogen are operational guidelines (non-health related) and specifically address potential treatment issues if the groundwater is used as a communal water supply. Manganese is an aesthetic objective (non-health related), set by appearance effects since excessive concentrations may impart an undesirable colour to laundered goods, plumbing fixtures and the water itself, and may produce a bitter astringent taste in water and beverages.

In summary, a review of the 2015 geochemical data from the residential water supply wells located downgradient of the Site indicates that these locations are not experiencing any evidence of a landfill-derived impact.

3.6.9 Groundwater Chemistry Analysis

The groundwater major ion chemistry analysis for the 2015 monitoring events is presented in Tri-Linear Piper Plots on Figures 6A through 6D. Tables depicting the calculations used to quantify the geochemical data are presented in Appendix F. The Piper diagram plots the major ions as percentages of milli-equivalents (meq) in two base triangles. The total cations and the total anions are set equal to 100% and the data points in the two triangles are projected onto an adjacent grid.

Tri-Linear Piper Plots for the on-Site monitoring wells are presented on Figures 6A through 6C for the spring, summer and fall 2015 monitoring events, respectively. The positioning of the downgradient property boundary wells in comparison to background wells and source wells

indicates varying groundwater types and varying degrees of groundwater impact, depending on well nest location and installation depth. All wells plotted vary in placement, with no wells indicating an identical water type with respect to either source or background. Shallow downgradient monitoring wells OW-16-III, OW-24-III and OW-17-III demonstrate a strong shift away from source water quality, indicating no landfill-derived impact and a substantial improvement in groundwater quality as compared to source wells. OW-25-III is situated in slightly closer proximity to the source wells on the Piper diagram, but does not indicate an identical water type, and therefore no substantial landfill-derived impact.

Moderate depth wells (i.e., suffix “II”) in downgradient CAZ boundary well nests are placed sporadically on the Piper diagram, with no wells placed in immediate proximity to source; OW-17-II and OW-16-II are situated in closest proximity to the source wells on the diagram.

The deep wells in the five downgradient locations (i.e., suffix “I”) indicate varying water types depending on well nest location. Deep wells in the OW-24 and OW-17 well nests indicate a similar shift away from source water quality as the shallow wells discussed above, and therefore indicate no apparent landfill-derived impact. The positions of OW-25-I, OW-16-I and OW-30-I, however, are inconclusive, and may indicate a variable water type at depth. Generally, the locations of all monitoring wells on the Piper diagrams confirm the water quality results discussed above.

Figure 6D presents the Tri-Linear Piper Plot for the residential supply well locations, as compared to the background and source monitoring wells at the Site. Residential supply wells are situated away from both the background and source wells on the Piper diagram, indicating that these wells are characterized by a dissimilar water type when compared to both the background water quality and the leachate-impacted groundwater quality in the immediate vicinity of the waste deposits. That the residential supply wells are positioned at a distance from the source wells on the diagram confirms that there is no landfill-derived impact evident in any of the residential supply wells downgradient of the Site. This may be indicative of the deep bedrock aquifers instrumented by these wells.

Recently installed deep wells OW26-14, OW27-14 sampled in the fall of 2014 and OW30-I are placed relatively close together on the diagram, indicating a similar water type in these three locations. Recently installed monitoring well OW28-14 indicates a landfill-derived impact based on the fall 2014 sampling effort, as it is positioned with the source wells on the Piper diagram. This confirms the water quality results discussed above. Generally, the locations of all monitoring wells on the Piper diagrams confirm the water quality results discussed above.

3.6.10 Groundwater Trend Analysis

The current and previous groundwater elevation and water quality data were reviewed with the objective of identifying any apparent trends or inconsistencies in the present monitoring record. With respect to groundwater elevations, the data available indicate that the seasonal water table fluctuation has been relatively consistent since 2000 (Appendix G).

A series of time-concentration graphs were developed for several select landfill indicator parameters (including alkalinity, barium, boron, chloride, DOC, hardness and TDS) for each monitoring well location from 2007 to 2015. These time-concentration graphs are presented in Appendix G. Historical groundwater quality data generally indicate consistent concentrations of most parameters over time. Source wells OW-1R-I and OW-1R-III indicate high concentrations of all parameters graphed throughout the monitoring record, as well as high ranges of fluctuation, as compared to other monitoring wells. This is not surprising, given their location immediately downgradient of the fill area.

All other monitoring wells demonstrate consistent concentrations of parameters over time, with little fluctuation observed, with the exception of OW-16-III, which indicates relatively high concentrations of alkalinity, barium and DOC, as well as high ranges of fluctuation for all three parameters. Concentrations of alkalinity at this location have shown a substantial increase since 2011, whereas barium has demonstrated a high range of fluctuation throughout the monitoring record. DOC was quantified at very high concentrations between 2011 and 2013, but has been within the historical range during recent monitoring events. These trends in alkalinity, DOC and barium are unexpected for this downgradient location, and trends in this well should continue to be observed as additional sampling efforts are undertaken. Other downgradient wells are behaving as anticipated, with low and stable concentrations of all parameters recorded throughout the monitoring record. Various anomalous concentrations are apparent in recently installed monitoring wells during the fall 2014 monitoring event; however, this is interpreted to be the result of residual impacts of drilling, and not representative of actual water quality conditions at the time of sampling.

A series of graphs were also developed for select indicator parameters (including alkalinity, barium, boron, chloride, copper and zinc) for each residential supply well location from 2002 to 2015. Groundwater quality data are stable throughout the monitoring record at all locations, with the exception of various anomalous results that have been reported for some parameters. Alkalinity is stable at all locations from 2002 to 2014. Boron is also stable, with the exception of one anomalous concentration reported at WS-7 during 2002; boron concentrations have been low and stable at this location since that time. Chloride is stable at all locations except WS-7, at which an anomalous result was quantified during 2008; chloride has since stabilized at WS-7. Various anomalous results for barium have been reported, however all are atypically low, as compared to the remainder of the monitoring record at each location; no atypically high barium concentrations have been quantified. Low barium concentrations were reported at WS-14 during 2003, at WS-7 from 2007 through 2009, and at WS-9 during 2014. Copper is generally low and stable at all locations, however anomalous values were reported at WS-7, WS-13, WS-14 and WS-15 in 2010, 2002, 2009 and 2007, respectively. Copper concentrations appear to have been slightly elevated at WS-13 prior to 2007, but have since stabilized at a low level. Zinc concentrations were elevated at all locations during 2003, but are generally stable with the exception of anomalies quantified at WS-15 and WS-9 during 2007 and 2013, respectively, and at WS-16 during 2015.

3.6.11 Groundwater Plume Characterization

The leachate generated through infiltration of the of the waste mound moves downward to merge with the groundwater beneath the waste mound to form the affected groundwater plume. As the plume moves downgradient it enters a recharging groundwater condition within an area of increased infiltration forcing the plume to sink. As it moves across the CAZ the plume is inferred to sink into the deeper confined overburden aquifer. As the plume moves past the CAZ into the area with a steeper topography in the confined deep overburden aquifer it generates upward vertical gradients pushing the plume into the lower permeability deposits towards the shallow overburden aquifer.

The Site has been reportedly in operation from 1916 to 2009, the plume has likely achieved its steady state attenuation rate. Inorganic pollutants constitute a substantial portion of the leachate generated but a major part of the biologically stabilized leachate. Several inorganic pollutants are not rapidly removed during natural attenuation. Chloride is a major anion and is relatively inert which makes this parameter a tracer for the plume, as elevated concentrations of chloride exist in the leachate characterization. A visual representation of the plume is provided with chloride concentration contours. Plan view contours are presented in Figure 7A, 7B, and 7C with Figure 8A, 8B, and 8C presenting a cross sectional profile of the chloride concentrations for the spring, summer, and fall 2015 sampling.

The concentration contours present a radial peak of concentrations forming as the leachate impacts the groundwater form the plume at the location of the waste mound. Downgradient the concentrations decrease rapidly in the area with high groundwater recharge. The plume sinks and is further dispersed and diluted further downgradient with the CAZ boundary wells indicating the decrease in concentration.

3.6.12 Reasonable Use Calculations (Guideline B-7)

In September 1986, a policy was introduced by the MOECC to assist in the evaluation of groundwater impacts, especially for the case of landfill and/or lagoon operations. The policy was entitled “The Incorporation of the Reasonable Use Concept into MOECC Groundwater Management Activities” and is referred to now as Guideline B-7 (formerly Policy 15-08) or the “Reasonable Use” policy. Simply stated, the policy sets groundwater contaminant discharge criteria for landfills and/or lagoons that may impair local water quality; the criteria are based on maintaining the protection of groundwater resources on the adjacent lands or properties.

The contaminant discharge criteria, which represent the maximum acceptable levels of contaminants that should not be exceeded, are established using a simple mathematical relationship that incorporates background (existing) water quality and the highest provincial water quality standards for the adjacent land use. Under Guideline B-7, water quality impacts will not be allowed to exceed the maximum calculated discharge criteria at the landfill (or Site) property boundaries.

In order to apply Guideline B-7, the appropriate resource use of the adjacent properties must be selected. At the New Liskeard Landfill Site, the highest end use for groundwater on the adjacent properties is for drinking water purposes, for which the ODWS - Table 1 through Table 4 have been established. The purpose of the ODWS is to protect public health through the provision of safe drinking water. Water intended for human consumption shall not contain unsafe concentrations of toxic chemicals (health related parameters). Health related standards are established for parameters that, when present above a certain concentration, have known or suspected adverse health effects. At the same time, water should also be aesthetically acceptable. Colour, odour and turbidity are parameters that, when controlled, result in water that is clear, colourless and without objectionable or unpleasant taste or odour (non-health related parameters). In addition, operational guidelines have been established for non-health related parameters that need to be controlled to ensure efficient and effective treatment and distribution of the water. As well, Guideline B-7 requires the identification of background water quality conditions in the underlying aquifer.

The background geochemical profile (based on the geometric mean of all results from OW-10-I and OW-10-II) and the resultant values were applied along with the ODWS, to complete a Guideline B-7 analysis for all of the downgradient groundwater monitoring wells for select landfill indicator parameters. Appendix H presents the Guideline B-7 calculations the 2015 monitoring results that have been developed using all valid background analytical data observed in the shallow and deep aquifers, in OW-10-II and OW-10-I, respectively.

It should be noted that these Guideline B-7 values are much lower (i.e., more stringent) than the ODWS, and a well-by-well comparison of the performance of each of the parameters at all of the groundwater monitoring wells is also presented in Appendix H for the 2015 monitoring events; exceedances are indicated by bold and shaded entries. In the event that the background concentration of a parameter exceeds the ODWS, the background level is considered the maximum allowable concentration not to be exceeded. This is the case for TDS during all 2015 monitoring events.

Comparing concentrations observed in the downgradient groundwater monitoring wells during the 2015 sampling events to the maximum allowable concentration at the contaminant attenuation zone boundary (Appendix H), two non-health related (DOC and sodium) parameter exceedances are noted as follows:

- DOC was detected in the deep aquifer at a concentration of 8.9 mg/L in OW-16-I during the spring monitoring event, at concentrations of 5.3 mg/L and 9.4 mg/L in OW-25-II and OW-16-I, respectively, during the summer monitoring event, and at a concentration of 8.8 mg/L in OW-16-I during the fall monitoring event. The calculated maximum concentration for DOC in the deep aquifer is 3.3 mg/L.
- DOC was detected in the shallow aquifer at a concentration of 3.7 mg/L in OW-24-III during the fall monitoring event. The calculated maximum concentration for DOC in the shallow aquifer is 3.65 mg/L.

- Sodium was detected in the deep aquifer at concentrations of 115 mg/L, 108 mg/L, 116 mg/L and 120 mg/L in OW-25-II, OW-16-I, OW-30-I and OW-30-II, respectively, during the spring monitoring event, at concentrations of 110 mg/L, 106 mg/L, 112 mg/L and 112 mg/L in OW-25-II, OW-16-I, OW-30-I and OW-30-II, respectively, during the summer monitoring event, and at concentrations of 115 mg/L, 109 mg/L, 117 mg/L and 116 mg/L in OW-25-II, OW-16-I, OW-30-I and OW-30-II, respectively, during the fall monitoring event. The calculated maximum concentration for sodium in the deep aquifer is 102 mg/L.

Exceedances of the Guideline B-7 maximum allowable concentrations have been recorded during the present monitoring review, as listed above. As previously discussed, a measurable water quality impact is occurring in the immediate vicinity of the waste deposits, however this impact decreases with increased distance from the source, and indicates substantial natural attenuation prior to the downgradient CAZ boundary. Exceedances of the Guideline B-7 maximum allowable concentrations have been quantified at the downgradient CAZ boundary in well nests OW-30, OW-25, OW-24 and OW-16. It is noted that the sole DOC exceedance quantified in the shallow aquifer, in downgradient well OW-24-III, is only marginally elevated above the calculated maximum concentration. Exceedances quantified in deep wells OW-25-II, OW-16-I, OW-30-I and OW-30-II are not necessarily landfill-derived, and could potentially represent unimpacted groundwater quality at depth that is dissimilar in water type to that of the moderate depth background well, as a result of increased residence time within the aquifer. This cannot be confirmed in the absence of a deep background monitoring well. Confirmation of these results through additional, regularly scheduled sampling in 2016 is recommended.

3.6.13 Groundwater Quality Summary

The groundwater quality data recorded at the Site to date indicates a landfill-derived impact to groundwater quality in the wells in closest proximity to the existing waste fill area, and a decrease in impact with distance from the landfill, indicating effective natural attenuation at the Site. Groundwater quality suggests impacts (when compared to background) are occurring due to landfill-derived leachate in source and mid-Site wells, as well as in select downgradient wells at the CAZ boundary. A landfill-derived impact was reported in downgradient well nests OW-25, OW-16 and OW-30 during 2015; however it cannot be confirmed at this time whether these results are indicative of groundwater impacts at depth, or rather merely a differing water type in the deep aquifer, associated with increased residence time. When plotted on a Piper diagram, water quality at the Site indicates varying groundwater types, dependent on well nest location and well installation depth. Water quality is stable over time, with consistent concentrations of most parameters graphed throughout the monitoring record, as well as low ranges of fluctuation at most monitoring wells. Exceedances of the Guideline B-7 maximum allowable concentrations were quantified at various locations throughout the Site, however not all exceedances were interpreted to be landfill-derived.

4.0 PREDICTION OF EFFECTS

4.1 Contaminant Attenuation Zone Assessment

The New Liskeard Landfill was historically operated as a natural attenuation landfill; groundwater/leachate impacts were managed through the historical purchase of approximately 32 ha of land to the east of the landfill property to act as a CAZ, as previously discussed. The proposed landfill expansion design, as illustrated on Figure 2, has assumed that the Site will continue to be operated as a natural attenuation landfill following expansion. Various historical assessments have been undertaken by Amec Foster Wheeler in order to confirm that the existing CAZ will be sufficient to manage any additional impacts introduced by the landfill expansion, as designed. Assessments of the dilution capacity of the CAZ have been undertaken using chloride concentrations as a leachate indicator.

The following revised assessment improves upon some of the initial assumptions used in the previous conceptual assessment (Amec Foster Wheeler, 2010), by using improved Civil 3D estimates of surface areas of the landfill expansion design. The revised surface areas and climatic information from the Earlton Airport weather station were used in the Thornthwaite Method (Thornthwaite and Mather, 1955) to calculate revised infiltration rates through the expanded landfill and the subsequently reduced CAZ. The input parameters for the revised assessment are based on the following factors:

- Expanded Footprint Area - The total surface area of the proposed New Liskeard expanded landfill is 109,000 square metres (m^2) (10.9 ha). This includes the existing landfill (part of which will be re-graded and recapped) and the additional waste to be placed northeast of the existing landfill.
- Reduced Downgradient Recharge Area – Based on the available distance from the northeast edge of the landfill to the northeast edge of the CAZ, the downgradient recharge area is considered the surface area of the available attenuation zone downgradient of the landfill. Since the expansion occurs onto the downgradient side of the landfill, the downgradient recharge area is reduced from the current recharge area of 200,000 m^2 by the expanded landfill area of 59,000 m^2 to 141,000 m^2 (14.1 ha).
- Expanded Source Area Infiltration Rate – Using the Thorthwaite Method, an infiltration rate (I_L) of 14.3 millimetres per year (mm/a) was calculated for the expanded New Liskeard Landfill. This infiltration rate is less than the infiltration rate of 19 mm/a calculated for the existing landfill because the clay cover of the expanded landfill was incorporated into the calculation.
- Downgradient Infiltration Rate – The infiltration rate (I_{CAZ}) of 69 mm/a for the downgradient attenuation zone in the CAZ would not change.

Based on the above factors, the expanded landfill footprint (i.e., source area) recharge rate is calculated as follows:

$Q_{L\ EXP}$ = $A_{L\ EXP}$ x I_L
= 109,000 m^2 x 0.0143 m/a
= 1,559 cubic metres (m^3)/a

Where: $Q_{L\ EXP}$ = Recharge rate within the expanded landfill footprint;
$A_{L\ EXP}$ = Total expanded landfill footprint surface area; and
I_L = Landfill footprint infiltration rate.

Similarly, the recharge rate for the downgradient CAZ area is calculated as follows:

$Q_{CAZ\ EXP}$ = $A_{CAZ\ EXP}$ x I_{CAZ}
= 141,000 m^2 x 0.069 m/a
= 9,729 m^3/a

Where: $Q_{CAZ\ EXP}$ = Downgradient CAZ recharge rate;
$A_{CAZ\ EXP}$ = Downgradient CAZ surface area; and
I_{CAZ} = Downgradient CAZ infiltration rate.

Assuming that groundwater recharges downgradient of the landfill in the CAZ and dilutes the migrating leachate plume, the expanded dilution factor is:

Dilution Factor, DF_{EXP} = $Q_{CAZ\ EXP}$ / $Q_{L\ EXP}$
= 9,729 m^3/a / 1,559 m^3/a
= 6.2

Where: DF = downgradient dilution factor;
$Q_{CAZ\ EXP}$ = Downgradient CAZ recharge rate; and
$Q_{L\ EXP}$ = Landfill recharge rate.

An attenuation factor was calculated based on historical chloride concentrations at source, background and mid-Site locations. The attenuation factor calculation has not been revised since the initial assessment, as groundwater geochemistry has remained at steady state at the Site. For the purposes of the CAZ assessment, the background concentration of chloride was conservatively assumed to be 20 mg/L. The highest concentration of chloride recorded at the Site to date was quantified in 2003 in leachate well OW-18, located within the waste fill area. The concentration of chloride in this leachate sample was 1,220 mg/L (JHL, 2008). Chloride was detected at a maximum historical concentration of 100 mg/L in well nest OW-12, reported during 2007, which is situated approximately 175 m downgradient of leachate well OW-18 (JHL, 2008). Concentrations of chloride quantified at this well nest have not reached this concentration again since that time, and this value is therefore considered to be conservative. This reduction in chloride concentration from source well OW-18 to downgradient/mid-Site well nest OW-12 is used to calculate the attenuation factor, as follows:

AF = (Cl_{SOURCE} – Cl_{DOWN}) / D_{ATT}
= (1,220 mg/L – 100 mg/L) / 175 m

= 6.4 mg/L/m

Where: Cl_{SOURCE} = Chloride concentration from source monitoring well;
Cl_{DOWN} = Maximum chloride concentration from a downgradient well; and
D_{ATT} = Attenuation distance between source area and downgradient well.

Based on the above attenuation factor, the required attenuation distance, D_{ATT}, for chloride, and by extension, the leachate plume, to be attenuated from the source area chloride concentration of 1,220 mg/L to an assumed background chloride concentration of 20 mg/L is calculated as follows:

$D_{ATT} = (Cl_{SOURCE} – Cl_{BACKGROUND}) / AF$
= (1,220 mg/L – 20 mg/L) / 6.4 mg/L/m
= 187.5 m

Similarly, if we were to complete the same calculation to determine the required attenuation distance, D_{B-7}, for chloride to the most recent Guideline B-7 criterion for the Site (chloride of 126 mg/L), the calculation would be as follows:

$D_{B-7} = (Cl_{SOURCE} – Cl_{B-7}) / AF$
= (1,220 mg/L – 126 mg/L) / 6.4 mg/L/m
= 171 m

The infiltration calculations completed during the initial effects assessment, although overestimating the observed impact, did indicate that the degree and extent of downgradient impact for the expanded landfill may be twice that of the existing landfill at steady state (i.e., an expected downgradient chloride concentration of 197 mg/L (i.e., 1,220 mg/L divided by the dilution factor of 6.2) for the expanded landfill versus an expected downgradient chloride concentration 101 mg/L for the existing landfill). Therefore, if it is conservatively assumed that the attenuation distance of the leachate plume from the edge of the landfill will also double as a result of the additional waste, the required distance for attenuation of the leachate plume in the subsurface would be 2 x 171 m = 342 m. This is still within the 400 m of the contaminant attenuation zone downgradient of the east property boundary. Using the attenuation method for the expanded New Liskeard Landfill, the expected downgradient chloride concentration would therefore meet the Guideline B-7 maximum allowable concentration at the northeast CAZ compliance boundary.

In summary, it has been determined that natural attenuation is an appropriate means of continued groundwater management at the Site following expansion. Although the CAZ is sufficient for expansion to the east, it is recommended that the existing CAZ be expanded to the north by approximately 50 m to 100 m to account for potential changes in the groundwater flow system due to groundwater mounding within the landfill deposits. Subsequently, the City may be required to obtain approximately 2 to 4 ha of additional land to ensure a minimum 400 m attenuation distance to the northeast. Figure 9 presents the configuration of the expanded CAZ required to fulfill the preliminary design criteria.

4.2 Contaminating Lifespan

The contaminating lifespan is related to the decomposition rates of the waste components which is typically characterized in five sequential phases. The first phase commencing immediately upon placement of the waste at the Site, biological decomposition both aerobically and anaerobically occurs until oxygen concentrations begin to deplete. The second phase transitions from both aerobic and anaerobic decomposition to only anaerobic, additionally the concentration of oxygen reaches a minimum and the concentration of carbon dioxide begins to rise, the leachate pH typically begins to decrease with an increase in organic acid production. The third phase peaks the generation of hydrogen gas and organic acid production and attains the lowest pH of the leachate to a value of 5 or lower. The biochemical oxygen demand (BOD), chemical oxygen demand (COD), metals content as well as the conductivity of the contamination plume will increase significantly and peak in the third phase with the dissolution of the organic acids from the leachate. The fourth phase typically associated with the generation of methane gas with both the methane and acid fermentation process simultaneously. Due to the conversion of the hydrogen gas and organic acids in this phase the pH rises to more neutral values and a reduction of the previously elevated BOD, COD, metals and conductivity occurs. The fifth phase is signified by the reduction in landfill gas generation because the majority of the available nutrients have been removed with the leachate.

The Site leachate well OW-18 was installed in October 2002 sampled successfully once in September 2003. The lack of additional data points does not permit the generation of a trend, normal distribution or determination of outlier data points. The nearest monitoring well with a continuous sampling record is OW-1R-I. Amec Foster Wheeler completed a review of all historical data for this location as an indicator of source strength. Key parameters indicative of leachate impact where reviewed in greater detail at the deep source well location OW-1R-I due to the larger dataset available in comparison to OW-18 or OW-1R-III. The parameters of alkalinity, boron, chloride, sodium, and TDS were scrutinized in detail as these parameters quantify elevated concentrations within the historical dataset and are typical landfill indicator parameters.

The time-concentration graph for chloride was extended to include all chloride values for location OW-1R-I. A review of the graph indicates a generally decreasing trend with high variability with a potential outlier on the first data point. Determining the trend line yields a correlation coefficient (R^2) which indicates no correlation for both linear and exponential trend lines. The R^2 value indicates the correlation coefficient or coefficient of determination for the trend line to the data, where a value of 1 indicates a perfect correlation and values below 0.4 indicating no correlation. Amec Foster Wheeler performed Mann-Kendall trend test and confirmed with 95% confidence there is a downward trend present. The residual values which are the difference from the predicted to the observed value of the best fit exponential and linear trend lines are required to provide a normal distribution to have a representative trend line. The Shapiro-Wilk normal distribution test confirmed with 95% confidence the residuals are not normally distributed. Amec Foster Wheeler removed the 140 mg/L chloride concentration observed on 27 September 2000 as an outlier and confirmed with 95% confidence there is a downward trend and the residuals provide a normal distribution. The best fit trend line is

determined to be linear with a weak correlation coefficient. The predicted date of compliance with the current reasonable use chloride concentration of 126 mg/L is in May 2023 providing a minimum contaminating lifespan of 22 years.

Similar to chloride the sodium dataset confirmed a trend with an outlier the best fit trend line is a linear interpolation with a weak correlation. The predicted date of compliance with the current reasonable use chloride concentration of 102 mg/L is in May 2026 providing a minimum contaminating lifespan of 25 years.

The boron dataset indicates a peak concentration in excess of the reasonable use criteria in November 2005 and came into compliance in June 2014. The contaminating lifespan is inferred to be 9 years from the peak concentration.

The dataset for TDS indicates that there is a trend and the first data point is an outlier. The best fit trend line is determined to be a linear interpolation with a moderate correlation coefficient. The predicted date of compliance is in August of 2029 to meet the ODWS TDS concentration of 500 mg/L. This infers a minimum contaminating lifespan of 28 years.

No trend for alkalinity exists with the current dataset, therefore there is no prediction for the contaminating lifespan of this parameter. Until a trend is apparent the contaminating lifespan for alkalinity should remain a minimum of 25 years.

The results indicate that the contaminating lifespan of the source waste deposits for the various landfill parameters range from 9 years to 28 years with greater than 25 years for alkalinity. The trend charts associated with the contaminating lifespan determination are provided in Appendix G. The expansion of the landfill should consider that the contaminating lifespan of the plume will likely exceed 25 years at the waste mound location to reach target concentrations. The downgradient effects of the plume will continue to dissipate as groundwater quality improves from both chemical and biological processes as well as dilution from the time of closure.

5.0 MITIGATION MEASURES

It has been determined that natural attenuation is an appropriate means of continued groundwater management at the Site following expansion. The above-described CAZ assessment has determined that, although the CAZ is sufficient to the east for landfill expansion, it is will require expansion to the north by approximately 50 m to 100 m. The City will therefore be required to obtain approximately 2 to 4 ha of additional land to ensure a minimum 400 m attenuation distance to the northeast. No additional mitigation measures are deemed necessary.

6.0 RECOMMENDED MONITORING

It is recommended that the existing annual monitoring program continue to be undertaken; no additional monitoring is necessary at this time. Groundwater samples should continue to be

collected three times annually, during the spring, summer and fall of each year, at which times static groundwater levels should also continue to be measured. As described above, the annual monitoring network for groundwater quality testing is comprised of 25 wells, many of which are multi-level installations. An additional nine monitoring wells are used for groundwater level measurements only.

7.0 CONCLUSIONS

During the current hydrogeological investigation conducted at the New Liskeard Landfill Site, various recent and historical data were collected, analysed and interpreted in order to characterize groundwater conditions at the Site. The existing monitoring well network was supplemented with various new installations, and all existing lithology, groundwater elevation and groundwater quality data were compiled to create an up to date database containing the most recent annual monitoring data, as well as supplemental data collected during 2014 for the purposes of this assessment. The current hydrogeological characterization included the incorporation of data collected as part of previous studies undertaken at the Site, and the revision of various calculations in order to present more accurate results based on additional information now available.

It was determined that the Site is situated on a topographic high comprised of an exposed limestone bedrock ridge. Little to no overburden is present in the immediate vicinity of the existing landfill and proposed landfill expansion. Overburden increases in thickness towards the northeast, with a significant increase in thickness at the east boundary of the CAZ, as compared to the landfill. Overburden is comprised primarily of silt, which varies in sand and clay content depending on location. A number of documented fault zones are present in the vicinity of the Site and within the downgradient area. The absence of a significant low permeability confining layer overlying the bedrock results in a high susceptibility for contaminant migration to the bedrock aquifer and subsequently the faults.

In general, the recorded static groundwater levels indicate groundwater flow across the Site towards the northeast in both the shallow and deep groundwater flow systems. Groundwater elevations in the vicinity of the Site mimic the topography of the area, decreasing to the northeast within the existing fill area, then flattening out across the CAZ, and subsequently decreasing steeply from the northeast corner of the CAZ to Highway 65. Strong downward hydraulic gradients have been reported on the bedrock ridge and below the landfill, indicating that the landfill is located in a groundwater recharge area. This is to be expected since the site is located just east of a presumed groundwater divide at the top of the bedrock ridge. The vertical hydraulic gradients level out to nearly horizontal downgradient of the landfill. At the eastern boundary of the CAZ, upward vertical hydraulic gradients have been observed in some well nests.

Groundwater quality measured as part of the 2015 annual monitoring program was compiled, along with supplemental water quality data collected from recently installed monitoring wells. The water quality data recorded at the Site to date indicates a landfill-derived impact to

groundwater quality in the wells in closest proximity to the existing waste fill area, and a decrease in impact with distance from the landfill, indicating effective natural attenuation at the Site.

A landfill-derived impact was reported in downgradient well nests OW-25, OW-16 and OW-30 during 2015; however it cannot be confirmed at this time whether these results are indicative of groundwater impacts at depth, or rather merely a differing water type in the deep aquifer, associated with increased residence time. When plotted on a Piper diagram, water quality at the Site indicates varying groundwater types, dependent on well nest location and well installation depth. Water quality is stable over time, with consistent concentrations of most parameters graphed throughout the monitoring record, as well as low ranges of fluctuation at most monitoring wells. Exceedances of the Guideline B-7 maximum allowable concentrations were quantified at various locations throughout the Site, however not all exceedances were interpreted to be landfill-derived.

A revised assessment of the adequacy of the CAZ was completed as part of the current study, and it was determined that natural attenuation is an appropriate means of continued groundwater management at the Site following expansion. Although the CAZ is sufficient for expansion to the east, it is recommended that the existing CAZ be expanded to the north by approximately 50 m to 100 m. Subsequently, the City will be required to obtain approximately 2 to 4 ha of additional land to ensure a minimum 400 m attenuation distance to the northeast.

The contaminating lifespan of key landfill parameters was determined based on the historical data available for the source strength well location. The contaminating lifespan of the source waste deposits for the various landfill parameters range from 9 years to greater than 25 years. The expansion of the landfill should consider that the contaminating lifespan of the plume will likely exceed 25 years at the waste mound location to reach target concentrations. Chemical and biological processes with dilution will attenuate the downgradient effects of the leachate plume from the time of closure.

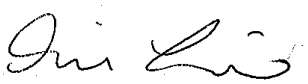
No additional mitigation measures aside from the expansion of the CAZ to the northeast are deemed necessary. It is recommended annual monitoring continue and that a deep aquifer background well be installed during 2016 in order to determine whether there is a landfill-derived impact at depth at the downgradient CAZ boundary.

8.0 CLOSURE

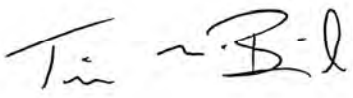
This report has been prepared for the exclusive use of the City for specific application to this Site. The report was prepared in accordance with the verbal and written requests from the City and generally accepted assessment practices, restricting the investigations to the assessment of the hydrogeological conditions associated with the Site. No other warranty, expressed or implied is made. Report limitations are provided in Appendix I.

Respectfully Submitted,

Amec Foster Wheeler Environment & Infrastructure
a Division of Amec Foster Wheeler Americas Limited



Emily Lemieux, B.Sc.
Environmental Scientist



Tim McBride, B.Sc., P.Geo.
Hydrogeologist

9.0 REFERENCES

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Project Liskeard 1, 3, and 4 Draft Stormwater Management Report; dated 2 December 2011, prepared by Dillon Consulting Limited. (DCL, December 2011).

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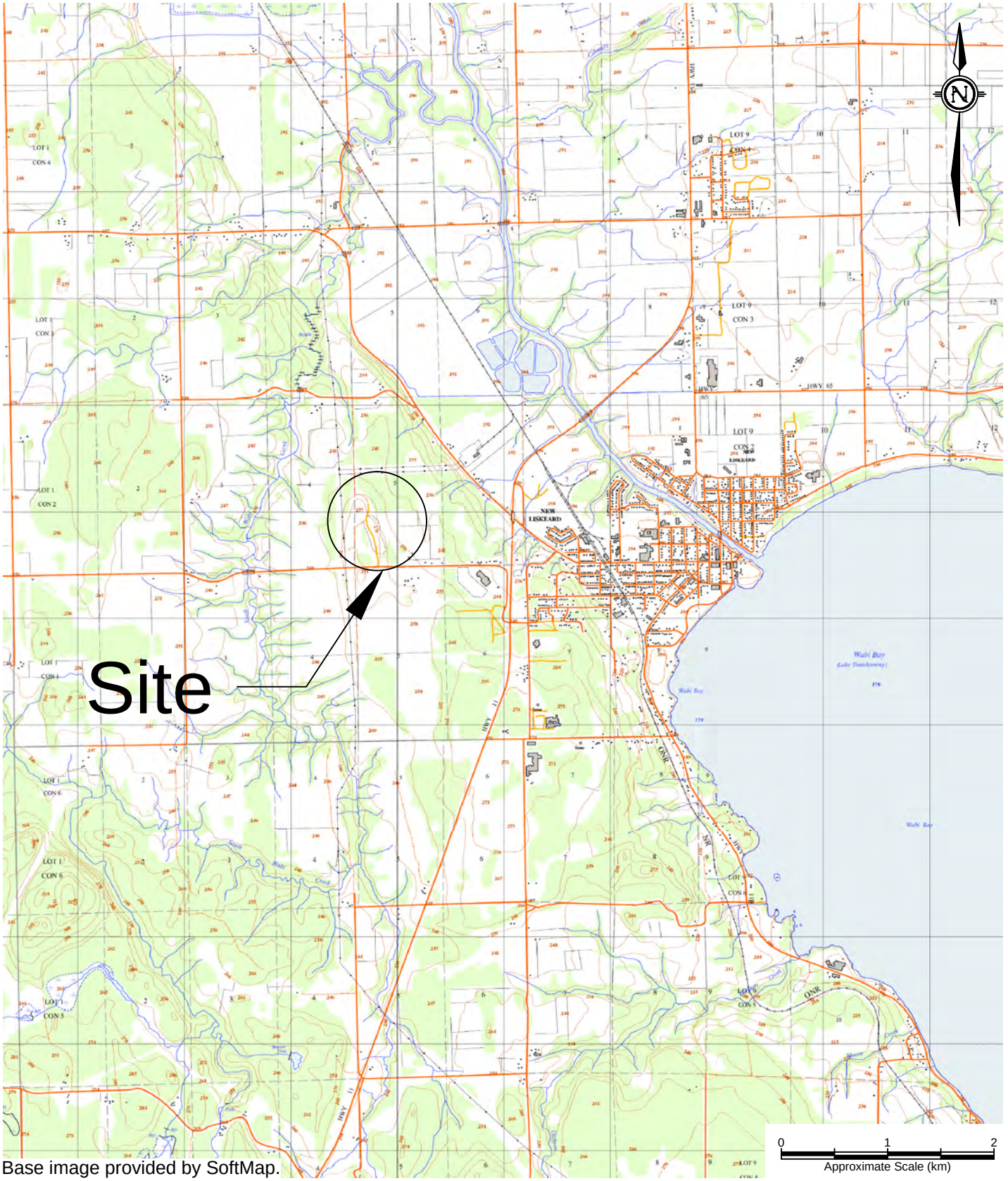
The water balance, ibid 8, pp. 104, dated 1955, prepared by Thornthwaite, C.W. and Mather, J.R.



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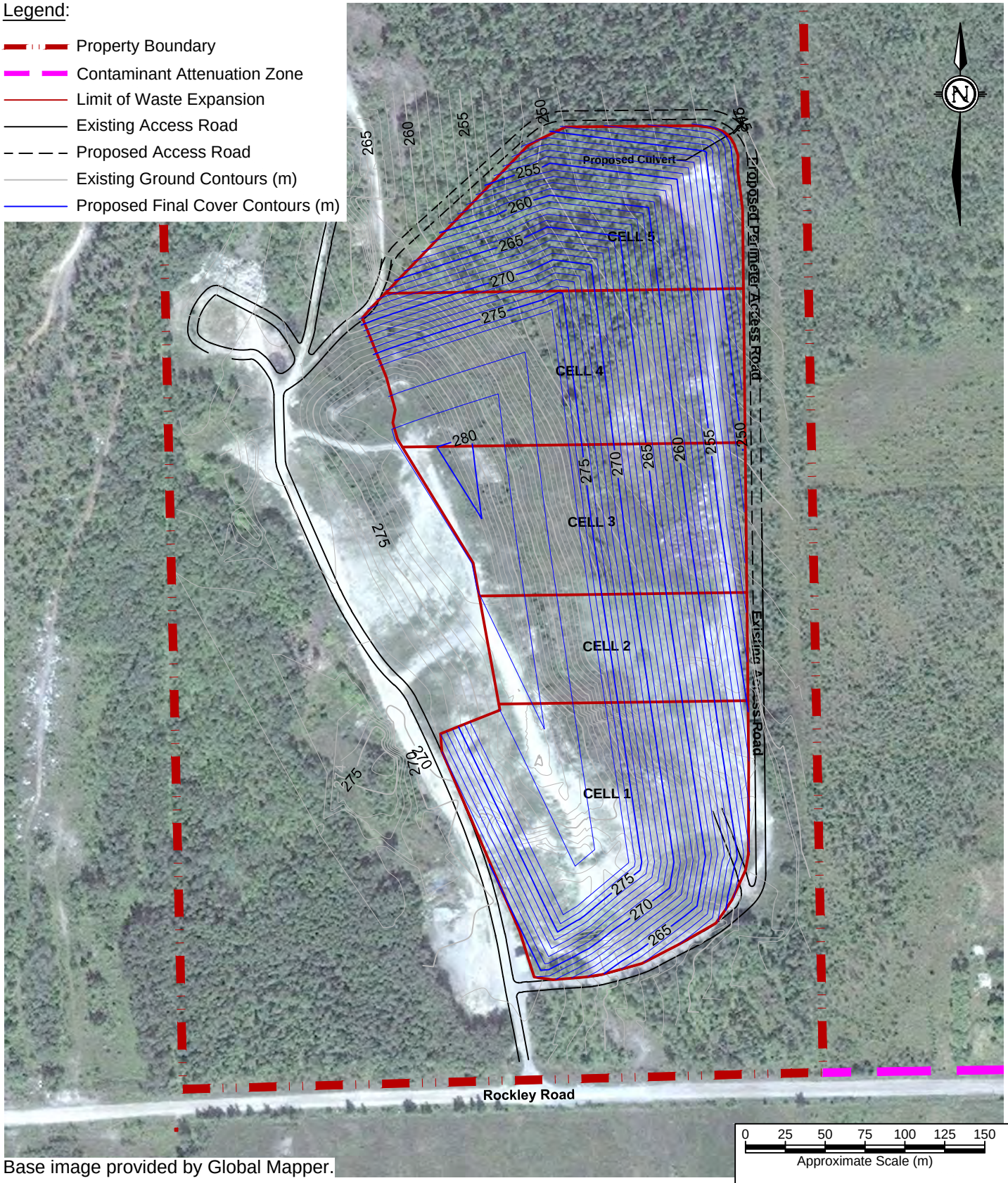
amec foster wheeler

The City of Temiskaming Shores

PROJECT	Hydrogeological Characterization New Liskeard Waste Disposal Site New Liskeard, Ontario	DWN BY: MAT	CHK'D BY: TIM	DATE: August 2016 PROJECT NO: TY910491.4000
TITLE	Site Location Map	REV. NO.: 1	SCALE: as shown	FIGURE NO: 1



Base image provided by Global Mapper.

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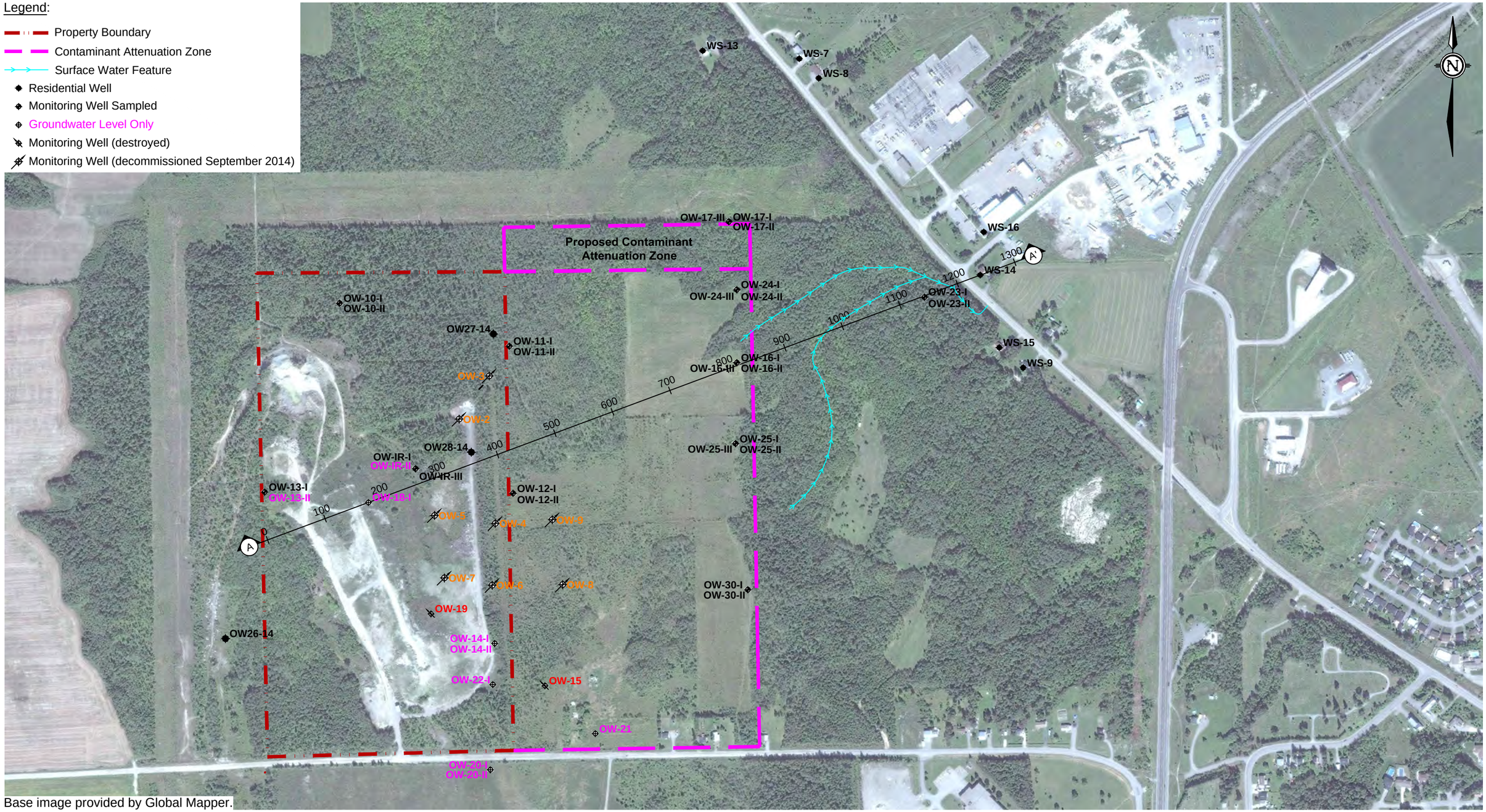
PROJECT	Hydrogeological Characterization New Liskeard Waste Disposal Site New Liskeard, Ontario	DWN BY: MAT	CHK'D BY: TIM	DATE: August 2016 PROJECT NO: TY910491.4000
TITLE	Proposed Landfill Expansion Contours	REV. NO.: 1	SCALE: as shown	FIGURE NO: 2

Legend:

- Property Boundary
- Contaminant Attenuation Zone
- Surface Water Feature
- Residential Well
- Monitoring Well Sampled
- Groundwater Level Only
- Monitoring Well (destroyed)
- Monitoring Well (decommissioned September 2014)



Base image provided by Global Mapper.

0 100 200 300 400

Approximate Scale (m)

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DWN BY:	MAT
CKD BY:	TIM
DATUM:	NAD 83
SCALE:	as shown

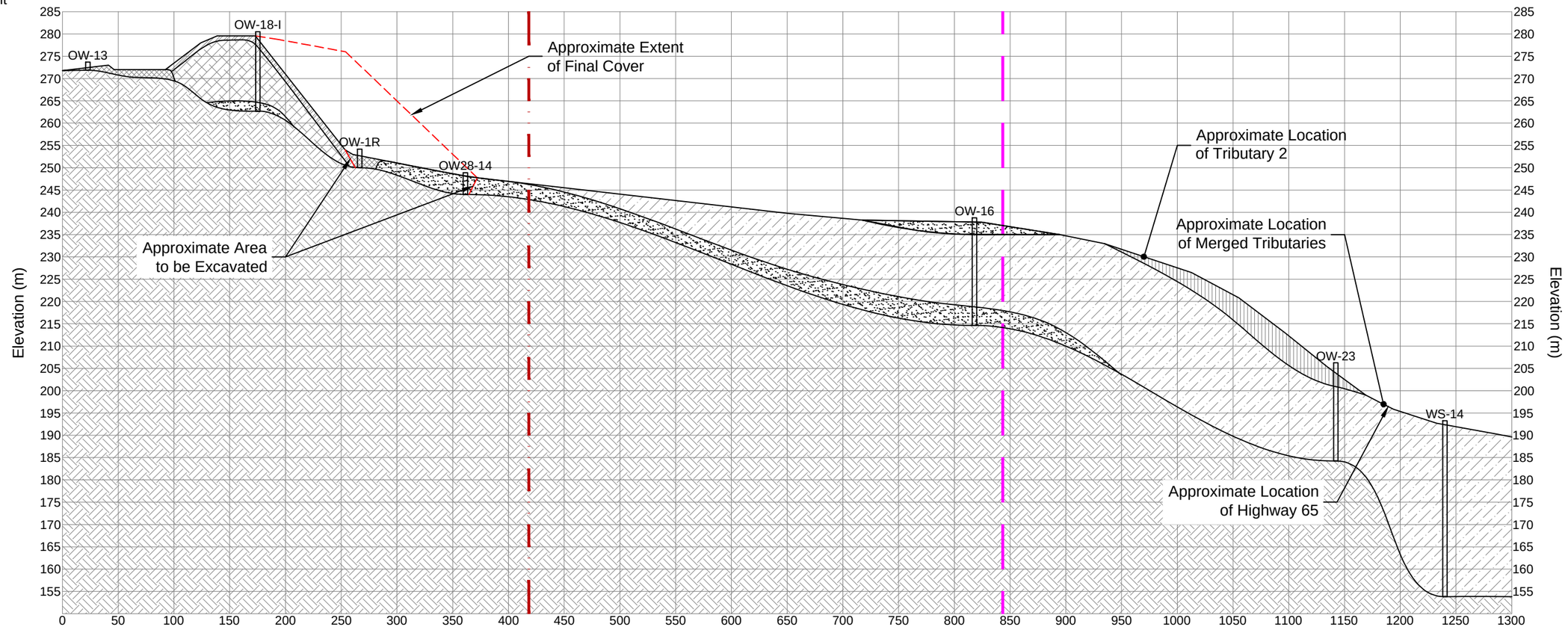
PROJECT
Hydrogeological Characterization
New Liskeard Waste Disposal Site
New Liskeard, Ontario

TITLE
Monitoring Well Location Plan

DATE	August 2016
PROJECT No.	TY910491.4000
REV. No.	1
FIGURE No.	3

Legend:

- Property Boundary
- Contaminant Attenuation Zone
- Approximate Extent of Final Cover
- Approximate Area to be Excavated
- Fill
- Clay
- Refuse
- Silty Sand
- Till
- Clayey Silt
- Bedrock



Section A - A

Notes:
1. Stratigraphy interpolated from borehole data.
2. Vertical exaggeration factor of four (4) shown.

The City of Temiskaming Shores

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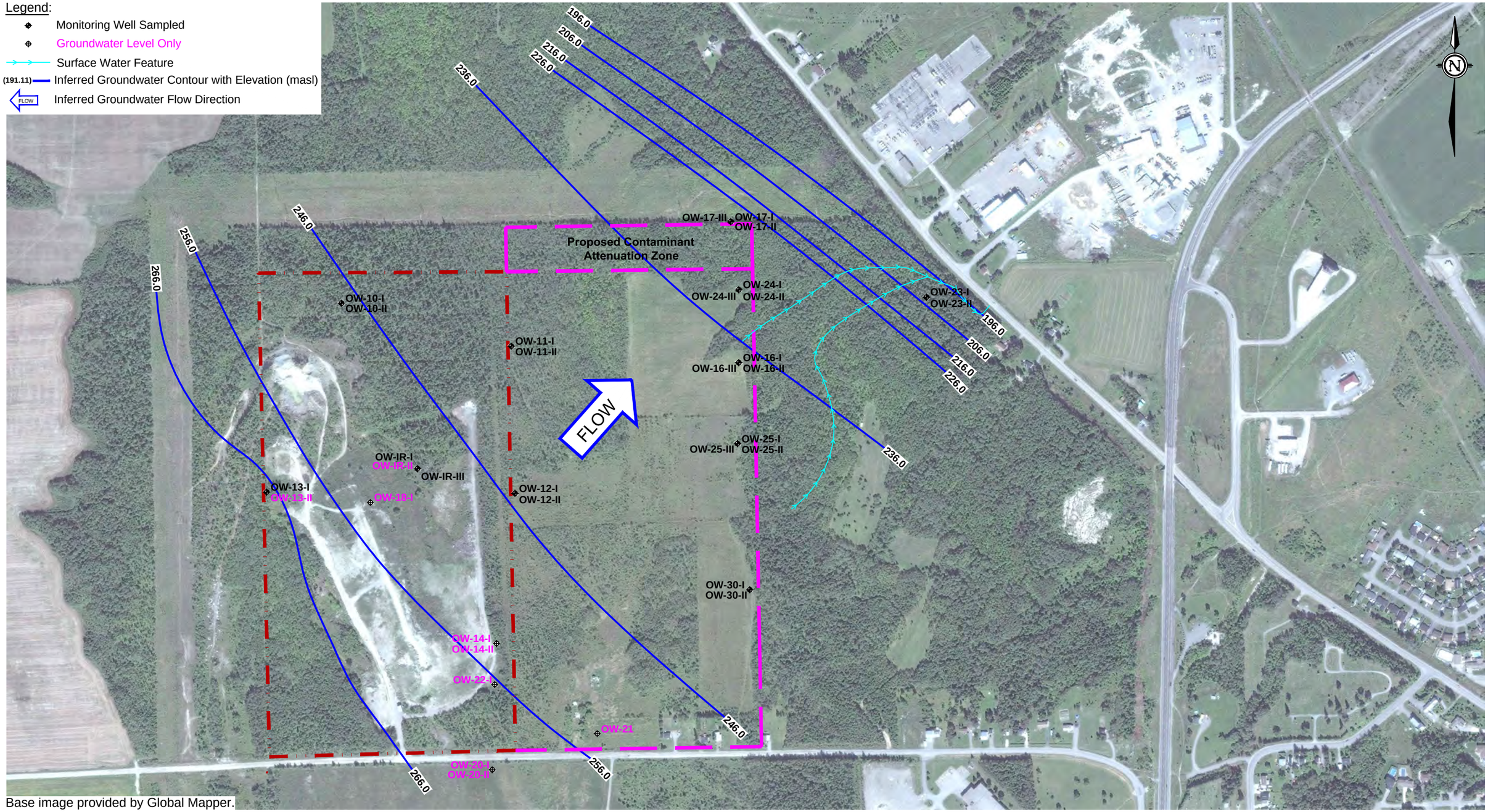
DWN BY:	MAT
CKD BY:	TIM
DATUM:	NAD 83
SCALE:	as shown
PROJECT	Hydrogeological Characterization New Liskeard Waste Disposal Site New Liskeard, Ontario
TITLE	Geological Cross Section
DATE	August 2016
PROJECT No.	TY910491.4000
REV. No.	1
FIGURE No.	4



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Approximate Scale (m)

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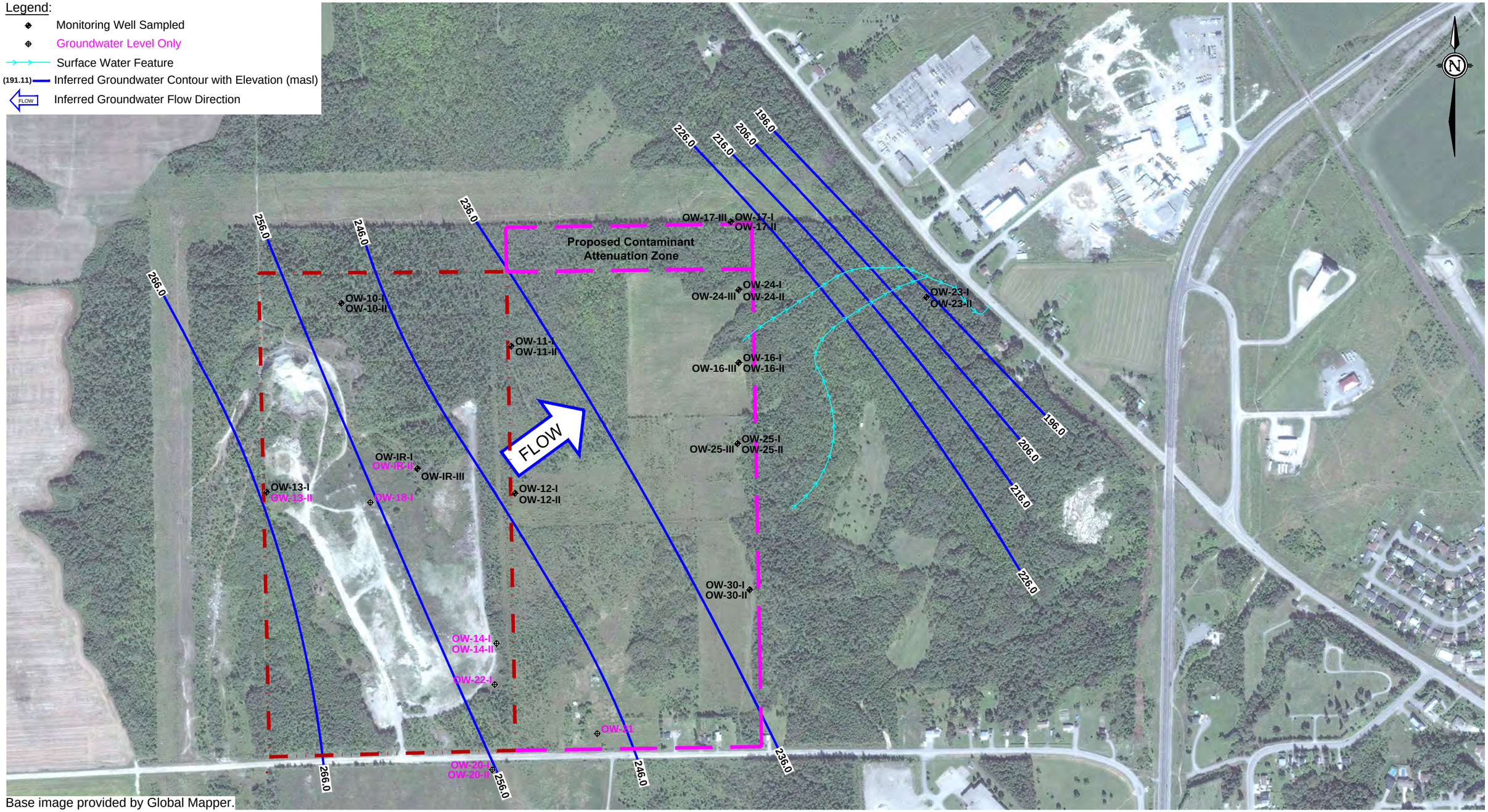
DATUM:	NAD 83
SCALE:	as shown

PROJECT
Hydrogeological Characterization
New Liskeard Waste Disposal Site
New Liskeard, Ontario

TITLE
Inferred Shallow Groundwater Contour Plan
May 2015

DATE	August 2016
PROJECT No.	TY910491.4000
REV. No.	1
FIGURE No.	5A



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DWN BY:	MAT
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DATUM:	NAD 83
SCALE:	as shown

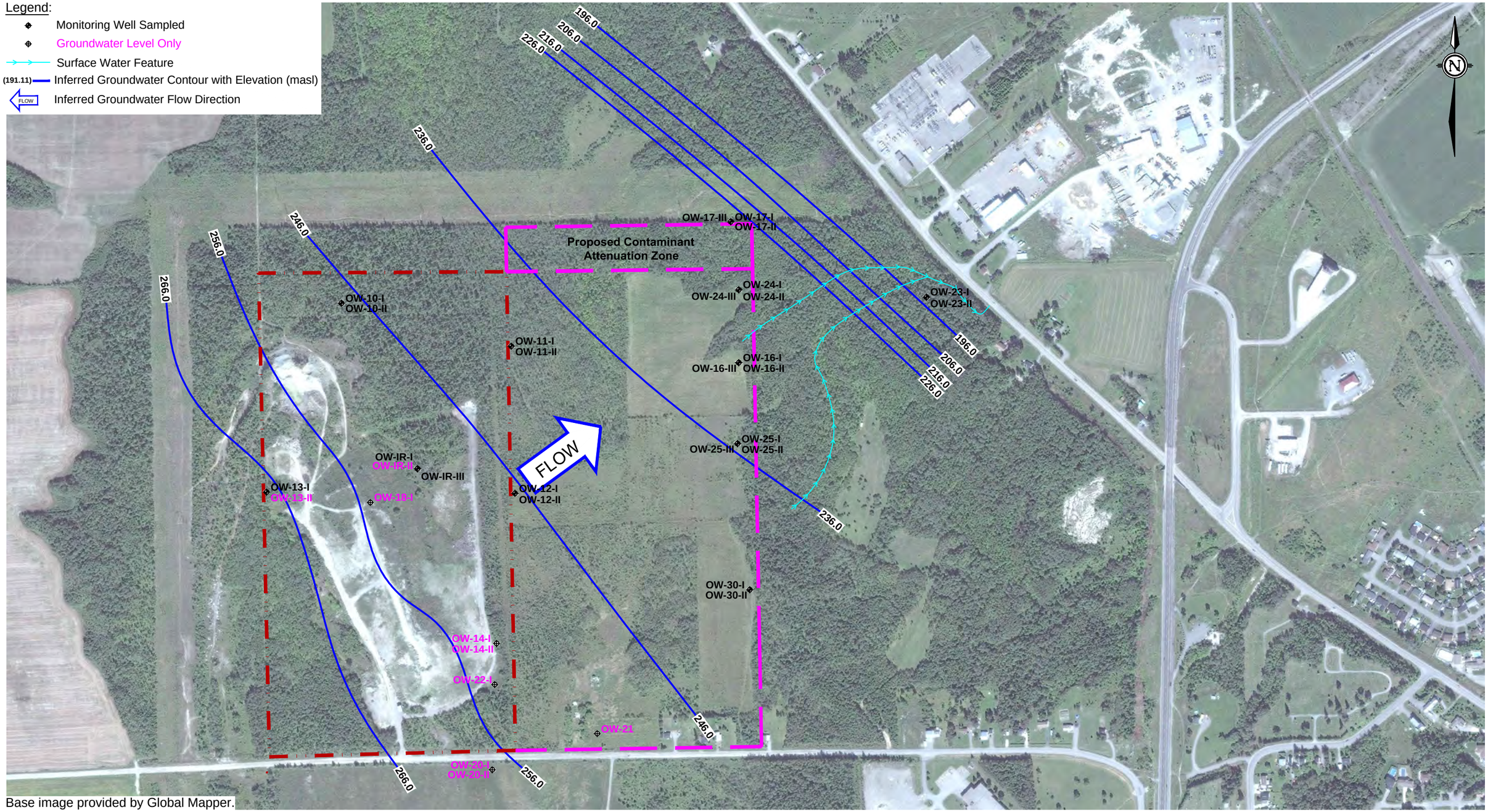
PROJECT
Hydrogeological Characterization
New Liskeard Waste Disposal Site
New Liskeard, Ontario

TITLE
Inferred Deep Groundwater Contour Plan
May 2015

DATE	August 2016
PROJECT No.	TY910491.4000
REV. No.	1
FIGURE No.	5B

Legend:

- Monitoring Well Sampled
- Groundwater Level Only
- Surface Water Feature
- (191.11) Inferred Groundwater Contour with Elevation (masl)
- Inferred Groundwater Flow Direction



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Approximate Scale (m)

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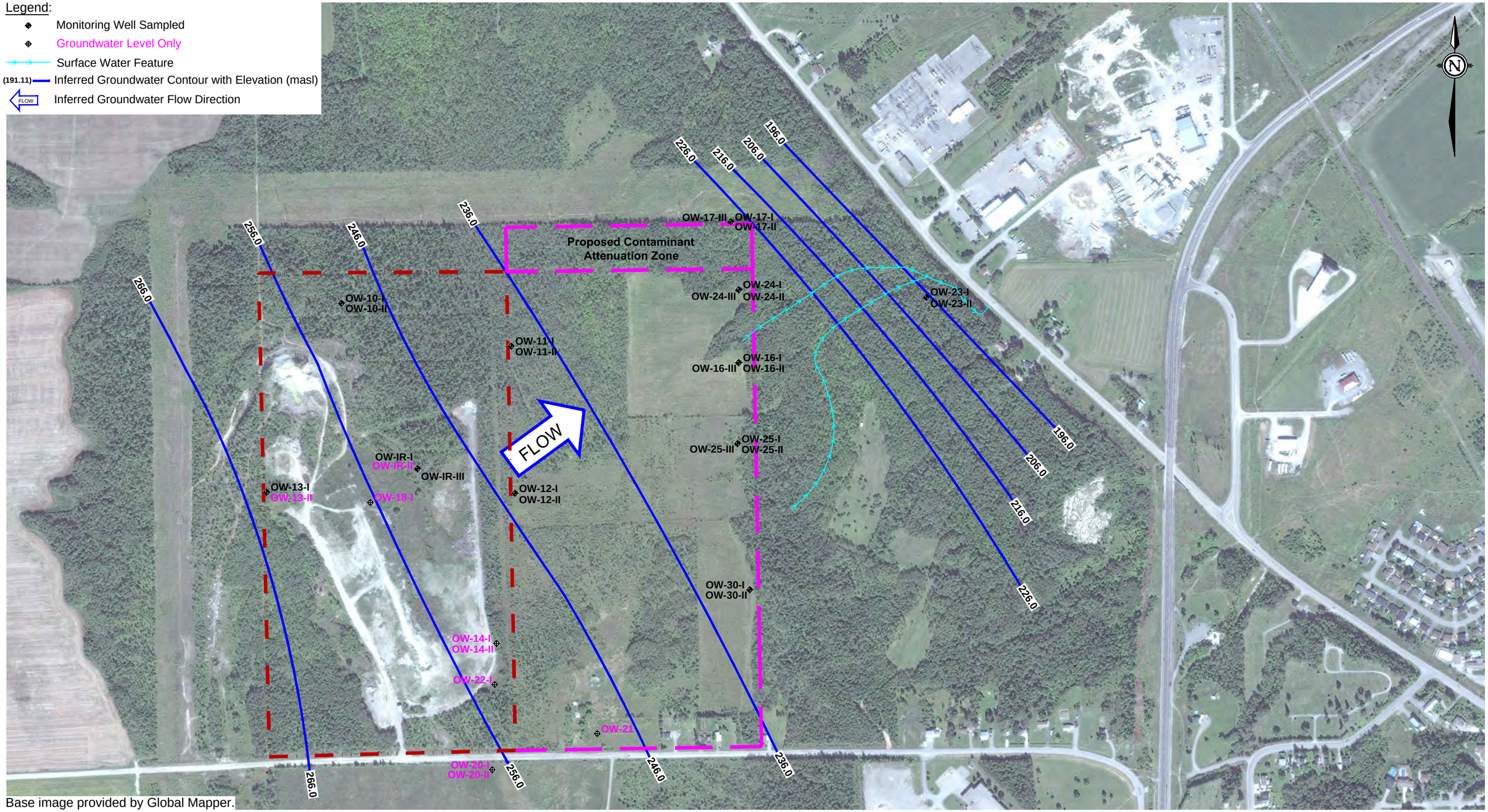
SCALE: as shown

PROJECT
Hydrogeological Characterization
New Liskeard Waste Disposal Site
New Liskeard, Ontario

TITLE
Inferred Shallow Groundwater Contour Plan
July 2015

DATE: August 2016
PROJECT No.: TY910491.4000
REV. No.: 1
FIGURE No.: 5C



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SCALE:	as shown

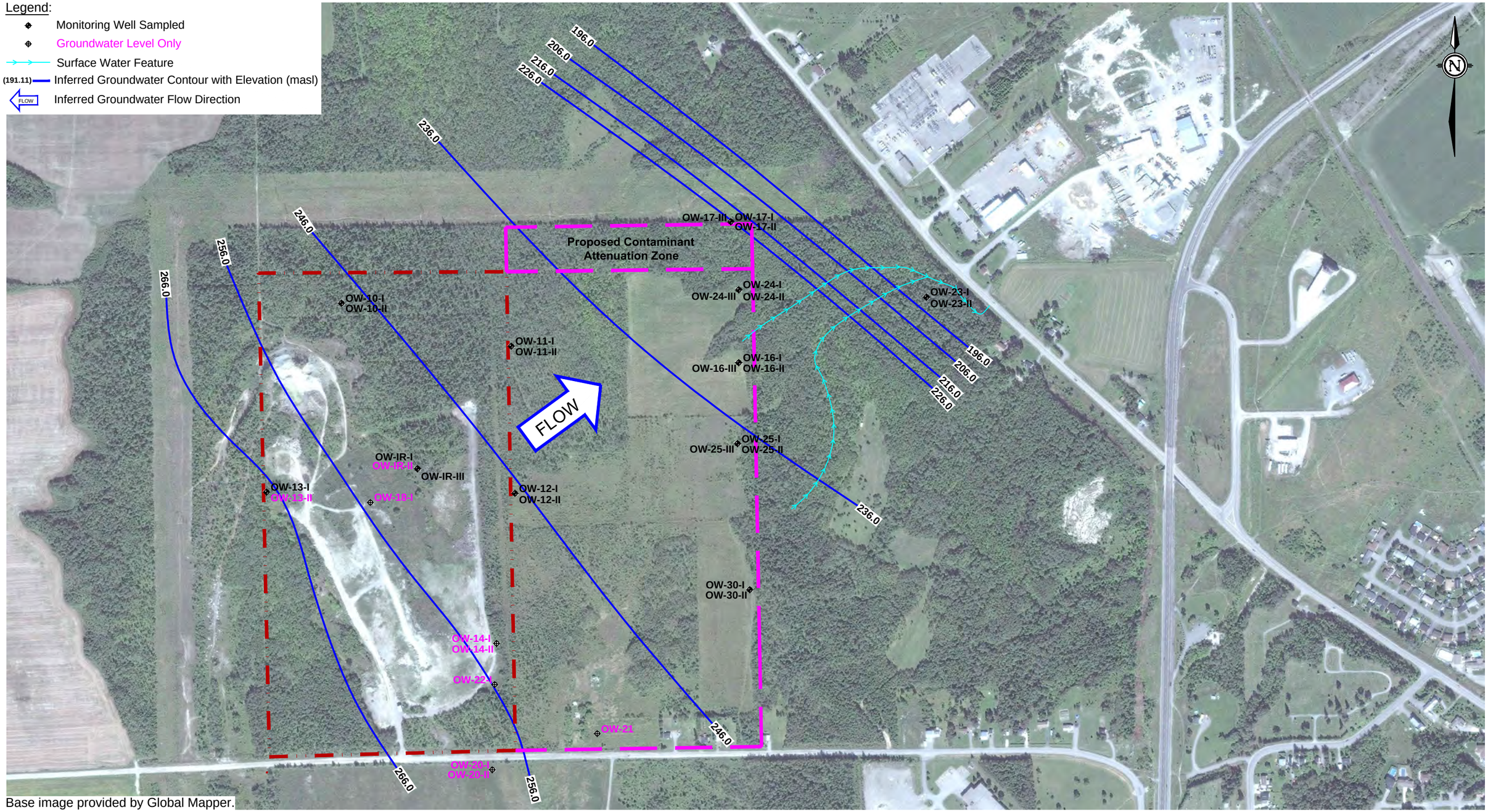
PROJECT

Hydrogeological Characterization
New Liskeard Waste Disposal Site
New Liskeard, Ontario

TITLE

Inferred Deep Groundwater Contour Plan
July 2015

DATE	August 2016
PROJECT No.	TY910491.4000
REV. No.	1
FIGURE No.	5D



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Approximate Scale (m)

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DATUM:	NAD 83
SCALE:	as shown

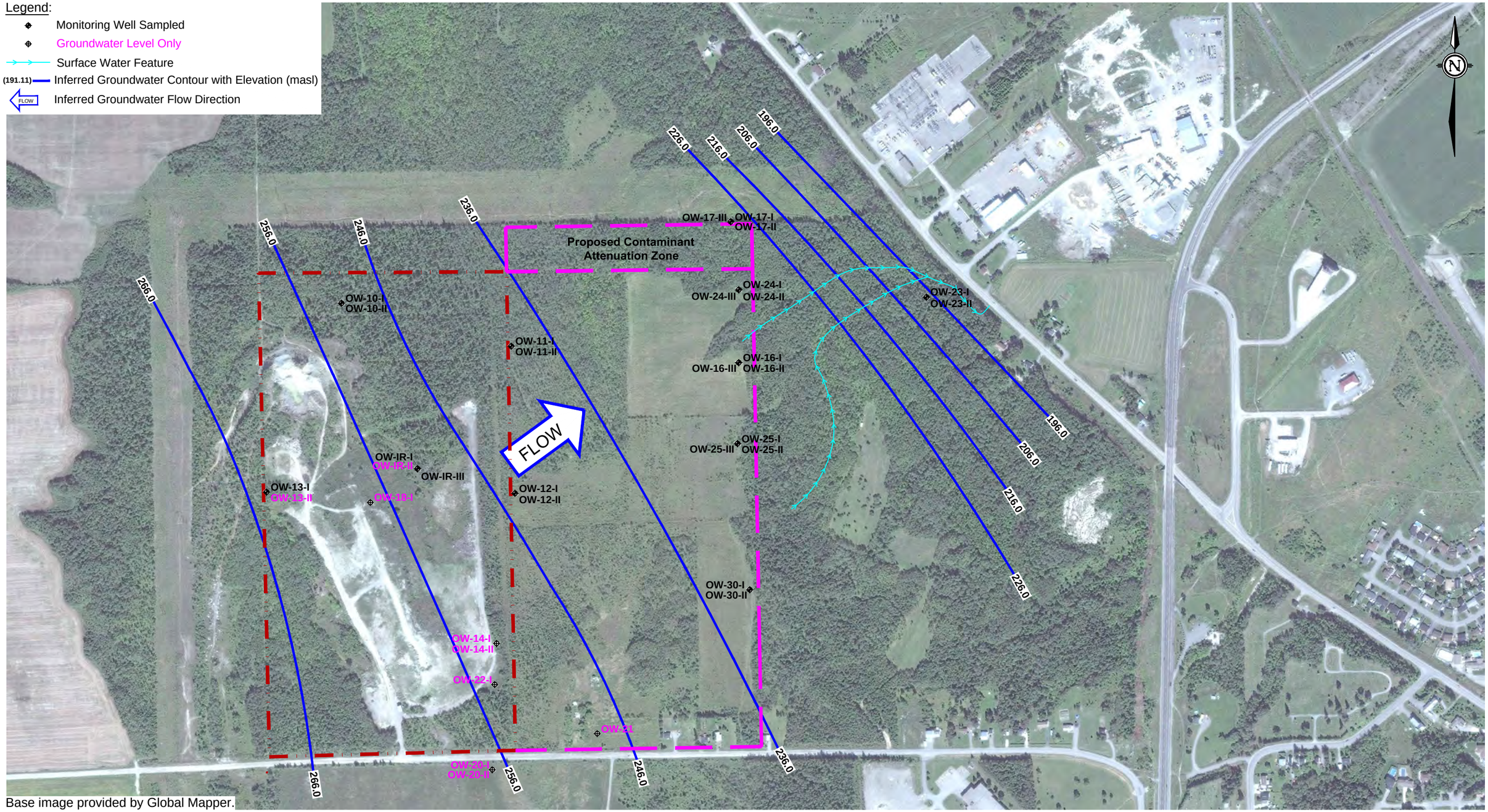
PROJECT
Hydrogeological Characterization
New Liskeard Waste Disposal Site
New Liskeard, Ontario

TITLE
Inferred Shallow Groundwater Contour Plan
September 2015

DATE	August 2016
PROJECT No.	TY910491.4000
REV. No.	1
FIGURE No.	5E

Legend:

- Monitoring Well Sampled
- Groundwater Level Only
- Surface Water Feature
- (191.11) Inferred Groundwater Contour with Elevation (masl)
- Inferred Groundwater Flow Direction



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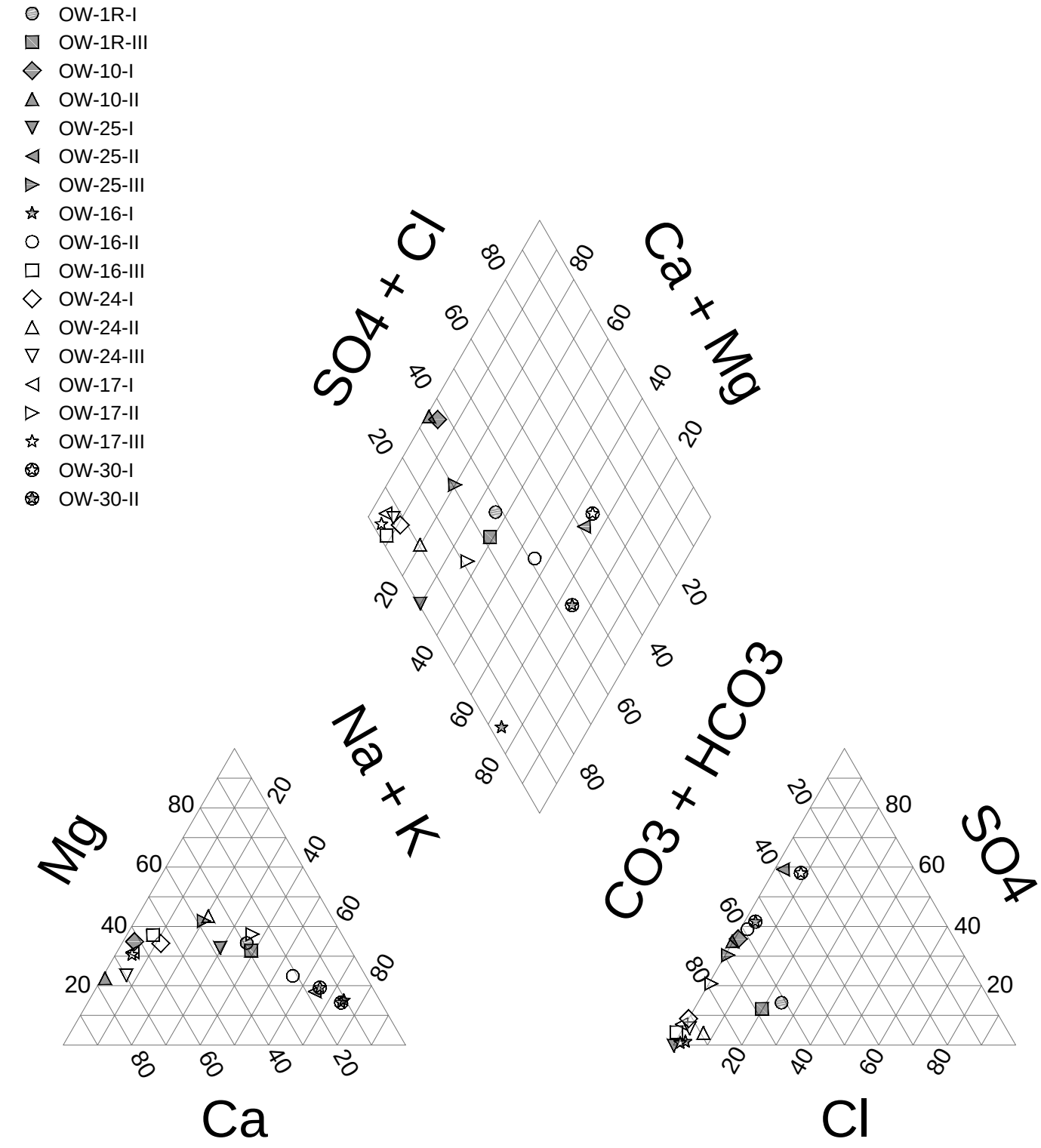
CKD BY:	TIM
DATUM:	NAD 83
SCALE:	as shown

PROJECT
Hydrogeological Characterization
New Liskeard Waste Disposal Site
New Liskeard, Ontario

TITLE
Inferred Deep Groundwater Contour Plan
September 2015

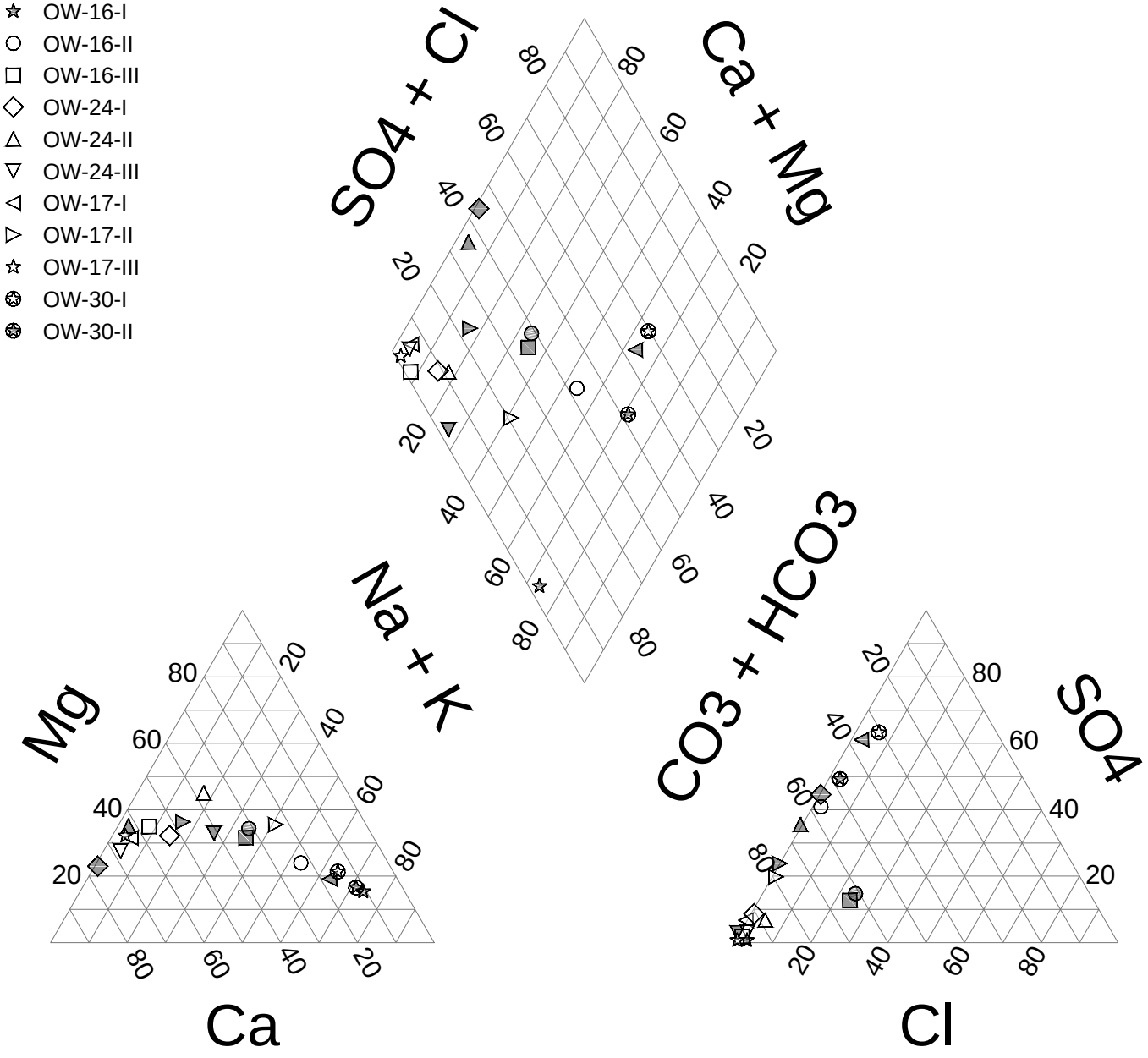
DATE	August 2016
PROJECT No.	TY910491.4000
REV. No.	1
FIGURE No.	5F



Amec Foster Wheeler Environment & Infrastructure 131 Fielding Road Lively, Ontario P3Y 1L7 705-682-2632	amec foster wheeler	Temiskaming Shores	The City of Temiskaming Shores
PROJECT: Hydrogeological Characterization New Liskeard Waste Disposal Site New Liskeard, Ontario		DWN BY: MAT	CHK'D BY: TIM	DATE: August 2016 PROJECT NO: TY910491.4000
TITLE: Groundwater Tri-Linear Piper Plot - May 2015		REV. NO.: 1	SCALE: as shown	FIGURE NO: 6A

Legend:

- OW-1R-I
- OW-1R-III
- OW-10-I
- OW-10-II
- OW-25-I
- OW-25-II
- OW-25-III
- OW-16-I
- OW-16-II
- OW-16-III
- OW-24-I
- OW-24-II
- OW-24-III
- OW-17-I
- OW-17-II
- OW-17-III
- OW-30-I
- OW-30-II



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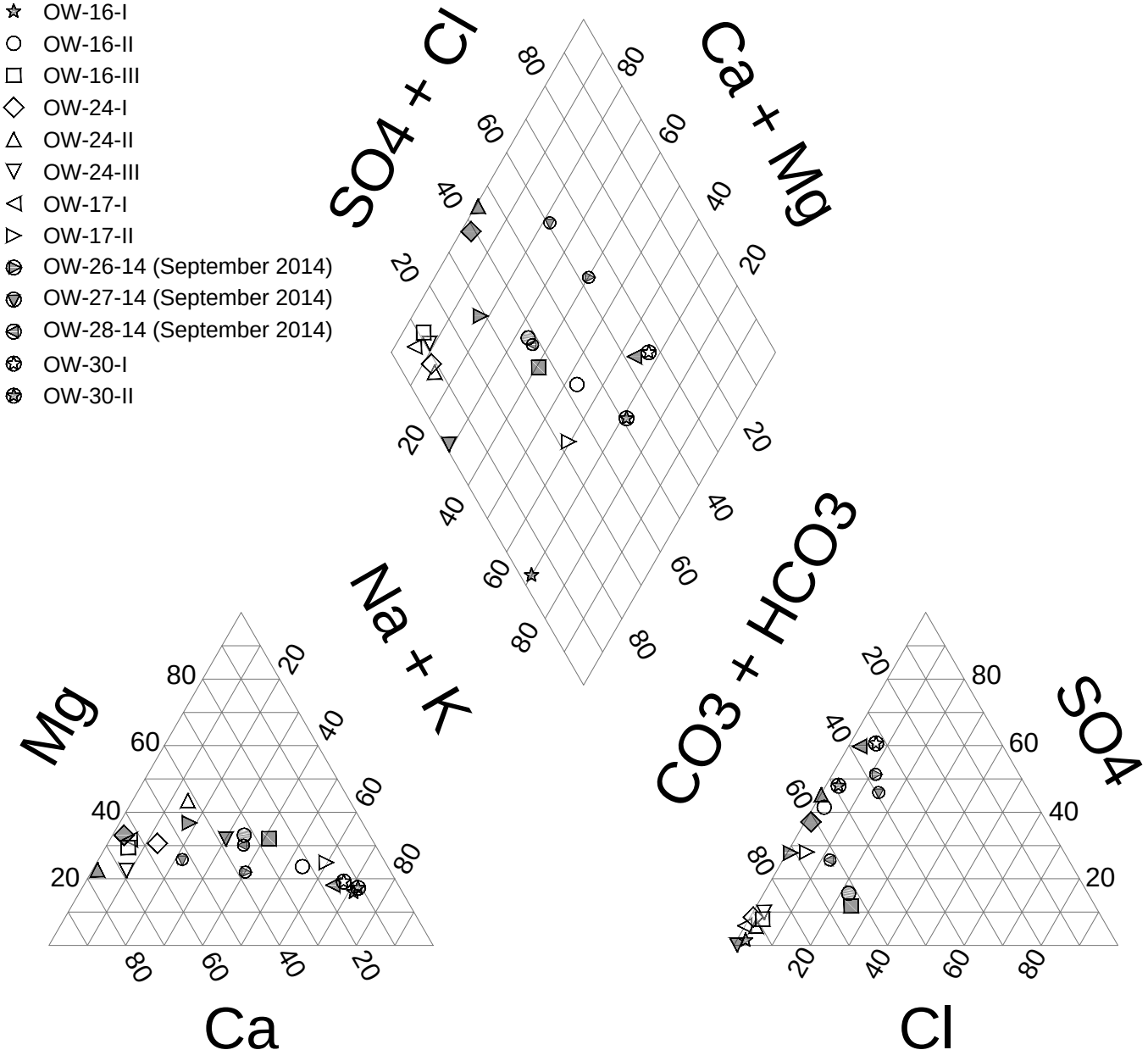
PROJECT: Hydrogeological Characterization New Liskeard Waste Disposal Site New Liskeard, Ontario		DWN BY: MAT	CHK'D BY: TIM	DATE: August 2016 PROJECT NO: TY910491.4000
TITLE: Groundwater Tri-Linear Piper Plot - July 2015		REV. NO.: 1	SCALE: as shown	FIGURE NO: 6B

Legend:

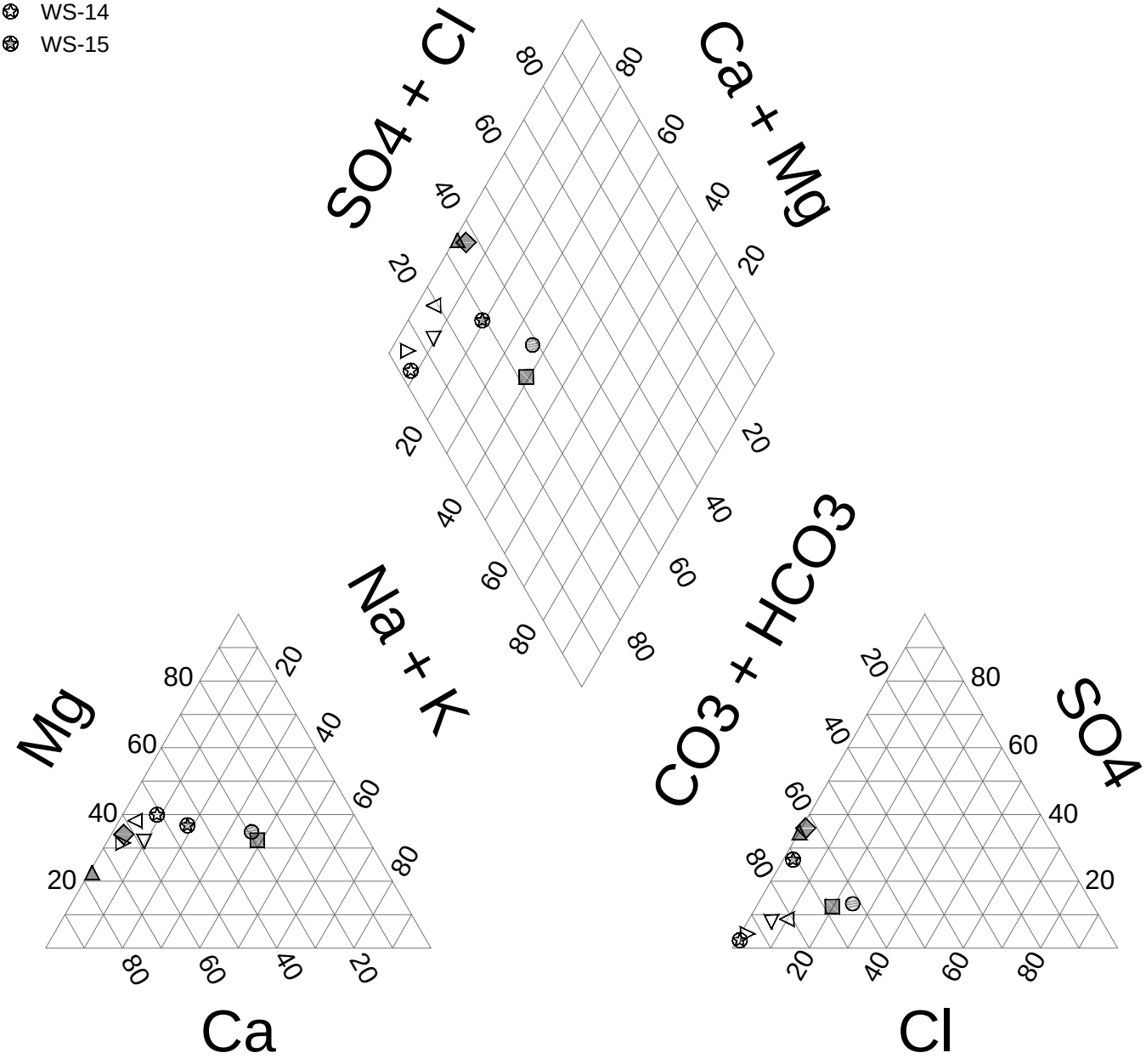
- OW-1R-I
- OW-1R-III
- OW-10-I
- OW-10-II
- OW-25-I
- OW-25-II
- OW-25-III
- OW-16-I
- OW-16-II
- OW-16-III
- OW-24-I
- OW-24-II
- OW-24-III
- OW-17-I
- OW-17-II
- OW-26-14 (September 2014)
- OW-27-14 (September 2014)
- OW-28-14 (September 2014)
- OW-30-I
- OW-30-II



Amec Foster Wheeler Environment & Infrastructure 131 Fielding Road Lively, Ontario P3Y 1L7 705-682-2632	amec foster wheeler	Temiskaming Shores	The City of Temiskaming Shores
PROJECT: Hydrogeological Characterization New Liskeard Waste Disposal Site New Liskeard, Ontario		DWN BY: MAT	CHK'D BY: TIM	DATE: August 2016 PROJECT NO: TY910491.4000
TITLE: Groundwater Tri-Linear Piper Plot - September 2015		REV. NO.: 1	SCALE: as shown	FIGURE NO: 6C

Legend:

- OW-1R-I
- OW-1R-III
- OW-10-I
- OW-10-II
- WS-7
- WS-8
- WS-13
- WS-14
- WS-15

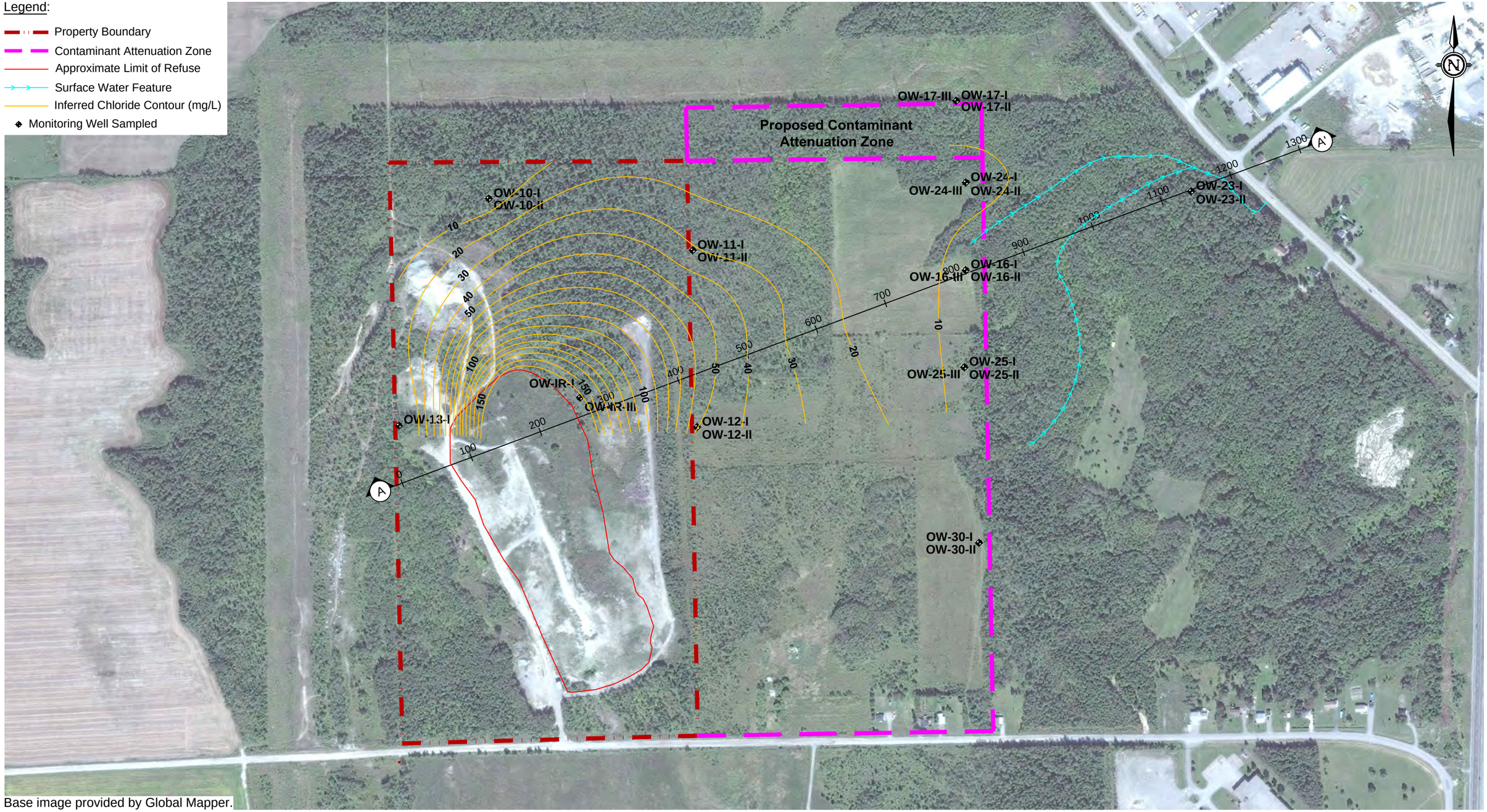


Amec Foster Wheeler Environment & Infrastructure
131 Fielding Road
Lively, Ontario
P3Y 1L7
705-682-2632

amec foster wheeler

The City of Temiskaming Shores

PROJECT	Hydrogeological Characterization New Liskeard Waste Disposal Site New Liskeard, Ontario	DWN BY: MAT	CHK'D BY: TIM	DATE: August 2016 PROJECT NO: TY910491.4000
TITLE	Residential Groundwater Tri-Linear Piper Plot - July 2015	REV. NO.: 1	SCALE: as shown	FIGURE NO: 6D



Base image provided by Global Mapper.

0 50 100 150 200 250 300
Approximate Scale (m)

The City of Temiskaming Shores

Amec Foster Wheeler Environment & Infrastructure
131 Fielding Road
Lively, Ontario
P3Y 1L7
705-682-2632

DWN BY:	MAT
CKD BY:	TIM
DATUM:	NAD 83
SCALE:	as shown

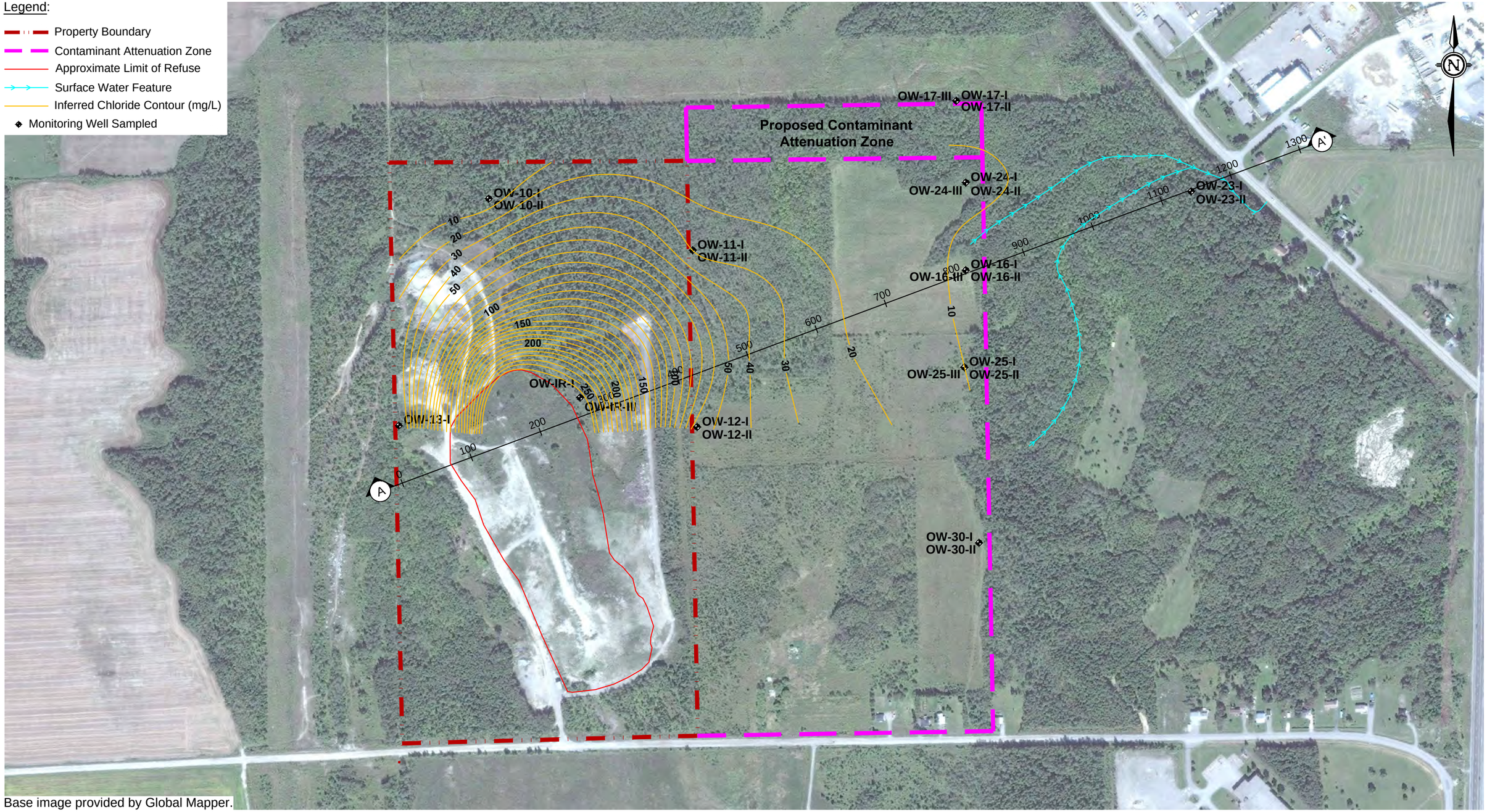
PROJECT
Hydrogeological Characterization
New Liskeard Waste Disposal Site
New Liskeard, Ontario

TITLE
Groundwater Chloride Concentrations
May 2015

DATE	August 2016
PROJECT No.	TY910491.4000
REV. No.	1
FIGURE No.	7A

Legend:

- Property Boundary
- Contaminant Attenuation Zone
- Approximate Limit of Refuse
- Surface Water Feature
- Inferred Chloride Contour (mg/L)
- Monitoring Well Sampled



Base image provided by Global Mapper.

0 50 100 150 200 250 300
Approximate Scale (m)

The City of Temiskaming Shores

Amec Foster Wheeler Environment & Infrastructure
131 Fielding Road
Lively, Ontario
P3Y 1L7
705-682-2632

DWN BY:	MAT
CKD BY:	TIM
DATUM:	NAD 83
SCALE:	as shown

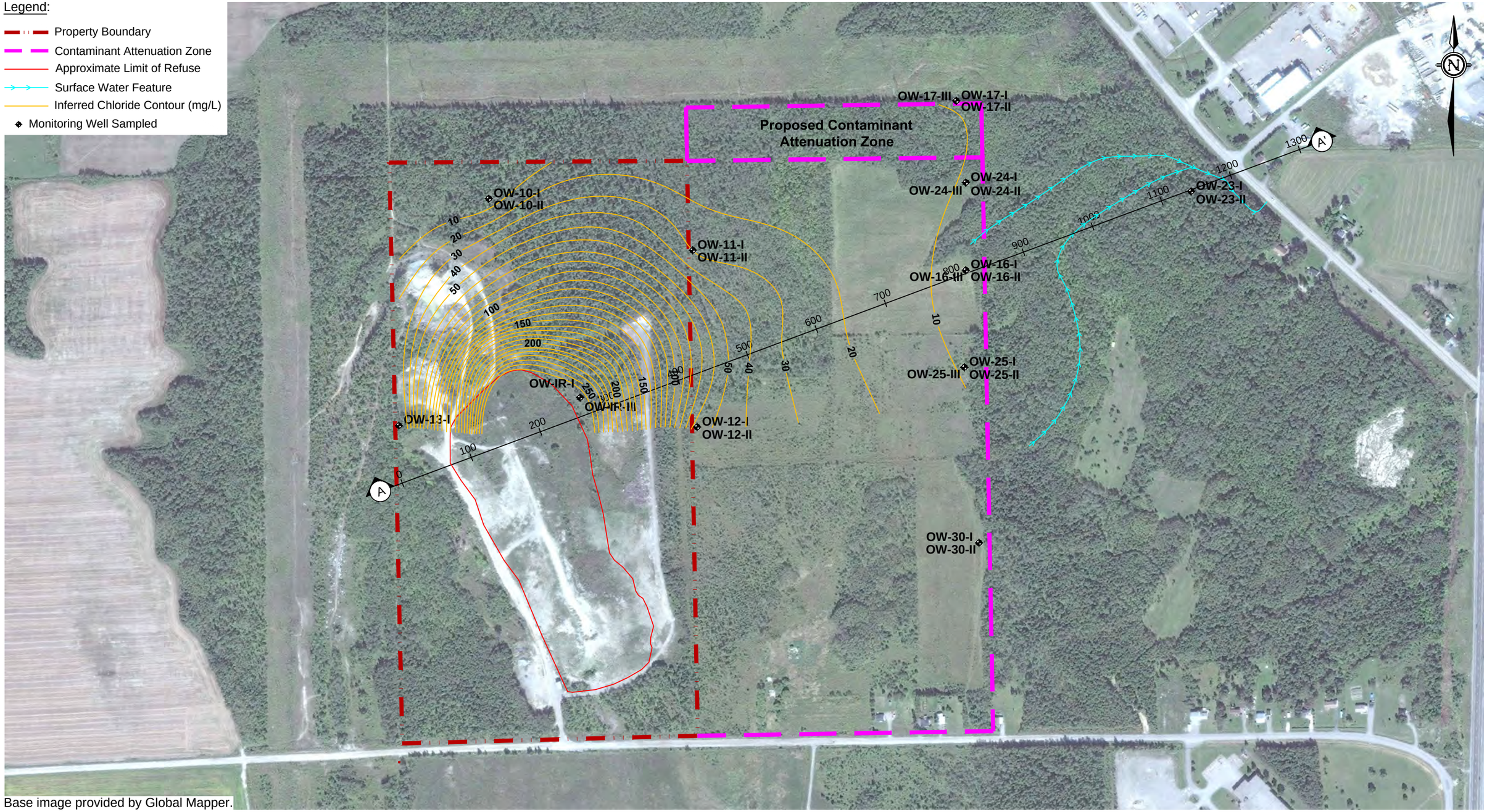
PROJECT
Hydrogeological Characterization
New Liskeard Waste Disposal Site
New Liskeard, Ontario

TITLE
Groundwater Chloride Concentrations
July 2015

DATE	August 2016
PROJECT No.	TY910491.4000
REV. No.	1
FIGURE No.	7B

Legend:

- Property Boundary
- Contaminant Attenuation Zone
- Approximate Limit of Refuse
- Surface Water Feature
- Inferred Chloride Contour (mg/L)
- Monitoring Well Sampled



Base image provided by Global Mapper.

0 50 100 150 200 250 300
Approximate Scale (m)

The City of Temiskaming Shores

Amec Foster Wheeler Environment & Infrastructure
131 Fielding Road
Lively, Ontario
P3Y 1L7
705-682-2632

DWN BY:	MAT
CKD BY:	TIM
DATUM:	NAD 83
SCALE:	as shown

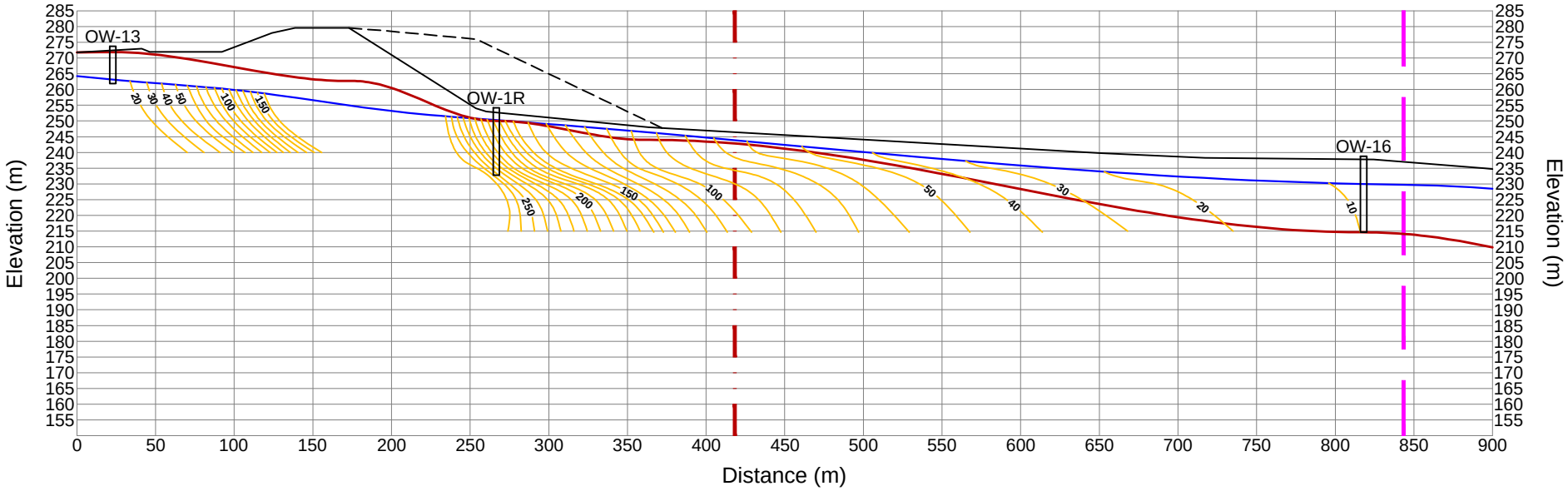
PROJECT
Hydrogeological Characterization
New Liskeard Waste Disposal Site
New Liskeard, Ontario

TITLE
Groundwater Chloride Concentrations
September 2015

DATE	August 2016
PROJECT No.	TY910491.4000
REV. No.	1
FIGURE No.	7C

Legend:

- Property Boundary
- Contaminant Attenuation Zone
- Existing Ground Profile
- Inferred Bedrock Profile
- Inferred Groundwater Profile
- Approximate Extent of Final Cover
- Inferred Chloride Contour (mg/L)

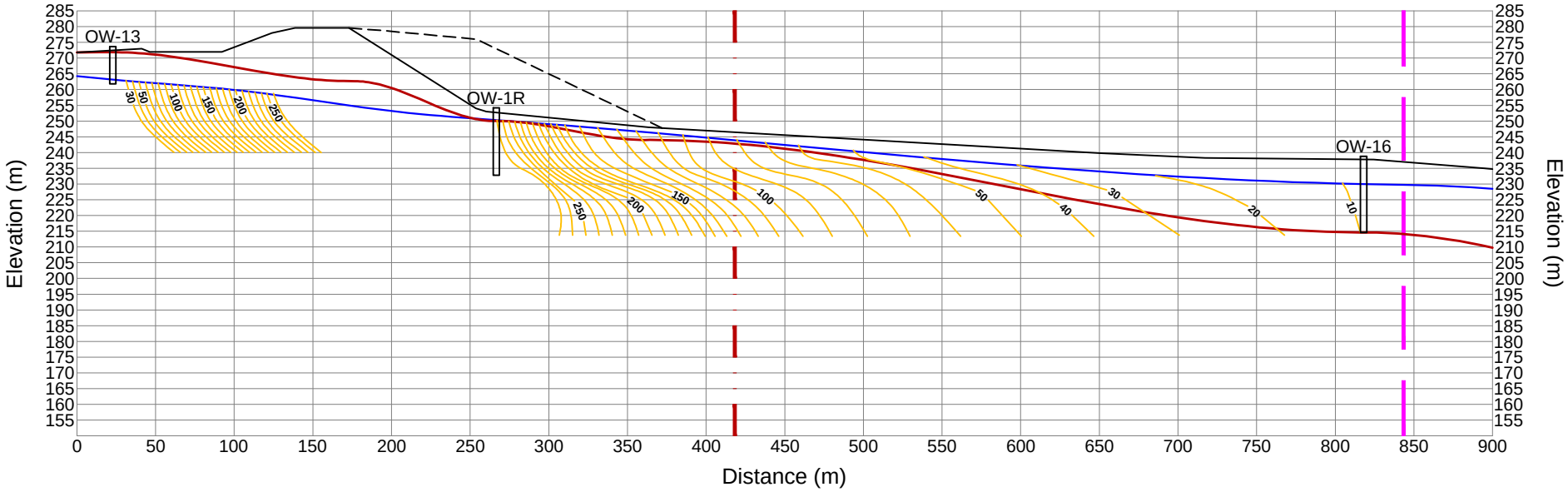


Section A - A

Temiskaming Shores	The City of Temiskaming Shores	DWN BY: MAT	PROJECT: Hydrogeological Characterization New Liskeard Waste Disposal Site New Liskeard, Ontario	REV. NO.: 1
		CHK'D BY: TIM		DATE: August 2016
Amec Foster Wheeler Environment & Infrastructure 131 Fielding Road Lively, Ontario P3Y 1L7 705-682-2632	amec foster wheeler	SCALE: as shown	TITLE: Chloride Cross Sectional Profile May 2015	PROJECT NO: TY910491.4000 FIGURE NO: 8A

Legend:

- Property Boundary
- Contaminant Attenuation Zone
- Existing Ground Profile
- Inferred Bedrock Profile
- Inferred Groundwater Profile
- Approximate Extent of Final Cover
- Inferred Chloride Contour (mg/L)

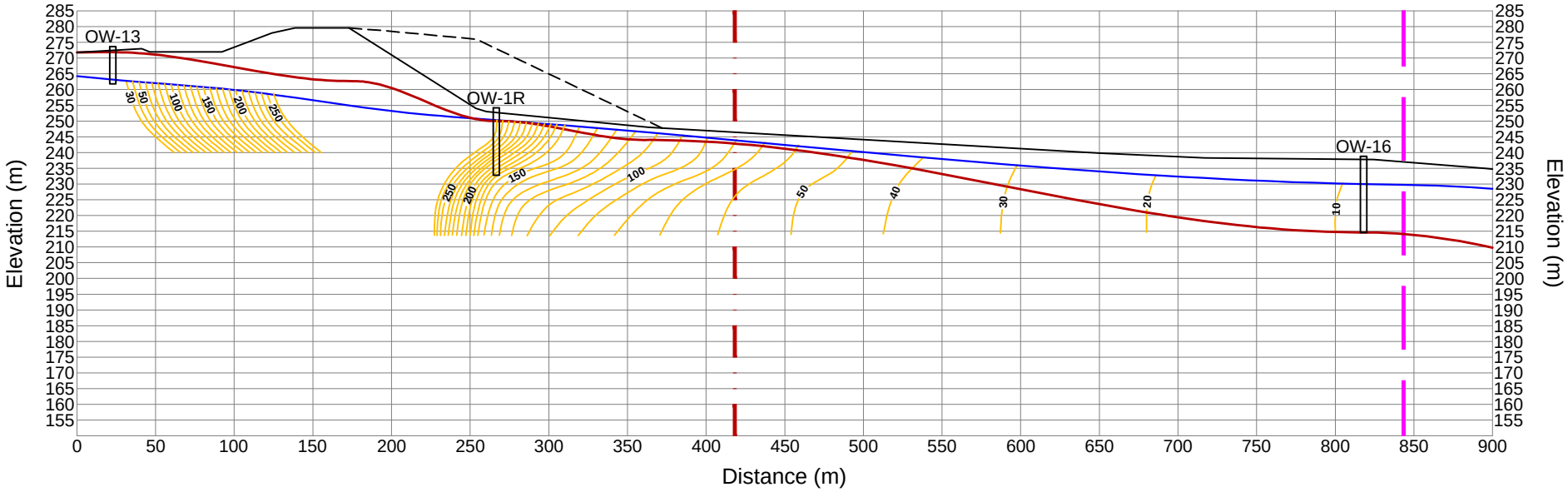


Section A - A

The City of Temiskaming Shores	DWN BY: MAT	PROJECT: Hydrogeological Characterization New Liskeard Waste Disposal Site New Liskeard, Ontario	REV. NO.: 1	
	CHK'D BY: TIM		DATE: August 2016	
Amec Foster Wheeler Environment & Infrastructure 131 Fielding Road Lively, Ontario P3Y 1L7 705-682-2632	SCALE: as shown	TITLE: Chloride Cross Sectional Profile July 2015	PROJECT NO: TY910491.4000	FIGURE NO: 8B

Legend:

- Property Boundary
- Contaminant Attenuation Zone
- Existing Ground Profile
- Inferred Bedrock Profile
- Inferred Groundwater Profile
- Approximate Extent of Final Cover
- Inferred Chloride Contour (mg/L)



Section A - A

The City of Temiskaming Shores	DWN BY: MAT	PROJECT: Hydrogeological Characterization New Liskeard Waste Disposal Site New Liskeard, Ontario	REV. NO.: 1
	CHK'D BY: TIM		DATE: August 2016
Amec Foster Wheeler Environment & Infrastructure 131 Fielding Road Lively, Ontario P3Y 1L7 705-682-2632	SCALE: as shown	TITLE: Chloride Cross Sectional Profile September 2015	PROJECT NO: TY910491.4000
			FIGURE NO: 8C

Legend:

- Property Boundary
- Contaminant Attenuation Zone
- Existing Access Road
- Proposed Access Road
- Existing Ground Contours (m)
- Proposed Final Cover Contours (m)

Base image provided by Global Mapper.

0 50 100 150 200 250 300

Approximate Scale (m)

The City of Temiskaming Shores

Amec Foster Wheeler Environment & Infrastructure

131 Fielding Road
Lively, Ontario
P3Y 1L7
705-682-2632

DWN BY:	MAT
CKD BY:	TIM
DATUM:	NAD 83
SCALE:	as shown

PROJECT

Hydrogeological Characterization
New Liskeard Waste Disposal Site
New Liskeard, Ontario

TITLE

Proposed Contaminant Attenuation Zone Expansion

DATE	August 2016
PROJECT No.	TY910491.4000
REV. No.	1
FIGURE No.	9

APPENDIX A

BOREHOLE LOGS

morrison beatty limited
consulting engineers and hydrogeologists
290 The West Mall, Etobicoke, Ontario M9C 1C6 (416-622-9374)

OW 1

New Liskeard Landfill — FILE NO. 147-802

Hydrogeologic Impact Study, Phase II

GEOLOGIST/ENGINEER WDB / BWB — DATE COMPLETED June 22-23, 1980

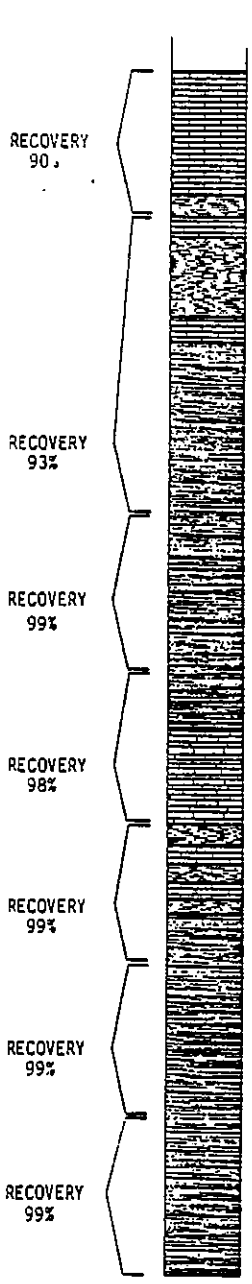
DEPTH metres	DEPTH feet	DESCRIPTION	SAMPLE no.	SAMPLE type	SAMPLE "N"	WELL DETAIL
						A B C
		TILL, glacial silty sand and gravel medium brown				
3	10					
		LIMESTONE BEDROCK grey, with interbeds of calcareous shale				
5	20	see next page for detailed bedrock core log				
10	30					
	40					
15	50					
	60					
20		End Hole				
	70					

Water levels taken August 28/80

GS - GRAB SAMPLE ||||| SS - SPLIT SPOON ▨ ST - SHELBY TUBE "N" BLOWS PER FOOT WATER LEVEL ▽

morrison beatty limited
consulting engineers and hydrogeologists
290 the west mall, etobicoke, ontario M9C 1C6 (416-622-9374)

BEDROCK CORE LOG, OWI-C



Depth (m) (BGL)	
6.8	Greenish grey LIMESTONE, occasional small calcite filled vugs, thin shale laminae, moderately weathered in top 0.7 metres
8.0	
8.3	Grey calcareous SHALE, fossiliferous
8.6	Grey LIMESTONE, irregular bedding, fossiliferous
	Greenish-grey calcareous SHALE, fissile
9.3	
9.7	Grey LIMESTONE, fossiliferous
	Greenish-grey calcareous SILTSTONE, fissile, occassional strata of argillaceous limestone or grey siltstone
13.6	
	Grey argillaceous SILTSTONE, sometimes nodular, indefinite contact with overlying unit
14.4	
	Greenish-grey argillaceous SHALE and LIMESTONE
15.4	
	Dark grey argillaceous SILTSTONE
19.0	

\SST

Water levels taken August 28/80

morrison beatty limited
consulting engineers and hydrogeologists
290 the west mall, etobicoke, ontario M9C 1C6 (416-622-9374)

OW2

New Liskeard Landfill — FILE NO. 147-802

Hydrogeologic Impact Study, Phase II

GEOLOGIST/ENGINEER WDB / BWB — DATE COMPLETED June 24/26, 1980

DEPTH metres	DEPTH feet	DESCRIPTION	SAMPLE no.	SAMPLE type	SAMPLE "N"	WELL DETAIL
						A B C
		TILL, glacial silty sand and gravel medium brown				
	10	LIMESTONE BEDROCK grey, with interbeds of calcareous shale				
5	20					
	30	End Hole				
10	40					
15	50					
	60					
20	70					

Water levels taken August 28/80

GS - GRAB SAMPLE |||| SS - SPLIT SPOON ▨ ST - SHELBY TUBE "N" BLOWS PER FOOT WATER LEVEL ▽

morrison beatty limited
consulting engineers and hydrogeologists
290 the west mall, etobicoke, ontario M9C 1C6 (416-622-9374)

OW4

New Liskeard Landfill — FILE NO. 147-802

Hydrogeologic Impact Study, Phase II

GEOLOGIST/ENGINEER WDB / BWB — DATE COMPLETED June 24-25, 1980

DEPTH metres	DEPTH feet	DESCRIPTION	SAMPLE no.	SAMPLE type	SAMPLE "N"	WELL DETAIL
						A B C
		TILL, glacial silty sand and gravel medium brown				
	10	LIMESTONE BEDROCK grey, with interbeds of calcareous shale				
5	20					
	30	End Hole				
10	40					
15	50					
	60					
20	70					

Water levels taken August 28/80

GS - GRAB SAMPLE SS - SPLIT SPOON ST - SHELBY TUBE "N" BLOWS PER FOOT WATER LEVEL ▽

morrison beatty limited
consulting engineers and hydrogeologists
290 the west mall, etobicoke, ontario M9C 1C6 (416-622-9374)

OW5

New Liskeard Landfill — FILE NO. 147-802

Hydrogeologic Impact Study, Phase II

GEOLOGIST/ENGINEER WDB / BWB — DATE COMPLETED June 24-25, 1980

DEPTH metres / feet	DESCRIPTION	SAMPLE no. / type / "N"	WELL DETAIL
0			A, B, C
10 / 5	TILL, glacial silty sand and gravel medium brown		
20 / 10	LIMESTONE BEDROCK grey, with interbeds of calcareous shale		
30 / 15			
40 / 20	End Hole		
50			
60			
70			

Water levels taken August 28/80

GS - GRAB SAMPLE SS - SPLIT SPOON ST - SHELBY TUBE "N" BLOWS PER FOOT WATER LEVEL ▽

morrison beatty limited
consulting engineers and hydrogeologists
290 the west mall, etobicoke, ontario M9C 1C6 (416-622-9374)

OW6

New Liskeard Landfill

Hydrogeologic Impact Study, Phase II

FILE NO. 147-802

GEOLOGIST/ENGINEER WDB / BWB DATE COMPLETED June 24/26, 1980

DEPTH metres	DEPTH feet	DESCRIPTION	SAMPLE no.	SAMPLE type	SAMPLE "N"	WELL DETAIL
		TILL, glacial silty sand and gravel medium brown				A, B
		LIMESTONE BEDROCK grey, with interbeds of calcareous shale				
		End Hole				

Water levels taken August 28/80

GS - GRAB SAMPLE SS - SPLIT SPOON ST - SHELBY TUBE "N" BLOWS PER FOOT WATER LEVEL ▽

WL-100280

morrison beatty limited
consulting engineers and hydrogeologists
290 the west mall, etobicoke, ontario M9C 1C6 (416-622-9374)

OW 7

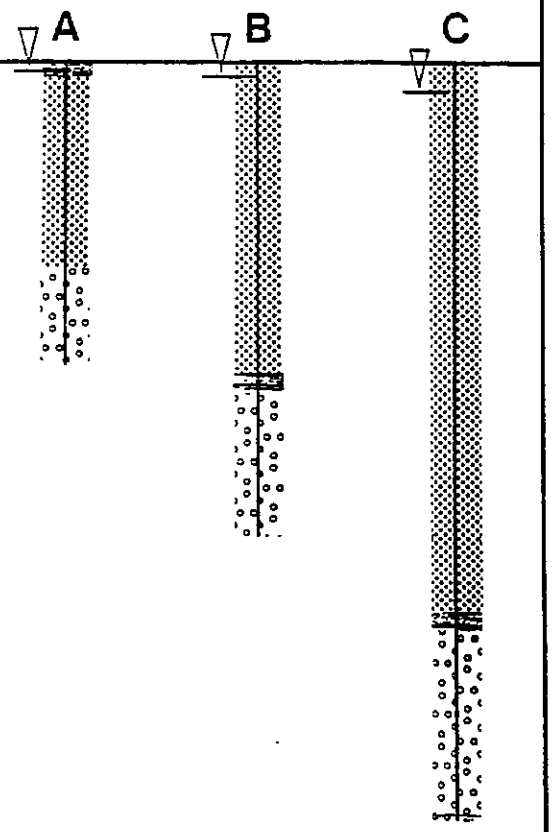
New Liskeard Landfill — FILE NO. 147-802

Hydrogeologic Impact Study, Phase II

GEOLOGIST/ENGINEER WDB / BWB — DATE COMPLETED June 24-26, 1980

DEPTH metres	DEPTH feet	DESCRIPTION	SAMPLE no.	SAMPLE type	SAMPLE "N"
0	0	TILL, glacial silty sand and gravel medium brown			
5	10				
	20	LIMESTONE BEDROCK grey, with interbeds of calcareous shale			
10	30				
	40	End Hole			
15	50				
	60				
20	70				

WELL DETAIL



Water levels taken August 28/80

GS - GRAB SAMPLE SS - SPLIT SPOON ST - SHELBY TUBE "N" BLOWS PER FOOT WATER LEVEL ▽

morrison beatty limited
consulting engineers and hydrogeologists
290 the west mall, etobicoke, ontario M9C 1C6 (416-622-9376)

OW 8

New Liskeard Landfill — FILE NO. 147-802

Hydrogeologic Impact Study, Phase II

GEOLOGIST/ENGINEER WDB / BWB — DATE COMPLETED June 24, 1980

DEPTH metres	DEPTH feet	DESCRIPTION	SAMPLE no.	SAMPLE type	SAMPLE "N"	WELL DETAIL
						A B
		TILL, glacial silty sand and gravel medium brown				
	10	LIMESTONE BEDROCK grey, with interbeds of calcareous shale				
5		End Hole				
	20					
	30					
10						
	40					
15						
	50					
	60					
20						
	70					

Water levels taken August 28/80

GS - GRAB SAMPLE SS - SPLIT SPOON ST - SHELBY TUBE "N" BLOWS PER FOOT WATER LEVEL ▽

WL-100880

morrison beatty limited
consulting engineers and hydrogeologists
290 the west mall, etobicoke, ontario M9C 1C6 (416-622-9374)

OW9

New Liskeard Landfill — FILE NO. 147-802

Hydrogeologic Impact Study, Phase II

GEOLOGIST/ENGINEER WDB / BWB — DATE COMPLETED June 24, 1980

DEPTH metres	DEPTH feet	DESCRIPTION	SAMPLE no.	SAMPLE type	SAMPLE "N"	WELL DETAIL
						A B
		TILL, glacial silty sand and gravel medium brown				
	10	LIMESTONE BEDROCK grey, with interbeds of calcareous shale				
5		End Hole				
	20					
	30					
10						
	40					
15						
	50					
	60					
20						
	70					

Water levels taken August 28/80

GS - GRAB SAMPLE SS - SPLIT SPOON ST - SHELBY TUBE "N" BLOWS PER FOOT WATER LEVEL ▽

WL-100880

BOREHOLE NO. OW-1R

PROJECT NAME: NEW LISKEARD LANDFILL SITE
PROJECT NO.: 001148.00
CLIENT: SUTCLIFFE RODY QUESNEL INC.
DATE: SEPTEMBER 24-25, 2000
BOREHOLE TYPE: HQ / HW CORING
GEOLOGIST: BDT
GROUND ELEVATION: 253.07 mASL (I), 253.21 mASL (II), 253.16 mASL (III)
REVIEWER:

DEPTH (m)	STRATIGRAPHIC DESCRIPTION	STRATIGRAPHY	MONITOR DETAILS	SAMPLE TYPE	SAMPLE 'N' VALUE	SAMPLE % WATER	SAMPLE % RECOVERY	SAMPLE RQD (%)	CONE PENETRATION "N" VALUE 10 20 30 / SHEAR STRENGTH	WATER CONTENT % 10 20 30 / W_P W_L	REMARKS
0			I II III								
	FILL/DISTURBED SOIL: MEDIUM BROWN FINE SANDY SILT, TRACE CLAY, TRACE GRAVEL, DAMP			SS1	47		17				WATER LEVEL DEPTH (mbgl) I – 0.82 II – 0.78 III – 0.75
1.2				SS2	78		100				MONITOR NEST COMPLETED IN SEPARATE ADJACENT BOREHOLES
	SAND TILL: MEDIUM GREY SILTY FINE SAND TILL, SOME GRAVEL, OCCASIONAL COBBLES, DAMP			RC	78		46				
2											INTER-FRACTURE SPACING (m):
3.3											
	LIMESTONE: GREY TO GREENISH GREY, CLASTIC. CLASTS ARE SUBROUNDED TO ROUNDED. MASSIVE TO THICK BEDDED. SEVERAL SHALEY PARTINGS, 3 CM THICK. SOFT TO MEDIUM SOFT. SLIGHT TO FRESH WEATHERING. HIGHLY BROKEN WHITE CALCITE NODULES UP TO 3 CM ACROSS, ROUNDED TO ELONGATED. SHARP CONTACT WITH NEXT UNIT.			RC			78	0			0.08
4				RC			100	63			0.20
				RC			100	78			0.31
6				RC			99	83			0.31
				RC			97	83			0.37
7.9											
8.5	SILTSTONE-SHALE: GREY, WITH THIN LIMESTONE INTERBEDS, APHANITIC, LAMINATED, SOFT, VERY BROKEN.			RC			93	40			0.18
				RC			100	96			0.45
9.6	LIMESTONE: GREENISH GREY, MASSIVE, CLASTIC. CLASTS ARE SUBROUNDED TO ROUNDED. MEDIUM SOFT TO SOFT. SLIGHT TO FRESH WEATHERING, BROKEN. WHITE CALCITE NODULES UP TO 1 CM ACROSS. ROUNDED TO ELONGATED.			RC			100	100			0.28
10											
10.7											
	SILTSTONE-SHALE: MEDIUM GREY, MICRO LAMINATED TO LAMINATED. SOFT, SLIGHT TO FRESH WEATHERING. BROKEN TO VERY BROKEN.			RC			100	94			
12											FRACTURE AT 12.68 m
	LIMESTONE: GREENISH GREY, CLASTIC. CLASTS UP TO 1 CM ACROSS, ROUNDED TO ELONGATED. THICK BEDDED TO MASSIVE, MEDIUM SOFT. SLIGHT TO FRESH WEATHERING. BLOCKY TO MASSIVE FRACTURING. BLACK SILTSTONE PARTING.			RC			100	100			
14											FRACTURE AT 13.71 m
14.2				RC			95	94			
	LIMESTONE: GREY, MASSIVE WITH THIN BEDS OF SHALE AND CLASTIC LIMESTONE. MEDIUM SOFT TO SOFT, MASSIVE TO BLOCKY FRACTURING. FRESH WEATHERING, OCCASIONAL CALCITE NODULE, OCCASIONAL SHALEY PARTINGS.			RC			100	86			0.74
16											
				RC			99	100			
18											FRACTURE AT 18.80 m
20	20.3 BOREHOLE TERMINATED AT 20.3 m										

Revision 1/ May 2000

BOREHOLE NO. OW-10

PROJECT NAME: NEW LISKEARD LANDFILL SITE
PROJECT NO.: 001148.00
CLIENT: SUTCLIFFE RODY QUESNEL INC.
DATE: SEPTEMBER 21, 2000
BOREHOLE TYPE: HQ / HW CORING
GEOLOGIST: BDT
GROUND ELEVATION: 250.76 mASL
REVIEWER:

DEPTH (m)	STRATIGRAPHIC DESCRIPTION	STRATIGRAPHY	MONITOR DETAILS	SAMPLE TYPE	SAMPLE 'N' VALUE	SAMPLE % WATER	SAMPLE % RECOVERY	SAMPLE ROD (%)	CONE PENETRATION "N" VALUE / SHEAR STRENGTH	WATER CONTENT % (W_P – W_L)	REMARKS
0			I II						10 20 30	10 20 30	WATER LEVEL DEPTH (mbgl)
	SILT: GREY BROWN SILT, TRACE SAND TO FINE SANDY, TRACE TO SOME CLAY, TRACE GRAVEL, DAMP			SS1	9		45				I – 0.94
				SS2	>50		43				II – 0.49
1.2				SS3			0				INTER-FRACTURE SPACING (m):
	SILT TILL: GREY BROWN, TRACE FINE SAND, TRACE CLAY, DAMP			RC			97	100			
2											
2.4											
	BEDROCK: LIMESTONE WITH SHALE AND SILTSTONE INTERBEDS. SEE BOREHOLE OW-1R FOR DETAIL.			RC			75	93			0.36
4				RC			100	94			0.58
				RC			85	49			0.23
5.8											
6	BOREHOLE TERMINATED AT 5.8 m										MONITOR NEST COMPLETED IN SEPARATE ADJACENT BOREHOLES
8											
10											
12											
14											
16											
18											
20											

Revision 1/ May 2000

BOREHOLE NO. OW-11

PROJECT NAME: NEW LISKEARD LANDFILL SITE
PROJECT NO.: 001148.00
CLIENT: SUTCLIFFE RODY QUESNEL INC.
DATE: SEPTEMBER 20, 2000
BOREHOLE TYPE: HQ / HW CORING
GEOLOGIST: BDT
GROUND ELEVATION: 242.12 mASL
REVIEWER:

DEPTH (m)	STRATIGRAPHIC DESCRIPTION	STRATIGRAPHY	MONITOR DETAILS	SAMPLE TYPE	SAMPLE 'N' VALUE	SAMPLE % WATER	SAMPLE % RECOVERY	SAMPLE RQD (%)	CONE PENETRATION "N" VALUE / SHEAR STRENGTH	WATER CONTENT % (W_P – W_L)	REMARKS
0			I II						10 20 30	10 20 30	
	SILT TILL: LIGHT BROWN SILT TILL, TRACE SAND TO FINE SANDY, TRACE TO SOME CLAY BOULDER 0.9 m–1.3 m, MOIST			SS1	5		50			II I	WATER LEVEL DEPTH (mbgl) I – 0.89 II – 0.32
				SS2	43		72				
1.3											INTER–FRACTURE SPACING (m):
	BEDROCK: LIMESTONE WITH SHALE AND SILTSTONE INTERBEDS. SEE BOREHOLE OW–1R FOR DETAIL.			RC			97	48			0.14
2				RC			100	79			0.16
4				RC			100	87			0.34
				RC			100	85			0.24
5.8											
6	BOREHOLE TERMINATED AT 5.8 m										MONITOR NEST COMPLETED IN SEPARATE ADJACENT BOREHOLES
8											
10											
12											
14											
16											
18											
20											

BOREHOLE NO. OW-12

PROJECT NAME: NEW LISKEARD LANDFILL SITE
PROJECT NO.: 001148.00
CLIENT: SUTCLIFFE RODY QUESNEL INC.
DATE: SEPTEMBER 19, 2000
BOREHOLE TYPE: HQ / HW CORING
GEOLOGIST: BDT
GROUND ELEVATION: 248.00 mASL (I), 248.15 mASL (II)
REVIEWER:

DEPTH (m)	STRATIGRAPHIC DESCRIPTION	STRATIGRAPHY	MONITOR DETAILS	SAMPLE TYPE	SAMPLE 'N' VALUE	SAMPLE % WATER	SAMPLE % RECOVERY	SAMPLE RQD (%)	CONE PENETRATION "N" VALUE / SHEAR STRENGTH	WATER CONTENT % (W_P – W_L)	REMARKS
0			I / II						10 20 30	10 20 30	
	SILT: LIGHT BROWN GRADING TO DARK GREY SILT, TRACE TO SOME FINE SAND, TRACE TO SOME CLAY, WET, MOIST			SS1	4		33				WATER LEVEL DEPTH I – 0.28 II – 0.20 INTER-FRACTURE SPACING (m):
				SS2	6		43				
				SS3	22		45				
2				SS4	>50		33				
2.0	BEDROCK: LIMESTONE WITH SHALE AND SILTSTONE INTERBEDS. SEE BOREHOLE OW-1R FOR DETAIL.			RC			99	32			0.10
4				RC			100	100			0.20
				RC			100	55			0.12
5.5											
6	BOREHOLE TERMINATED AT 5.5 m										MONITOR NEST COMPLETED IN SEPARATE ADJACENT BOREHOLES
8											
10											
12											
14											
16											
18											
20											

Revision 1/ May 2000

BOREHOLE NO. OW-13

PROJECT NAME: NEW LISKEARD LANDFILL SITE
PROJECT NO.: 001148.00
CLIENT: SUTCLIFFE RODY QUESNEL INC.
DATE: SEPTEMBER 22-23, 2000
BOREHOLE TYPE: HQ / HW CORING
GEOLOGIST: BDT
GROUND ELEVATION: 272.83 mASL (I), 272.77 mASL (II)
REVIEWER:

DEPTH (m)	STRATIGRAPHIC DESCRIPTION	STRATIGRAPHY	MONITOR DETAILS I	MONITOR DETAILS II	SAMPLE TYPE	SAMPLE 'N' VALUE	SAMPLE % WATER	SAMPLE % RECOVERY	SAMPLE RQD (%)	CONE PENETRATION "N" VALUE 10 20 30 / SHEAR STRENGTH	WATER CONTENT % 10 20 30 (Wp, Wl)	REMARKS
0												WATER LEVEL DEPTH (MBGL) I – 4.15 II – 1.63 INTER-FRACTURE SPACING (m):
0.9	FILL: BROWN FINE SAND TO SANDY SILT, WITH GRAVEL				SS1	13		33				
					SS2	>50		13				
	BEDROCK: GREENISH GREY NODULAR LIMESTONE. MASSIVE BEDDED NODULES UP TO 10 CM , SEPARATED BY SHALEY STRINGERS. VERY FINE GRAINED CRYSTALLINE. MEDIUM HARD, BROKEN TO BLOCKY. WHITE CARBONATE CLASTS OR FRAGMENTS THAT ARE ROUNDED TO ELONGATED, SOME SHELL FOSSILS. SLIGHT WEATHERING FROM 0.9 M TO 6.7 M. FRESH WEATHERING FROM 7.6 M TO 10.8 M.				RC			98	47			0.10
2											II	0.13 FRACTURES BROWN STAINED
					RC			100	57			
					RC			100	85			0.22 SOME FRACTURES BROWN STAINED
4											I	
					RC			100	100			0.27 NO STAINED FRACTURES
6												
					RC			100	98			0.25 BROWN STAINED FRACTURE AT 6.8 m
8												
					RC			100	67			0.19 NO STAINED FRACTURES
10					RC			91	93			0.16 NO STAINED FRACTURES
10.8												
	BOREHOLE TERMINATED AT 10.8 m (I) AND 4.4 m (II)											MONITOR NEST COMPLETED IN SEPARATE ADJACENT BOREHOLES
12												
14												
16												
18												
20												

Revision 1/ May 2000

BOREHOLE NO. OW-14

PROJECT NAME: NEW LISKEARD LANDFILL SITE | **PROJECT NO.:** 001148.00

CLIENT: SUTCLIFFE RODY QUESNEL INC. | **DATE:** SEPTEMBER 26-27, 2000

BOREHOLE TYPE: HQ / HW CORING | **GEOLOGIST:** BDT

GROUND ELEVATION: 257.93 mASL | **REVIEWER:**

DEPTH (m)	STRATIGRAPHIC DESCRIPTION	STRATIGRAPHY	MONITOR DETAILS	SAMPLE TYPE	SAMPLE 'N' VALUE	SAMPLE % WATER	SAMPLE % RECOVERY	SAMPLE RQD (%)	CONE PENETRATION "N" VALUE / SHEAR STRENGTH	WATER CONTENT % (W_P – W_L)	REMARKS
0			I II						10 20 30	10 20 30	
	FILL: GREY SILTY FINE SAND FILL WITH BOULDERS			SS1	10		39				WATER LEVEL DEPTH (mbgl) I – 1.91 II – 1.16 INTER-FRACTURE SPACING (m):
2				SS2	6		0				
				SS3	20		0				
											DRILLER REPORTS LOSS OF CIRCULATION
				RC			0				
4				RC			0				2.9–4.0 mbgl
4.3											
	SANDY SILT TILL: GREY FINE SANDY SILT TILL, SOME GRAVEL TO FINE TO COARSE GRAVELY, OCCASIONAL COBBLE			SS4	>50		30				
5.0				RC			97	50			0.10
	BEDROCK: LIMESTONE WITH SHALE AND SILTSTONE INTERBEDS. SEE BOREHOLE OW-1R FOR DETAIL.										
6											
				RC			100	8			0.05
8											
				RC			85	85			FRACTURE ZONE 8.1–8.5 mbgl
9.5											
10	BOREHOLE TERMINATED AT 9.5 m (I) AND 5.5 m (II)										MONITOR NEST COMPLETED IN SEPARATE ADJACENT BOREHOLES
12											
14											
16											
18											
20											

Revision 1/ May 2000

BOREHOLE NO. OW-15

PROJECT NAME: NEW LISKEARD LANDFILL SITE
PROJECT NO.: 001148.02
CLIENT: TOWN OF NEW LISKEARD / SUTCLIFFE RODY QUESNEL INC.
DATE: OCTOBER 16, 2002
BOREHOLE TYPE: 108 mm I.D. HOLLOW STEM AUGER
SUPERVISOR: WDN
GROUND ELEVATION: 253.7 mASL
REVIEWER: BDT

DEPTH (m)	STRATIGRAPHIC DESCRIPTION	STRATIGRAPHY	MONITOR DETAILS	SAMPLE TYPE	SAMPLE 'N' VALUE	SAMPLE % WATER	SAMPLE % RECOVERY	SAMPLE RQD (%)	CONE PENETRATION "N" VALUE / SHEAR STRENGTH	WATER CONTENT % W_P W_L	REMARKS
0			I II						10 20 30	10 20 30	
0.15	TOPSOIL										MONITORS ARE INSTALLED WITHIN SEPARATE BOREHOLES.
	CLAYEY SILT: MOTTLED YELLOWISH-ORANGE BEIGE AND LIGHT GREY CLAYEY SILT, APL-WTPL, FIRM TO HARD, OCCASIONAL MEDIUM TO FINE GRAVEL.			1SS	5	16.5	67				
				2SS	24	14.3	42		50 FOR 76 mm		
2				3SS		14.6	36				
2.3	CLAYEY SILT TO SILTY CLAY: LIGHT GREY CALCAREOUS CLAYEY SILT TO SILTY CLAY, MOIST TO DRY, MDTPL, HARD, OCCASIONAL LIMESTONE BOULDERS, WEATHERED.			4SS		–	75		100 FOR 102 mm		
				5SS		–	25		75 FOR 102 mm		
4									100 FOR 102 mm		
				6SS		–	100		125 FOR 178 mm		
				7SS		–	89				
6									100 FOR 102 mm		
				8SS		–	100				
8									100 FOR 76 mm		
				9SS		–	100				
9.4	BOREHOLE TERMINATED AT 9.4 m IN HARD CLAYEY SILT TO SILTY CLAY.			10SS		–	100		50 FOR 76 mm		
10											
12											
14											
16											
18											
20											

BOREHOLE NO. OW-16

PROJECT NAME: NEW LISKEARD LANDFILL SITE

PROJECT NO.: 001148.02

CLIENT: TOWN OF NEW LISKEARD / SUTCLIFFE RODY QUESNEL INC.

DATE: OCTOBER 19, 2002

BOREHOLE TYPE: 108 mm I.D. HOLLOW STEM AUGER

SUPERVISOR: WDN

GROUND ELEVATION: 238.0 mASL

REVIEWER: BDT

DEPTH (m)	STRATIGRAPHIC DESCRIPTION	STRATIGRAPHY	MONITOR DETAILS I II III	SAMPLE TYPE	'N' VALUE	% WATER	% RECOVERY	RQD (%)	CONE PENETRATION "N" VALUE 10 20 30 / SHEAR STRENGTH	WATER CONTENT % 10 20 30 / W_P W_L	REMARKS
0											
0.15	TOPSOIL										MONITORS ARE INSTALLED WITHIN SEPARATE BOREHOLES.
	SILTY FINE TO MEDIUM SAND TO FINE SANDY SILT: LIGHT BROWN TO MOTTLED, SILTY FINE TO MEDIUM SAND TO FINE SANDY SILT, TRACE COBBLES, MOIST, DENSE TO VERY DENSE.			1SS	30	5.3	25				
2				2SS		5.9	61		100 FOR 127 mm		
2.3	SILT TILL: BROWNISH-GREY BECOMING DARK GREY BELOW 3.0 m, SILT TILL, TRACE TO SOME SAND, TRACE TO SOME CLAY, OCCASIONAL FINE TO MEDIUM GRAVEL AND COBBLES THROUGHOUT, APL TO DTPL, VERY STIFF TO HARD.			3SS		7.6	50		50 FOR 128 mm		– SPOON SAMPLER BOUNCING
4				4SS	39	8.4	92				
				5SS	44	9.6	100		44		
6				6SS	29	9.7	100				
				7SS	36	8.6	58				
8				8SS	141	8.4	67		141		
10				9SS	37	8.8	100				
				10SS	36	8.9	96				
12				11SS	86	8.2	71		86		
14				12SS	60	8.4	100		60		
				13SS	105	10.3	67		105		
16				14SS		8.9	100		130 FOR 230 mm		
18				15SS	177	8.2	72		177		
19.5	SILTY MEDIUM TO FINE SAND TO MEDIUM TO FINE SANDY SILT: GREY SILTY MEDIUM TO FINE SAND TO MEDIUM TO FINE SANDY SILT, SATURATED, OCCASIONAL MEDIUM TO FINE GRAVEL, DENSE TO VERY DENSE.										
20											

BOREHOLE NO. OW-16

PROJECT NAME: NEW LISKEARD LANDFILL SITE
PROJECT NO.: 001148.02
CLIENT: TOWN OF NEW LISKEARD / SUTCLIFFE RODY QUESNEL INC.
DATE: OCTOBER 19, 2002
BOREHOLE TYPE: 108 mm I.D. HOLLOW STEM AUGER
SUPERVISOR: WDN
GROUND ELEVATION: 238.0 mASL
REVIEWER: BDT

DEPTH (m)	STRATIGRAPHIC DESCRIPTION	STRATIGRAPHY	MONITOR DETAILS	SAMPLE TYPE	SAMPLE 'N' VALUE	SAMPLE % WATER	SAMPLE % RECOVERY	SAMPLE RQD (%)	CONE PENETRATION "N" VALUE / SHEAR STRENGTH	WATER CONTENT %	REMARKS
20	SILTY MEDIUM TO FINE SAND TO MEDIUM TO FINE SANDY SILT CONTINUED		I	16SS	43	10.7	100		43	Wp — Wl	
22				17SS		12.2	100		125 FOR 127 mm		
	– BOULDER AT 22.9 – 23.1 m			18SS					300 FOR 5 mm		
23.3				19RC			80	100			
24	IGNEOUS BEDROCK: BLACK WITH GREY TO WHITE SPECKLING, PHANERITIC, GRANODIORITE TO GABBRO, HARD, SLIGHTLY WEATHERED.			20SS			0	100	125 FOR 25 mm		
				21RC			100	92			
24.8											
26	BOREHOLE TERMINATED AT 24.8 m IN MAFIC IGNEOUS BEDROCK.										
28											
30											
32											
34											
36											
38											
40											

BOREHOLE NO. OW-17

PROJECT NAME: NEW LISKEARD LANDFILL SITE
PROJECT NO.: 001148.02
CLIENT: TOWN OF NEW LISKEARD / SUTCLIFFE RODY QUESNEL INC.
DATE: OCTOBER 20, 2002
BOREHOLE TYPE: 108 mm I.D. HOLLOW STEM AUGER
SUPERVISOR: WDN
GROUND ELEVATION: 229.3 mASL
REVIEWER: BDT

DEPTH (m)	STRATIGRAPHIC DESCRIPTION	STRATIGRAPHY	MONITOR DETAILS I II III	SAMPLE TYPE	'N' VALUE	% WATER	% RECOVERY	RQD (%)	CONE PENETRATION "N" VALUE 10 20 30 / SHEAR STRENGTH	WATER CONTENT % 10 20 30 / W_P W_L	REMARKS
0											
0.15	TOPSOIL										
1.5	SILTY CLAY TO CLAYEY SILT: MOTTLED GREY BROWN SILTY CLAY TO CLAYEY SILT, TRACE FINE SAND, APL TO WTPL. STIFF.			1SS	12	34.0	100				MONITORS ARE INSTALLED WITHIN SEPARATE BOREHOLES.
2				2SS	11	21.3	75				
3.0	FINE SAND, TRACE TO SOME SILT: BROWN FINE SAND, TRACE SILT, INTERBEDDED CLAYEY SILT, WET, DENSE.			3SS	39	15.4	88				
4				4SS	29	7.8	75				
	SANDY SILT TO SILT TILL: BROWN BECOMES GREY BELOW 3.4 m SANDY SILT TILL, TRACE TO SOME CLAY, TRACE MEDIUM TO FINE GRAVEL, OCCASIONAL COBBLES, APL TO DTPL, VERY STIFF TO HARD.			5SS	47	6.5	71		47		
6	– CLAYEY			6SS	21	8.4	79				
8				7SS		5.6	100		114 FOR 152 mm		
8.8											
10	SILTY FINE SAND: GREY SILTY FINE SAND, TRACE COARSE SAND, TRACE MEDIUM TO FINE GRAVEL FRAGMENTS, SATURATED, VERY DENSE.			8SS	81	13.7	100		81		
				9SS	132	14.2	100		132		1 ROCK CHIP WAS RECOVERED FROM THE SPOON SAMPLER.
12	11.9			10SS		–	2		200 FOR 0 mm		
	BOREHOLE TERMINATED ON ASSUMED MAFIC IGNEOUS BEDROCK.										
14											
16											
18											
20											

BOREHOLE NO. OW-18

PROJECT NAME: NEW LISKEARD LANDFILL SITE | PROJECT NO.: 001148.02

CLIENT: TOWN OF NEW LISKEARD / SUTCLIFFE RODY QUESNEL INC. | DATE: OCTOBER 21, 2002

BOREHOLE TYPE: 108 mm I.D. HOLLOW STEM AUGER | SUPERVISOR: WDN

GROUND ELEVATION: 278.8 mASL | REVIEWER: BDT

DEPTH (m)	STRATIGRAPHIC DESCRIPTION	STRATIGRAPHY	MONITOR DETAILS	SAMPLE TYPE	SAMPLE 'N' VALUE	SAMPLE % WATER	SAMPLE % RECOVERY	SAMPLE RQD (%)	CONE PENETRATION "N" VALUE / SHEAR STRENGTH	WATER CONTENT %	REMARKS
0			I						10 20 30	10 20 30	
0.6	COVER SOIL FILL: BLACK TO MEDIUM BROWN SILT, SOME SAND, TRACE GRAVEL. STIFF.			1SS	10	13.8	42				
1.5	CLAYEY SILT FILL: BLACK TO BROWN TO GREY CLAYEY SILT, SOME SAND, WET, VERY STIFF.			2SS	28	20.7	0				
2	REFUSE: HOUSEHOLD REFUSE CONSISTING OF PLASTIC BAGS, PAPER, WOOD DEBRIS, PIECES OF METAL AND GLASS AT DEPTH, MOIST TO DRY, STRONG ODOUR.			3SS	54	-	20.8		54 →	W_P W_L	
4											
6											
8											
10											
12											
14				4SS		-	100		50 FOR 150 mm →		
				5SS		-	100		50 FOR 100 mm →		
15.2											
16	SANDY CLAYEY SILT: LIGHT BROWN, DARK STAINED TO 15.4 m SANDY CLAYEY SILT, WET, ODOUROUS, HARD.			6SS	34	8.1	50				
16.1	BOREHOLE TERMINATED AT 16.1 m DUE TO REFUSAL ON ASSUMED LIMESTONE BEDROCK.										
18											
20											

Jacobs Hine Limited

BOREHOLE NO. OW-19

PROJECT NAME: NEW LISKEARD LANDFILL SITE | PROJECT NO.: 001148.02

CLIENT: TOWN OF NEW LISKEARD / SUTCLIFFE RODY QUESNEL INC. | DATE: OCTOBER 22, 2002

BOREHOLE TYPE: 108 mm I.D. HOLLOW STEM AUGER | SUPERVISOR: WDN

GROUND ELEVATION: 258.7 mASL | REVIEWER: BDT

DEPTH (m)	STRATIGRAPHIC DESCRIPTION	STRATIGRAPHY	MONITOR DETAILS	SAMPLE TYPE	SAMPLE 'N' VALUE	SAMPLE % WATER	SAMPLE % RECOVERY	SAMPLE RQD (%)	CONE PENETRATION "N" VALUE / SHEAR STRENGTH	WATER CONTENT % (W_P – W_L)	REMARKS
0			I II						10 20 30	10 20 30	
2	MEDIUM TO FINE SAND FILL: BROWN, ORANGY-BROWN AND BLACK MEDIUM TO FINE SAND, TRACE SILT, OCCASIONAL PIECES OF SLAG, MOIST TO DRY, LOOSE.			1SS	8	3.7	50				MONITORS ARE INSTALLED WITHIN SEPARATE BOREHOLES.
				2SS	10	5.2	42				
	– TRACE FINE GRAVEL, SOME SILT, GLASS, SLIGHTLY ODOUROUS.			3SS	17	10.8	42				
2.7				4SS	99	12.2	79		99		
	FINE SANDY SILT: LIGHT BROWN FINE SANDY SILT, MOIST, VERY DENSE, SOME ROCK FRAGMENTS.										– COBBLE AT 3.0 m
3.6				5SS		–	0		126 FOR 101 mm		
4	CLAYEY SILT TO SILT, SOME CLAY: MOTTLED GREENISH-GREY THEN MEDIUM BROWN CLAYEY SILT, GRADING TO SILT SOME CLAY WITH DEPTH, TRACE SAND, FINE GRAVEL, APL, FIRM TO STIFF.			6SS	7	23.3	83				
				7SS	18	24.0	71				
5.5											
6	SANDY SILT TILL: BROWN SANDY SILT, TRACE TO SOME CLAY TILL, OCCASIONAL MEDIUM TO FINE GRAVEL, APL, VERY STIFF.			8SS	22	12.6	83				
6.1											
	BOREHOLE TERMINATED AT 6.1 m IN SANDY SILT TILL.										
8											
10											
12											
14											
16											
18											
20											

BOREHOLE NO. OW-20

PROJECT NAME: NEW LISKEARD LANDFILL SITE

PROJECT NO.: 001148.04

CLIENT: CITY OF TEMISKAMING SHORES

DATE: NOVEMBER 11. 2004

BOREHOLE TYPE: HOLLOW STEM AUGERS 203 mm (8") O.D.

SUPERVISOR: DJW

GROUND ELEVATION: 258.52 mASL

REVIEWER: BDT

DEPTH (m)	STRATIGRAPHIC DESCRIPTION	STRATIGRAPHY	MONITOR DETAILS	SAMPLE TYPE	'N' VALUE	% WATER	% RECOVERY	RQD (%)	CONE PENETRATION "N" VALUE / SHEAR STRENGTH	WATER CONTENT %	REMARKS
0			I II						10 20 30	10 20 30	
0.2	TOPSOIL, CLAYEY SILT;										STATIC WATER LEVELS AT I = 0.82 mBGL II = 0.91 mBGL ON DECEMBER 7, 2004
	CLAYEY SILT: LIGHT BROWN TO LIGHT GREY BROWN WITH MOTTLED BROWN CLAYEY SILT, NONE TO TRACE FINE GRAVEL, NONE TO TRACE SAND, DTPL TO APL, FIRM TO STIFF.			SS1	8		79				
2				SS2	15		100				
	– GREYISH BROWN AT 3.0 m.			SS3	7		100				
				SS4	10		50				
3.7	SAND: MEDIUM BROWN FINE TO MEDIUM SAND, TRACE TO SOME SILT, TRACE FINE GRAVEL, MOIST, VERY DENSE.			SS5	50+		37		50/50 mm		
4											
4.5	SILT TILL: GREY SILT TILL, SOME FINE SAND, TRACE TO SOME CLAY, TRACE TO SOME FINE TO MEDIUM GRAVEL, MOIST, COMPACT TO VERY DENSE.			SS6	37		83				
				SS7	48		42		48		
6				SS8	25		100				
	– WET AT 7.6 m.			SS9	27		100				
8											
9.1	BOREHOLE TERMINATED AT 9.1 m AT AUGER REFUSAL (PROBABLE BEDROCK).			SS10	80+		0		80/25 mm		
10											
12											
14											
16											
18											
20											

Revision 2/ Aug 2003

RECORD OF MONITORING WELL No. OW-21 Co-Ord. 17T 0597146 E, 5262516 N

Project Number: **TY131010.6000**
Project Client: **City of Temiskaming Shores**
Project Name: **Monitoring Well Installation Project - New Liskeard Landfill Site**
Project Location: **New Liskeard, Ontario**
Drilling Location: **East of Solar Farm Gate**
Drilling Method: **200 mm Hollow Stem Augers**
Drilling Machine: **Track Mounted Drill**
Date Started: **9 Sep 14** Date Completed: **9 Sep 14**
Logged by: **JS**
Compiled by: **MAT**
Reviewed by: **TIM**
Revision No.: **0, 21/11/14**

LITHOLOGY PROFILE		SOIL SAMPLING						FIELD TESTING			COMMENTS
Lithology Plot	DESCRIPTION Local Ground Surface Elevation:	Sample Type	Sample Number	Recovery (%)	SPT 'N' Value	DEPTH (m)	ELEVATION (m)	Penetration Testing: ○ SPT ● DCPT; MTO Vane* △ Intact ▲ Remould; Nilcon Vane* ◇ Intact ◆ Remould; * Undrained Shear Strength (kPa) 20 40 60 80	★ Rinse pH Values 2 4 6 8 10 12; Soil Vapour Reading △ parts per million (ppm) 100 200 300 400; ▲ Lower Explosive Limit ✳ Passing 75 um (%) ○ Moisture Content (%) 20 40 60 80	INSTRUMENTATION INSTALLATION	1 riser pipe in bentonite 1 riser pipe in sand 1 slotted pipe in sand
	light brown CLAYEY SILT trace gravel mottled, soft										STICK-UP HEIGHT: 0.95 m
	brown 0.4 SILT trace sand, gravel and clay loose to very dense	AU				1 2 3 4					
	END OF BOREHOLE 4.2 DUE TO REFUSAL ON PROBABLE BEDROCK OR BOULDERS										

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Scale: 1 : 30

BOREHOLE NO. OW-22

PROJECT NAME: NEW LISKEARD LANDFILL SITE
PROJECT NO.: 001148.04
CLIENT: CITY OF TEMISKAMING SHORES
DATE: NOVEMBER 11. 2004
BOREHOLE TYPE: HOLLOW STEM AUGERS 203 mm (8") O.D.
SUPERVISOR: DJW
GROUND ELEVATION: 257.99 mASL
REVIEWER: BDT

DEPTH (m)	STRATIGRAPHIC DESCRIPTION	STRATIGRAPHY	MONITOR DETAILS	SAMPLE TYPE	'N' VALUE	% WATER	% RECOVERY	RQD (%)	CONE PENETRATION "N" VALUE 10 20 30 / SHEAR STRENGTH	WATER CONTENT % 10 20 30 (W_P – W_L)	REMARKS
0											
	CLAYEY SILT FILL: LIGHT GREY BROWN GRADING TO LIGHT BROWN CLAYEY SILT TO CLAY AND SILT FILL, APL, SOFT TO FIRM.			SS1	5		13				STATIC WATER LEVEL AT 1.99 m BGL ON DECEMBER 7, 2004
				SS2	5		33				
2				SS3	4		21				
2.1	CLAYEY SILT AND BUREID TOPSOIL:										
2.3	CLAYEY SILT AND BURIED TOPSOIL, APL.			SS4	18		21				
	SANDY SILT TILL: LIGHT BROWN SANDY SILT TILL, TRACE TO SOME CLAY, TRACE FINE GRAVEL, DTPL TO APL, VERY STIFF TO HARD.			SS5	50+		4		50/127 mm		
	– CLAYEY SILT ZONE AT 3.0 m			SS6	37		38				
4											
4.3	BOREHOLE TERMINATED AT 4.3 m AT AUGER REFUSAL (PROBABLE BEDROCK).			SS7	66+		4		66/102 mm		
6											
8											
10											
12											
14											
16											
18											
20											

BOREHOLE NO. OW-23

PROJECT NAME: NEW LISKEARD LANDFILL SITE
PROJECT NO.: 001148.04
CLIENT: CITY OF TEMISKAMING SHORES
DATE: NOVEMBER 12-13. 2004
BOREHOLE TYPE: HOLLOW STEM AUGERS 203 mm (8") O.D.
SUPERVISOR: DJW
GROUND ELEVATION: 202.33 mASL
REVIEWER: BDT

DEPTH (m)	STRATIGRAPHIC DESCRIPTION	STRATIGRAPHY	MONITOR DETAILS I / II	SAMPLE TYPE	'N' VALUE	% WATER	% RECOVERY	RQD (%)	CONE PENETRATION "N" VALUE / SHEAR STRENGTH	WATER CONTENT % (W_P – W_L)	REMARKS
0									10 20 30	10 20 30	STATIC WATER LEVEL AT I = 6.29 m BGL, II = DRY ON DECEMBER 7, 2004
0.6	TOPSOIL: DARK BROWN TOPSOIL WITH CLAYEY SILT AND ORGANIC SILT, BRANCHES, APL, STIFF.			SS1	10		29				
1.4	CLAYEY SILT: MEDIUM BROWN CLAYEY SILT, TRACE FINE SAND, DTPL, STIFF.			SS2	14		79				
2	SANDY SILT TILL: LIGHT TO MEDIUM BROWN SANDY TO SOME SILT TILL, TRACE CLAY TO CLAYEY, TRACE FINE GRAVEL, DTPL, VERY STIFF TO HARD.			SS3	19		25				
	– COBBLES AT 3.1 m			SS4	36		100				
4				SS5	58		38		58		
	– GREY TO DARK GREY BELOW 4.6 m.			SS6	52		50		52		
6	– COBBLES BELOW 6.1 m.			SS7	50+		4		50/25 mm		
8				SS8	79		46		56/102 mm		
9.1				SS9	63		100		63		
10	CLAYEY SILT TILL: GREY CLAYEY SILT TILL, SOME FINE SAND, TRACE FINE GRAVEL, DTPL, HARD.										
12				SS10	53		58		53		
12.2				SS11	83+		38		83/292 mm		
	SANDY SILT TO CLAYEY SILT TILL: MEDIUM GREY TO DARK GREY SANDY SILT TO CLAYEY SILT TILL, TRACE FINE TO MEDIUM GRAVEL, TRACE CLAY, DTPL TO APL, VERY STIFF TO HARD.			SS12	56		92		56		
14											
	– WET BELOW 15.2 m.			SS13	37		96				
16											
				SS14	28		79				
18				SS15	–		–				
18.1	BOREHOLE TERMINATED AT 18.1 m AT AUGER REFUSAL (PROBABLE BEDROCK).										
20											

RECORD OF MONITORING WELL No. OW-24-I Co-Ord. 17T 0597379 E, 5263237 N

Project Number: **TY131010.6000**
Project Client: **City of Temiskaming Shores**
Project Name: **Monitoring Well Installation Project - New Liskeard Landfill Site**
Project Location: **New Liskeard, Ontario**

Drilling Location: **NE Corner of Solar Farm**
Drilling Method: **200 mm Hollow Stem Augers**
Drilling Machine: **Track Mounted Drill**
Date Started: **3 Sep 14** Date Completed: **3 Sep 14**

Logged by: **JS**
Compiled by: **MAT**
Reviewed by: **TIM**
Revision No.: **0, 21/11/14**

Local Ground Surface Elevation:

LITHOLOGY PROFILE		SOIL SAMPLING						FIELD TESTING		INSTRUMENTATION INSTALLATION	COMMENTS
Lithology Plot	DESCRIPTION	Sample Type	Sample Number	Recovery (%)	SPT 'N' Value	DEPTH (m)	ELEVATION (m)	Penetration Testing: ○ SPT ● DCPT; MTO Vane* △ Intact ▲ Remould; Nilcon Vane* ◇ Intact ◆ Remould; * Undrained Shear Strength (kPa) 20 40 60 80	★ Rinse pH Values 2 4 6 8 10 12; Soil Vapour Reading △ parts per million (ppm) 100 200 300 400; ▲ Lower Explosive Limit; ✳ Passing 75 um (%); ○ Moisture Content (%) 20 40 60 80		1 riser pipe in bentonite 1 riser pipe in grout 1 riser pipe in sand 1 slotted pipe in sand
	brown SILTY SAND some organics, roots moist, compact										STICK-UP HEIGHT: 0.93 m
	light brown / grey 0.8 SILTY CLAY some sand, trace cobbles very stiff to stiff					1					
						2					
						3					
						4					
						5					
						6					

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Scale: 1 : 30

RECORD OF MONITORING WELL No. OW-24-I Co-Ord. 17T 0597379 E, 5263237 N

Project Number: **TY131010.6000** Drilling Location: **NE Corner of Solar Farm** Logged by: **JS**

LITHOLOGY PROFILE		SOIL SAMPLING						FIELD TESTING		INSTRUMENTATION INSTALLATION	COMMENTS
Lithology Plot	DESCRIPTION	Sample Type	Sample Number	Recovery (%)	SPT 'N' Value	DEPTH (m)	ELEVATION (m)	Penetration Testing: ○ SPT ● DCPT; MTO Vane* △ Intact ▲ Remould; Nilcon Vane* ◇ Intact ◆ Remould; * Undrained Shear Strength (kPa) 20 40 60 80	★ Rinse pH Values 2 4 6 8 10 12; Soil Vapour Reading △ parts per million (ppm) 100 200 300 400; ▲ Lower Explosive Limit; ✳ Passing 75 um (%); ○ Moisture Content (%) 20 40 60 80		1 riser pipe in bentonite 1 riser pipe in grout 1 riser pipe in sand 1 slotted pipe in sand
	light brown / grey SILTY CLAY some sand, trace cobbles very stiff to stiff										
	grey / brown 7.3 SANDY SILT some gravel, some to trace clay moist very dense	AU				7 8 9 10 11 12					

Continued on Next Page

RECORD OF MONITORING WELL No. OW-24-I Co-Ord. 17T 0597379 E, 5263237 N

Project Number: **TY131010.6000** Drilling Location: **NE Corner of Solar Farm** Logged by: **JS**

LITHOLOGY PROFILE		SOIL SAMPLING						FIELD TESTING		INSTRUMENTATION INSTALLATION	COMMENTS
Lithology Plot	DESCRIPTION	Sample Type	Sample Number	Recovery (%)	SPT 'N' Value	DEPTH (m)	ELEVATION (m)	Penetration Testing: ○ SPT ● DCPT; MTO Vane* △ Intact ▲ Remould; Nilcon Vane* ◇ Intact ◆ Remould; * Undrained Shear Strength (kPa) 20 40 60 80	★ Rinse pH Values 2 4 6 8 10 12; Soil Vapour Reading △ parts per million (ppm) 100 200 300 400; ▲ Lower Explosive Limit; ✳ Passing 75 um (%); ○ Moisture Content (%) 20 40 60 80		1 riser pipe in bentonite 1 riser pipe in grout 1 riser pipe in sand 1 slotted pipe in sand
	grey / brown SANDY SILT some gravel, some to trace clay moist very dense					13					
	grey 13.1 SAND trace silt and gravel moist to wet, fine to medium, very dense					14					
						15					
						16					
						17					
						18					
	END OF BOREHOLE 18.3 (no refusal)										

RECORD OF MONITORING WELL No. OW-24-II Co-Ord. 17T 0597379 E, 5263237 N

Project Number: **TY131010.6000**
Project Client: **City of Temiskaming Shores**
Project Name: **Monitoring Well Installation Project - New Liskeard Landfill Site**
Project Location: **New Liskeard, Ontario**
Drilling Location: **NE Corner of Solar Farm**
Drilling Method: **200 mm Hollow Stem Augers**
Drilling Machine: **Track Mounted Drill**
Date Started: **4 Sep 14** Date Completed: **4 Sep 14**
Logged by: **JS**
Compiled by: **MAT**
Reviewed by: **TIM**
Revision No.: **0, 21/11/14**

Local Ground Surface Elevation:

Lithology Plot	DESCRIPTION	Sample Type	Sample Number	Recovery (%)	SPT 'N' Value	DEPTH (m)	ELEVATION (m)
	brown SILTY SAND some organics, roots moist, compact						
	light brown / grey 0.8 SILTY CLAY some sand, trace cobbles very stiff to stiff	AU				1 2 3 4 5 6	

FIELD TESTING

Penetration Testing: ○ SPT ● DCPT
MTO Vane*: △ Intact ▲ Remould
Nilcon Vane*: ◇ Intact ◆ Remould
* Undrained Shear Strength (kPa): 20 40 60 80

★ Rinse pH Values: 2 4 6 8 10 12
Soil Vapour Reading: △ parts per million (ppm): 100 200 300 400
▲ Lower Explosive Limit
✳ Passing 75 um (%)
○ Moisture Content (%): 20 40 60 80

INSTRUMENTATION INSTALLATION

COMMENTS

1 riser pipe in bentonite
1 riser pipe in sand
1 slotted pipe in sand

STICK-UP HEIGHT: 0.93 m

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Scale: 1 : 30

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RECORD OF MONITORING WELL No. OW-24-II Co-Ord. 17T 0597379 E, 5263237 N

Project Number: **TY131010.6000** Drilling Location: **NE Corner of Solar Farm** Logged by: **JS**

LITHOLOGY PROFILE		SOIL SAMPLING						FIELD TESTING		INSTRUMENTATION INSTALLATION	COMMENTS
Lithology Plot	DESCRIPTION	Sample Type	Sample Number	Recovery (%)	SPT 'N' Value	DEPTH (m)	ELEVATION (m)	Penetration Testing: ○ SPT ● DCPT; MTO Vane* △ Intact ▲ Remould; Nilcon Vane* ◇ Intact ◆ Remould; * Undrained Shear Strength (kPa) 20 40 60 80	★ Rinse pH Values 2 4 6 8 10 12; Soil Vapour Reading △ parts per million (ppm) 100 200 300 400; ▲ Lower Explosive Limit; ✳ Passing 75 um (%); ○ Moisture Content (%) 20 40 60 80		1 riser pipe in bentonite 1 riser pipe in sand 1 slotted pipe in sand
	light brown / grey SILTY CLAY some sand, trace cobbles very stiff to stiff										
	grey / brown 7.3 SANDY SILT some gravel, some to trace clay moist very dense					7 8 9					
	END OF BOREHOLE 9.1 (no refusal)										

BOREHOLE NO. OW 24-I

PROJECT NAME: 2007 MONITORING WELL NEST INSTALLATION
PROJECT NO.: 4-001148.08
CLIENT: CITY OF TEMISKAMING SHORES
DATE COMPLETED: Oct 24, 2007
BOREHOLE TYPE: 110 mm HOLLOW STEM AUGER
SUPERVISOR: SLW
GROUND ELEVATION: 235.9 mASL
REVIEWER: AGH

DEPTH (m)	STRATIGRAPHIC DESCRIPTION	STRATIGRAPHY	MONITOR DETAILS	SAMPLE TYPE	N VALUE	% WATER	% RECOVERY	RQD (%)	CONE PENETRATION "N" VALUE 10 20 30 / SHEAR STRENGTH	WATER CONTENT % 10 20 30 / W_P W_L	REMARKS
0.0											UTM CO-ORDINATES UTM Zone: 17 NAD: 27 Easting: 597359 Northing: 5263019
0.1	TOPSOIL: DARK BROWN SILTY SAND, ROOTS AND ORGANIC MATERIAL, MOIST.			SS1	27	23	53				OW24-I STICKUP = 0.76 m OW24-II STICKUP = 0.81 m OW24-III STICKUP = 0.81 m
0.8	SANDY SILT: DARK GREY FINE SANDY SILT, MOIST, COMPACT.			SS2	18	23	94				
	SILTY CLAY/CLAYEY SILT: LIGHT BROWN/GREY MOTTLED SILTY CLAY/CLAYEY SILT, APL TO WPL, VERY STIFF TO STIFF.			SS3	16	36	100				
				SS4	12	38	100				
				SS5	10	38	100				
				SS6	8	48	100				
				SS7	11	36	100				OW24-III MONITOR INSTALLED AT 4.9 m
5.3	SILTY CLAY/CLAYEY SILT: MOTTLED GREY/LIGHT BROWN SILTY CLAY/CLAYEY SILT, SOME FINE TO MEDIUM SAND, TRACE COBBLES, MOIST, HARD/VERY DENSE.			SS8	64	24	42		64		
7.3	TILL: GRAY/BROWN TILL - SANDY SILT/SILTY SAND, SOME TO TRACE CLAY, SOME FINE TO MEDIUM GRAVEL, MOIST, VERY DENSE.			SS9	50	8	53				OW24-II MONITOR INSTALLED AT 8.4 m
				SS10			0				
				SS11	140	8	72		140		
				SS12	130	9	100		130		
13.1	SAND: GRAY FINE TO MEDIUM SAND, TRACE SILT, TRACE FINE TO COARSE GRAVEL, MOIST TO WET, VERY DENSE.			SS13	46	8	100		46		
				SS14	188	10	100		188		
				SS15	169	9	100		169		FLOWING SANDS
				SS16	89	16	89		89		
18.7	BOREHOLE TEMINATED AT 18.7 m DUE TO AUGER REFUSAL ON ASSUMED BEDROCK.										OW24-I MONITOR INSTALLED AT 18.7 m
20.0											

JHL GEOLOGIC B/W (METRIC) WITH UTM 4-00114808 TEMISKAMING SHORES.GPJ JAGGER HIMS BASIC.GDT 5/15/08

Jagger Hims Limited

BOREHOLE NO. OW 25-I

PROJECT NAME: 2007 MONITORING WELL NEST INSTALLATION
PROJECT NO.: 4-001148.08
CLIENT: CITY OF TEMISKAMING SHORES
DATE COMPLETED: Oct 25, 2007
BOREHOLE TYPE: 110 mm HOLLOW STEM AUGER
SUPERVISOR: SLW
GROUND ELEVATION: 239.5 mASL
REVIEWER: AGH

DEPTH (m)	STRATIGRAPHIC DESCRIPTION	STRATIGRAPHY	MONITOR DETAILS	SAMPLE TYPE	N VALUE	% WATER	% RECOVERY	ROD (%)	CONE PENETRATION "N" VALUE 10 20 30 / SHEAR STRENGTH	WATER CONTENT % 10 20 30 Wp Wl	REMARKS
0.0											UTM CO-ORDINATES UTM Zone: 17 NAD: 27 Easting: 597357 Northing: 5262765
0.0	TOPSOIL: DARK BROWN SILTY SAND, ROOTS AND ORGANIC MATERIAL, MOIST.			SS1	14	8	47				MOE WELL TAG # A059653
	SILTY SAND/SANDY SILT: LIGHT/DARK BROWN MOTTLED SILTY SAND/SANDY SILT, SOME FINE TO MEDIUM GRAVEL, SOME TO TRACE SILT, TRACE COBBLES, MOIST, COMPACT TO DENSE, TO VERY DENSE TO COMPACT.			SS2	61	8	75		61		OW25-I STICKUP = 0.81 m OW25-II STICKUP = 0.82 m OW25-III STICKUP = 0.82 m
				SS3	67	9	61		67		
2.3				SS4	38	6	81				
	TILL: GREY SILT TILL, SOME TO TRACE FINE SAND, SOME TO TRACE CLAY, OCCASIONAL FINE TO MEDIUM GRAVEL, OCCASIONAL COBBLES, MOIST, HARD.			SS5	190	6	78		190		
				SS6	192	7	72		192		OW25-III MONITOR INSTALLED AT 4.0 m
				SS7	85	9	100		85		
				SS8	90	8	89		90		
				SS9	52	8	100		52		
				SS10	67	9	67		67		OW25-II MONITOR INSTALLED AT 9.1 m
10.1	CLAYEY SILT/SILTY CLAY: DARK GREY CLAYEY SILT/SILTYCLAY, TRACE FINE SAND, TRACE FINE TO MEDIUM GRAVEL, OCCASIONAL COBBLE, MOIST, HARD TO VERY HARD.			SS11	53	9	100		53		
				SS12	56	11	100		56		
				SS13	58	10	100		58		
				SS14			100				
				SS15	111	11	72		111		
				SS16	100	10	94				
				SS17	50	12	72				

JHL GEOLOGIC B/W (METRIC) WITH UTM 4-001148-08 TEMISKAMING SHORES.GPJ JAGGER HIMS BASIC.GDT 5/15/08

BOREHOLE NO. OW 25-I

PROJECT NAME: 2007 MONITORING WELL NEST INSTALLATION
PROJECT NO.: 4-001148.08
CLIENT: CITY OF TEMISKAMING SHORES
DATE COMPLETED: Oct 25, 2007
BOREHOLE TYPE: 110 mm HOLLOW STEM AUGER
SUPERVISOR: SLW
GROUND ELEVATION: 239.5 mASL
REVIEWER: AGH

DEPTH (m)	STRATIGRAPHIC DESCRIPTION	STRATIGRAPHY	MONITOR DETAILS	SAMPLE TYPE	SAMPLE N VALUE	SAMPLE % WATER	SAMPLE % RECOVERY	SAMPLE RQD (%)	CONE PENETRATION "N" VALUE / SHEAR STRENGTH	WATER CONTENT % (Wp, WL)	UTM CO-ORDINATES / REMARKS
20.0	SILT: DARK GREY SILT, SOME FINE SAND, SOME CLAY, SOME TO TRACE FINE GRAVEL, OCCASIONAL COBBLE, MOIST, HARD.			SS18	92	11	100		92		UTM Zone: 17 NAD: 27 Easting: 597357 Northing: 5262765
21.0											
22.0											
23.0				SS19	99	14	100		99		OW25-I MONITOR INSTALLED AT 22.8 m
23.3	BOREHOLE TERMINATED AT 23.3 m DUE TO AUGER REFUSAL ON ASSUMED BEDROCK.										
24.0											
25.0											
26.0											
27.0											
28.0											
29.0											
30.0											
31.0											
32.0											
33.0											
34.0											
35.0											
36.0											
37.0											
38.0											
39.0											
40.0											

JHL GEOLOGIC B/W (METRIC) WITH UTM 4-00114808 TEMISKAMING SHORES.GPJ JAGGER HIMS BASIC.GDT 5/15/08

Jagger Hims Limited

RECORD OF MONITORING WELL No. OW26-14 Co-Ord. 0596538 E, 5262682 N

Project Number: **TY910491.4000**
Project Client: **City of Temiskaming Shores**
Project Name: **New Liskeard Landfill Hydrogeological Characterization**
Project Location: **New Liskeard, Ontario**

Drilling Location: **W (SW) of Landfill**
Drilling Method: **HQ 50 mm Casing and Coring**
Drilling Machine: **Track Mounted Drill**
Date Started: **25 Sep 14** Date Completed: **26 Sep 14**

Logged by: **MET**
Compiled by: **MAT**
Reviewed by: **TIM**
Revision No.: **0, 20/11/14**

LITHOLOGY PROFILE		SOIL SAMPLING						FIELD TESTING		INSTRUMENTATION INSTALLATION	COMMENTS
Lithology Plot	DESCRIPTION Local Ground Surface Elevation:	Sample Type	Sample Number	Recovery (%)	SPT 'N' Value	DEPTH (m)	ELEVATION (m)	Penetration Testing: ○ SPT ● DCPT; MTO Vane* △ Intact ▲ Remould; Nilcon Vane* ◇ Intact ◆ Remould; * Undrained Shear Strength (kPa) 20 40 60 80	★ Rinse pH Values 2 4 6 8 10 12; Soil Vapour Reading △ parts per million (ppm) 100 200 300 400; ▲ Lower Explosive Limit ✳ Passing 75 um (%) ○ Moisture Content (%) 20 40 60 80		1 riser pipe in bentonite 1 riser pipe in sand 1 slotted pipe in sand
	black TOPSOIL some clay wet	AU				0					
	grey 1.1 BEDROCK trace organics wet TCR = 43 % SCR = 43 % RQD = 30 %	RC	1			1					
	TCR = 98 % SCR = 79 % RQD = 88 % 2.9	RC	2			2					
	TCR = 97 % SCR = 98 % RQD = 90 % 4.4	RC	3			3					
	TCR = 97 % SCR = 80 % RQD = 74 % 5.9	RC	4			4					
	7.4	RC	5			5					
						6					
						7					
						8					

▽ Groundwater level recorded on completion at a depth of: 5.7 m.

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Scale: 1 : 40

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RECORD OF MONITORING WELL No. OW26-14 Co-Ord. 0596538 E, 5262682 N

Project Number: **TY910491.4000** Drilling Location: **W (SW) of Landfill** Logged by: **MET**

LITHOLOGY PROFILE		SOIL SAMPLING						FIELD TESTING			COMMENTS
Lithology Plot	DESCRIPTION	Sample Type	Sample Number	Recovery (%)	SPT 'N' Value	DEPTH (m)	ELEVATION (m)	Penetration Testing: ○ SPT ● DCPT; MTO Vane* △ Intact ▲ Remould; Nilcon Vane* ◇ Intact ◆ Remould; * Undrained Shear Strength (kPa) 20 40 60 80	★ Rinse pH Values 2 4 6 8 10 12; Soil Vapour Reading △ parts per million (ppm) 100 200 300 400; ▲ Lower Explosive Limit; ✳ Passing 75 um (%); ○ Moisture Content (%) 20 40 60 80	INSTRUMENTATION INSTALLATION	1 riser pipe in bentonite 1 riser pipe in sand 1 slotted pipe in sand
	grey BEDROCK										
	trace organics 8.2 wet TCR = 88 % SCR = 8 % RQD = 0 %	RC	6								
	TCR = 100 % SCR = 100 % RQD = 100 % 8.9					9					
	TCR = 92 % SCR = 85 % RQD = 63 %	RC	7								
	TCR = 76 % 9.5 SCR = 71 % RQD = 52 %	RC	8			10					
	TCR = 64 % 10.7 SCR = 62 % RQD = 43 %	RC	9			11					
	END OF COREHOLE 11.6										

RECORD OF MONITORING WELL No. OW27-14 Co-Ord. 0596975 E, 5263179 N

Project Number: **TY910491.4000**
Project Client: **City of Temiskaming Shores**
Project Name: **New Liskeard Landfill Hydrogeological Characterization**
Project Location: **New Liskeard, Ontario**

Drilling Location: **NE of Landfill - Along Fence Line**
Drilling Method: **HQ 50 mm Casing and Coring**
Drilling Machine: **Track Mounted Drill**
Date Started: **23 Sep 14** Date Completed: **25 Sep 14**

Logged by: **MET**
Compiled by: **MAT**
Reviewed by: **TIM**
Revision No.: **0, 20/11/14**

LITHOLOGY PROFILE		SOIL SAMPLING						FIELD TESTING		INSTRUMENTATION INSTALLATION	COMMENTS
Lithology Plot	DESCRIPTION Local Ground Surface Elevation:	Sample Type	Sample Number	Recovery (%)	SPT 'N' Value	DEPTH (m)	ELEVATION (m)	Penetration Testing: ○ SPT ● DCPT; MTO Vane* △ Intact ▲ Remould; Nilcon Vane* ◇ Intact ◆ Remould; * Undrained Shear Strength (kPa) 20 40 60 80	★ Rinse pH Values 2 4 6 8 10 12; Soil Vapour Reading △ parts per million (ppm) 100 200 300 400; ▲ Lower Explosive Limit ✳ Passing 75 um (%) ○ Moisture Content (%) 20 40 60 80		1 riser pipe in bentonite 1 riser pipe in sand 1 slotted pipe in sand
	black TOPSOIL some clay wet	AU				0					
	2.1 grey BEDROCK trace organics wet TCR = 87 % SCR = 72 % RQD = 65 %	RC	1			1					
	3.3 TCR = 67 % SCR = 50 % RQD = 50 %	RC	2			2					
	3.9 TCR = 100 % SCR = 97 % RQD = 92 %	RC	3			3					
	4.8 TCR = 98 % SCR = 96 % RQD = 95 %	RC	4			4					
	6.2 TCR = 97 % SCR = 90 % RQD = 85 %	RC	5			5 ▽					
	7.8					6					
						7					
						8					

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▽ Groundwater level recorded on completion at a depth of: 5.0 m.

Scale: 1 : 40

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RECORD OF MONITORING WELL No. OW27-14 Co-Ord. 0596975 E, 5263179 N

Project Number: **TY910491.4000** Drilling Location: **NE of Landfill - Along Fence Line** Logged by: **MET**

LITHOLOGY PROFILE		SOIL SAMPLING						FIELD TESTING			COMMENTS
Lithology Plot	DESCRIPTION	Sample Type	Sample Number	Recovery (%)	SPT 'N' Value	DEPTH (m)	ELEVATION (m)	Penetration Testing: ○ SPT ● DCPT; MTO Vane* △ Intact ▲ Remould; Nilcon Vane* ◇ Intact ◆ Remould; * Undrained Shear Strength (kPa) 20 40 60 80	★ Rinse pH Values 2 4 6 8 10 12; Soil Vapour Reading △ parts per million (ppm) 100 200 300 400; ▲ Lower Explosive Limit ✳ Passing 75 um (%) ○ Moisture Content (%) 20 40 60 80	INSTRUMENTATION INSTALLATION	1 riser pipe in bentonite 1 riser pipe in sand 1 slotted pipe in sand
	grey BEDROCK trace organics wet TCR = 97 % SCR = 95 % RQD = 97 %	RC	6			9					
	TCR = 80 % SCR = 78 % RQD = 58 % 9.3	RC	7			10					
	TCR = 77 % SCR = 55 % RQD = 0 % 10.8	RC	8			11					
	TCR = 98 % SCR = 82 % RQD = 28 % 12.2	RC	9			12 13					
	END OF COREHOLE DUE TO REFUSAL 13.7										

RECORD OF MONITORING WELL No. OW28-14 Co-Ord. 0596939 E, 5262986 N

Project Number: **TY910491.4000**
Project Client: **City of Temiskaming Shores**
Project Name: **New Liskeard Landfill Hydrogeological Characterization**
Project Location: **New Liskeard, Ontario**

Drilling Location:
Drilling Method: **HQ 50 mm Casing and Coring**
Drilling Machine: **Track Mounted Drill**
Date Started: **8 Sep 14** Date Completed: **8 Sep 14**

Logged by: **JS**
Compiled by: **MAT**
Reviewed by: **TIM**
Revision No.: **0, 20/11/14**

LITHOLOGY PROFILE		SOIL SAMPLING						FIELD TESTING			COMMENTS
Lithology Plot	DESCRIPTION Local Ground Surface Elevation:	Sample Type	Sample Number	Recovery (%)	SPT 'N' Value	DEPTH (m)	ELEVATION (m)	Penetration Testing: ○ SPT ● DCPT; MTO Vane* △ Intact ▲ Remould; Nilcon Vane* ◇ Intact ◆ Remould; * Undrained Shear Strength (kPa) 20 40 60 80	★ Rinse pH Values 2 4 6 8 10 12; Soil Vapour Reading △ parts per million (ppm) 100 200 300 400; ▲ Lower Explosive Limit ✳ Passing 75 um (%) ○ Moisture Content (%) 20 40 60 80	INSTRUMENTATION INSTALLATION	1 riser pipe in bentonite 1 riser pipe in sand 1 slotted pipe in sand
	50 mm ORGANICS over light brown SILTY SAND some gravel and pebbles dry, dense	SS	1	38	7			○			
		SS	2	64	17	1		○			
		SS	3	16	50+	2		○			
		SS	4	0	50+			○			
	END OF BOREHOLE 2.4 DUE TO REFUSAL ON PROBABLE BEDROCK OR BOULDERS										

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Scale: 1 : 40

RECORD OF MONITORING WELL No. OW-30-I Co-Ord. 17T 0597401 E, 5262836 N

Project Number: **TY131010.6000**
Project Client: **City of Temiskaming Shores**
Project Name: **Monitoring Well Installation Project - New Liskeard Landfill Site**
Project Location: **New Liskeard, Ontario**

Drilling Location: **East Side of Solar Farm**
Drilling Method: **200 mm Hollow Stem Augers**
Drilling Machine: **Track Mounted Drill**
Date Started: **6 Sep 14** Date Completed: **7 Sep 14**

Logged by: **JS**
Compiled by: **MAT**
Reviewed by: **TIM**
Revision No.: **0, 20/11/14**

LITHOLOGY PROFILE		SOIL SAMPLING						FIELD TESTING		INSTRUMENTATION INSTALLATION	COMMENTS
Lithology Plot	DESCRIPTION **Local Ground Surface Elevation:**	Sample Type	Sample Number	Recovery (%)	SPT 'N' Value	DEPTH (m)	ELEVATION (m)	Penetration Testing: ○ SPT ● DCPT; MTO Vane* △ Intact ▲ Remould; Nilcon Vane* ◇ Intact ◆ Remould; * Undrained Shear Strength (kPa) 20 40 60 80	★ Rinse pH Values 2 4 6 8 10 12; Soil Vapour Reading △ parts per million (ppm) 100 200 300 400; ▲ Lower Explosive Limit ✳ Passing 75 um (%) ○ Moisture Content (%) 20 40 60 80		1 riser pipe in bentonite 1 riser pipe in grout 1 riser pipe in sand 1 slotted pipe in sand
	dark grey SILTY SAND some gravel and cobbles, trace clay damp to wet, dense to very dense	AU				0 1 2 3 4 5 6					STICK-UP HEIGHT: 0.90 m

AMEC Environment & Infrastructure
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Continued on Next Page

Scale: 1 : 30

RECORD OF MONITORING WELL No. OW-30-I Co-Ord. 17T 0597401 E, 5262836 N

Project Number: **TY131010.6000** Drilling Location: **East Side of Solar Farm** Logged by: **JS**

LITHOLOGY PROFILE		SOIL SAMPLING						FIELD TESTING			INSTRUMENTATION INSTALLATION	COMMENTS
Lithology Plot	DESCRIPTION	Sample Type	Sample Number	Recovery (%)	SPT 'N' Value	DEPTH (m)	ELEVATION (m)	PenetrationTesting ○ SPT ● DCPT; MTO Vane* △ Intact ▲ Remould; Nilcon Vane* ◇ Intact ◆ Remould; * Undrained Shear Strength (kPa) 20 40 60 80	★ Rinse pH Values 2 4 6 8 10 12; Soil Vapour Reading △ parts per million (ppm) 100 200 300 400; ▲ Lower Explosive Limit ✳ Passing 75 um (%) ○ Moisture Content (%) 20 40 60 80			1 riser pipe in bentonite 1 riser pipe in grout 1 riser pipe in sand 1 slotted pipe in sand
	dark grey SILTY SAND some gravel and cobbles, trace clay damp to wet, dense to very dense					7 8 9						
		SS	1	100	15			○				
						10						
		SS	2	100	21	11		○				
						12						
		SS	3	100	30			○				

Continued on Next Page

RECORD OF MONITORING WELL No. OW-30-I Co-Ord. 17T 0597401 E, 5262836 N

Project Number: **TY131010.6000** Drilling Location: **East Side of Solar Farm** Logged by: **JS**

LITHOLOGY PROFILE		SOIL SAMPLING						FIELD TESTING		INSTRUMENTATION INSTALLATION	COMMENTS
Lithology Plot	DESCRIPTION	Sample Type	Sample Number	Recovery (%)	SPT 'N' Value	DEPTH (m)	ELEVATION (m)	Penetration Testing: ○ SPT ● DCPT; MTO Vane* △ Intact ▲ Remould; Nilcon Vane* ◇ Intact ◆ Remould; * Undrained Shear Strength (kPa) 20 40 60 80	★ Rinse pH Values 2 4 6 8 10 12; Soil Vapour Reading △ parts per million (ppm) 100 200 300 400; ▲ Lower Explosive Limit; ✳ Passing 75 um (%); ○ Moisture Content (%) 20 40 60 80		1 riser pipe in bentonite 1 riser pipe in grout 1 riser pipe in sand 1 slotted pipe in sand
	dark grey SILTY SAND some gravel and cobbles, trace clay damp to wet, dense to very dense					13					
		SS	4	38	100+	14			○		
						15					
		SS	5	100	65			○			
						16					
		SS	6	100	64	17		○			
						18					
		SS	7	100	78			○			
						19					

Continued on Next Page

RECORD OF MONITORING WELL No. OW-30-I Co-Ord. 17T 0597401 E, 5262836 N

Project Number: **TY131010.6000** Drilling Location: **East Side of Solar Farm** Logged by: **JS**

LITHOLOGY PROFILE		SOIL SAMPLING						FIELD TESTING		INSTRUMENTATION INSTALLATION	COMMENTS
Lithology Plot	DESCRIPTION	Sample Type	Sample Number	Recovery (%)	SPT 'N' Value	DEPTH (m)	ELEVATION (m)	Penetration Testing: ○ SPT ● DCPT; MTO Vane* △ Intact ▲ Remould; Nilcon Vane* ◇ Intact ◆ Remould; * Undrained Shear Strength (kPa) 20 40 60 80	★ Rinse pH Values 2 4 6 8 10 12; Soil Vapour Reading △ parts per million (ppm) 100 200 300 400; ▲ Lower Explosive Limit; ✳ Passing 75 um (%); ○ Moisture Content (%) 20 40 60 80		1 riser pipe in bentonite 1 riser pipe in grout 1 riser pipe in sand 1 slotted pipe in sand
	dark grey SILTY SAND some gravel and cobbles, trace clay damp to wet, dense to very dense										
		SS	8	100	50+	20		○			
	END OF BOREHOLE 20.3 DUE TO REFUSAL ON PROBABLE BEDROCK OR BOULDERS										

RECORD OF MONITORING WELL No. OW-30-II Co-Ord. 17T 0597401 E, 5262836 N

Project Number: **TY131010.6000**
Project Client: **City of Temiskaming Shores**
Project Name: **Monitoring Well Installation Project - New Liskeard Landfill Site**
Project Location: **New Liskeard, Ontario**

Drilling Location: **East Side of Solar Farm**
Drilling Method: **200 mm Hollow Stem Augers**
Drilling Machine: **Track Mounted Drill**
Date Started: **5 Sep 14** Date Completed: **8 Sep 14**

Logged by: **JS**
Compiled by: **MAT**
Reviewed by: **TIM**
Revision No.: **0, 20/11/14**

Local Ground Surface Elevation:

Lithology Plot	DESCRIPTION	Sample Type	Sample Number	Recovery (%)	SPT 'N' Value	DEPTH (m)	ELEVATION (m)
	light brown to dark grey SILTY SAND some gravel damp, dense	AU	1				
		SS	2	72	21	1	
		SS	3	75	18	2	
		SS	4	89	53	3	
		SS	5	79	38		
		SS	6	100	38	4	
		SS	7	100	26	5	
						6	

FIELD TESTING

Penetration Testing: ○ SPT ● DCPT
MTO Vane*: △ Intact ▲ Remould
Nilcon Vane*: ◇ Intact ◆ Remould
* Undrained Shear Strength (kPa): 20 40 60 80

★ Rinse pH Values: 2 4 6 8 10 12
Soil Vapour Reading: △ parts per million (ppm): 100 200 300 400
▲ Lower Explosive Limit
✳ Passing 75 um (%)
○ Moisture Content (%): 20 40 60 80

INSTRUMENTATION INSTALLATION

COMMENTS

1 riser pipe in bentonite
1 riser pipe in grout
1 riser pipe in sand
1 slotted pipe in sand

STICK-UP HEIGHT: 0.93 m

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Continued on Next Page

Scale: 1 : 30

RECORD OF MONITORING WELL No. OW-30-II Co-Ord. 17T 0597401 E, 5262836 N

Project Number: **TY131010.6000** Drilling Location: **East Side of Solar Farm** Logged by: **JS**

LITHOLOGY PROFILE		SOIL SAMPLING						FIELD TESTING			INSTRUMENTATION INSTALLATION	COMMENTS
Lithology Plot	DESCRIPTION	Sample Type	Sample Number	Recovery (%)	SPT 'N' Value	DEPTH (m)	ELEVATION (m)	Penetration Testing: ○ SPT ● DCPT; MTO Vane* △ Intact ▲ Remould; Nilcon Vane* ◇ Intact ◆ Remould; * Undrained Shear Strength (kPa) 20 40 60 80	★ Rinse pH Values 2 4 6 8 10 12; Soil Vapour Reading △ parts per million (ppm) 100 200 300 400; ▲ Lower Explosive Limit ✳ Passing 75 um (%) ○ Moisture Content (%) 20 40 60 80			1 riser pipe in bentonite 1 riser pipe in grout 1 riser pipe in sand 1 slotted pipe in sand
	light brown to dark grey SILTY SAND some gravel damp, dense	SS	8	100	19	7		◐				
		SS	9	87	50+			○				
	END OF BOREHOLE 7.8 (no refusal)											

APPENDIX B

AMEC FOSTER WHEELER
GROUNDWATER MONITORING
STANDARD OPERATING PROCEDURE

AMEC Standard Operating Procedure

Ground Water Monitoring and Sampling

Prepared by:

AMEC Earth & Environmental
a division of AMEC Americas Limited
160 Traders Boulevard
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Revision 1.5

July 2011

Table of Contents

Appendices

AMEC Earth & Environmental
Standard Operating Procedure

Ground Water Monitoring and Sampling

1.0 PURPOSE AND SCOPE

This Standard Operating Procedure (SOP) addresses how all ground water monitoring and/or sampling events are to be performed and documented. This SOP applies only to ground water monitors where separate, free-phase non-aqueous phase liquids (NAPLs) are not present. The step-by-step procedures described herein are sufficiently detailed to allow AMEC field personnel to properly monitor ground water monitors and collect ground water samples that are representative of formation ground water.

The objective of all AMEC field staff should be collecting data and ground water samples that are representative of existing ground water conditions at the time of monitoring/sampling. Improper handling, preservation and transport procedures may cause concentrations of compounds of interest to change prior to analysis. The importance of proper field monitoring and sampling procedures cannot be over emphasized.

Ideally to meet this objective, sampling equipment, sampling method, monitor construction, monitor operation and maintenance and sample handling procedures should not alter the chemistry of the samples so that they are representative of true formation waters.

O.Reg. 511/09 prohibits the use of ground water samples collected from test pits, boreholes, excavations, undeveloped wells, etc. A ground water sample can only be collected from either a properly constructed, developed and purged monitoring well, a FLUTe Liner or from a GeoProbe "grab" ground water sampler. Due to potential issues associated with the sediment content of samples collected using the GeoProbe sampler, this technique should only be used if authorized by the Project Manager. Note: the MOE is said to be preparing a guidance document that will document what other commercial sampling systems will be accepted in the near future.

2.0 PROCEDURES

This section details the equipment required and pre-monitoring/sampling procedures to be carried out before fieldwork occurs.

2.1 Typical Equipment and Materials List

- Camera (digital preferred).
- Location map, showing monitor locations and ID number.
- Sample containers appropriate to parameters being sampled (see Section 5.2 below).
- Plastic bags for grouping of bottle sample sets (Ziploc).
- Gastechtor ME1238 or other organic vapor analyzer (e.g. photoionization detector) depending on target parameter calibrated before use, reference gas and regulator or Tedlar bag.
- pH/specific conductance/temperature instrument(s). Note: other parameters such as dissolved oxygen (DO), turbidity and oxidation-reduction potential (ORP, redox, Eh) may also

be measured at some sites. Refer to the Work Plan or Proposal when preparing for the field program.
- Instrument calibration standards.
- Water level or interface probe (the use of an interface probe is mandatory if NAPLs are a potential issue).
- Survey equipment (if monitors not previously surveyed).
- Appropriate Health and Safety Equipment (i.e. Safety Kit, PPE and fire extinguishers).
- Appropriate Health and Safety Forms/Package (i.e. AMEC, client preferred).
- Personal documents (i.e. first aid and WHMIS certifications).
- Material Safety Data Sheets (lab preservatives, methanol, etc.)
- Weatherproof field notebook.
- Distilled water.
- Methanol.
- Bucket(s).
- Alconox or other laboratory-grade detergent.
- Bailers.
- Bailer retrieval device (in case string breaks), e.g. fishing line with treble hook.
- Waterra tubing, check valves.
- Spare J-plugs and push-on well caps
- 0.45 micron in-line filters (for field filtering of inorganic parameters).
- Permanent markers.
- Nitrile gloves.
- pH strips.
- Hammer.
- Socket Set.
- Hex Key set.
- Flat-blade Screwdrivers.
- Chisel or large blow torch/propane torch for cutting/ melting ice inside protective casing in winter. (staff should be trained in use of blow torch/propane torch prior to use)
- Hack saw or tubing shears (for cutting Waterra tubing. The saw can also be used to vent well caps).
- Retractable bladed knife.
- Measuring tape
- Pliers or vise grips (to pull stuck J-plugs)
- 10 or 12 inch nail puller and 12 inch crowbar or pry bar (lifting well lids or stuck push-on caps)
- Oil filter pliers (for removing stuck push-on caps, rotate clockwise only)
- T-handle for brass lid flushmount casings (the handle of an 18 inch pipe wrench usually fits)
- “Cross”-wrench for self-locking narrow diameter well caps
- Turkey baster or sponge (for removing accumulated water within protective casings).
- String.
- Ductile wire, wire coat hanger or ½ inch diameter coarse-threaded rod (to retrieve Waterra tubing some distance down the well)
- Spare batteries for field instruments.
- Keys for locks (ensure proper keys obtained prior to field work), bolt cutters as backup.
- Spare locks with extra keys if not the same as the locks used on-site
- Packaging materials (i.e. bubble wrap).
- Packing tapes.

- Coolers for samples (with cubed ice, not chunked ice or frozen bottles).
- Portable containers for purge water (buckets with lids, gas cans or water jugs labelled "Wastewater only")
- Previous data (if available)

2.2 Pre-Field Activities

- Obtain Provincial Ministry of Transportation or Municipality Road Occupancy Permits if activity located on a public right-of-way.

- Evaluate need for road traffic crew and prepare traffic management plan (required by Occupational Health and Safety Act – see Section 67 (4) and (5)). Some road traffic providers will set-up a traffic management plan, however it is the responsibility of the site supervisor to ensure the plan is appropriate. The plan should follow the requirements of the Ontario Traffic Control Manual, Book 7, Temporary Conditions.

- Have drums or tank available for purge water, if required (refer to project scope of work).

- Submit laboratory bottle order, including QA/QC (trip blanks/spikes, water for field blank).

- Check bottle order before going to field to ensure completeness.

- Check operation of water level meter or interface probe before departing to field.

- Calibrate the organic vapour measurement device (e.g. PID with appropriate lamp - PID preferred, Gastechtor 1238ME) to ensure it is working properly and record results in a log and/or notebook

- Ensure that a current Health and Safety Plan (HSP) with all appropriate documents exists for the site. Examples would be an AMEC Job Safety Hazard Assessment (see AMEC SOP – Field Safety Procedures and Documentation) or client-driven safety program for contractors.

2.3 Project Health and Safety Plan

Ground water investigations are to be undertaken with due regard to the health and safety of the individuals who will be undertaking the work, including subcontractors. It is the policy of AMEC that the highest priority be assigned to the health and safety of AMEC and subcontracted personnel at project sites as well as the general public. AMEC strongly believes that all accidents, injury and occupational illness are preventable. The company's overall goal is to protect both people and the environment and have zero accidents, injuries and occupational illnesses.

The project health and safety plan should have the following elements:

- Identification of hazards and risks;
- Level and type of personnel protective equipment (PPE) to be worn and, where applicable, the "trigger criteria" for their use (e.g., respirators required if PID screening of breathing air exceeds 25 ppm_v);

- Safety Method Statement/Job Safety Analysis;
- Documentation of training given to workers;
- Emergency contacts, response plan and hospital routing plan/map; and
- Signature of the Project Manager. The project manager is criminally liable so it is important that he/she sees the plan and signs off.

For assistance in the generation of a site-specific health and safety hazard plan, please see your respective unit SHE Coordinator or refer to the AMEC SOP – Field Safety Procedures and Documentation.

3.0 Ground Water Monitoring Methodology

Monitoring of ground water monitors consists of two activities: field vapour measurements and measuring depth to water and/or other liquids present, e.g. LNAPL or DNAPL.

Field vapour concentration measurements can indicate impact to ground water by volatile organic compounds (VOC). The vapour concentration measured in the field is a measure of the concentration of VOC in the air column located above the fluid within the well casing. The measurement is only semi-quantitative and does not represent the volatile organic concentration in the air above the air/ground water interface.

In geotechnical, hydrogeological and environmental subsurface investigations, it is necessary to obtain data relating to the depths of ground water below the ground surface to allow the distribution of ground water potential (head) to be plotted and flow direction inferred. Checking for ground water depths with an interface probe will also indicate the presence of other liquids i.e., LNAPL and DNAPL. The use of an interface probe at sites where NAPLs may be an issue is mandatory under O.Reg. 511/09.

3.1 Removal of Casing Lids and Well Caps

Prior to monitoring activities, the monitors need to be located and prepared. During winter periods it is common for monitors equipped with flushmount protective casings to be obscured from view by snow and/or ice cover. A bar locator can facilitate the locating of monitors. A locator with a ferrous/non-ferrous switch is preferable because of the widespread use of aluminum flushmounts. Also, alternating the switch position will allow you to tell a steel casing/brass lid flushmount from a steel installation such as valve box cover without digging. Once all monitors are located, the protective casing lids need to be removed.

It is important to take a few minutes to inspect the integrity of the concrete and protective casing (flush mount protective casing, monument protective casing) prior to exposing the monitor. Also a visual inspection of any potential surface impacts (such as flowing water from rainfall or snowmelt) must be made to ensure that the removal of the casing lid does not impact the monitor located within.

Casing lids can be of various types. The lid can be held down to the casing body using bolts (hex head or hex key heads) or it can be of the water valve box type. Another type has a twist-locking brass lid which are usually slotted in the centre and opened with a T-shaped handle. The condition of the protective casing lid must be inspected for any deficiencies and observations

should be recorded (missing water seal, bolts, well cap etc.). It is quite common that a hammer will be needed to loosen the lid to lift it off. It is important to take precautions when metal-to-metal contact is taking place, wear protective eyewear.

Once the lid is removed, inspect the inside of the casing before removing the monitor cap. If the casing is filled with water it will require bailing. The best method is to use a turkey baster. A sponge can also be used. All water must be removed to prevent it from entering the monitor. Another common occurrence is for the casing to be full of ice. A hammer and chisel can be used to chip out the ice to allow access to the monitor. Depending on the thickness and amount of ice in the casing, it may be more efficient to melt it with a propane torch or brazing torch (small propane cylinders do not work in severe cold). Operation of a large propane torch should not be attempted until training has been received. Occasionally, a flushmount well casing will be filled with a swollen bentonite seal. Excess bentonite should be removed.

When the monitor cap is exposed, it can be removed. When removing the well cap do not overlook the monitor. Air within the monitor can be under pressure and when released can cause particles to fly up out of the casing. In some cases the well cap could also fly up as it is loosened. If this condition is encountered in the field, following permission from the project manager, an operating vent should be constructed in the monitor top.

3.2 Field Vapour Measurements

Prior to its use, the organic vapour analyzer being utilized should be calibrated prior to use (office calibration) following the manufacturer's instructions for the instrument. A record should be made in the field logbook detailing the calibration process followed and results of the calibration. Note whether any changes to the unit were required.

Once the well cap has been removed, a quick visual check is made to ensure that water is not near the surface. This is done to prevent accidentally lowering the instrument probe down into water and sucking it up into the unit, which will render it inoperative.

The probe of the organic vapour analyzer being used is then inserted into the monitor pipe immediately. In this way the loss of volatiles is minimized. The probe should be inserted no less than 6 inches (15 cm) below and no more than 12 inches (30 cm) from top of pipe ("TOP"). The peak reading within 15 seconds should be recorded in the field notebook.

In the case of suspected petroleum impacts to groundwater, a combustible gas meter with a methane elimination switch (e.g., Gastechtor 1238) is the preferred instrument to measure concentrations of VOC vapours, however, some Project Managers may require the use of a PID instead. In the case of chlorinated solvents or unknown conditions, a photoionization detection (PID) device fitted with the appropriate lamp should be used.

The instrument should be checked against the reference gas, but not recalibrated, at the end of each working day. The instrument reading at the end of the day and actual gas concentration are to be recorded to permit compensation for drift, if required.

3.3 Fluid Level Measurement

Water level measurements are taken prior to purging or sampling to determine the depth to water relative to the top of the monitor casing pipe (riser). Water level measurements are then converted into ground water elevations to enable ground water flow direction and hydraulic gradient to be inferred. It is imperative that the measurements be accurate. The measurements collected are also used in the calculation of monitor purge volumes (See Section 4.2 below).

In addition to water levels, the presence of phase-separated compounds (i.e. LNAPL, DNAPL) can be detected and thickness measured using an interface probe. If the interface probe indicates LNAPL, continue lowering it down until water is indicated. For DNAPL plumes the probe should be lowered down to the bottom of the monitor to determine if any phase-separated compounds are present.

To ensure that reliable data are obtained, water levels across the monitoring network must be collected over as short a time as possible from all monitoring points. Ground water levels can be influenced by diurnal drift, tidal fluctuations, surface water controls, rainfall events and ground water pumping. With the exception of unconfined aquifers, barometric pressure can affect ground water levels and, as such, weather observations are important to note during the period of water level measurements. Field personnel should note any observations that may affect ground water levels at the time of monitoring.

Beware of water tight caps (J-plug) which provide an air tight seal on the TOP. If the ground water level is positioned within casing i.e. above the top of the screened interval, a vacuum or pressurized zone may be created which supports or depresses the water column within the monitor. This situation creates an unrepresentative (either an artificially high or low) water level. This is most common in confined aquifers and in relatively impermeable formations. It can also be found in weathered bedrock (locally confined or unconfined). If a monitor is found to be unvented, it should be vented appropriately AFTER permission is received from the project manager. The water level in an unvented monitor should be allowed to equilibrate to atmospheric pressure before water level is recorded (i.e., remove the cap from the well and measure the water level at intervals until it stabilizes without placing the cap back on the well and document in writing that this procedure was followed).

The preferred AMEC procedures for water level measurements are:

- Depth to ground water and free product thickness (at sites where it may be expected and if present) monitoring should be performed every time a ground water monitor is sampled.

- If known/suspected, work from monitors in the least impacted areas to most impacted areas.

- Ground water level measurement should occur in all monitors prior to purging/sampling activity to obtain representative static water levels and prevent changes to water level in nearby monitors by purging. The only exception is where a group of staff are sampling. Wells where water levels have been taken may be purged and sampled while water levels are taken by other staff at the remaining wells.

- If a monitor is found to be under pressure, allow it to equilibrate to atmospheric pressure before proceeding with any measurements. This could require some time in monitors completed in relatively impermeable soils. All monitors in “tight” formations should generally be vented due to the time required for the water level to stabilize. Construct a vent in the monitor AFTER agreement/permission by/from the project manager. Vents are not to be used in wells located where flooding (surface water, runoff, etc.) may occur.

- The ground water level should be measured from the top of pipe (TOP) to a common reference point as the TOP is rarely level. For consistency by AMEC field personnel, all water levels are to be measured to the highest point on the top of the well casing (TOP) unless a notch has been cut into the casing or a triangular mark has been placed on the casing to denote the measuring point. The instrument used should be an industry accepted standard water level device such as the Solinst Model 101 or Heron O1L.

- If free product is suspected to be present, an industry accepted interface probe should be used, such as the Solinst Model 122 or Heron O1L. The measurement of product thickness should be performed prior to the removal of product or monitor purging. The use of a bailer to measure the thickness of product is not a preferred practice and does not meet the requirements of O.Reg. 511/09.

- A measurement of total monitor depth should also be performed unless the data are already available. Notwithstanding, the measurement of total depth must be undertaken at nested locations to confirm that the correct well(s) is/are being sampled (i.e. the caps have not be inadvertently switched during previous monitoring/sampling). This measurement will allow for the calculation of purge volumes and over time will also indicate whether sediment build-up in the monitor is occurring.

- Perform the water level measurement twice to ensure the accuracy of the reading; it is very easy to misread the tape or transpose figures when recording the data. **Compare the measurement against previous data, if available, and repeat the measurement if the result looks out-of-place.** Specifically note in writing that you checked and verified apparently anomalous measurements (you might be within the zone of influence of a pumping well or the older number could be in error).

- When working with monitors containing liquid petroleum products, hand protection, such as nitrile gloves, should be worn. Contact between the measurement probe and the nitrile gloves should be minimized. Replace any gloves contaminated by hydrocarbons.

- After each measurement, the ground water level equipment should be cleaned before being used in another monitor. This is done to prevent cross contamination between monitoring wells. The probe should be washed in a lab-grade detergent solution (e.g. Alconox), rinsed with distilled water, then rinsed in methanol followed by a final rinse with distilled water. The portion of the measurement tape that was immersed (e.g., when measuring total depth or probing for DNAPL) must also be decontaminated between wells. It is also good practice to wash the entire length of measurement tape between field jobs.

3.4 Total Monitor Depth

Measurement of the total monitor depth is necessary for the following reasons:

- Calculation of monitor water volume for developing/purge volume calculations.
- Determination of any sediment accumulation in the screened portion of the monitor.
- Additional assurance that the correct monitor is being monitored (i.e., avoids mixing up the shallow and deep wells in a nest).

Measurements to the bottom of a monitor provide a check on the integrity of the casing and for siltation of the screened portion. Total depth measured should be checked against borehole

logs and previous monitoring events to determine if there are any significant changes. Excessive siltation of a monitor can affect its response to water level changes and water chemistry. If the length of screen is more than 50 per cent blocked/filled with sediment the monitor should be re-developed prior to sampling, either by flushing, bailing or vacuuming the sediment out.

4.0 Ground Water Monitor Purging

Purging of ground water monitors prior to collection of samples is required to remove standing/stagnant water, allowing fresh representative formation water to move into the monitor. Although water in the screened portion of the monitor is generally in a state of natural flux as ground water passes through, water above the screened section remains isolated and becomes stagnant. Stagnant water is subject to physio-chemical changes and may contain foreign materials introduced from the surface or during monitor construction (e.g. cuttings from when riser pipe cut to fit below grade). This results in non-representative water being present. To prevent the collection of a biased water sample consisting of stagnant water, specific monitor purging guidelines and techniques should be followed.

Under O.Reg. 511/09, ground water monitors must have been developed prior to purging activity and not less than 24 hours prior to undertaking water level measurements. The purpose of well development is to remove any fluids that may have been introduced during drilling (e.g., drilling mud, water added to control flowing sands, etc.) and to remove as much sediment as is practical to minimize any associated interference during analysis of ground water. Typically newly installed monitors are developed at the time of installation. For developing procedures refer to the AMEC SOP – Ground Water Monitor Installation (Section 8.0).

4.1 Purging and Sampling Devices

The device used to develop/purge and sample a monitor is dependent on the inside diameter of the monitor, depth to water, volume of water and type of compound to be sampled. Types of equipment available include hand-operated or motor driven pumps, peristaltic pumps, positive displacement pumps, submersible pumps and bailers made of various materials such as PVC, Teflon or stainless steel. In general the device used should not change the geochemical and physical parameters of the ground water or increase turbidity. The devices should be constructed of inert materials with respect to the analytes of concern.

The AMEC preferred devices are the inertial lift pump, bailer and low-flow sampler. The low-flow sampler should be used if there is any reason to believe that the well produces sediment that may affect analytical results for ‘whole bottle extraction” organics and is the preferred method when sampling for trace organics such as PAHs and PCBs.

4.1.1 Inertial Lift Pump

The inertial lift pump (e.g. WaTerra™) consists of a foot valve attached to the end of high density polyethylene (HDPE) tubing, typically 16 mm (5/8”) diameter. The foot valve is moved up and down in the water column which forces water to rise in the tubing eventually resulting in the discharge of water at the surface. The rate of pumping is simply controlled by the speed at which the foot valve is raised and lowered.

An advantage to this method is that a surge block can be attached to the foot valve. The surge block creates a strong surging action of water through the screen into the surrounding sand pack, flushing out finer particles.

For situations where a large volume of water needs to be removed to complete purging or the water level is deep/will be drawn deep, a mechanical device such as a "Waterra auto-lift" or "whacker" (motorized pump), can be attached to the tubing to move it up and down.

4.1.2 Bailer

The typical bailer consists of a polyethylene or plexiglass tube, with a PVC check ball in the lower end to allow water to enter but not exit when the bailer is retrieved. A regular or low flow sampling device is attached to the end of the bailer to allow trapped water to flow out the bottom. A typical bailer used for a 2" diameter monitor contains approximately one litre of water when full.

4.2 Monitor Water Volume Calculation

Prior to monitor development or purging, the volume of water in the monitor must be known to evaluate the number of volumes being removed. A monitor volume is defined as the volume of water contained within the monitor screen and riser. If the hydraulic conductivity of the formation is similar to or greater than that of the sand pack, the volume is calculated according to the following formula:

$$V = 3.14 \times r^2 \times (h_T - h_W) \times 1000\ L/m^3$$

Where: V = monitor volume (L)
r = radius of monitor casing (m)
h_T = total depth of monitor below TOP (m)
h_W = depth to water below TOP (m)

The following table illustrates typical monitor volumes per metre of commonly encountered monitor diameters.

Typical One Metre Casing Volumes		
Diameter (in)	Diameter (mm)	Litres/m
1.25	32	0.8
1.5	38	1.1
2	50	2.0
4	100	8.1
6	150	18.2
8	200	32.0

The Ministry of the Environment (MOE) accepts the use of monitor volumes for purging when the hydraulic conductivity of the sand pack is similar to that of the surrounding formation. However, if the hydraulic conductivity of the formation is lower than that of the sand pack (e.g., silt or clay), the water in the sand pack may exist in an environment different from that of the formation. Removing three monitor volumes may be insufficient to remove the water in the sand pack prior to sampling. As an example, a metre of 2" (51 mm) ø pipe and the surrounding sand pack in a 20 cm borehole contains 10.8 L of water assuming a sand pack porosity of 30% as opposed to 6 L in three monitor volumes. This leads to an unfortunate requirement that the lower the yield of a well, the greater the required purge volume. In practice, it may be necessary to repeatedly pump the well dry (at least three times) prior to sampling because the required volume cannot be reasonably obtained. The formula to be used in this case is:

$$V = 3.14 \times (R^2 + 0.67 \times r^2) \times (h_T - h_W) \times 1000\ L/m^3$$

Where: V = monitor volume (L)
r = radius of monitor casing (m)
R = radius of borehole (m)
h_T = total depth of monitor below TOP (m)
h_W = depth to water below TOP (m)

4.3 Ground Water Purging Methods

Purging is commonly performed using one of the following methods. O.Reg. 511/09 requires that the rationale for concluding that well purging is complete be provided. Thus, the field notes must document that parameters stabilized, three well volumes were removed, a low yield well was pumped dry several times, etc. as the rationale for ending purging.

4.3.1 Fixed Volume Purging

This method involves the removal of a specified number of monitor volumes prior to sampling. After calculation of volume, multiply by the number of volumes to be removed to get total volume to remove. The minimum number of volumes to be removed should be specified in the sampling plan, but is typically ranges from 3 to 5. However, it should be noted that purging beyond these volumes may be needed to obtain relatively sediment-free water.

4.3.2 Purging Based on Stabilization of Indicator Parameters

In some cases, monitoring of ground water parameters will be required to document stabilization before samples are collected. Parameters commonly measured are pH, temperature, specific conductivity, dissolved oxygen (DO) and oxygen reduction potential (ORP, Redox, Eh). Measurements are taken at the start of purging (i.e. after 1L) and at regular intervals thereafter (e.g. every 5L, or every 0.5 monitor volumes, depending on monitor volumes). Results of the measurements should be documented in the field notebook. Alternately, if yield is low, take them at these intervals until the well pumps dry, when it pumps dry and when you restart pumping after waiting for recovery. Also take the measurements immediately before sampling unless yield is so low that all water is needed for sample volume.

The ground water is considered to be stabilized and acceptable to sample when successive measurements meet the criteria as detailed in the table below.

Parameter	Units	Stabilization Criteria
pH		+/- 0.1
Specific Conductivity	µS/cm	+/- 3%
Temperature	^{0}C	+/- 0.1
DO	mg/L	+/- 0.3
ORP	mV	+/- 10

Stabilization is considered to be indicative that fresh formation water has entered the monitor. Use of this method is best done by pumping through a flow cell into which the monitoring probes are fixed. Use of a down hole bladder or submersible pump or peristaltic pump from the monitor into the flow cell is a preferred pumping method with this method.

A variation of this method includes removal of a fixed volume as described above while monitoring parameters. If stabilization is achieved before removal of the specified volume, purging continues until it is reached. Purging should also continue until relatively sediment-free water is produced.

4.3.3 Low-Yield Monitor Purging

In cases of slow recovering monitors, such as those completed in fine-grained or low permeability soils, the monitor should be purged to dryness and allowed to recover to 90 per cent and then purged dry again at least twice. Samples can then be taken after the monitor recharges to 90 per cent unless the sample is to be analyzed for volatile compounds in which case it should be sampled as soon as possible.

With regards to low yield wells, the MOE's "Guideline for Phase II Environmental Site Assessments in Ontario" (DRAFT)", 2006, states "Low recovery wells (e.g., clay formations) should be sampled at the end of the day, whatever portion of the static water level equilibrium has been reached. The exception to this practice is when the field technician is returning to the site the next day. In this case, sampling of the monitoring well the next morning is also acceptable (this will give the well more time to recover) even for volatile organic parameters." In the case of extremely low yield clays, it may be several days before sampling can be completed. It is recommended that volatile organics be sampled as soon as possible, even if a return trip is necessary later for other parameters. The Waterra tube, if installed, should be emptied before the volatile organics are sampled.

4.3.4 Low-Flow Purging

This method involves the sampling of water within the zone of the screened portion of the monitor without disturbing the stagnant water above. Low-flow purging and sampling techniques are used in monitors that recover very slowly, have excessive turbidity (samples for PAH and metals can be positively biased if highly turbid) even after adequate purging. This type of purging causes minimal drawdown of the water in a monitor and results in less purging before formation water is drawn in. The amount of purging is also lessened as there is less agitation and mobilization of sediments in the monitor compared to use of bailers or Waterra.

The pump, typically a stainless steel bladder pump, is lowered into the screened area of the ground water monitor to the required depth within the water column. The pump should be lowered in slowly as to not disturb any sediment present. Initial pumping rates should be at the lower range of the low-flow pump. Regular monitoring of the water level is required to confirm a drawdown of less than 0.3 metres is maintained. The flow can be adjusted to meet this criterion. As discussed in Section 4.3.2, use of relatively constant pressure low flow pumping system and flow cell is preferred for this type of purging/sampling.

In this type of sampling, documentation of stabilization of indicator parameters (section 4.3.2) is required before sampling occurs.

Peristaltic pumps may be used if depth to water is less than 6 m. Note: check with the Project Manager if samples are to be collected for volatiles. Although industry standards (e.g., the APGO's ESA guidance document) permit the use of peristaltic pumps for sampling for volatiles, there is a body of literature that suggests that this technique is not advisable. It is the Project Manager's decision as to whether or not peristaltic pumps can be used when sampling for volatiles. They can be used for VOC samples but are not a preferred method. A small submersible pump with frequency control (e.g. Grundfos Redi-Flo 2) or a valve at surface can also be used. Solinst's 12 v pumps can run at 400 – 500 mL/min for at least 4 hours without overheating.

MOE, 2006a (DRAFT) requires that if a low flow sampling technique is used, it must be used at all monitoring wells on-site. There is no such specific requirement in O.Reg. 511/09 or its supporting documents. Thus, low-flow sampling may be used in clay wells and an intertial lift pump used in wells at the same site that screened are in sand if authorized by the Project Manager.

If non-dedicated sampling equipment is used (e.g., bladder pump, mini-submersible), it must be decontaminated between locations and an equipment rinsate sample must be submitted for the analysis of all parameters for which ground water was sampled.

The APGO guidance document recommends a flow rate of 100 mL/min or less when sampling for volatiles.

4.4 Documentation

The details of the monitor purging process should be documented in the field notebook and should contain the following:

- Date and time (mandatory to include start/stop times for purging and the time of sample collection);
- Person performing the purging;
- Type of equipment used to purge the monitor;
- Type of instruments used, including documentation of calibration;
- Monitor volume calculation;
- Total volume of water purged;
- Note if monitor purged to dryness;
- Measurements taken during purging (pH, temperature, etc. if performed.);
- Appearance of the water as monitor purged (e.g. foamy, silty, coloured, turbid)
- Presence of NAPL including film or sheen; and
- Note clarity (turbidity) of water as purging completed.

In addition to the field notebook, the AMEC Ground Water Sampling Record form should be filled out. A copy of this form is attached in Appendix A.

4.6 Ground Water Monitor Purging Waste Disposal

Water generated by purging activities needs to be handled in an appropriate manner as it may be contaminated. Prior to the start of a ground water sampling program, the method of disposal needs to be determined by the Project Manager and communicated to the field personnel involved. Note: O.Reg. 511/09 requires that the Phase II ESA report documents how investigation-derived wastes were managed.

Ground water disposal methods will vary on a site-to-site basis but can consist of the following:

- Temporary storage on-site in drums or a holding tank for off-site disposal at private treatment/disposal facilities or publicly-owned treatment facilities;
- On-site treatment (e.g. carbon drum filtration);
- Discharge to sanitary sewer (if the necessary permit/surcharge agreement is in place).

The last option should only be implemented after careful review of these practices and the conditions anticipated. Under no circumstances will AMEC field staff aggravate an existing condition, spread contamination into non-impacted areas or contravene applicable regulations.

5.0 Sampling Procedures

5.1 Sample Containers and Safe Handling

Prior to a ground water sampling event, the proper sample bottles should be obtained for the specific parameters to be sampled. Enough lead time needs to be given to the lab for bottle preparation.

Table B of “Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the *Environmental Protection Act”* (the “Analytical Protocol”), Ministry of the Environment, March 9, 2004 amended as of July 1, 2011, specifies the types of containers that must be used for the different analyses. As several versions of the Analytical Protocol with the same title and date have been released, check to be sure that you have the current version. The current version does not have a PIBS document number in the lower left corner of the title page, while the other pages do, and the References section starts on page 85.

TABLE B: GROUND WATER Sample Handling and Storage Requirement

GROUND WATER Inorganic Parameters	Container[10]	Field Preservation	Storage Temperature[2]	Preserved Holding Time[3]	Unpreserved Holding Time[3]
Chloride, electrical conductivity, pH	HDPE or glass	none	5 ± 3 °C		28 days
Cyanide (CN^-)	HDPE or glass	NaOH to a pH > 12	5 ± 3 °C	14 days	must be field preserved
Hexavalent chromium	HDPE or glass	field filter followed by buffer solution to a pH 9.3–9.7[17]	5 ± 3 °C	28 days[17]	24 hours[17]
Metals (includes hydride-forming metals, calcium, magnesium, sodium)	HDPE or Teflon™[10]	field filter followed by HNO_3 to pH < 2[11]	room temperature when preserved	60 days	must be field preserved
Mercury	glass or Teflon™[10]	field filter followed by HCl to pH < 2[11]	room temperature when preserved	28 days	must be field preserved
Methyl mercury	glass or Teflon™	DO NOT FILTER HCl or H_2SO_4 to pH <2[12]	5 ± 3 °C	28 days	DO NOT FILTER must be field preserved[12]
GROUND WATER Organic Parameters[10, 13, 14]	**Container[10, 13, 14]**	**Field Preservation**	**Storage Temperature[2]**	**Preserved Holding Time[3]**	**Unpreserved Holding Time[3]**
BTEX, PHCs (F1),THMs, VOCs;	40–60 mL glass vials (minimum of 2)[14] (no headspace)	$NaHSO_4$ or HCl to a pH < 2[16]	5 ± 3 °C	14 days	7 days
1,4-Dioxane[9, 15]	when processed as a VOC sample: same as per VOCs above; when processed as an extractable: same as per ABNs below; (consult laboratory)[9, 15]		5 ± 3 °C	14 days	14 days
PHCs (F2–F4)	1L amber glass bottle, Teflon™ lined lid	$NaHSO_4$ or HCl to a pH < 2[16]	5 ± 3 °C	40 days	7 days
ABNs, CP, OCs, PAHs[19], PCBs	1L amber glass bottle, Teflon™ lined lid	none	5 ± 3 °C		14 days
Dioxins and furans	1L amber glass bottle, Teflon™ lined lid	None	5 ± 3 °C		indefinite storage time

HDPE = high density polyethylene;THM = trihalomethanes; VOC = volatile organic compounds; BTEX = benzene, toluene, ethylbenzene, xylenes; PHCs = petroleum hydrocarbons; CPs = chlorophenols; PCBs = polychlorinated biphenyls; OCs = organochlorine pesticides

[1] One soil container is generally sufficient for inorganic analysis and another for extractable organics. A separate container is required for BTEX, THM, VOC and PHC (F1) moisture analysis.

[2] Storage temperature refers to storage at the laboratory. Samples should be cooled and transported as soon as possible after collection.

[3] Holding time refers to the time delay between time of sample collection and time stabilization/analysis is initiated. For samples stabilized with methanol, the hold time for the recovered methanol extract is up to 40 days.

[4] PET can not be used for samples requiring antimony analysis.

[5] As an alternative, the USEPA has investigated hermetic sample devices that take and seal a single core sample. The sample is submitted as is to the laboratory where it is extruded into an extracting solvent. Samples must be received at the laboratory within 48 hours of sampling. (Note that replicate samples are necessary for bisulphate and methanol extraction for all samples plus laboratory duplicates and spikes.) Consult the laboratory for the number of samples required.

[6] The USEPA has approved field preservation. Pre-weighed vials containing known weights of methanol preservative (or aqueous sodium bisulphate if used for bromomethane) are sent to the field. Sample cores (approximately 5 g) are extruded directly into the vial. The vials are sealed, and submitted directly to the laboratory. In practice, this technique requires great care to prevent losses of methanol due to leaking vials or through splashing. Consult the laboratory for the number of containers required.

[7] Methanol-preserved samples may elevate the detection limit for bromomethane (VOC); a separate bisulphate-preserved sample or hermetically sealed sample may be submitted at the time of sampling if bromomethane is a chemical of concern – contact the laboratory to determine if a separate sample should be collected.

[8] For BTEX and PHC (F1) pre-charging the soil sampling container with methanol preservative is an accepted deviation from the CCME method.

[9] 1,4-Dioxane may be analyzed with the ABNs or VOCs; sample container requirements used for ABNs or VOCs are both acceptable. If 1,4-dioxane is to be analyzed with ABNs, follow the ABN sample container requirements; similarly if it is to be analyzed with VOCs, follow VOC sample container requirements. Consult the laboratory for the container type and the total number required (see also footnote #15).

[10] Samples containing visual sediment at the time of analysis should be documented and noted on the Certificate of Analysis or written report as results may be biased high due to the inclusion of sediment in the extraction.

[11] Field filter with 0.45µm immediately prior to adding preservative or filling pre-charged container.

[12] Sample directly into a HCl or H_2SO4 preserved container, or add acid to an unfiltered sample immediately after sample collection in the field.

[13] Aqueous organic samples should be protected from light. If amber bottles are not available, glass should be wrapped in foil.

[14] Separate containers are required for each organic water analysis. Consult the laboratory for required volumes. Chloride and electrical conductivity can be taken from the same container.

[15] For 1,4-dioxane in soil and sediment, no preservative is required if processed as an ABN, however. Methanol is an acceptable alternative if processed as a VOC. For 1,4-dioxane in groundwater, no preservative is required, however, $NaHSO_4$ or HCl are acceptable alternatives.

[16] Preserved to reduce biodegradation, however effervescence/degassing may occur in some ground water samples. In this case, rinse preservative out three times with sample and submit to the laboratory as unpreserved.

[17] To achieve the 28-day holding time, use the ammonium sulfate buffer solution [i.e., $(NH_4)_2SO_4/NH_4OH$] or $(NH_4)_2SO_4/NH_4OH/NaOH + NaOH$] as specified in EPA Method 218.6 (revision 3.3, 1994) or Standard Methods 3500-Cr Chromium (2009).Using only NaOH without the ammonium sulfate buffer to adjust the pH would require analysis within 24 hours of sampling.

[18] Alternatively, to achieve a longer hold time, hermetic samples may be frozen within 48 hours of sampling as per ASTM method D6418 – 09; however, storage stability must be validated by the laboratory with no more than 10% losses.

[19] For benzo(a)pyrene in ground water samples filtration prior to analysis on a duplicate sample is permitted.

AG = amber glass
CG = clear glass
TL = Teflon lined
WM = wide mouth
* = bottles must have a Teflon lined cap
** = No headspace or large air bubbles in container
*** = Samples must be field filtered
DOC must be filtered if it is collected in a separate bottle from TOC.

There are several significant differences between sampling and analytical requirements between the original O.Reg. 153/04 and O.Reg. 153/04 as amended by O.Reg. 179/11. Key changes include:

- The holdtime for Cr^{+6} is increased from 5 to 28 days and the samples are now preserved;
- PET bottles may not be used for samples to be analyzed for antimony;
- The entire bottle must be extracted for SVOCs. As a result, a second bottle should be be provided in the event that re-analysis or running a filtered sample for B(a)P is required. In addition, additional bottle(s) must be provided for the laboratory to run replicates;
- The holdtimes for extractable organics, e.g., PCBs, are now down to 14 days.
- Chomium(VI) samples must be filtered, methyl mercury samples must not be filtered; and
- It must be documented that the filters did not affect the samples (requires a manufacturer's batch assay with detection limits suitable under the Analytical Protocol or a filtered sample of reagent-grade water must be analyzed).

In addition to obtaining proper sample bottles, field technicians must familiarize themselves with the types of preservatives that may be required for certain parameters. It is common for the sample containers to come from the laboratory with preservatives in the sample containers. At a minimum field technicians should have MSDS sheets for the various chemicals and review them prior to sampling to identify proper handling procedures and the type of safety equipment and PPE required.

Another good practice is to check the pH of the ground water to be sampled prior to addition to preservative containing bottles. In this way problem waters (e.g. adding basic water to acid preservative) can be identified to ensure bottles can be filled safely. The pH can be checked quite easily through the use of pH test strips or, preferably, from pH measurement obtained during purging. The measured field pH should be documented in the field log book.

5.2 Sample Collection

After purging activities are complete and ground water stabilization and clarity are acceptable, collection of ground water samples can proceed. Typically, ground water samples are collected using the same equipment as that used to perform purging. Ground water discharged from the sampling device is allowed to spill directly into the sample container. Care should be taken to ensure no contact with the hands (gloved or not) with the water, the inside of the sample container or inside of the container lid. It is the AMEC preferred practice that all sample bottles are to be filled with **zero** headspace as a general practice other than metals bottles, which have a marked "fill line".

The preferred method is to use the Waterra inertial lift pump if there is enough water to allow its use. The pump and tubing should be dedicated to the monitor and left inside between sampling events. Dedicated or disposable bailers are acceptable if conditions are such that Waterra cannot be used.

Ground water used to fill sample containers should be taken from the mid-point of the water column in the screened length to ensure that the sample is representative of the entire screened water column. This is easier to accomplish using Waterra than a bailer and easiest with an electrical pump intake.

The following is the order that should be followed when filling sample containers, based on sensitivity of the parameter to volatilization:

- Volatile Organic Compounds (VOCs)
- PHC F1
- Semi-Volatile Organic Compounds (SVOCs including PAHs, BNAEs and chlorophenols)
- PHC F2 – F4
- Total Metals
- Dissolved Metals
- Phenols (other than chlorophenols)
- Cyanide
- Sulphate and chloride
- Nitrate and ammonia

It may be necessary to collect filtered samples first (i.e. metals other than mercury and Cr^{+6} and DOC if collected in a separate container from TOC) if well yield/volume is so low that filtration may not be possible after the other samples are collected.

When sampling for volatiles (VOCs, PHC F1 and SVOCs), aspiration of the groundwater should be kept to a minimum to prevent loss and negative bias. The Waterra should be manipulated slowly and the water transferred directly to the sample containers. It is an unacceptable practice to fill a larger container first and then fill the vials from the larger containers. Care should be taken to ensure, as much as possible, that collection of this type of sample does not occur near a internal combustion engine, running electric motor or any type of exhaust system as samples could be impacted.

Samples for VOC are contained in 40 ml glass vials filled until a meniscus is formed and topped with a teflon-lined cap. It is imperative that there is zero headspace in bottles submitted for VOC analysis to prevent the loss of volatiles from the sample. Bottles should be inverted and tapped to be checked for bubbles. Note: bottles filled with zero headspace can later be found to contain small bubbles from degassing. If this occurs, note it on the chain of custody form.

Samples for dissolved metals analysis, including Cr^{+6} but not including methyl mercury require field filtration. Field filtration can be carried out up to 24 hours after sample collection on unpreserved samples. A 0.45 µm disposable in-line filter can be attached to the end of the Waterra tubing and filters the water before it enters the container. It is possible to filter water from a bailer but it requires a hose from the end of the bailer to the top of the filter to create the necessary hydraulic head. Care must be taken to ensure that no unfiltered water enters the container as the acid preservative will dissolve any sediment in the water resulting in anomalously high metal values. If the well yield is adequate and the water is not excessively turbid, the filter should be conditioned prior to sampling by flushing it with twice its volume of

ground water. If it is not possible to collect a filtered sample, a sample can be placed into a **non**-preserved container. Such a sample must be identified on the laboratory chain of custody as requiring filtering by the lab and the lab must note on the Certificate of Analysis that they filtered the sample.

O.Reg. 179/11 requires that it must be demonstrated that the filters did not affect the samples. This requires that we obtain the manufacturer's assay(s) for the batch(es) of filters used and that the reported detection limits do not exceed the Reporting Limits specified in the Analytical Protocol or a sample of reagent-grade water must be run through a filter and submitted for analysis for QA purposes.

All samples are to be stored on ice in a cooler immediately after collection to begin the cool down process. The objective is to cool the samples to 4^0C or less.

5.3 Sample Container Labeling Requirements

All sample bottles are to have a laboratory supplied label affixed. The label should be filled out in detail with indelible ink. At a minimum, all sample labels should have the following information:

- Sample name (should be consistent [exactly] with monitor name except for blind duplicates blind or samples collected for specific purposes such as at different times during a pumping test, over sequential dates, etc.);
- Consultant name;
- Date and time of collection (important for time sensitive samples);
- AMEC job number; and
- Contaminant Level – high if known, otherwise mark as unknown.

The following figure shows examples of properly filled out labels. Note that if a duplicate sample is collected, it should be labeled as a blind duplicate, as in the example. A sample name of BH201 DUP would be incorrect because it tells the laboratory what "real" sample the results should match, defeating the purpose of the duplicate sample.

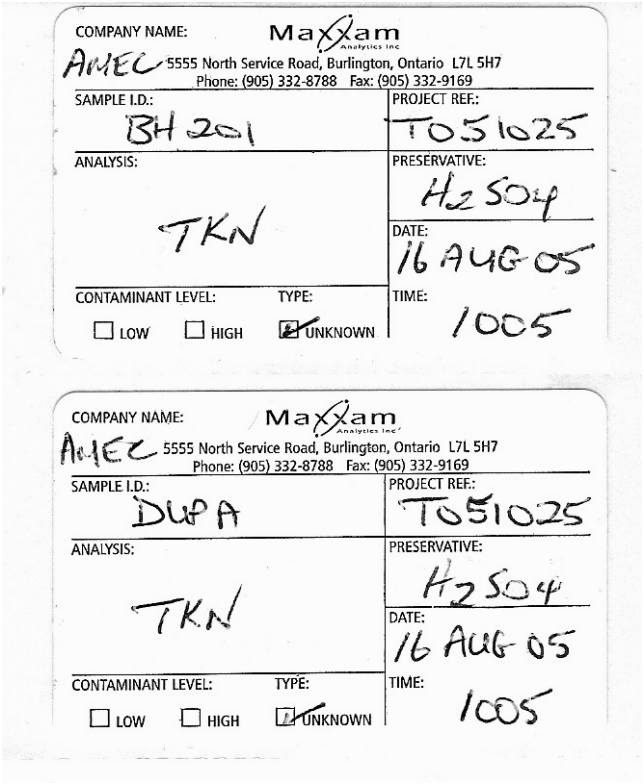
Another unacceptable practice would be the adding of a fictitious borehole number as the duplicate. For example, labeling a duplicate BH14 on a site with thirteen monitors. Years down the road someone revisiting the site might actually look for BH14 not knowing it did not exist. Alternately, BH14 might be drilled in future and appear to have a very strange first sample.

Sample identifications must be unique. As an example, there must not be two blind duplicates labeled "DUP-October31" if two people are sampling the site together on October 31. Use a system such as one person has numeric duplicates (DUPW-1, DUPW-2…) and the other has alphabetic (DUPW- A…). Do not use blind duplicate names that could assist in identifying them (e.g., use of sampler's initials in the alias, BH103 as a duplicate of BH3, etc.).

Be sure to handle blanks as required (Sections 6.1 through 6.4) when collecting samples.

In the case of VOCs, it is important to note if high concentrations are expected. Providing this information will reduce the number of dilutions required to obtain accurate results. If it cannot be determined or decided that high concentrations can be expected, mark the sample as unknown.

It should be noted that it is common practice for the lab to send bottles with labels already attached which have the analysis and preservative sections already filled out.



5.4 Sample Laboratory Submission

Samples are placed on ice (cubes, not chunks or frozen bottles) in an insulated cooler after collection and delivered to the lab promptly for analysis. Temperature of the samples should be at or near 4^0C. It is the AMEC preferred practice that samples should be delivered to the lab of choice within two business days of collection. Samples should be packed in such a manner as to prevent breakage of sample containers (e.g. use of bubble wrap). Where possible, samples should be delivered directly to the lab/lab depot by AMEC personnel.

Consider the timing of sample shipments. How much ice will be left if you ship to the lab on the Friday before a long weekend? What will happen if samples sit in the courier vehicle over the weekend in January? Remember, the holdtime for Cr^{+6} is now 28 days instead of 5.

Chain of Custody (CofC) documents are completed prior to submitting samples to the laboratory and are placed inside the cooler in a sealed plastic bag during shipment. The objective of sample custody procedures is to create a legal and accurate written record which can be used to trace the possession and handling of all samples from the moment of their collection, through analysis, until their final disposition. Field personnel collecting the samples maintain custody for samples collected during any AMEC field investigation. AMEC personnel are responsible for documenting each sample transfer and maintaining custody of all samples (including keeping

them cool) until they are delivered to the laboratory. The CofC documents the names of the relinquishing and receiving parties, and the time and date of the transfer of custody.

Special attention should be paid to the Regulatory Requirements section of the CofC. Indicating what regulatory requirements the samples are to be compared with indicates to the laboratory personnel what detection limits to set for the analysis. For certain analyses the lower the detection limit the more expensive the analysis. Regulatory criteria can also be included on the certificate of analysis for comparison with analytical results.

In the case of VOCs it is important to note if high concentrations are expected. Providing this information will reduce the number of dilutions required to obtain accurate results. If it cannot be determined in the field, mark as unknown. A travel blank (Section 6.3) must be included in each cooler containing VOC samples. The VOC vials for all samples may be shipped together to reduce the required number of blanks. All other samples from a given well should be kept together in a plastic bag in the cooler whenever practical.

An example of a properly filled out CofC is provided below:

Maxxam Analytics Inc

CHAIN OF CUSTODY RECORD

☑ 6740 Campobello Road, Mississauga, ON L5N 2L8 Phone: 905-817-5700 Fax: 905-817-5777 Toll Free: (800) 563-6266
☐ 50 Bathurst Drive, Unit 12, Waterloo, ON N2V 2C5 Phone: 519-747-2575 Fax: 519-747-3806 Toll Free: (866) 747-8749
www.maxxamanalytics.com

Form TS.1002-1

331320

INVOICE INFORMATION:	REPORT INFORMATION (if differs from invoice):		MAXXAM JOB NUMBER:
Company Name: AMEC E & E	Company Name:	PO #:	
Contact Name: Johnny Sampler	Contact Name:	Project #: T051025	
Address: 104 Crockford Blvd Scarborough ON M1R 3C3	Address:	Project Name: ABC Auto	SAMPLES ENTERED BY:
Phone / Fax #: ~~Hide~~ 751 6565 Fax: 751 7592	Phone / Fax #: Phone: Fax:	Location: Toronto	
		Quotation #:	
		Submitted By: J. Sampler	

Are these regulatory samples? Yes ☑ No ☐
If yes, which regulation applies?
☐ GUCSO ☐ MISA ☐ PWQO ☐ SDWA ☑ OTHER Reg 153/04 Table 2

WATERWORKS NAME: N/A
WATERWORKS NUMBER: N/A

Is this submission a "resampling" due to previously reported adverse conditions? Yes ☐ No ☑

** UNLESS CLEARLY IDENTIFIED ALL WATER SAMPLES RECEIVED AT MAXXAM ANALYTICS WILL BE TREATED AS NON-POTABLE AND WILL NOT BE SUBJECT TO THE REQUIREMENTS UNDER THE SDWA REGULATION. **
* IF DRINKING WATER, IDENTIFY AS "RAW", "TREATED", "DISTRIBUTION" OR "PLUMBING"

ANALYSIS REQUESTED (Indicate Preferred Method)

DUE DATE:

STANDARD: ✓
RUSH:
*Note: Rush analysis must be scheduled prior to sample submission.

	Sample Identification	Sample Type*	Date / Time Sampled	# of Cont.	Sample requires notification if adverse under the Safe Drinking Water Act	VOC	TPH (F2-F4)	F1	Health / Chemical Hazard?	COMMENTS
1	BH1	H2O	16AUG05/1000	7		X	X	X		Expect VOC high
2	BH2		16AUG05/1030	7		X	X	X		VOC unknown
3	BH5		16AUG05/1100	7		X	X	X		VOC unknown
4	BH7*		16AUG05/1130	7		X	X	X		Expect VOC high
5	DUP A		16AUG05/1100	7		X	X	X		VOC unknown
6										
7										
8										
9										* - small bubbles in VOC vials
10										developed after sampling
11										
12										

"I the undersigned, hereby acknowledge the understanding and acceptance of Maxxam's terms and conditions as listed on the back of this form."

REQUESTED BY: (Signature/Print)	RECEIVED BY: (Signature/Print)	DATE / TIME	PURPOSE OF CHANGE / REMARKS	TEMP (°C) ON RECEIPT AT MAXXAM
Johnny Sampler J Sampler				

If samples are shipped via courier it is even more important to consider the temperature of the samples. The cooler must be well sealed, filled completely with ice and sample bottles/labels should be suitably protected from damage. If necessary, split the shipment up into extra coolers

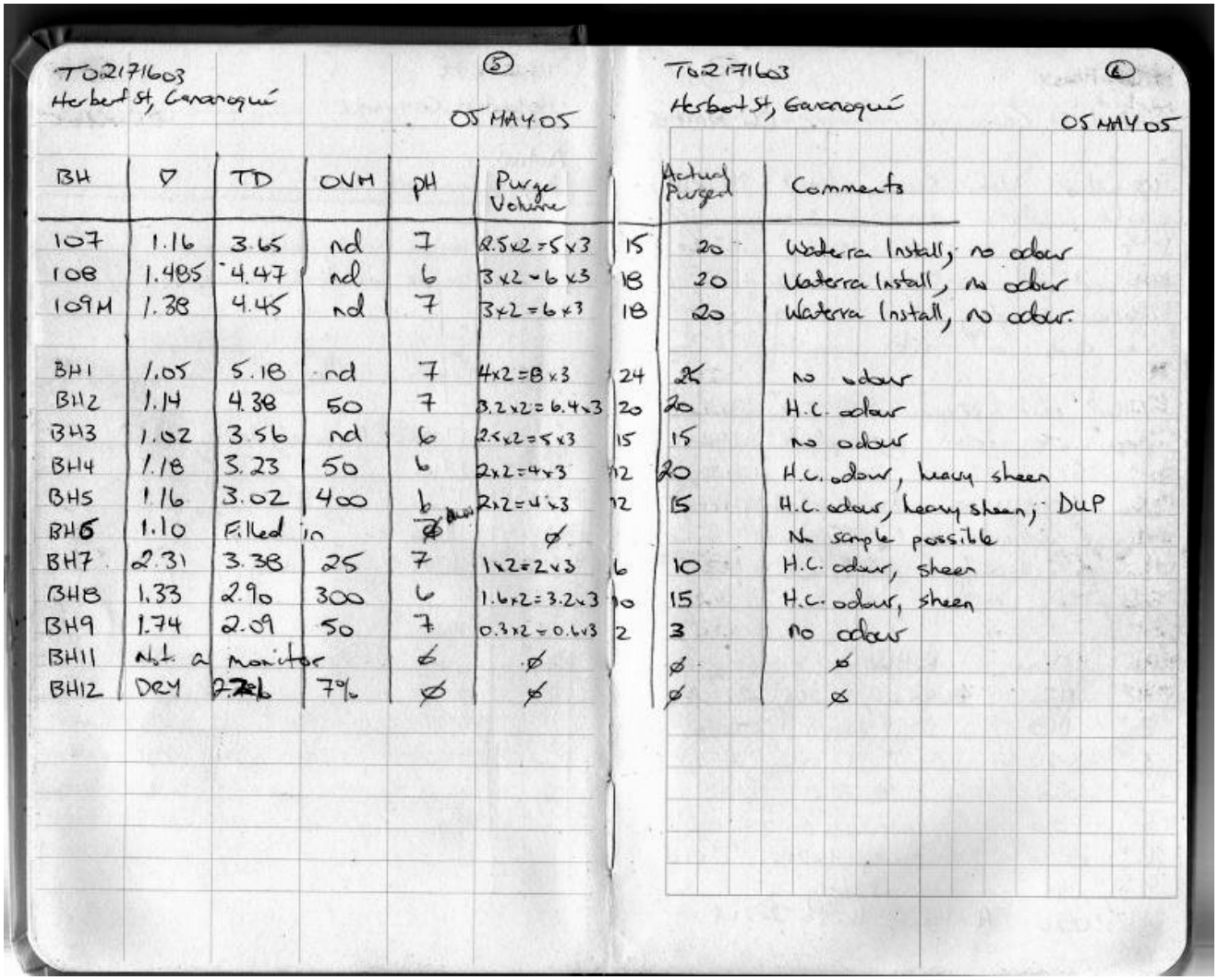
to ensure an adequate amount of ice can be added to keep proper temperature. The results may be invalid if the samples arrive at the lab with elevated temperatures. Extra costs for ice and shipping fees are better than re-sampling at our expense. When samples are shipped by a third party, notify the laboratory as to when to expect the samples and provide courier name and tracking information should the samples not arrive when expected.

5.5 Documentation

The ground water sampling event must be accurately documented in the field notebook and the following points, some of which were addressed in Section 4.4, should be documented:

- Monitor ID consistent with BH Log or name on figures;
- OVM reading (if taken);
- Depth to water;
- Depth to LNAPL/DNAPL (if present);
- Total depth of monitor (measured or from logs);
- Purge volume calculation;
- Start and end times of purging (mandatory)
- Actual volume purged (mandatory);
- Measurements taken during purging (pH, temperature, etc.; mandatory);
- Sampling equipment used (mandatory);
- Calibration record for equipment used;
- Observation of odours to water;
- Clarity of water;
- General character of water;
- Types and number of sample containers filled;
- Note if preservatives used;
- Time and date of sampling;
- Weather conditions
- pH from test strips (if taken);
- Duplicate alias (if applicable);
- Field blank prepared (if applicable);
- Extra SVOC bottle taken for lab replicate (if applicable);
- Names of samplers and what monitors they sampled;
- Note name of laboratory and CofC number;
- Method of sample delivery to lab;
- If delivered by courier: waybill number, number of coolers including colour and ID number, listing of what samples are in each if more than one in shipment; and
- Note if any problems encountered or if there were any deviations from the established sampling protocols.

Some of these data are best set up as a table in the field notebook, an example of which follows:

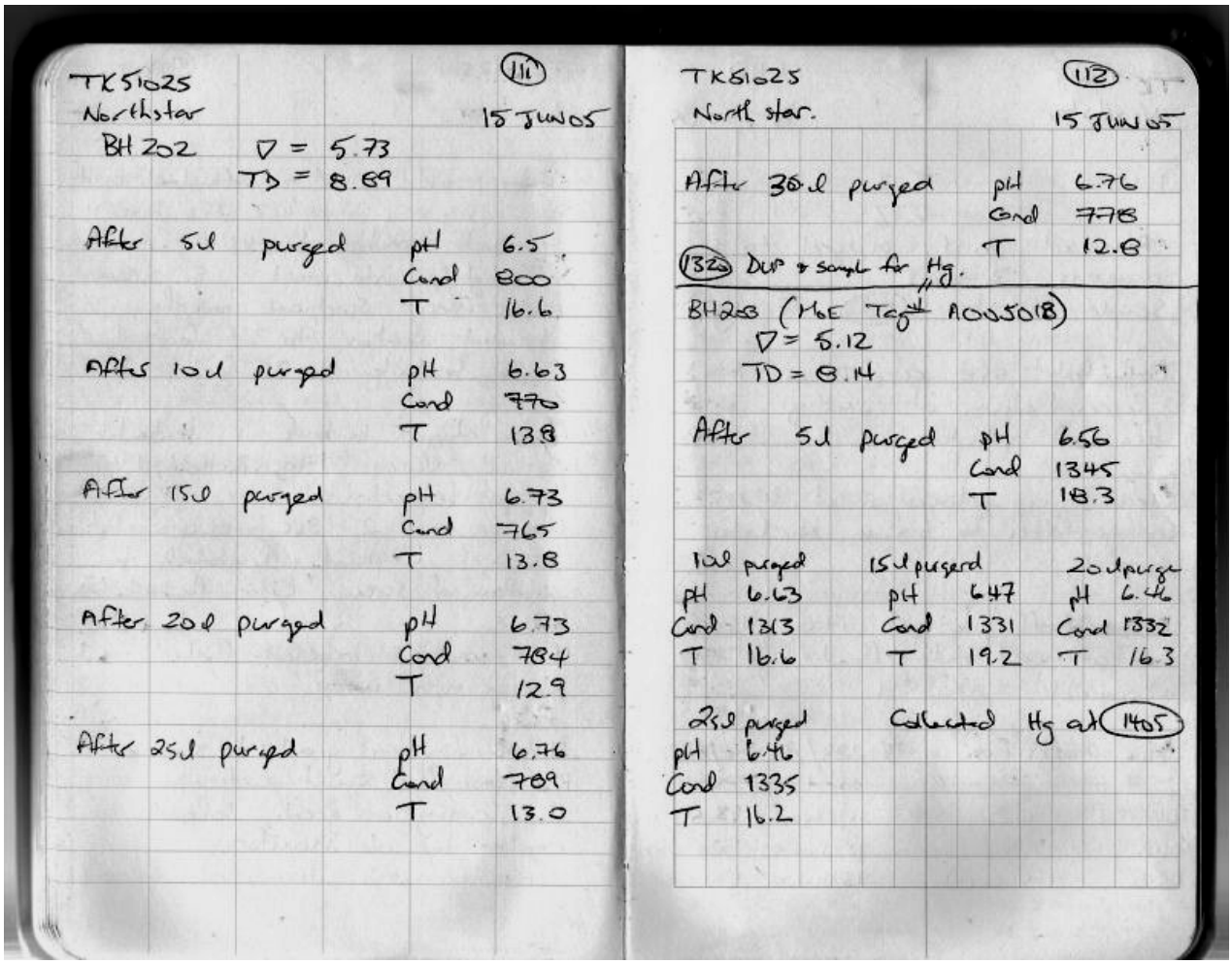


TOR171603 ⑤
Herbert St, Gananoque
05 MAY 05

BH	▽	TD	OVM	pH	Purge Volume		Actual Purged	Comments
107	1.16	3.65	nd	7	2.5x2=5x3	15	20	Waterra Install, no odour
108	1.485	4.47	nd	6	3x2=6x3	18	20	Waterra Install, no odour
109M	1.38	4.45	nd	7	3x2=6x3	18	20	Waterra Install, no odour.
BH1	1.05	5.18	nd	7	4x2=8x3	24	25	no odour
BH2	1.14	4.38	50	7	3.2x2=6.4x3	20	20	H.C. odour
BH3	1.02	3.56	nd	6	2.5x2=5x3	15	15	no odour
BH4	1.18	3.23	50	6	2x2=4x3	12	20	H.C. odour, heavy sheen
BH5	1.16	3.02	400	6	2x2=4x3	12	15	H.C. odour, heavy sheen; DUP
BH6	1.10	Filled in		~~Ø~~	Ø			No sample possible
BH7	2.31	3.38	25	7	1x2=2x3	6	10	H.C. odour, sheen
BH8	1.33	2.90	300	6	1.6x2=3.2x3	10	15	H.C. odour, sheen
BH9	1.74	2.09	50	7	0.3x2=0.6x3	2	3	no odour
BH11	Not a	Monitor		Ø	Ø		Ø	Ø
BH12	DRY	~~2.26~~	7%	Ø	Ø		Ø	Ø

TOR171603 ⑥
Herbert St, Gananoque
05 MAY 05

Example notes for when various parameters are monitored to prepare for sampling.



In addition to the data to be recorded in the field notebook, an AMEC Ground Water Sampling Record should be filled out and submitted to the Project Manager. An example of this form is provided in Appendix A attached to this SOP.

6.0 Ground Water Sampling Quality Assurance/Quality Control

AMEC's approach to Quality Assurance/Quality Control (QA/QC) for environmental assessment activities covers all aspects of the sampling program used to provide chemical data to support the assessment of environmental conditions at a site. All activities from the planning stages of a sampling event through the final submission of samples to the laboratory are part of the unified protocols including:

- Development of Data Quality Objectives (DQOs);
- Sampling procedures;
- Sample preservation;
- Sample transport; and
- Sample analysis and correct selection of Method Detection Limits (MDLs).

Errors can occur at any one of these steps. The role of a QA/QC program is to minimize these errors.

QA/QC is often a term that is misunderstood. We define QA as a management function, which includes:

- Preparation of protocols (e.g. SOP's) for field personnel to obtain appropriate and defensible results; and
- Preparation of the documentation that demonstrates that QC procedures have been followed.

Quality control consists of those activities, such as the calibration of instrumentation before measurements are made, that are carried out during a sampling event at the field level. QC activities recorded by field personnel become part of the QA documentation.

To ensure that the laboratory of choice is producing data of acceptable quality, it is AMEC's preferred practice to submit field QA/QC samples, consisting of field duplicates (blind), trip blanks, trip spikes and field blanks. Note that, whereas the original O. Reg. 153/04 required the collection of field duplicate samples for analysis for general and inorganic parameters only, O.Reg. 511/09 requires the collection of blind duplicate samples for all analyzed parameters on the basis of one duplicate for every ten samples.

O.Reg. 511/09 does not specifically require analysis of trip spikes or field blanks but allows their use as part of the QA program. Trip blanks are required as part of the Sampling and Analysis Plan but the Regulation and supporting document do not specify what parameters they are required for. It is AMEC policy that they be used when sampling for VOCs and PHC F1 and may be warranted when sampling for other parameters (SVOCs and any parameter for which airborne emissions may be an issue at the site).

Note: the Analytical Protocol describes what we would call a field blank when it discusses trip blanks.

It should be noted that some clients of AMEC have specialized requirements for QA/QC. Sampling programs for these clients should have QA/QC programs designed to meet those requirements as well as those described above.

6.1 Field Duplicates

Field duplicate samples are taken at the same time as the intended test sample in a manner that minimizes the difference between the two samples (i.e. the original and the field duplicate). Field duplicates should be collected using the split sampling technique for non-volatile parameters, as it is possible for ground water chemistry to change as water is removed from a monitor to fill bottles. This allows for the collection of a duplicate sample that has the same chemistry as the original sample. This technique is accomplished by filling up half of the original bottle and then half of the corresponding bottle for that parameter that will be the duplicate. The filling of the original bottle is then completed followed by the duplicate bottle. Sampling continues in this manner for all the parameters at a particular monitor location. Note that the same filter is used, where applicable, for both the "real" and duplicate samples.

Volatiles: the split sampling technique is **not** used for samples taken for volatile organic analysis. All the bottles for the original sample are filled, then those for the duplicate. The bottles should be capped immediately after filling to minimize the loss of volatiles.

A minimum of one field duplicate should be taken during each sampling event for every group of ten water samples being submitted to the laboratory for analysis. For example, if a sample submission consisted of 32 samples, this would require the collection of four field duplicates (i.e. 0 – 10, 11 – 20, 21 – 30 and >30). In all cases the field duplicates should be collected from samples that exhibit evidence of impact by the parameters of concern. Limited information on field duplicate reproducibility can be obtained when samples containing non-detectible levels of the parameters of concern are submitted for analysis.

Do not collect blind duplicate samples that can be easily identified at the laboratory (e.g., the only well on-site with rusty water).

Field duplicates should be labeled as indicated in Section 5.3 above. Care should be taken to ensure that the locations of blind duplicates are documented in the field notes.

6.2 Field Blank

A field blank is a sample of laboratory-provided reagent-grade water. The water is poured into a set of bottles identical to those used to sample at the ground water monitors at a site. The blank is created at the same time and in the same general area as the samples are collected by the field technician performing the sampling. The field blank is used to determine if there is presence of contamination as a result of field handling and ambient conditions (e.g., operating gas station). One field blank should be collected per sampling day or one for every 20 samples collected, whichever is more frequent. This is required for samples collected for hydrocarbon and VOC analysis

6.3 Travel (Trip) Blank

A travel, also known as trip, blank is a sample of laboratory-provided reagent-grade water prepared and filled in the bottles of interest by the laboratory. The sample is sent with the bottle shipment, taken out to the field and then shipped back with collected samples to be analyzed. The trip blank is not to be opened at any time by the field staff. Each cooler containing samples to be analyzed for volatile organic compounds should contain a trip blank. As noted previously, O.Reg. 511/09 requires the use of trip blanks as part of the Sampling and Analysis Plan but does not specify what parameters they are required for.

Note: the Analytical Protocol describes what we would call a field blank when it discusses trip blanks.

6.4 Spiked Travel Blank

A spiked travel blank is a sample of laboratory-provided reagent-grade water to which a known amount of analyte(s) of interest and appropriate preservative has been added by the laboratory. This sample makes the round trip from the lab with the bottle shipment to the field and then back to the laboratory with collected samples. The sample is not opened during this time. The spiked blank is prepared a short time before being sent out; ensuring that the hold time of the analyte(s) of interest can be met. There should be a minimum of one spiked trip blank per site, especially for VOCs.

6.5 Rinsate/Equipment Blank

A rinsate/equipment blank is a sample of analyte-free water poured over or through decontaminated field sampling equipment prior to the collection of environmental samples. This is used to assess the adequacy of the decontamination process and assesses contamination from the total sampling, sample preparation and measurement process, when decontaminated sampling equipment is used to collect samples. One rinsate/equipment blank should be collected per sampling day for each sample matrix or one for every 20 samples collected for each sample matrix, which ever is more frequent. In the case of ground water sampling, an equipment rinsate sample would be needed if a non-dedicated submersible pump was used, if inflatable packers were used, etc.

7.0 References

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ASTM D 6452-99."Standard Guide for Purging Methods for Wells Used for Ground Water Quality". Annual Book of ASTM Standards 2000, Vol. 08.09.

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CSA (2000). "Z769-00 Phase II Environmental Site Assessment". CSA International, March 2000.

D. Nicol (AMEC E&E Markham Office) personal field notes.

Ontario Ministry of the Environment (1996). "Guidance on Sampling and Analytical Methods for Use at Contaminated Sites in Ontario, Version 1.1". December 1996.

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Ontario Ministry of the Environment (09 March 2004, amended as of 01 July 2011). "Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the *Environmental Protection Act*."

Province of Ontario (2004). "Regulation 153/04 Records of Site Condition Regulation".

Province of Ontario (2009). "Regulation 511/09 made under the *Environmental Protection Act*".

Province of Ontario (2011). "Regulation 179/11 made under the *Environmental Protection Act*".

APPENDIX C

2015 LABORATORY ANALYTICAL REPORTS

AGAT Laboratories

5835 COOPERS AVENUE
MISSISSAUGA, ONTARIO
CANADA L4Z 1Y2
TEL (905)712-5100
FAX (905)712-5122
http://www.agatlabs.com

CLIENT NAME: AMEC FOSTER WHEELER ENVIRO&INFRASTR
131 FIELDING ROAD
LIVELY, ON P3Y1L7
(705) 682-2632

ATTENTION TO: Emily Lemieux

PROJECT: New Liskeard GW

AGAT WORK ORDER: 15T976680

WATER ANALYSIS REVIEWED BY: Anthony Dapaah, PhD (Chem), Inorganic Lab Manager

DATE REPORTED: Jun 02, 2015

PAGES (INCLUDING COVER): 27

VERSION*: 1

Should you require any information regarding this analysis please contact your client services representative at (905) 712-5100

*NOTES

All samples will be disposed of within 30 days following analysis. Please contact the lab if you require additional sample storage time.

AGAT Laboratories

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MISSISSAUGA, ONTARIO
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FAX (905)712-5122
http://www.agatlabs.com

Certificate of Analysis

AGAT WORK ORDER: 15T976680

PROJECT: New Liskeard GW

CLIENT NAME: AMEC FOSTER WHEELER ENVIRO&INFRASTR

ATTENTION TO: Emily Lemieux

SAMPLING SITE:

SAMPLED BY:

New Liskeard Groundwater Package

DATE RECEIVED: 2015-05-22

DATE REPORTED: 2015-06-02

		SAMPLE DESCRIPTION:		OW-1R-1		OW-1R-III		OW-10-I	OW-10-II		OW-11-II
		SAMPLE TYPE:		Water		Water		Water	Water		Water
		DATE SAMPLED:		5/21/2015		5/21/2015		5/21/2015	5/21/2015		5/21/2015
Parameter	Unit	G / S	RDL	6575491	RDL	6575659	RDL	6575782	6575789	RDL	6575807
pH	pH Units	(6.5-8.5)	NA	7.60	NA	7.81	NA	8.15	8.10	NA	8.16
Alkalinity (as CaCO3)	mg/L	(30-500)	5	951	5	764	5	253	247	5	411
Electrical Conductivity	uS/cm		2	2850	2	2210	2	741	715	2	950
Total Hardness (as CaCO3)	mg/L	(80-100)	0.5	885	0.5	683	0.5	361	363	0.5	417
Total Dissolved Solids	mg/L	500	20	**1630**	20	**1160**	20	434	426	20	**534**
Fluoride	mg/L	1.5	0.5	<0.5	0.25	<0.25	0.10	0.18	<0.10	0.25	<0.25
Chloride	mg/L	250	1.0	**274**	0.50	164	0.20	3.25	2.14	0.50	29.9
Nitrate as N	mg/L	10.0	0.5	<0.5	0.25	9.87	0.10	<0.10	<0.10	0.25	<0.25
Nitrite as N	mg/L	1.0	0.5	<0.5	0.25	<0.25	0.10	<0.10	<0.10	0.25	<0.25
Sulphate	mg/L	500	1.0	207	0.50	131	0.20	137	126	0.50	58.8
Phosphate as P	mg/L		1.0	<1.0	0.50	<0.50	0.20	<0.20	<0.20	0.50	<0.50
Ammonia as N	mg/L		0.2	12.0	0.2	11.5	0.02	<0.02	<0.02	0.02	<0.02
Total Kjeldahl Nitrogen	mg/L		0.10	14.3	0.10	13.2	0.10	<0.10	0.12	0.10	1.10
Organic Nitrogen	mg/L	0.15	0.10	**2.30**	0.10	**1.70**	0.10	<0.10	0.12	0.10	**1.10**
Dissolved Organic Carbon	mg/L	5	1.0	**23.2**	0.5	**16.2**	0.5	1.3	2.0	0.5	**7.2**
Calcium	mg/L		0.25	163	0.25	131	0.05	93.4	113	0.05	104
Magnesium	mg/L		0.25	116	0.25	86.4	0.05	31.1	19.7	0.05	38.1
Sodium	mg/L	20 (200)	0.25	187	0.25	155	0.05	4.15	2.21	0.05	34.1
Potassium	mg/L		0.25	78.9	0.25	78.1	0.05	4.01	1.04	0.05	6.11
Aluminum	mg/L	0.1	0.004	<0.004	0.004	0.014	0.004	<0.004	<0.004	0.004	<0.004
Arsenic	mg/L	0.025	0.003	<0.003	0.003	<0.003	0.003	<0.003	<0.003	0.003	<0.003
Barium	mg/L	1	0.002	0.079	0.002	0.095	0.002	0.027	0.014	0.002	0.023
Beryllium	mg/L		0.001	<0.001	0.001	<0.001	0.001	<0.001	<0.001	0.001	<0.001
Bismuth	mg/L		0.002	<0.002	0.002	<0.002	0.002	<0.002	<0.002	0.002	<0.002
Boron	mg/L	5	0.010	1.67	0.010	1.31	0.010	0.139	0.016	0.010	0.295
Cadmium	mg/L	0.005	0.002	<0.002	0.002	<0.002	0.002	<0.002	<0.002	0.002	<0.002
Chromium	mg/L	0.05	0.003	0.008	0.003	0.005	0.003	<0.003	<0.003	0.003	<0.003
Cobalt	mg/L		0.001	0.005	0.001	0.005	0.001	<0.001	<0.001	0.001	<0.001
Copper	mg/L	1	0.003	0.003	0.003	0.012	0.003	<0.003	<0.003	0.003	<0.003
Iron	mg/L	0.3	0.010	0.157	0.010	<0.010	0.010	0.129	<0.010	0.010	<0.010

Certified By:

AGAT Laboratories

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FAX (905)712-5122
http://www.agatlabs.com

Certificate of Analysis

AGAT WORK ORDER: 15T976680

PROJECT: New Liskeard GW

CLIENT NAME: AMEC FOSTER WHEELER ENVIRO&INFRASTR

ATTENTION TO: Emily Lemieux

SAMPLING SITE:

SAMPLED BY:

New Liskeard Groundwater Package

DATE RECEIVED: 2015-05-22

DATE REPORTED: 2015-06-02

		SAMPLE DESCRIPTION:		OW-1R-1		OW-1R-III		OW-10-I	OW-10-II		OW-11-II
		SAMPLE TYPE:		Water		Water		Water	Water		Water
		DATE SAMPLED:		5/21/2015		5/21/2015		5/21/2015	5/21/2015		5/21/2015
Parameter	Unit	G / S	RDL	6575491	RDL	6575659	RDL	6575782	6575789	RDL	6575807
Lead	mg/L	0.01	0.002	<0.002	0.002	<0.002	0.002	<0.002	<0.002	0.002	<0.002
Manganese	mg/L	0.05	0.002	**0.788**	0.002	**0.764**	0.002	0.024	<0.002	0.002	0.046
Molybdenum	mg/L		0.002	<0.002	0.002	<0.002	0.002	<0.002	<0.002	0.002	<0.002
Nickel	mg/L		0.003	0.043	0.003	0.033	0.003	<0.003	<0.003	0.003	0.004
Phosphorus	mg/L		0.05	<0.05	0.05	<0.05	0.05	<0.05	<0.05	0.05	<0.05
Selenium	mg/L	0.01	0.004	<0.004	0.004	<0.004	0.004	<0.004	<0.004	0.004	<0.004
Silicon	mg/L		0.05	8.14	0.05	6.43	0.05	3.24	2.13	0.05	4.42
Silver	mg/L		0.002	<0.002	0.002	<0.002	0.002	<0.002	<0.002	0.002	<0.002
Strontium	mg/L		0.005	2.25	0.005	0.802	0.005	0.878	0.138	0.005	0.192
Sulfur	mg/L		0.25	88.9	0.25	50.0	0.05	49.2	44.8	0.05	21.4
Thallium	mg/L		0.006	<0.006	0.006	<0.006	0.006	<0.006	<0.006	0.006	<0.006
Tin	mg/L		0.002	<0.002	0.002	<0.002	0.002	<0.002	<0.002	0.002	<0.002
Titanium	mg/L		0.002	0.004	0.002	0.003	0.002	0.002	0.002	0.002	<0.002
Uranium	mg/L	0.02	0.002	<0.002	0.002	<0.002	0.002	<0.002	<0.002	0.002	<0.002
Vanadium	mg/L		0.002	<0.002	0.002	<0.002	0.002	<0.002	<0.002	0.002	<0.002
Zinc	mg/L	5	0.005	0.006	0.005	0.008	0.005	0.006	<0.005	0.005	0.006

Certified By:

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Certificate of Analysis

AGAT WORK ORDER: 15T976680

PROJECT: New Liskeard GW

CLIENT NAME: AMEC FOSTER WHEELER ENVIRO&INFRASTR

ATTENTION TO: Emily Lemieux

SAMPLING SITE:

SAMPLED BY:

New Liskeard Groundwater Package

DATE RECEIVED: 2015-05-22

DATE REPORTED: 2015-06-02

		SAMPLE DESCRIPTION:		OW-12-I		OW-12-II		OW-13-I		OW-16-I
		SAMPLE TYPE:		Water		Water		Water		Water
		DATE SAMPLED:		5/21/2015		5/21/2015		5/21/2015		5/21/2015
Parameter	Unit	G / S	RDL	6575818	RDL	6575825	RDL	6575839	RDL	6575849
pH	pH Units	(6.5-8.5)	NA	8.23	NA	7.90	NA	7.99	NA	8.26
Alkalinity (as CaCO3)	mg/L	(30-500)	5	265	5	477	5	328	5	310
Electrical Conductivity	uS/cm		2	797	2	1250	2	805	2	600
Total Hardness (as CaCO3)	mg/L	(80-100)	0.5	348	0.5	466	0.5	396	0.5	81.7
Total Dissolved Solids	mg/L	500	20	462	20	**722**	20	488	20	400
Fluoride	mg/L	1.5	0.10	0.41	0.25	<0.25	0.25	<0.25	0.05	**1.65**
Chloride	mg/L	250	0.20	48.4	0.50	49.1	0.50	3.35	0.10	6.69
Nitrate as N	mg/L	10.0	0.10	<0.10	0.25	<0.25	0.25	<0.25	0.05	<0.05
Nitrite as N	mg/L	1.0	0.10	<0.10	0.25	<0.25	0.25	<0.25	0.05	<0.05
Sulphate	mg/L	500	0.20	78.5	0.50	118	0.50	96.9	0.10	3.55
Phosphate as P	mg/L		0.20	<0.20	0.50	<0.50	0.50	<0.50	0.10	<0.10
Ammonia as N	mg/L		0.02	<0.02	0.02	<0.02	0.02	<0.02	0.02	1.15
Total Kjeldahl Nitrogen	mg/L		0.10	0.30	0.10	1.29	0.10	0.39	0.10	1.86
Organic Nitrogen	mg/L	0.15	0.10	**0.30**	0.10	**1.29**	0.10	**0.39**	0.10	**0.71**
Dissolved Organic Carbon	mg/L	5	0.5	1.7	0.5	**7.9**	0.5	1.9	0.5	**8.9**
Calcium	mg/L		0.05	81.0	0.10	133	0.05	96.1	0.05	13.6
Magnesium	mg/L		0.05	35.3	0.10	32.6	0.05	38.0	0.05	11.6
Sodium	mg/L	20 (200)	0.05	17.2	0.10	73.3	0.05	2.66	0.05	108
Potassium	mg/L		0.05	8.00	0.10	2.92	0.05	5.49	0.05	4.44
Aluminum	mg/L	0.1	0.004	<0.004	0.004	<0.004	0.004	0.004	0.004	0.007
Arsenic	mg/L	0.025	0.003	<0.003	0.003	<0.003	0.003	<0.003	0.003	<0.003
Barium	mg/L	1	0.002	0.052	0.002	0.039	0.002	0.039	0.002	0.037
Beryllium	mg/L		0.001	<0.001	0.001	<0.001	0.001	<0.001	0.001	<0.001
Bismuth	mg/L		0.002	<0.002	0.002	<0.002	0.002	<0.002	0.002	<0.002
Boron	mg/L	5	0.010	0.309	0.010	0.138	0.010	0.107	0.010	0.413
Cadmium	mg/L	0.005	0.002	<0.002	0.002	<0.002	0.002	<0.002	0.002	<0.002
Chromium	mg/L	0.05	0.003	<0.003	0.003	0.004	0.003	<0.003	0.003	<0.003
Cobalt	mg/L		0.001	<0.001	0.001	<0.001	0.001	<0.001	0.001	<0.001
Copper	mg/L	1	0.003	<0.003	0.003	<0.003	0.003	<0.003	0.003	<0.003
Iron	mg/L	0.3	0.010	0.011	0.010	0.131	0.010	<0.010	0.010	0.157

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Certificate of Analysis

AGAT WORK ORDER: 15T976680

PROJECT: New Liskeard GW

CLIENT NAME: AMEC FOSTER WHEELER ENVIRO&INFRASTR

ATTENTION TO: Emily Lemieux

SAMPLING SITE:

SAMPLED BY:

New Liskeard Groundwater Package

DATE RECEIVED: 2015-05-22

DATE REPORTED: 2015-06-02

		SAMPLE DESCRIPTION:		OW-12-I		OW-12-II		OW-13-I		OW-16-I
		SAMPLE TYPE:		Water		Water		Water		Water
		DATE SAMPLED:		5/21/2015		5/21/2015		5/21/2015		5/21/2015
Parameter	Unit	G / S	RDL	6575818	RDL	6575825	RDL	6575839	RDL	6575849
Lead	mg/L	0.01	0.002	<0.002	0.002	<0.002	0.002	<0.002	0.002	<0.002
Manganese	mg/L	0.05	0.002	<0.002	0.002	0.046	0.002	<0.002	0.002	0.021
Molybdenum	mg/L		0.002	<0.002	0.002	<0.002	0.002	<0.002	0.002	0.013
Nickel	mg/L		0.003	<0.003	0.003	0.008	0.003	<0.003	0.003	<0.003
Phosphorus	mg/L		0.05	<0.05	0.05	<0.05	0.05	<0.05	0.05	<0.05
Selenium	mg/L	0.01	0.004	<0.004	0.004	<0.004	0.004	<0.004	0.004	<0.004
Silicon	mg/L		0.05	3.75	0.05	4.16	0.05	5.08	0.05	7.41
Silver	mg/L		0.002	<0.002	0.002	<0.002	0.002	<0.002	0.002	<0.002
Strontium	mg/L		0.005	1.71	0.005	0.468	0.005	0.574	0.005	0.491
Sulfur	mg/L		0.05	28.6	0.10	41.5	0.05	34.7	0.05	1.80
Thallium	mg/L		0.006	<0.006	0.006	<0.006	0.006	<0.006	0.006	<0.006
Tin	mg/L		0.002	<0.002	0.002	<0.002	0.002	<0.002	0.002	<0.002
Titanium	mg/L		0.002	<0.002	0.002	0.002	0.002	<0.002	0.002	<0.002
Uranium	mg/L	0.02	0.002	<0.002	0.002	<0.002	0.002	<0.002	0.002	<0.002
Vanadium	mg/L		0.002	<0.002	0.002	<0.002	0.002	<0.002	0.002	<0.002
Zinc	mg/L	5	0.005	0.005	0.005	<0.005	0.005	0.007	0.005	<0.005

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AGAT WORK ORDER: 15T976680

PROJECT: New Liskeard GW

CLIENT NAME: AMEC FOSTER WHEELER ENVIRO&INFRASTR

ATTENTION TO: Emily Lemieux

SAMPLING SITE:

SAMPLED BY:

New Liskeard Groundwater Package

DATE RECEIVED: 2015-05-22

DATE REPORTED: 2015-06-02

		SAMPLE DESCRIPTION:		OW-16-11		OW-16-III		OW-17-I		OW-17-II
		SAMPLE TYPE:		Water		Water		Water		Water
		DATE SAMPLED:		5/21/2015		5/21/2015		5/21/2015		5/21/2015
Parameter	Unit	G / S	RDL	6575865	RDL	6575880	RDL	6575892	RDL	6576268
pH	pH Units	(6.5-8.5)	NA	8.30	NA	7.99	NA	8.27	NA	8.37
Alkalinity (as CaCO3)	mg/L	(30-500)	5	167	5	423	5	219	5	274
Electrical Conductivity	uS/cm		2	576	2	804	2	454	2	673
Total Hardness (as CaCO3)	mg/L	(80-100)	0.5	129	0.5	364	0.5	227	0.5	226
Total Dissolved Solids	mg/L	500	20	308	20	408	20	250	20	348
Fluoride	mg/L	1.5	0.05	0.86	0.10	0.34	0.10	0.35	0.10	1.22
Chloride	mg/L	250	0.10	4.74	0.20	3.35	0.20	0.85	0.20	2.44
Nitrate as N	mg/L	10.0	0.05	0.06	0.10	<0.10	0.10	<0.10	0.10	<0.10
Nitrite as N	mg/L	1.0	0.05	<0.05	0.10	<0.10	0.10	<0.10	0.10	<0.10
Sulphate	mg/L	500	0.50	108	0.20	7.59	0.20	14.8	0.20	68.8
Phosphate as P	mg/L		0.10	<0.10	0.20	<0.20	0.20	<0.20	0.20	<0.20
Ammonia as N	mg/L		0.02	<0.02	0.04	0.41	0.02	<0.02	0.02	<0.02
Total Kjeldahl Nitrogen	mg/L		0.10	0.23	0.10	0.64	0.10	<0.10	0.10	<0.10
Organic Nitrogen	mg/L	0.15	0.10	**0.23**	0.10	**0.23**	0.10	<0.10	0.10	<0.10
Dissolved Organic Carbon	mg/L	5	0.5	1.4	0.5	1.6	1.0	2.3	0.5	1.5
Calcium	mg/L		0.05	24.8	0.05	87.7	0.05	61.1	0.05	38.4
Magnesium	mg/L		0.05	16.2	0.05	35.3	0.05	18.1	0.05	31.7
Sodium	mg/L	20 (200)	0.05	69.7	0.05	10.7	0.05	4.49	0.05	55.3
Potassium	mg/L		0.05	7.58	0.05	7.43	0.05	3.06	0.05	4.78
Aluminum	mg/L	0.1	0.004	0.008	0.004	<0.004	0.004	<0.004	0.004	0.004
Arsenic	mg/L	0.025	0.003	<0.003	0.003	<0.003	0.003	<0.003	0.003	<0.003
Barium	mg/L	1	0.002	0.026	0.002	0.063	0.002	0.028	0.002	0.045
Beryllium	mg/L		0.001	<0.001	0.001	<0.001	0.001	<0.001	0.001	<0.001
Bismuth	mg/L		0.002	<0.002	0.002	<0.002	0.002	<0.002	0.002	<0.002
Boron	mg/L	5	0.010	0.163	0.010	0.015	0.010	0.029	0.010	0.128
Cadmium	mg/L	0.005	0.002	<0.002	0.002	<0.002	0.002	<0.002	0.002	<0.002
Chromium	mg/L	0.05	0.003	<0.003	0.003	<0.003	0.003	<0.003	0.003	<0.003
Cobalt	mg/L		0.001	<0.001	0.001	<0.001	0.001	<0.001	0.001	<0.001
Copper	mg/L	1	0.003	<0.003	0.003	<0.003	0.003	<0.003	0.003	<0.003
Iron	mg/L	0.3	0.010	<0.010	0.010	**0.684**	0.010	**0.453**	0.010	<0.010

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Certificate of Analysis

AGAT WORK ORDER: 15T976680

PROJECT: New Liskeard GW

CLIENT NAME: AMEC FOSTER WHEELER ENVIRO&INFRASTR

ATTENTION TO: Emily Lemieux

SAMPLING SITE:

SAMPLED BY:

New Liskeard Groundwater Package

DATE RECEIVED: 2015-05-22

DATE REPORTED: 2015-06-02

		SAMPLE DESCRIPTION:		OW-16-11		OW-16-III		OW-17-I		OW-17-II
		SAMPLE TYPE:		Water		Water		Water		Water
		DATE SAMPLED:		5/21/2015		5/21/2015		5/21/2015		5/21/2015
Parameter	Unit	G / S	RDL	6575865	RDL	6575880	RDL	6575892	RDL	6576268
Lead	mg/L	0.01	0.002	<0.002	0.002	<0.002	0.002	<0.002	0.002	<0.002
Manganese	mg/L	0.05	0.002	<0.002	0.002	0.049	0.002	0.024	0.002	<0.002
Molybdenum	mg/L		0.002	0.028	0.002	<0.002	0.002	<0.002	0.002	0.014
Nickel	mg/L		0.003	<0.003	0.003	<0.003	0.003	<0.003	0.003	<0.003
Phosphorus	mg/L		0.05	<0.05	0.05	0.12	0.05	<0.05	0.05	<0.05
Selenium	mg/L	0.01	0.004	<0.004	0.004	**0.065**	0.004	<0.004	0.004	<0.004
Silicon	mg/L		0.05	3.04	0.05	6.01	0.05	8.04	0.05	4.02
Silver	mg/L		0.002	<0.002	0.002	<0.002	0.002	<0.002	0.002	<0.002
Strontium	mg/L		0.005	0.495	0.005	0.591	0.005	0.404	0.005	2.80
Sulfur	mg/L		0.05	40.0	0.05	9.93	0.05	5.86	0.05	25.5
Thallium	mg/L		0.006	<0.006	0.006	<0.006	0.006	<0.006	0.006	<0.006
Tin	mg/L		0.002	<0.002	0.002	<0.002	0.002	<0.002	0.002	<0.002
Titanium	mg/L		0.002	<0.002	0.002	<0.002	0.002	<0.002	0.002	<0.002
Uranium	mg/L	0.02	0.002	0.002	0.002	<0.002	0.002	<0.002	0.002	0.003
Vanadium	mg/L		0.002	<0.002	0.002	<0.002	0.002	<0.002	0.002	<0.002
Zinc	mg/L	5	0.005	0.008	0.005	<0.005	0.005	<0.005	0.005	0.005

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AGAT WORK ORDER: 15T976680

PROJECT: New Liskeard GW

CLIENT NAME: AMEC FOSTER WHEELER ENVIRO&INFRASTR

ATTENTION TO: Emily Lemieux

SAMPLING SITE:

SAMPLED BY:

New Liskeard Groundwater Package

DATE RECEIVED: 2015-05-22

DATE REPORTED: 2015-06-02

		SAMPLE DESCRIPTION:		OW-17-III	OW-23-I		OW-23-II		OW-24-I	OW-24-II	OW-24-III
		SAMPLE TYPE:		Water	Water		Water		Water	Water	Water
		DATE SAMPLED:		5/21/2015	5/21/2015		5/21/2015		5/21/2015	5/21/2015	5/21/2015
Parameter	Unit	G / S	RDL	6576297	6576320	RDL	6576349	RDL	6576384	6576420	6576441
pH	pH Units	(6.5-8.5)	NA	7.88	8.39	NA	8.41	NA	8.32	8.36	8.25
Alkalinity (as CaCO3)	mg/L	(30-500)	5	175	228	5	220	5	213	263	227
Electrical Conductivity	uS/cm		2	354	457	2	675	2	455	571	470
Total Hardness (as CaCO3)	mg/L	(80-100)	0.5	172	153	0.5	143	0.5	206	231	224
Total Dissolved Solids	mg/L	500	20	178	218	20	362	20	226	276	252
Fluoride	mg/L	1.5	0.05	<0.05	0.89	0.05	1.02	0.05	0.37	0.92	<0.05
Chloride	mg/L	250	0.10	1.41	1.34	0.10	11.2	0.10	1.63	15.0	3.55
Nitrate as N	mg/L	10.0	0.05	<0.05	<0.05	0.05	0.08	0.05	<0.05	<0.05	1.20
Nitrite as N	mg/L	1.0	0.05	<0.05	<0.05	0.05	<0.05	0.05	<0.05	<0.05	<0.05
Sulphate	mg/L	500	0.10	2.82	5.40	0.50	104	0.10	16.9	10.4	14.1
Phosphate as P	mg/L		0.10	<0.10	<0.10	0.10	<0.10	0.10	<0.10	<0.10	<0.10
Ammonia as N	mg/L		0.02	<0.02	0.50	0.02	<0.02	0.02	0.04	<0.02	0.45
Total Kjeldahl Nitrogen	mg/L		0.10	<0.10	0.76	0.10	0.10	0.10	0.37	0.14	1.22
Organic Nitrogen	mg/L	0.15	0.10	<0.10	**0.26**	0.10	0.10	0.10	**0.33**	0.14	**0.77**
Dissolved Organic Carbon	mg/L	5	0.5	2.2	2.7	0.5	1.6	0.5	2.2	1.9	1.9
Calcium	mg/L		0.05	46.2	26.9	0.05	23.0	0.05	50.6	42.4	66.9
Magnesium	mg/L		0.05	13.7	20.9	0.05	20.7	0.05	19.3	30.3	13.9
Sodium	mg/L	20 (200)	0.05	3.85	35.0	0.05	91.1	0.05	9.55	21.9	6.67
Potassium	mg/L		0.05	0.83	3.50	0.05	4.36	0.05	4.79	9.50	1.77
Aluminum	mg/L	0.1	0.004	0.012	<0.004	0.004	0.009	0.004	<0.004	0.004	<0.004
Arsenic	mg/L	0.025	0.003	<0.003	<0.003	0.003	<0.003	0.003	<0.003	<0.003	<0.003
Barium	mg/L	1	0.002	0.015	0.029	0.002	0.024	0.002	0.038	0.049	0.019
Beryllium	mg/L		0.001	<0.001	<0.001	0.001	<0.001	0.001	<0.001	<0.001	<0.001
Bismuth	mg/L		0.002	<0.002	<0.002	0.002	<0.002	0.002	<0.002	<0.002	<0.002
Boron	mg/L	5	0.010	<0.010	0.272	0.010	0.285	0.010	0.044	0.068	0.011
Cadmium	mg/L	0.005	0.002	<0.002	<0.002	0.002	<0.002	0.002	<0.002	<0.002	<0.002
Chromium	mg/L	0.05	0.003	<0.003	<0.003	0.003	<0.003	0.003	<0.003	<0.003	<0.003
Cobalt	mg/L		0.001	<0.001	<0.001	0.001	<0.001	0.001	<0.001	<0.001	<0.001
Copper	mg/L	1	0.003	<0.003	<0.003	0.003	<0.003	0.003	<0.003	<0.003	<0.003
Iron	mg/L	0.3	0.010	<0.010	0.028	0.010	<0.010	0.010	**1.03**	<0.010	0.156

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Certificate of Analysis

AGAT WORK ORDER: 15T976680

PROJECT: New Liskeard GW

CLIENT NAME: AMEC FOSTER WHEELER ENVIRO&INFRASTR

ATTENTION TO: Emily Lemieux

SAMPLING SITE:

SAMPLED BY:

New Liskeard Groundwater Package

DATE RECEIVED: 2015-05-22

DATE REPORTED: 2015-06-02

		SAMPLE DESCRIPTION:		OW-17-III	OW-23-I		OW-23-II		OW-24-I	OW-24-II	OW-24-III
		SAMPLE TYPE:		Water	Water		Water		Water	Water	Water
		DATE SAMPLED:		5/21/2015	5/21/2015		5/21/2015		5/21/2015	5/21/2015	5/21/2015
Parameter	Unit	G / S	RDL	6576297	6576320	RDL	6576349	RDL	6576384	6576420	6576441
Lead	mg/L	0.01	0.002	<0.002	<0.002	0.002	<0.002	0.002	<0.002	<0.002	<0.002
Manganese	mg/L	0.05	0.002	0.009	0.009	0.002	0.007	0.002	0.039	**0.083**	**0.364**
Molybdenum	mg/L		0.002	<0.002	0.009	0.002	0.038	0.002	0.005	0.018	<0.002
Nickel	mg/L		0.003	<0.003	<0.003	0.003	<0.003	0.003	<0.003	<0.003	<0.003
Phosphorus	mg/L		0.05	<0.05	<0.05	0.05	<0.05	0.05	<0.05	<0.05	<0.05
Selenium	mg/L	0.01	0.004	<0.004	<0.004	0.004	<0.004	0.004	<0.004	<0.004	<0.004
Silicon	mg/L		0.05	5.60	4.59	0.05	2.86	0.05	6.88	6.15	3.80
Silver	mg/L		0.002	<0.002	<0.002	0.002	<0.002	0.002	<0.002	<0.002	<0.002
Strontium	mg/L		0.005	0.084	0.433	0.005	0.674	0.005	0.396	0.616	0.129
Sulfur	mg/L		0.05	1.19	2.25	0.05	38.6	0.05	5.57	2.83	6.26
Thallium	mg/L		0.006	<0.006	<0.006	0.006	<0.006	0.006	<0.006	<0.006	<0.006
Tin	mg/L		0.002	<0.002	<0.002	0.002	<0.002	0.002	<0.002	<0.002	<0.002
Titanium	mg/L		0.002	<0.002	<0.002	0.002	<0.002	0.002	<0.002	<0.002	<0.002
Uranium	mg/L	0.02	0.002	<0.002	<0.002	0.002	<0.002	0.002	<0.002	<0.002	<0.002
Vanadium	mg/L		0.002	<0.002	<0.002	0.002	<0.002	0.002	<0.002	<0.002	<0.002
Zinc	mg/L	5	0.005	0.007	<0.005	0.005	<0.005	0.005	<0.005	<0.005	<0.005

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Certificate of Analysis

AGAT WORK ORDER: 15T976680

PROJECT: New Liskeard GW

CLIENT NAME: AMEC FOSTER WHEELER ENVIRO&INFRASTR

ATTENTION TO: Emily Lemieux

SAMPLING SITE:

SAMPLED BY:

New Liskeard Groundwater Package

DATE RECEIVED: 2015-05-22

DATE REPORTED: 2015-06-02

		SAMPLE DESCRIPTION:		OW-25-I		OW-25-II	OW-25-III		OW-30-14-I		OW-30-14-II
		SAMPLE TYPE:		Water		Water	Water		Water		Water
		DATE SAMPLED:		5/21/2015		5/21/2015	5/21/2015		5/21/2015		5/21/2015
Parameter	Unit	G / S	RDL	6576449	RDL	6576457	6576469	RDL	6576477	RDL	6576494
pH	pH Units	(6.5-8.5)	NA	8.39	NA	8.33	8.15	NA	8.44	NA	8.34
Alkalinity (as CaCO3)	mg/L	(30-500)	5	221	5	145	307	5	192	5	137
Electrical Conductivity	uS/cm		2	432	2	798	818	2	718	2	869
Total Hardness (as CaCO3)	mg/L	(80-100)	0.5	163	0.5	141	341	0.5	93.6	0.5	145
Total Dissolved Solids	mg/L	500	20	220	20	408	450	20	410	20	480
Fluoride	mg/L	1.5	0.05	0.60	0.25	1.16	1.14	0.05	0.53	0.25	**1.53**
Chloride	mg/L	250	0.10	1.27	0.50	8.82	1.36	0.10	8.80	0.50	24.4
Nitrate as N	mg/L	10.0	0.05	<0.05	0.25	<0.25	<0.25	0.05	0.37	0.25	<0.25
Nitrite as N	mg/L	1.0	0.05	<0.05	0.25	<0.25	<0.25	0.05	<0.05	0.25	<0.25
Sulphate	mg/L	500	0.10	0.90	0.50	218	130	0.50	138	0.50	225
Phosphate as P	mg/L		0.10	0.55	0.50	<0.50	<0.50	0.10	<0.10	0.50	<0.50
Ammonia as N	mg/L		0.02	0.31	0.02	<0.02	<0.02	0.02	0.18	0.02	0.29
Total Kjeldahl Nitrogen	mg/L		0.10	0.48	0.10	0.32	<0.10	0.25	0.56	0.10	0.68
Organic Nitrogen	mg/L	0.15	0.10	**0.17**	0.10	**0.32**	<0.10	0.10	**0.38**	0.10	**0.39**
Dissolved Organic Carbon	mg/L	5	0.5	2.7	0.5	1.5	1.0	0.5	2.5	0.5	2.7
Calcium	mg/L		0.05	34.8	0.05	26.3	65.3	0.05	17.7	0.05	26.3
Magnesium	mg/L		0.05	18.4	0.05	18.2	43.2	0.05	12.0	0.05	19.2
Sodium	mg/L	20 (200)	0.05	29.1	0.05	115	34.8	0.05	120	0.05	116
Potassium	mg/L		0.05	3.92	0.05	8.37	5.56	0.05	5.30	0.05	12.9
Aluminum	mg/L	0.1	0.004	<0.004	0.004	0.024	0.005	0.004	0.006	0.004	**0.129**
Arsenic	mg/L	0.025	0.003	<0.003	0.003	<0.003	<0.003	0.003	<0.003	0.003	<0.003
Barium	mg/L	1	0.002	0.040	0.002	0.024	0.031	0.002	0.022	0.002	0.039
Beryllium	mg/L		0.001	<0.001	0.001	<0.001	<0.001	0.001	<0.001	0.001	<0.001
Bismuth	mg/L		0.002	<0.002	0.002	<0.002	<0.002	0.002	<0.002	0.002	<0.002
Boron	mg/L	5	0.010	0.113	0.010	0.204	0.050	0.010	0.145	0.010	0.390
Cadmium	mg/L	0.005	0.002	<0.002	0.002	<0.002	<0.002	0.002	<0.002	0.002	<0.002
Chromium	mg/L	0.05	0.003	<0.003	0.003	<0.003	<0.003	0.003	<0.003	0.003	<0.003
Cobalt	mg/L		0.001	<0.001	0.001	<0.001	<0.001	0.001	<0.001	0.001	<0.001
Copper	mg/L	1	0.003	<0.003	0.003	<0.003	<0.003	0.003	<0.003	0.003	<0.003
Iron	mg/L	0.3	0.010	0.157	0.010	<0.010	<0.010	0.010	<0.010	0.010	0.178

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Certificate of Analysis

AGAT WORK ORDER: 15T976680

PROJECT: New Liskeard GW

CLIENT NAME: AMEC FOSTER WHEELER ENVIRO&INFRASTR

ATTENTION TO: Emily Lemieux

SAMPLING SITE:

SAMPLED BY:

New Liskeard Groundwater Package

DATE RECEIVED: 2015-05-22

DATE REPORTED: 2015-06-02

SAMPLE DESCRIPTION:				OW-25-I		OW-25-II	OW-25-III		OW-30-14-I		OW-30-14-II
SAMPLE TYPE:				Water		Water	Water		Water		Water
DATE SAMPLED:				5/21/2015		5/21/2015	5/21/2015		5/21/2015		5/21/2015
Parameter	Unit	G / S	RDL	6576449	RDL	6576457	6576469	RDL	6576477	RDL	6576494
Lead	mg/L	0.01	0.002	<0.002	0.002	<0.002	<0.002	0.002	<0.002	0.002	<0.002
Manganese	mg/L	0.05	0.002	0.009	0.002	<0.002	0.005	0.002	0.029	0.002	0.021
Molybdenum	mg/L		0.002	<0.002	0.002	0.067	0.008	0.002	0.046	0.002	0.069
Nickel	mg/L		0.003	<0.003	0.003	<0.003	<0.003	0.003	<0.003	0.003	<0.003
Phosphorus	mg/L		0.05	<0.05	0.05	<0.05	<0.05	0.05	<0.05	0.05	<0.05
Selenium	mg/L	0.01	0.004	<0.004	0.004	<0.004	<0.004	0.004	<0.004	0.004	<0.004
Silicon	mg/L		0.05	6.94	0.05	3.24	4.42	0.05	3.13	0.05	2.95
Silver	mg/L		0.002	<0.002	0.002	<0.002	<0.002	0.002	<0.002	0.002	<0.002
Strontium	mg/L		0.005	0.654	0.005	0.550	2.54	0.005	0.208	0.005	0.673
Sulfur	mg/L		0.05	0.55	0.05	82.0	47.1	0.05	51.2	0.05	84.0
Thallium	mg/L		0.006	<0.006	0.006	<0.006	<0.006	0.006	<0.006	0.006	<0.006
Tin	mg/L		0.002	<0.002	0.002	<0.002	<0.002	0.002	<0.002	0.002	<0.002
Titanium	mg/L		0.002	<0.002	0.002	0.005	0.002	0.002	0.002	0.002	0.010
Uranium	mg/L	0.02	0.002	<0.002	0.002	0.003	0.003	0.002	0.003	0.002	<0.002
Vanadium	mg/L		0.002	<0.002	0.002	<0.002	<0.002	0.002	<0.002	0.002	<0.002
Zinc	mg/L	5	0.005	0.006	0.005	<0.005	<0.005	0.005	<0.005	0.005	0.009

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Certificate of Analysis

AGAT WORK ORDER: 15T976680

PROJECT: New Liskeard GW

CLIENT NAME: AMEC FOSTER WHEELER ENVIRO&INFRASTR

ATTENTION TO: Emily Lemieux

SAMPLING SITE:

SAMPLED BY:

New Liskeard Groundwater Package

DATE RECEIVED: 2015-05-22

DATE REPORTED: 2015-06-02

		SAMPLE DESCRIPTION:		NL GW DUP-1		NL GW DUP-2		NL GW DUP-3
		SAMPLE TYPE:		Water		Water		Water
		DATE SAMPLED:		5/21/2015		5/21/2015		5/21/2015
Parameter	Unit	G / S	RDL	6576510	RDL	6576525	RDL	6576532
pH	pH Units	(6.5-8.5)	NA	8.45	NA	8.17	NA	8.46
Alkalinity (as CaCO3)	mg/L	(30-500)	5	298	5	296	5	214
Electrical Conductivity	uS/cm		2	608	2	801	2	680
Total Hardness (as CaCO3)	mg/L	(80-100)	0.5	81.9	0.5	335	0.5	141
Total Dissolved Solids	mg/L	500	20	418	20	444	20	370
Fluoride	mg/L	1.5	0.05	**1.58**	0.25	1.17	0.10	1.22
Chloride	mg/L	250	0.10	6.43	0.50	1.31	0.20	10.9
Nitrate as N	mg/L	10.0	0.05	<0.05	0.25	<0.25	0.10	<0.10
Nitrite as N	mg/L	1.0	0.05	<0.05	0.25	<0.25	0.10	<0.10
Sulphate	mg/L	500	0.10	3.58	0.50	128	0.20	102
Phosphate as P	mg/L		0.10	<0.10	0.50	<0.50	0.20	<0.20
Ammonia as N	mg/L		0.02	1.18	0.02	<0.02	0.02	<0.02
Total Kjeldahl Nitrogen	mg/L		0.10	1.94	0.10	<0.10	0.10	<0.10
Organic Nitrogen	mg/L	0.15	0.10	**0.76**	0.10	<0.10	0.10	<0.10
Dissolved Organic Carbon	mg/L	5	0.5	**8.7**	0.5	1.2	0.5	1.8
Calcium	mg/L		0.05	13.5	0.05	64.5	0.05	22.8
Magnesium	mg/L		0.05	11.7	0.05	42.3	0.05	20.3
Sodium	mg/L	20 (200)	0.05	108	0.05	34.1	0.05	88.6
Potassium	mg/L		0.05	4.47	0.05	5.43	0.05	4.25
Aluminum	mg/L	0.1	0.004	0.017	0.004	0.004	0.004	0.010
Arsenic	mg/L	0.025	0.003	<0.003	0.003	<0.003	0.003	<0.003
Barium	mg/L	1	0.002	0.035	0.002	0.030	0.002	0.026
Beryllium	mg/L		0.001	<0.001	0.001	<0.001	0.001	<0.001
Bismuth	mg/L		0.002	<0.002	0.002	<0.002	0.002	<0.002
Boron	mg/L	5	0.010	0.446	0.010	0.050	0.010	0.333
Cadmium	mg/L	0.005	0.002	<0.002	0.002	<0.002	0.002	<0.002
Chromium	mg/L	0.05	0.003	<0.003	0.003	<0.003	0.003	<0.003
Cobalt	mg/L		0.001	<0.001	0.001	<0.001	0.001	<0.001
Copper	mg/L	1	0.003	<0.003	0.003	<0.003	0.003	<0.003
Iron	mg/L	0.3	0.010	0.164	0.010	<0.010	0.010	<0.010

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Certificate of Analysis

AGAT WORK ORDER: 15T976680

PROJECT: New Liskeard GW

CLIENT NAME: AMEC FOSTER WHEELER ENVIRO&INFRASTR

ATTENTION TO: Emily Lemieux

SAMPLING SITE:

SAMPLED BY:

New Liskeard Groundwater Package

DATE RECEIVED: 2015-05-22

DATE REPORTED: 2015-06-02

		SAMPLE DESCRIPTION:		NL GW DUP-1		NL GW DUP-2		NL GW DUP-3
		SAMPLE TYPE:		Water		Water		Water
		DATE SAMPLED:		5/21/2015		5/21/2015		5/21/2015
Parameter	Unit	G / S	RDL	6576510	RDL	6576525	RDL	6576532
Lead	mg/L	0.01	0.002	<0.002	0.002	<0.002	0.002	<0.002
Manganese	mg/L	0.05	0.002	0.021	0.002	0.006	0.002	0.007
Molybdenum	mg/L		0.002	0.013	0.002	0.008	0.002	0.042
Nickel	mg/L		0.003	<0.003	0.003	<0.003	0.003	<0.003
Phosphorus	mg/L		0.05	0.05	0.05	<0.05	0.05	<0.05
Selenium	mg/L	0.01	0.004	<0.004	0.004	<0.004	0.004	<0.004
Silicon	mg/L		0.05	7.52	0.05	4.67	0.05	3.10
Silver	mg/L		0.002	<0.002	0.002	<0.002	0.002	<0.002
Strontium	mg/L		0.005	0.470	0.005	2.66	0.005	0.724
Sulfur	mg/L		0.05	1.83	0.05	47.9	0.05	38.4
Thallium	mg/L		0.006	<0.006	0.006	<0.006	0.006	<0.006
Tin	mg/L		0.002	<0.002	0.002	<0.002	0.002	<0.002
Titanium	mg/L		0.002	<0.002	0.002	0.002	0.002	0.002
Uranium	mg/L	0.02	0.002	<0.002	0.002	0.003	0.002	<0.002
Vanadium	mg/L		0.002	<0.002	0.002	<0.002	0.002	<0.002
Zinc	mg/L	5	0.005	<0.005	0.005	<0.005	0.005	<0.005

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard: Refers to O.Reg.169/03(mg/L)

6575491-6575839 Elevated RDL indicates the degree of sample dilution prior to the analysis to keep analytes within the calibration range, reduce matrix interference and/or to avoid contaminating the instrument.

6575880-6576268 Elevated RDL indicates the degree of sample dilution prior to the analysis to keep analytes within the calibration range, reduce matrix interference and/or to avoid contaminating the instrument.

6576457-6576494 Elevated RDL indicates the degree of sample dilution prior to the analysis to keep analytes within the calibration range, reduce matrix interference and/or to avoid contaminating the instrument.

6576525-6576532 Elevated RDL indicates the degree of sample dilution prior to the analysis to keep analytes within the calibration range, reduce matrix interference and/or to avoid contaminating the instrument.

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Certificate of Analysis

AGAT WORK ORDER: 15T976680

PROJECT: New Liskeard GW

CLIENT NAME: AMEC FOSTER WHEELER ENVIRO&INFRASTR

ATTENTION TO: Emily Lemieux

SAMPLING SITE:

SAMPLED BY:

New Liskeard Groundwater Package excl. TDS

DATE RECEIVED: 2015-05-22

DATE REPORTED: 2015-06-02

		SAMPLE DESCRIPTION:		OW11-I
		SAMPLE TYPE:		Water
		DATE SAMPLED:		5/21/2015
Parameter	Unit	G / S	RDL	6575800
pH	pH Units	(6.5-8.5)	NA	8.34
Alkalinity (as CaCO3)	mg/L	(30-500)	5	225
Electrical Conductivity	uS/cm		2	599
Total Hardness (as CaCO3)	mg/L	(80-100)	0.5	265
Fluoride	mg/L	1.5	0.10	0.33
Chloride	mg/L	250	0.20	8.67
Nitrate as N	mg/L	10.0	0.10	0.53
Nitrite as N	mg/L	1.0	0.10	<0.10
Sulphate	mg/L	500	0.20	72.3
Phosphate as P	mg/L		0.20	<0.20
Ammonia as N	mg/L		0.02	<0.02
Total Kjeldahl Nitrogen	mg/L		0.10	0.17
Organic Nitrogen	mg/L	0.15	0.10	**0.17**
Dissolved Organic Carbon	mg/L	5	0.5	0.7
Calcium	mg/L		0.05	62.7
Magnesium	mg/L		0.05	26.3
Sodium	mg/L	20 (200)	0.05	15.3
Potassium	mg/L		0.05	6.10
Aluminum	mg/L	0.1	0.004	0.043
Arsenic	mg/L	0.025	0.003	<0.003
Barium	mg/L	1	0.002	0.030
Beryllium	mg/L		0.001	<0.001
Bismuth	mg/L		0.002	<0.002
Boron	mg/L	5	0.010	0.257
Cadmium	mg/L	0.005	0.002	<0.002
Chromium	mg/L	0.05	0.003	<0.003
Cobalt	mg/L		0.001	<0.001
Copper	mg/L	1	0.003	<0.003
Iron	mg/L	0.3	0.010	0.043
Lead	mg/L	0.01	0.002	<0.002

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Certificate of Analysis

AGAT WORK ORDER: 15T976680

PROJECT: New Liskeard GW

CLIENT NAME: AMEC FOSTER WHEELER ENVIRO&INFRASTR

ATTENTION TO: Emily Lemieux

SAMPLING SITE:

SAMPLED BY:

New Liskeard Groundwater Package excl. TDS

DATE RECEIVED: 2015-05-22

DATE REPORTED: 2015-06-02

		SAMPLE DESCRIPTION:		OW11-I
		SAMPLE TYPE:		Water
		DATE SAMPLED:		5/21/2015
Parameter	Unit	G / S	RDL	6575800
Manganese	mg/L	0.05	0.002	0.008
Molybdenum	mg/L		0.002	<0.002
Nickel	mg/L		0.003	<0.003
Phosphorus	mg/L		0.05	<0.05
Selenium	mg/L	0.01	0.004	<0.004
Silicon	mg/L		0.05	2.68
Silver	mg/L		0.002	<0.002
Strontium	mg/L		0.005	1.81
Sulfur	mg/L		0.05	25.7
Thallium	mg/L		0.006	<0.006
Tin	mg/L		0.002	<0.002
Titanium	mg/L		0.002	0.003
Uranium	mg/L	0.02	0.002	<0.002
Vanadium	mg/L		0.002	<0.002
Zinc	mg/L	5	0.005	0.007

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard: Refers to O.Reg.169/03(mg/L)

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Guideline Violation

AGAT WORK ORDER: 15T976680

PROJECT: New Liskeard GW

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CLIENT NAME: AMEC FOSTER WHEELER ENVIRO&INFRASTR

ATTENTION TO: Emily Lemieux

SAMPLEID	SAMPLE TITLE	GUIDELINE	ANALYSIS PACKAGE	PARAMETER	GUIDEVALUE	RESULT
6575491	OW-1R-1	O.Reg.169/03(mg/L)	New Liskeard Groundwater Package	Alkalinity (as CaCO3)	(30-500)	951
6575491	OW-1R-1	O.Reg.169/03(mg/L)	New Liskeard Groundwater Package	Chloride	250	274
6575491	OW-1R-1	O.Reg.169/03(mg/L)	New Liskeard Groundwater Package	Dissolved Organic Carbon	5	23.2
6575491	OW-1R-1	O.Reg.169/03(mg/L)	New Liskeard Groundwater Package	Manganese	0.05	0.788
6575491	OW-1R-1	O.Reg.169/03(mg/L)	New Liskeard Groundwater Package	Organic Nitrogen	0.15	2.30
6575491	OW-1R-1	O.Reg.169/03(mg/L)	New Liskeard Groundwater Package	Sodium	20 (200)	187
6575491	OW-1R-1	O.Reg.169/03(mg/L)	New Liskeard Groundwater Package	Total Dissolved Solids	500	1630
6575491	OW-1R-1	O.Reg.169/03(mg/L)	New Liskeard Groundwater Package	Total Hardness (as CaCO3)	(80-100)	885
6575659	OW-1R-III	O.Reg.169/03(mg/L)	New Liskeard Groundwater Package	Alkalinity (as CaCO3)	(30-500)	764
6575659	OW-1R-III	O.Reg.169/03(mg/L)	New Liskeard Groundwater Package	Dissolved Organic Carbon	5	16.2
6575659	OW-1R-III	O.Reg.169/03(mg/L)	New Liskeard Groundwater Package	Manganese	0.05	0.764
6575659	OW-1R-III	O.Reg.169/03(mg/L)	New Liskeard Groundwater Package	Organic Nitrogen	0.15	1.70
6575659	OW-1R-III	O.Reg.169/03(mg/L)	New Liskeard Groundwater Package	Sodium	20 (200)	155
6575659	OW-1R-III	O.Reg.169/03(mg/L)	New Liskeard Groundwater Package	Total Dissolved Solids	500	1160
6575659	OW-1R-III	O.Reg.169/03(mg/L)	New Liskeard Groundwater Package	Total Hardness (as CaCO3)	(80-100)	683
6575782	OW-10-I	O.Reg.169/03(mg/L)	New Liskeard Groundwater Package	Total Hardness (as CaCO3)	(80-100)	361
6575789	OW-10-II	O.Reg.169/03(mg/L)	New Liskeard Groundwater Package	Total Hardness (as CaCO3)	(80-100)	363
6575800	OW11-I	O.Reg.169/03(mg/L)	New Liskeard Groundwater Package excl. TDS	Organic Nitrogen	0.15	0.17
6575800	OW11-I	O.Reg.169/03(mg/L)	New Liskeard Groundwater Package excl. TDS	Total Hardness (as CaCO3)	(80-100)	265
6575807	OW-11-II	O.Reg.169/03(mg/L)	New Liskeard Groundwater Package	Dissolved Organic Carbon	5	7.2
6575807	OW-11-II	O.Reg.169/03(mg/L)	New Liskeard Groundwater Package	Organic Nitrogen	0.15	1.10
6575807	OW-11-II	O.Reg.169/03(mg/L)	New Liskeard Groundwater Package	Sodium	20 (200)	34.1
6575807	OW-11-II	O.Reg.169/03(mg/L)	New Liskeard Groundwater Package	Total Dissolved Solids	500	534
6575807	OW-11-II	O.Reg.169/03(mg/L)	New Liskeard Groundwater Package	Total Hardness (as CaCO3)	(80-100)	417
6575818	OW-12-I	O.Reg.169/03(mg/L)	New Liskeard Groundwater Package	Organic Nitrogen	0.15	0.30
6575818	OW-12-I	O.Reg.169/03(mg/L)	New Liskeard Groundwater Package	Total Hardness (as CaCO3)	(80-100)	348
6575825	OW-12-II	O.Reg.169/03(mg/L)	New Liskeard Groundwater Package	Dissolved Organic Carbon	5	7.9
6575825	OW-12-II	O.Reg.169/03(mg/L)	New Liskeard Groundwater Package	Organic Nitrogen	0.15	1.29
6575825	OW-12-II	O.Reg.169/03(mg/L)	New Liskeard Groundwater Package	Sodium	20 (200)	73.3
6575825	OW-12-II	O.Reg.169/03(mg/L)	New Liskeard Groundwater Package	Total Dissolved Solids	500	722
6575825	OW-12-II	O.Reg.169/03(mg/L)	New Liskeard Groundwater Package	Total Hardness (as CaCO3)	(80-100)	466
6575839	OW-13-I	O.Reg.169/03(mg/L)	New Liskeard Groundwater Package	Organic Nitrogen	0.15	0.39
6575839	OW-13-I	O.Reg.169/03(mg/L)	New Liskeard Groundwater Package	Total Hardness (as CaCO3)	(80-100)	396
6575849	OW-16-I	O.Reg.169/03(mg/L)	New Liskeard Groundwater Package	Dissolved Organic Carbon	5	8.9
6575849	OW-16-I	O.Reg.169/03(mg/L)	New Liskeard Groundwater Package	Fluoride	1.5	1.65
6575849	OW-16-I	O.Reg.169/03(mg/L)	New Liskeard Groundwater Package	Organic Nitrogen	0.15	0.71
6575849	OW-16-I	O.Reg.169/03(mg/L)	New Liskeard Groundwater Package	Sodium	20 (200)	108
6575865	OW-16-11	O.Reg.169/03(mg/L)	New Liskeard Groundwater Package	Organic Nitrogen	0.15	0.23
6575865	OW-16-11	O.Reg.169/03(mg/L)	New Liskeard Groundwater Package	Sodium	20 (200)	69.7
6575865	OW-16-11	O.Reg.169/03(mg/L)	New Liskeard Groundwater Package	Total Hardness (as CaCO3)	(80-100)	129
6575880	OW-16-III	O.Reg.169/03(mg/L)	New Liskeard Groundwater Package	Iron	0.3	0.684
6575880	OW-16-III	O.Reg.169/03(mg/L)	New Liskeard Groundwater Package	Organic Nitrogen	0.15	0.23
6575880	OW-16-III	O.Reg.169/03(mg/L)	New Liskeard Groundwater Package	Selenium	0.01	0.065

AGAT Laboratories

Guideline Violation

AGAT WORK ORDER: 15T976680

PROJECT: New Liskeard GW

5835 COOPERS AVENUE
MISSISSAUGA, ONTARIO
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http://www.agatlabs.com

CLIENT NAME: AMEC FOSTER WHEELER ENVIRO&INFRASTR

ATTENTION TO: Emily Lemieux

SAMPLEID	SAMPLE TITLE	GUIDELINE	ANALYSIS PACKAGE	PARAMETER	GUIDEVALUE	RESULT
6575880	OW-16-III	O.Reg.169/03(mg/L)	New Liskeard Groundwater Package	Total Hardness (as CaCO3)	(80-100)	364
6575892	OW-17-I	O.Reg.169/03(mg/L)	New Liskeard Groundwater Package	Iron	0.3	0.453
6575892	OW-17-I	O.Reg.169/03(mg/L)	New Liskeard Groundwater Package	Total Hardness (as CaCO3)	(80-100)	227
6576268	OW-17-II	O.Reg.169/03(mg/L)	New Liskeard Groundwater Package	Sodium	20 (200)	55.3
6576268	OW-17-II	O.Reg.169/03(mg/L)	New Liskeard Groundwater Package	Total Hardness (as CaCO3)	(80-100)	226
6576297	OW-17-III	O.Reg.169/03(mg/L)	New Liskeard Groundwater Package	Total Hardness (as CaCO3)	(80-100)	172
6576320	OW-23-I	O.Reg.169/03(mg/L)	New Liskeard Groundwater Package	Organic Nitrogen	0.15	0.26
6576320	OW-23-I	O.Reg.169/03(mg/L)	New Liskeard Groundwater Package	Sodium	20 (200)	35.0
6576320	OW-23-I	O.Reg.169/03(mg/L)	New Liskeard Groundwater Package	Total Hardness (as CaCO3)	(80-100)	153
6576349	OW-23-II	O.Reg.169/03(mg/L)	New Liskeard Groundwater Package	Sodium	20 (200)	91.1
6576349	OW-23-II	O.Reg.169/03(mg/L)	New Liskeard Groundwater Package	Total Hardness (as CaCO3)	(80-100)	143
6576384	OW-24-I	O.Reg.169/03(mg/L)	New Liskeard Groundwater Package	Iron	0.3	1.03
6576384	OW-24-I	O.Reg.169/03(mg/L)	New Liskeard Groundwater Package	Organic Nitrogen	0.15	0.33
6576384	OW-24-I	O.Reg.169/03(mg/L)	New Liskeard Groundwater Package	Total Hardness (as CaCO3)	(80-100)	206
6576420	OW-24-II	O.Reg.169/03(mg/L)	New Liskeard Groundwater Package	Manganese	0.05	0.083
6576420	OW-24-II	O.Reg.169/03(mg/L)	New Liskeard Groundwater Package	Sodium	20 (200)	21.9
6576420	OW-24-II	O.Reg.169/03(mg/L)	New Liskeard Groundwater Package	Total Hardness (as CaCO3)	(80-100)	231
6576441	OW-24-III	O.Reg.169/03(mg/L)	New Liskeard Groundwater Package	Manganese	0.05	0.364
6576441	OW-24-III	O.Reg.169/03(mg/L)	New Liskeard Groundwater Package	Organic Nitrogen	0.15	0.77
6576441	OW-24-III	O.Reg.169/03(mg/L)	New Liskeard Groundwater Package	Total Hardness (as CaCO3)	(80-100)	224
6576449	OW-25-I	O.Reg.169/03(mg/L)	New Liskeard Groundwater Package	Organic Nitrogen	0.15	0.17
6576449	OW-25-I	O.Reg.169/03(mg/L)	New Liskeard Groundwater Package	Sodium	20 (200)	29.1
6576449	OW-25-I	O.Reg.169/03(mg/L)	New Liskeard Groundwater Package	Total Hardness (as CaCO3)	(80-100)	163
6576457	OW-25-II	O.Reg.169/03(mg/L)	New Liskeard Groundwater Package	Organic Nitrogen	0.15	0.32
6576457	OW-25-II	O.Reg.169/03(mg/L)	New Liskeard Groundwater Package	Sodium	20 (200)	115
6576457	OW-25-II	O.Reg.169/03(mg/L)	New Liskeard Groundwater Package	Total Hardness (as CaCO3)	(80-100)	141
6576469	OW-25-III	O.Reg.169/03(mg/L)	New Liskeard Groundwater Package	Sodium	20 (200)	34.8
6576469	OW-25-III	O.Reg.169/03(mg/L)	New Liskeard Groundwater Package	Total Hardness (as CaCO3)	(80-100)	341
6576477	OW-30-14-I	O.Reg.169/03(mg/L)	New Liskeard Groundwater Package	Organic Nitrogen	0.15	0.38
6576477	OW-30-14-I	O.Reg.169/03(mg/L)	New Liskeard Groundwater Package	Sodium	20 (200)	120
6576494	OW-30-14-II	O.Reg.169/03(mg/L)	New Liskeard Groundwater Package	Aluminum	0.1	0.129
6576494	OW-30-14-II	O.Reg.169/03(mg/L)	New Liskeard Groundwater Package	Fluoride	1.5	1.53
6576494	OW-30-14-II	O.Reg.169/03(mg/L)	New Liskeard Groundwater Package	Organic Nitrogen	0.15	0.39
6576494	OW-30-14-II	O.Reg.169/03(mg/L)	New Liskeard Groundwater Package	Sodium	20 (200)	116
6576494	OW-30-14-II	O.Reg.169/03(mg/L)	New Liskeard Groundwater Package	Total Hardness (as CaCO3)	(80-100)	145
6576510	NL GW DUP-1	O.Reg.169/03(mg/L)	New Liskeard Groundwater Package	Dissolved Organic Carbon	5	8.7
6576510	NL GW DUP-1	O.Reg.169/03(mg/L)	New Liskeard Groundwater Package	Fluoride	1.5	1.58
6576510	NL GW DUP-1	O.Reg.169/03(mg/L)	New Liskeard Groundwater Package	Organic Nitrogen	0.15	0.76
6576510	NL GW DUP-1	O.Reg.169/03(mg/L)	New Liskeard Groundwater Package	Sodium	20 (200)	108
6576525	NL GW DUP-2	O.Reg.169/03(mg/L)	New Liskeard Groundwater Package	Sodium	20 (200)	34.1
6576525	NL GW DUP-2	O.Reg.169/03(mg/L)	New Liskeard Groundwater Package	Total Hardness (as CaCO3)	(80-100)	335
6576532	NL GW DUP-3	O.Reg.169/03(mg/L)	New Liskeard Groundwater Package	Sodium	20 (200)	88.6
6576532	NL GW DUP-3	O.Reg.169/03(mg/L)	New Liskeard Groundwater Package	Total Hardness (as CaCO3)	(80-100)	141

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Quality Assurance

CLIENT NAME: AMEC FOSTER WHEELER ENVIRO&INFRASTR

AGAT WORK ORDER: 15T976680

PROJECT: New Liskeard GW

ATTENTION TO: Emily Lemieux

SAMPLING SITE:

SAMPLED BY:

Water Analysis

RPT Date: Jun 02, 2015			DUPLICATE				REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD	Method Blank	Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
New Liskeard Groundwater Package															
pH	6576525	6576525	8.17	8.17	0.0%	NA	99%	90%	110%	NA			NA		
Alkalinity (as CaCO3)	6576525	6576525	296	294	0.7%	< 5	93%	80%	120%	NA			NA		
Electrical Conductivity	6576525	6576525	801	804	0.4%	< 2	103%	80%	120%	NA			NA		
Total Dissolved Solids	6575491	6575491	1630	1660	1.8%	< 20	90%	80%	120%	NA			NA		
Fluoride	6575839	6575839	<0.25	<0.25	0.0%	< 0.05	99%	90%	110%	103%	90%	110%	98%	80%	120%
Chloride	6575839	6575839	3.35	3.35	0.0%	< 0.10	97%	90%	110%	102%	90%	110%	100%	80%	120%
Nitrate as N	6575839	6575839	<0.25	<0.25	0.0%	< 0.05	92%	90%	110%	100%	90%	110%	98%	80%	120%
Nitrite as N	6575839	6575839	<0.25	<0.25	0.0%	< 0.05	NA	90%	110%	95%	90%	110%	94%	80%	120%
Sulphate	6575839	6575839	96.9	96.2	0.7%	< 0.10	95%	90%	110%	101%	90%	110%	98%	80%	120%
Phosphate as P	6575839	6575839	<0.50	<0.50	0.0%	< 0.10	110%	90%	110%	90%	90%	110%	94%	80%	120%
Ammonia as N	6577184		0.66	0.65	1.5%	< 0.02	100%	90%	110%	100%	90%	110%	88%	80%	120%
Total Kjeldahl Nitrogen	6575800	6575800	0.17	0.21	21.1%	< 0.10	101%	80%	120%	99%	80%	120%	99%	70%	130%
Dissolved Organic Carbon	6575491	6575491	23.2	22.4	3.5%	< 0.5	107%	90%	110%	98%	90%	110%	98%	80%	120%
Calcium	6575782	6575782	102	101	0.2%	< 0.05	100%	90%	110%	100%	90%	110%	98%	70%	130%
Magnesium	6575800	6575800	26.3	26.3	0.2%	< 0.05	107%	90%	110%	104%	90%	110%	96%	70%	130%
Sodium	6575800	6575800	15.3	15.3	0.2%	< 0.05	106%	90%	110%	106%	90%	110%	100%	70%	130%
Potassium	6575800	6575800	6.10	6.13	0.6%	< 0.05	106%	90%	110%	103%	90%	110%	102%	70%	130%
Aluminum	6575491	6575491	0.004	0.004	0.0%	< 0.004	97%	90%	110%	101%	90%	110%	100%	70%	130%
Arsenic	6575491	6575491	< 0.003	< 0.003	0.0%	< 0.003	107%	90%	110%	105%	90%	110%	108%	70%	130%
Barium	6575491	6575491	0.079	0.071	10.7%	< 0.002	102%	90%	110%	105%	90%	110%	104%	70%	130%
Beryllium	6575491	6575491	< 0.001	< 0.001	0.0%	< 0.001	95%	90%	110%	95%	90%	110%	99%	70%	130%
Bismuth	6575491	6575491	< 0.002	< 0.002	0.0%	< 0.002	102%	90%	110%	104%	90%	110%	103%	70%	130%
Boron	6575491	6575491	1.67	1.64	1.8%	< 0.010	103%	90%	110%	106%	90%	110%	121%	70%	130%
Cadmium	6575491	6575491	< 0.002	< 0.002	0.0%	< 0.002	101%	90%	110%	103%	90%	110%	114%	70%	130%
Chromium	6575491	6575491	0.008	0.010	NA	< 0.003	106%	90%	110%	110%	90%	110%	111%	70%	130%
Cobalt	6575491	6575491	0.005	0.005	0.0%	< 0.001	96%	90%	110%	100%	90%	110%	99%	70%	130%
Copper	6575491	6575491	0.003	0.003	0.0%	< 0.003	107%	90%	110%	109%	90%	110%	104%	70%	130%
Iron	6575491	6575491	0.157	0.147	6.6%	< 0.010	109%	90%	110%	100%	90%	110%	100%	70%	130%
Lead	6575491	6575491	< 0.002	< 0.002	0.0%	< 0.002	99%	90%	110%	104%	90%	110%	102%	70%	130%
Manganese	6575491	6575491	0.788	0.738	6.6%	< 0.002	104%	90%	110%	105%	90%	110%	94%	70%	130%
Molybdenum	6575491	6575491	< 0.002	< 0.002	0.0%	< 0.002	101%	90%	110%	103%	90%	110%	104%	70%	130%
Nickel	6575491	6575491	0.043	0.040	7.2%	< 0.003	108%	90%	110%	103%	90%	110%	100%	70%	130%
Phosphorus	6575491	6575491	< 0.05	< 0.05	0.0%	< 0.05	102%	90%	110%	99%	90%	110%	103%	70%	130%
Selenium	6575491	6575491	< 0.004	< 0.004	0.0%	< 0.004	100%	90%	110%	102%	90%	110%	104%	70%	130%
Silicon	6575491	6575491	8.14	8.45	3.7%	< 0.05	107%	90%	110%	104%	90%	110%	107%	70%	130%
Silver	6575491	6575491	< 0.002	< 0.002	0.0%	< 0.002	100%	90%	110%	113%	90%	110%	109%	70%	130%
Strontium	6575491	6575491	2.25	2.11	6.4%	< 0.005	104%	90%	110%	100%	90%	110%	102%	70%	130%
Sulfur	6575782	6575782	49.2	50.5	2.6%	< 0.05	110%	90%	110%	109%	80%	130%	122%	70%	130%
Thallium	6575491	6575491	< 0.006	< 0.006	0.0%	< 0.006	101%	90%	110%	106%	90%	110%	99%	70%	130%

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Quality Assurance

CLIENT NAME: AMEC FOSTER WHEELER ENVIRO&INFRASTR

AGAT WORK ORDER: 15T976680

PROJECT: New Liskeard GW

ATTENTION TO: Emily Lemieux

SAMPLING SITE:

SAMPLED BY:

Water Analysis (Continued)

RPT Date: Jun 02, 2015			DUPLICATE				REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD	Method Blank	Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
Tin	6575491	6575491	< 0.002	< 0.002	0.0%	< 0.002	99%	90%	110%	100%	90%	110%	101%	70%	130%
Titanium	6575491	6575491	0.004	0.004	0.0%	< 0.002	107%	90%	110%	102%	90%	110%	106%	70%	130%
Uranium	6575491	6575491	< 0.002	< 0.002	0.0%	< 0.002	99%	90%	110%	99%	90%	110%	100%	70%	130%
Vanadium	6575491	6575491	< 0.002	< 0.002	0.0%	< 0.002	100%	90%	110%	101%	90%	110%	103%	70%	130%
Zinc	6575491	6575491	0.0060	0.0054	10.5%	< 0.005	102%	90%	110%	102%	90%	110%	103%	70%	130%

Comments: NA Signifies Not Applicable.
RPD Qualifier for Chromium: As the average value for the sample and a duplicate is less than 5X RDL, lab's RPD acceptance criteria is not applicable.
QA Qualifier for metals - Silver: For a multi-element scan up to 10% of analytes may exceed the quoted limits by up to 10% absolute.

New Liskeard Groundwater Package

pH	6575825	6575825	7.90	7.95	0.6%	NA	98%	90%	110%	NA			NA		
Alkalinity (as CaCO3)	6575825	6575825	477	472	1.1%	< 5	94%	80%	120%	NA			NA		
Electrical Conductivity	6575825	6575825	1250	1240	0.8%	< 2	103%	80%	120%	NA			NA		
Total Dissolved Solids	6576449	6576449	220	234	6.2%	< 20	90%	80%	120%	NA			NA		
Fluoride	6576532	6576532	1.22	1.07	13.1%	< 0.05	101%	90%	110%	103%	90%	110%	84%	80%	120%
Chloride	6576532	6576532	10.9	10.9	0.0%	< 0.10	96%	90%	110%	102%	90%	110%	101%	80%	120%
Nitrate as N	6576532	6576532	< 0.10	< 0.10	0.0%	< 0.05	93%	90%	110%	100%	90%	110%	101%	80%	120%
Nitrite as N	6576532	6576532	< 0.10	< 0.10	0.0%	< 0.05	NA	90%	110%	95%	90%	110%	93%	80%	120%
Sulphate	6576532	6576532	102	102	0.0%	< 0.10	96%	90%	110%	101%	90%	110%	100%	80%	120%
Phosphate as P	6576532	6576532	< 0.20	< 0.20	0.0%	< 0.10	100%	90%	110%	90%	90%	110%	92%	80%	120%
Ammonia as N	6575880	6575880	0.41	0.42	2.4%	< 0.02	93%	90%	110%	98%	90%	110%	89%	80%	120%
Total Kjeldahl Nitrogen	6576469	6576469	<0.10	<0.10	0.0%	< 0.10	98%	80%	120%	100%	80%	120%	96%	70%	130%
Dissolved Organic Carbon	6575892	6575892	2.3	2.4	4.3%	< 0.5	100%	90%	110%	106%	90%	110%	110%	80%	120%
Calcium	6576525	6576525	24.2	24.3	0.4%	< 0.05	100%	90%	110%	100%	90%	110%	98%	70%	130%
Magnesium	6576525	6576525	42.3	42.5	0.5%	< 0.05	106%	90%	110%	104%	90%	110%	93%	70%	130%
Sodium	6576525	6576525	34.1	33.9	0.6%	< 0.05	106%	90%	110%	105%	90%	110%	96%	70%	130%
Potassium	6576525	6576525	5.43	5.44	0.2%	< 0.05	105%	90%	110%	104%	90%	110%	99%	70%	130%
Aluminum	6576449	6576449	< 0.004	< 0.004	0.0%	< 0.004	94%	90%	110%	92%	90%	110%	102%	70%	130%
Arsenic	6576449	6576449	< 0.003	< 0.003	0.0%	< 0.003	105%	90%	110%	101%	90%	110%	103%	70%	130%
Barium	6576449	6576449	0.040	0.038	5.1%	< 0.002	106%	90%	110%	101%	90%	110%	101%	70%	130%
Beryllium	6576449	6576449	< 0.001	< 0.001	0.0%	< 0.001	93%	90%	110%	94%	90%	110%	97%	70%	130%
Bismuth	6576449	6576449	< 0.002	< 0.002	0.0%	< 0.002	98%	90%	110%	98%	90%	110%	98%	70%	130%
Boron	6576449	6576449	0.113	0.110	2.7%	< 0.010	98%	90%	110%	93%	90%	110%	102%	70%	130%
Cadmium	6576449	6576449	< 0.002	< 0.002	0.0%	< 0.002	103%	90%	110%	99%	90%	110%	111%	70%	130%
Chromium	6576449	6576449	< 0.003	< 0.003	0.0%	< 0.003	108%	90%	110%	106%	90%	110%	104%	70%	130%
Cobalt	6576449	6576449	< 0.001	< 0.001	0.0%	< 0.001	97%	90%	110%	96%	90%	110%	96%	70%	130%
Copper	6576449	6576449	< 0.003	< 0.003	0.0%	< 0.003	101%	90%	110%	108%	90%	110%	105%	70%	130%
Iron	6576449	6576449	0.157	0.156	0.6%	< 0.010	110%	90%	110%	98%	90%	110%	103%	70%	130%
Lead	6576449	6576449	< 0.002	< 0.002	0.0%	< 0.002	95%	90%	110%	100%	90%	110%	99%	70%	130%
Manganese	6576449	6576449	0.009	0.009	0.0%	< 0.002	104%	90%	110%	104%	90%	110%	102%	70%	130%

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AGAT WORK ORDER: 15T976680

PROJECT: New Liskeard GW

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SAMPLING SITE:

SAMPLED BY:

Water Analysis (Continued)

RPT Date: Jun 02, 2015			DUPLICATE				REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD	Method Blank	Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
Molybdenum	6576449	6576449	< 0.002	< 0.002	0.0%	< 0.002	102%	90%	110%	100%	90%	110%	100%	70%	130%
Nickel	6576449	6576449	< 0.003	< 0.003	0.0%	< 0.003	101%	90%	110%	103%	90%	110%	101%	70%	130%
Phosphorus	6576449	6576449	< 0.05	< 0.05	0.0%	< 0.05	99%	90%	110%	92%	90%	110%	101%	70%	130%
Selenium	6576449	6576449	< 0.004	< 0.004	0.0%	< 0.004	99%	90%	110%	99%	90%	110%	96%	70%	130%
Silicon	6576449	6576449	6.94	6.72	3.2%	< 0.05	107%	90%	110%	95%	90%	110%	100%	70%	130%
Silver	6576449	6576449	< 0.002	< 0.002	0.0%	< 0.002	101%	90%	110%	110%	90%	110%	107%	70%	130%
Strontium	6576449	6576449	0.654	0.629	3.9%	< 0.005	100%	90%	110%	102%	90%	110%	98%	70%	130%
Sulfur	6576494	6576494	84.0	83.9	0.1%	< 0.05	109%	90%	110%	109%	80%	130%	125%	70%	130%
Thallium	6576449	6576449	< 0.006	< 0.006	0.0%	< 0.006	98%	90%	110%	102%	90%	110%	99%	70%	130%
Tin	6576449	6576449	< 0.002	< 0.002	0.0%	< 0.002	99%	90%	110%	98%	90%	110%	101%	70%	130%
Titanium	6576449	6576449	< 0.002	< 0.002	0.0%	< 0.002	101%	90%	110%	99%	90%	110%	104%	70%	130%
Uranium	6576449	6576449	< 0.002	< 0.002	0.0%	< 0.002	98%	90%	110%	96%	90%	110%	99%	70%	130%
Vanadium	6576449	6576449	< 0.002	< 0.002	0.0%	< 0.002	101%	90%	110%	101%	90%	110%	102%	70%	130%
Zinc	6576449	6576449	0.006	0.006	0.0%	< 0.005	100%	90%	110%	99%	90%	110%	111%	70%	130%

Comments: NA signifies Not Applicable.

Certified By:

AGAT Laboratories

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QA Violation

CLIENT NAME: AMEC FOSTER WHEELER ENVIRO&INFRASTR

AGAT WORK ORDER: 15T976680

PROJECT: New Liskeard GW

ATTENTION TO: Emily Lemieux

RPT Date: Jun 02, 2015

PARAMETER	Sample Id	Sample Description	REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
			Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
				Lower	Upper		Lower	Upper		Lower	Upper
New Liskeard Groundwater Package											
Silver	6575491	OW-1R-1	100%	90%	110%	113%	90%	110%	109%	70%	130%

Comments: NA Signifies Not Applicable.
RPD Qualifier for Chromium: As the average value for the sample and a duplicate is less than 5X RDL, lab's RPD acceptance criteria is not applicable.
QA Qualifier for metals - Silver: For a multi-element scan up to 10% of analytes may exceed the quoted limits by up to 10% absolute.

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Method Summary

CLIENT NAME: AMEC FOSTER WHEELER ENVIRO&INFRASTR

AGAT WORK ORDER: 15T976680

PROJECT: New Liskeard GW

ATTENTION TO: Emily Lemieux

SAMPLING SITE:

SAMPLED BY:

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Water Analysis			
pH	INOR-93-6000	SM 4500-H+ B	PC TITRATE
Alkalinity (as CaCO3)	INOR-93-6000	SM 2320 B	PC TITRATE
Electrical Conductivity	INOR-93-6000	SM 2510 B	PC TITRATE
Total Hardness (as CaCO3)	MET-93-6105	EPA SW-846 6010C & 200.7	ICP/OES
Total Dissolved Solids	INOR-93-6028	SM 2540 C	BALANCE
Fluoride	INOR-93-6004	SM 4110 B	ION CHROMATOGRAPH
Chloride	INOR-93-6004	SM 4110 B	ION CHROMATOGRAPH
Nitrate as N	INOR-93-6004	SM 4110 B	ION CHROMATOGRAPH
Nitrite as N	INOR-93-6004	SM 4110 B	ION CHROMATOGRAPH
Sulphate	INOR-93-6004	SM 4110 B	ION CHROMATOGRAPH
Phosphate as P	INOR-93-6004	SM 4110 B	ION CHROMATOGRAPH
Ammonia as N	INOR-93-6002	AQ2 EPA-103A & SM 4500 NH3-F	AQ-2 DISCRETE ANALYZER
Total Kjeldahl Nitrogen	INOR-93-6048	QuikChem 10-107-06-2-I & SM 4500-Norg D	LACHAT FIA
Organic Nitrogen		SM 4500-Norg A	CALCULATION
Dissolved Organic Carbon	INOR-93-6049	EPA 415.1 & SM 5310 B	SHIMADZU CARBON ANALYZER
Calcium	MET-93-6105	EPA SW-846 6010C & 200.7	ICP/OES
Magnesium	MET-93-6105	EPA SW-846 6010C & 200.7	ICP/OES
Sodium	MET-93-6105	EPA SW-846 6010C & 200.7	ICP/OES
Potassium	MET-93-6105	EPA SW-846 6010C & 200.7	ICP/OES
Aluminum	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Arsenic	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Barium	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Beryllium	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Bismuth	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Boron	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Cadmium	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Chromium	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Cobalt	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Copper	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Iron	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Lead	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Manganese	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Molybdenum	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Nickel	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Phosphorus	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Selenium	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Silicon	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Silver	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Strontium	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Sulfur	MET-93-6105	EPA SW-846 6010C & 200.7	ICP/OES
Thallium	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Tin	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Titanium	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Uranium	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Vanadium	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Zinc	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
pH	INOR-93-6000	SM 4500-H+ B	PC TITRATE
Alkalinity (as CaCO3)	INOR-93-6000	SM 2320 B	PC TITRATE

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Method Summary

CLIENT NAME: AMEC FOSTER WHEELER ENVIRO&INFRASTR

AGAT WORK ORDER: 15T976680

PROJECT: New Liskeard GW

ATTENTION TO: Emily Lemieux

SAMPLING SITE:

SAMPLED BY:

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Electrical Conductivity	INOR-93-6000	SM 2510 B	PC TITRATE
Total Hardness (as CaCO3)	MET-93-6105	EPA SW-846 6010C & 200.7	ICP/OES
Fluoride	INOR-93-6004	SM 4110 B	ION CHROMATOGRAPH
Chloride	INOR-93-6004	SM 4110 B	ION CHROMATOGRAPH
Nitrate as N	INOR-93-6004	SM 4110 B	ION CHROMATOGRAPH
Nitrite as N	INOR-93-6004	SM 4110 B	ION CHROMATOGRAPH
Sulphate	INOR-93-6004	SM 4110 B	ION CHROMATOGRAPH
Phosphate as P	INOR-93-6004	SM 4110 B	ION CHROMATOGRAPH
Ammonia as N	INOR-93-6002	AQ2 EPA-103A & SM 4500 NH3-F	AQ-2 DISCRETE ANALYZER
Total Kjeldahl Nitrogen	INOR-93-6048	QuikChem 10-107-06-2-I & SM 4500-Norg D	LACHAT FIA
Organic Nitrogen		SM 4500-Norg A	CALCULATION
Dissolved Organic Carbon	INOR-93-6049	EPA 415.1 & SM 5310 B	SHIMADZU CARBON ANALYZER
Calcium	MET-93-6105	EPA SW-846 6010C & 200.7	ICP/OES
Magnesium	MET-93-6105	EPA SW-846 6010C & 200.7	ICP/OES
Sodium	MET-93-6105	EPA SW-846 6010C & 200.7	ICP/OES
Potassium	MET-93-6105	EPA SW-846 6010C & 200.7	ICP/OES
Aluminum	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Arsenic	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Barium	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Beryllium	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Bismuth	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Boron	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Cadmium	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Chromium	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Cobalt	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Copper	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Iron	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Lead	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Manganese	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Molybdenum	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Nickel	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Phosphorus	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Selenium	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Silicon	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Silver	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Strontium	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Sulfur	MET-93-6105	EPA SW-846 6010C & 200.7	ICP/OES
Thallium	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Tin	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Titanium	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Uranium	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Vanadium	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Zinc	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS

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CLIENT NAME: AMEC FOSTER WHEELER ENVIRO&INFRASTR
131 FIELDING ROAD
LIVELY, ON P3Y1L7
(705) 682-2632

ATTENTION TO: Emily Lemieux

PROJECT: New Liskeard Residential

AGAT WORK ORDER: 15T976676

WATER ANALYSIS REVIEWED BY: Sofka Pehlyova, Senior Analyst

DATE REPORTED: Jun 03, 2015

PAGES (INCLUDING COVER): 10

VERSION*: 1

Should you require any information regarding this analysis please contact your client services representative at (905) 712-5100

*NOTES

All samples will be disposed of within 30 days following analysis. Please contact the lab if you require additional sample storage time.

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Certificate of Analysis

AGAT WORK ORDER: 15T976676

PROJECT: New Liskeard Residential

CLIENT NAME: AMEC FOSTER WHEELER ENVIRO&INFRASTR

ATTENTION TO: Emily Lemieux

SAMPLING SITE:

SAMPLED BY:

New Liskeard - Groundwater Supply Wells Package

DATE RECEIVED: 2015-05-22

DATE REPORTED: 2015-06-03

		SAMPLE DESCRIPTION:		WS-7	WS-8	WS-13	WS-14	WS-15	WS-16	NL RES DUP
		SAMPLE TYPE:		Water	Water	Water	Water	Water	Water	Water
		DATE SAMPLED:		5/20/2015	5/20/2015	5/20/2015	5/20/2015	5/20/2015	5/21/2015	5/20/2015
Parameter	Unit	G / S	RDL	6574072	6574320	6574328	6574335	6574342	6574348	6574361
pH	pH Units	(6.5-8.5)	NA	7.94	7.88	7.76	7.83	7.95	7.78	7.95
Alkalinity (as CaCO3)	mg/L	(30-500)	5	309	297	265	310	264	341	295
Electrical Conductivity	uS/cm		2	671	692	525	596	680	661	708
Total Hardness (as CaCO3)	mg/L	(80-100)	0.5	323	342	265	291	287	334	339
Total Dissolved Solids	mg/L	500	20	354	378	280	302	384	328	366
Fluoride	mg/L	1.5	0.05	0.07	0.16	<0.05	0.37	0.79	0.18	0.15
Chloride	mg/L	250	0.10	15.1	28.7	2.93	1.38	7.75	1.98	28.6
Nitrate as N	mg/L	10.0	0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Nitrite as N	mg/L	1.0	0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Sulphate	mg/L	500	0.10	30.6	30.3	9.01	8.53	95.0	13.9	30.2
Phosphate as P	mg/L		0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Ammonia as N	mg/L		0.02	<0.02	0.06	<0.02	0.22	0.16	0.03	0.06
Total Kjeldahl Nitrogen	mg/L		0.10	<0.10	0.10	<0.10	0.23	0.17	<0.10	<0.10
Organic Nitrogen	mg/L	0.15	0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Dissolved Organic Carbon	mg/L	5	0.5	1.6	1.3	2.6	1.3	1.4	1.4	1.4
Calcium	mg/L		0.05	83.4	82.2	70.6	65.5	63.0	81.3	81.0
Magnesium	mg/L		0.05	27.9	33.3	21.5	30.9	31.4	31.8	33.2
Sodium	mg/L	20 (200)	0.05	15.0	7.66	4.92	11.2	28.1	7.23	7.64
Potassium	mg/L		0.05	1.77	2.28	0.99	3.10	3.86	2.06	2.24
Aluminum	mg/L	0.1	0.004	<0.004	<0.004	<0.004	<0.004	0.010	<0.004	<0.004
Arsenic	mg/L	0.025	0.003	<0.003	<0.003	<0.003	0.003	<0.003	0.004	<0.003
Barium	mg/L	1	0.002	0.060	0.060	0.016	0.079	0.052	0.088	0.061
Beryllium	mg/L		0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Bismuth	mg/L		0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Boron	mg/L	5	0.010	<0.010	0.014	0.022	0.083	0.330	0.030	0.015
Cadmium	mg/L	0.005	0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Chromium	mg/L	0.05	0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
Cobalt	mg/L		0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Copper	mg/L	1	0.003	0.005	<0.003	0.006	<0.003	0.004	0.009	<0.003
Iron	mg/L	0.3	0.010	2.12	1.27	<0.010	1.55	1.06	1.30	1.29

Certified By: Sofiya Pehlyova

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Certificate of Analysis

AGAT WORK ORDER: 15T976676

PROJECT: New Liskeard Residential

CLIENT NAME: AMEC FOSTER WHEELER ENVIRO&INFRASTR

ATTENTION TO: Emily Lemieux

SAMPLING SITE:

SAMPLED BY:

New Liskeard - Groundwater Supply Wells Package

DATE RECEIVED: 2015-05-22

DATE REPORTED: 2015-06-03

		SAMPLE DESCRIPTION:		WS-7	WS-8	WS-13	WS-14	WS-15	WS-16	NL RES DUP
		SAMPLE TYPE:		Water	Water	Water	Water	Water	Water	Water
		DATE SAMPLED:		5/20/2015	5/20/2015	5/20/2015	5/20/2015	5/20/2015	5/21/2015	5/20/2015
Parameter	Unit	G / S	RDL	6574072	6574320	6574328	6574335	6574342	6574348	6574361
Lead	mg/L	0.01	0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Manganese	mg/L	0.05	0.002	0.035	0.027	<0.002	0.015	0.026	0.018	0.027
Molybdenum	mg/L		0.002	<0.002	<0.002	<0.002	0.003	0.005	<0.002	<0.002
Nickel	mg/L		0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
Phosphorus	mg/L		0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Selenium	mg/L	0.01	0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004
Silicon	mg/L		0.05	7.14	9.61	4.78	4.92	5.89	5.32	9.52
Silver	mg/L		0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Strontium	mg/L		0.005	0.141	0.231	0.118	1.40	5.34	0.446	0.225
Sulfur	mg/L		0.05	9.74	9.94	3.04	3.02	28.2	4.52	9.96
Thallium	mg/L		0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006
Tin	mg/L		0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Titanium	mg/L		0.002	<0.002	<0.002	<0.002	<0.002	0.002	<0.002	<0.002
Uranium	mg/L	0.02	0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Vanadium	mg/L		0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Zinc	mg/L	5	0.005	0.037	<0.005	0.005	0.019	0.251	0.735	<0.005

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard: Refers to O.Reg.169/03(mg/L)

Certified By: Sofiya Pehlyova

AGAT Laboratories

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Guideline Violation

AGAT WORK ORDER: 15T976676

PROJECT: New Liskeard Residential

CLIENT NAME: AMEC FOSTER WHEELER ENVIRO&INFRASTR

ATTENTION TO: Emily Lemieux

SAMPLEID	SAMPLE TITLE	GUIDELINE	ANALYSIS PACKAGE	PARAMETER	GUIDEVALUE	RESULT
6574072	WS-7	O.Reg.169/03(mg/L)	New Liskeard - Groundwater Supply Wells Package	Iron	0.3	2.12
6574072	WS-7	O.Reg.169/03(mg/L)	New Liskeard - Groundwater Supply Wells Package	Total Hardness (as CaCO3)	(80-100)	323
6574320	WS-8	O.Reg.169/03(mg/L)	New Liskeard - Groundwater Supply Wells Package	Iron	0.3	1.27
6574320	WS-8	O.Reg.169/03(mg/L)	New Liskeard - Groundwater Supply Wells Package	Total Hardness (as CaCO3)	(80-100)	342
6574328	WS-13	O.Reg.169/03(mg/L)	New Liskeard - Groundwater Supply Wells Package	Total Hardness (as CaCO3)	(80-100)	265
6574335	WS-14	O.Reg.169/03(mg/L)	New Liskeard - Groundwater Supply Wells Package	Iron	0.3	1.55
6574335	WS-14	O.Reg.169/03(mg/L)	New Liskeard - Groundwater Supply Wells Package	Total Hardness (as CaCO3)	(80-100)	291
6574342	WS-15	O.Reg.169/03(mg/L)	New Liskeard - Groundwater Supply Wells Package	Iron	0.3	1.06
6574342	WS-15	O.Reg.169/03(mg/L)	New Liskeard - Groundwater Supply Wells Package	Sodium	20 (200)	28.1
6574342	WS-15	O.Reg.169/03(mg/L)	New Liskeard - Groundwater Supply Wells Package	Total Hardness (as CaCO3)	(80-100)	287
6574348	WS-16	O.Reg.169/03(mg/L)	New Liskeard - Groundwater Supply Wells Package	Iron	0.3	1.30
6574348	WS-16	O.Reg.169/03(mg/L)	New Liskeard - Groundwater Supply Wells Package	Total Hardness (as CaCO3)	(80-100)	334
6574361	NL RES DUP	O.Reg.169/03(mg/L)	New Liskeard - Groundwater Supply Wells Package	Iron	0.3	1.29
6574361	NL RES DUP	O.Reg.169/03(mg/L)	New Liskeard - Groundwater Supply Wells Package	Total Hardness (as CaCO3)	(80-100)	339

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Quality Assurance

CLIENT NAME: AMEC FOSTER WHEELER ENVIRO&INFRASTR

AGAT WORK ORDER: 15T976676

PROJECT: New Liskeard Residential

ATTENTION TO: Emily Lemieux

SAMPLING SITE:

SAMPLED BY:

Water Analysis

RPT Date: Jun 03, 2015

PARAMETER	Batch	Sample Id	DUPLICATE			Method Blank	REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
			Dup #1	Dup #2	RPD		Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
New Liskeard - Groundwater Supply Wells Package															
pH	6577749		7.87	7.89	0.3%	NA	99%	90%	110%	NA			NA		
Alkalinity (as CaCO3)	6577749		288	289	0.3%	< 5	94%	80%	120%	NA			NA		
Electrical Conductivity	6577749		576	589	2.2%	< 2	103%	80%	120%	NA			NA		
Total Dissolved Solids	6571855		558	564	1.1%	< 20	104%	80%	120%	NA			NA		
Fluoride	6573179		<0.25	<0.25	0.0%	< 0.05	97%	90%	110%	98%	90%	110%	98%	80%	120%
Chloride	6573179		6.64	6.62	0.3%	< 0.10	95%	90%	110%	104%	90%	110%	106%	80%	120%
Nitrate as N	6573179		<0.25	<0.25	0.0%	< 0.05	91%	90%	110%	101%	90%	110%	98%	80%	120%
Nitrite as N	6573179		<0.25	<0.25	0.0%	< 0.05	NA	90%	110%	96%	90%	110%	95%	80%	120%
Sulphate	6573179		110	111	0.9%	< 0.10	94%	90%	110%	102%	90%	110%	111%	80%	120%
Phosphate as P	6573179		<0.50	<0.50	0.0%	< 0.10	105%	90%	110%	104%	90%	110%	111%	80%	120%
Ammonia as N	6574320	6574320	0.06	0.06	0.0%	< 0.02	94%	90%	110%	99%	90%	110%	101%	80%	120%
Total Kjeldahl Nitrogen	6574361	6574361	<0.10	<0.10	0.0%	< 0.10	97%	80%	120%	97%	80%	120%	94%	70%	130%
Dissolved Organic Carbon	6575491		23.2	22.4	3.5%	< 0.5	107%	90%	110%	98%	90%	110%	98%	80%	120%
Calcium	6530166		82.8	81.9	1.1%	< 0.05	105%	90%	110%	104%	90%	110%	103%	70%	130%
Magnesium	6530166		31.4	31.5	0.3%	< 0.05	106%	90%	110%	108%	90%	110%	100%	70%	130%
Sodium	6530166		49.8	49.2	1.2%	< 0.05	104%	90%	110%	103%	90%	110%	103%	70%	130%
Potassium	6530166		1.22	1.20	1.7%	< 0.05	107%	90%	110%	106%	90%	110%	106%	70%	130%
Aluminum	6574072	6574072	<0.004	<0.004	0.0%	< 0.004	95%	90%	110%	100%	90%	110%	96%	70%	130%
Arsenic	6574072	6574072	<0.003	<0.003	0.0%	< 0.003	100%	90%	110%	101%	90%	110%	103%	70%	130%
Barium	6574072	6574072	0.060	0.059	1.7%	< 0.002	104%	90%	110%	108%	90%	110%	105%	70%	130%
Beryllium	6574072	6574072	<0.001	<0.001	0.0%	< 0.001	98%	90%	110%	102%	90%	110%	101%	70%	130%
Bismuth	6574072	6574072	<0.002	<0.002	0.0%	< 0.002	99%	90%	110%	99%	90%	110%	93%	70%	130%
Boron	6574072	6574072	<0.010	<0.010	0.0%	< 0.010	103%	90%	110%	106%	90%	110%	95%	70%	130%
Cadmium	6574072	6574072	<0.002	<0.002	0.0%	< 0.002	102%	90%	110%	108%	90%	110%	104%	70%	130%
Chromium	6574072	6574072	<0.003	<0.003	0.0%	< 0.003	104%	90%	110%	107%	90%	110%	103%	70%	130%
Cobalt	6574072	6574072	<0.001	<0.001	0.0%	< 0.001	96%	90%	110%	100%	90%	110%	95%	70%	130%
Copper	6574072	6574072	0.005	0.005	0.0%	< 0.003	96%	90%	110%	100%	90%	110%	90%	70%	130%
Iron	6574072	6574072	2.12	2.13	0.5%	< 0.010	106%	90%	110%	100%	90%	110%	102%	70%	130%
Lead	6574072	6574072	<0.002	<0.002	0.0%	< 0.002	98%	90%	110%	103%	90%	110%	98%	70%	130%
Manganese	6574072	6574072	0.035	0.035	0.0%	< 0.002	104%	90%	110%	108%	90%	110%	106%	70%	130%
Molybdenum	6574072	6574072	<0.002	<0.002	0.0%	< 0.002	100%	90%	110%	100%	90%	110%	110%	70%	130%
Nickel	6574072	6574072	<0.003	<0.003	0.0%	< 0.003	96%	90%	110%	100%	90%	110%	92%	70%	130%
Phosphorus	6574072	6574072	<0.05	<0.05	0.0%	< 0.05	98%	90%	110%	98%	90%	110%	104%	70%	130%
Selenium	6574072	6574072	<0.004	<0.004	0.0%	< 0.004	99%	90%	110%	104%	90%	110%	103%	70%	130%
Silicon	6574072	6574072	7.14	7.15	0.1%	< 0.05	104%	90%	110%	97%	90%	110%	93%	70%	130%
Silver	6574072	6574072	<0.002	<0.002	0.0%	< 0.002	98%	90%	110%	112%	90%	110%	111%	70%	130%
Strontium	6574072	6574072	0.141	0.139	1.4%	< 0.005	106%	90%	110%	107%	90%	110%	107%	70%	130%
Sulfur	6574072	6574072	9.74	9.83	0.9%	< 0.05	104%	90%	110%	107%	80%	130%	120%	70%	130%
Thallium	6574072	6574072	<0.006	<0.006	0.0%	< 0.006	97%	90%	110%	101%	90%	110%	97%	70%	130%

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Quality Assurance

CLIENT NAME: AMEC FOSTER WHEELER ENVIRO&INFRASTR
AGAT WORK ORDER: 15T976676
PROJECT: New Liskeard Residential
ATTENTION TO: Emily Lemieux
SAMPLING SITE:
SAMPLED BY:

Water Analysis (Continued)

RPT Date: Jun 03, 2015

PARAMETER	Batch	Sample Id	DUPLICATE			Method Blank	REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
			Dup #1	Dup #2	RPD		Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
Tin	6574072	6574072	<0.002	<0.002	0.0%	< 0.002	101%	90%	110%	107%	90%	110%	103%	70%	130%
Titanium	6574072	6574072	<0.002	<0.002	0.0%	< 0.002	103%	90%	110%	104%	90%	110%	102%	70%	130%
Uranium	6574072	6574072	<0.002	<0.002	0.0%	< 0.002	97%	90%	110%	100%	90%	110%	104%	70%	130%
Vanadium	6574072	6574072	<0.002	<0.002	0.0%	< 0.002	103%	90%	110%	105%	90%	110%	103%	70%	130%
Zinc	6574072	6574072	0.037	0.036	2.7%	< 0.005	102%	90%	110%	107%	90%	110%	102%	70%	130%

Comments: NA signifies Not Applicable.
QA Qualifier for metals - Silver: For a multi-element scan up to 10% of analytes may exceed the quoted limits by up to 10% absolute.

New Liskeard - Groundwater Supply Wells Package

Total Dissolved Solids	6574328	6574328	280	278	0.7%	< 20	104%	80%	120%	NA			NA		

Certified By: Sofiya Pehlyova

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QA Violation

CLIENT NAME: AMEC FOSTER WHEELER ENVIRO&INFRASTR

AGAT WORK ORDER: 15T976676

PROJECT: New Liskeard Residential

ATTENTION TO: Emily Lemieux

RPT Date: Jun 03, 2015

PARAMETER	Sample Id	Sample Description	REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
			Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
				Lower	Upper		Lower	Upper		Lower	Upper
New Liskeard - Groundwater Supply Wells Package											
Silver	6574072	WS-7	98%	90%	110%	112%	90%	110%	111%	70%	130%

Comments: NA signifies Not Applicable.
QA Qualifier for metals - Silver: For a multi-element scan up to 10% of analytes may exceed the quoted limits by up to 10% absolute.

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Method Summary

CLIENT NAME: AMEC FOSTER WHEELER ENVIRO&INFRASTR

AGAT WORK ORDER: 15T976676

PROJECT: New Liskeard Residential

ATTENTION TO: Emily Lemieux

SAMPLING SITE:

SAMPLED BY:

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Water Analysis			
pH	INOR-93-6000	SM 4500-H+ B	PC TITRATE
Alkalinity (as CaCO3)	INOR-93-6000	SM 2320 B	PC TITRATE
Electrical Conductivity	INOR-93-6000	SM 2510 B	PC TITRATE
Total Hardness (as CaCO3)	MET-93-6105	EPA SW-846 6010C & 200.7	ICP/OES
Total Dissolved Solids	INOR-93-6028	SM 2540 C	BALANCE
Fluoride	INOR-93-6004	SM 4110 B	ION CHROMATOGRAPH
Chloride	INOR-93-6004	SM 4110 B	ION CHROMATOGRAPH
Nitrate as N	INOR-93-6004	SM 4110 B	ION CHROMATOGRAPH
Nitrite as N	INOR-93-6004	SM 4110 B	ION CHROMATOGRAPH
Sulphate	INOR-93-6004	SM 4110 B	ION CHROMATOGRAPH
Phosphate as P	INOR-93-6004	SM 4110 B	ION CHROMATOGRAPH
Ammonia as N	INOR-93-6002	AQ2 EPA-103A & SM 4500 NH3-F	AQ-2 DISCRETE ANALYZER
Total Kjeldahl Nitrogen	INOR-93-6048	QuikChem 10-107-06-2-I & SM 4500-Norg D	LACHAT FIA
Organic Nitrogen		SM 4500-Norg A	CALCULATION
Dissolved Organic Carbon	INOR-93-6049	EPA 415.1 & SM 5310 B	SHIMADZU CARBON ANALYZER
Calcium	MET-93-6105	EPA SW-846 6010C & 200.7	ICP/OES
Magnesium	MET-93-6105	EPA SW-846 6010C & 200.7	ICP/OES
Sodium	MET-93-6105	EPA SW-846 6010C & 200.7	ICP/OES
Potassium	MET-93-6105	EPA SW-846 6010C & 200.7	ICP/OES
Aluminum	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Arsenic	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Barium	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Beryllium	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Bismuth	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Boron	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Cadmium	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Chromium	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Cobalt	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Copper	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Iron	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Lead	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Manganese	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Molybdenum	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Nickel	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Phosphorus	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Selenium	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Silicon	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Silver	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Strontium	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Sulfur	MET-93-6105	EPA SW-846 6010C & 200.7	ICP/OES
Thallium	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Tin	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Titanium	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Uranium	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Vanadium	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Zinc	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS

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CLIENT NAME: AMEC FOSTER WHEELER ENVIRO&INFRASTR
131 FIELDING ROAD
LIVELY, ON P3Y1L7
(705) 682-2632

ATTENTION TO: Emily Lemieux

PROJECT: New Liskeard GW

AGAT WORK ORDER: 15T998992

WATER ANALYSIS REVIEWED BY: Mike Muneswar, BSc (Chem), Senior Inorganic Analyst

DATE REPORTED: Aug 05, 2015

PAGES (INCLUDING COVER): 22

VERSION*: 1

Should you require any information regarding this analysis please contact your client services representative at (905) 712-5100

*NOTES

All samples will be disposed of within 30 days following analysis. Please contact the lab if you require additional sample storage time.

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Certificate of Analysis

AGAT WORK ORDER: 15T998992

PROJECT: New Liskeard GW

CLIENT NAME: AMEC FOSTER WHEELER ENVIRO&INFRASTR

ATTENTION TO: Emily Lemieux

SAMPLING SITE:

SAMPLED BY:

New Liskeard Groundwater Package

DATE RECEIVED: 2015-07-23

DATE REPORTED: 2015-08-05

		SAMPLE DESCRIPTION:		OW-1R-1		OW-1-R-III		OW-10-I		OW-10-II
		SAMPLE TYPE:		Water		Water		Water		Water
		DATE SAMPLED:		7/22/2015		7/22/2015		7/22/2015		7/22/2015
Parameter	Unit	G / S	RDL	6774914	RDL	6774996	RDL	6775021	RDL	6775028
pH	pH Units	(6.5-8.5)	NA	7.97	NA	7.87	NA	7.74	NA	8.03
Alkalinity (as CaCO3)	mg/L	(30-500)	5	912	5	976	5	267	5	262
Electrical Conductivity	uS/cm		2	2730	2	2840	2	868	2	744
Total Hardness (as CaCO3)	mg/L	(80-100)	0.5	980	0.5	927	0.5	465	0.5	384
Total Dissolved Solids	mg/L	500	20	1450	20	1540	20	548	20	426
Fluoride	mg/L	1.5	1.0	<1.0	1.0	<1.0	0.25	<0.25	0.25	<0.25
Chloride	mg/L	250	2.0	268	2.0	271	0.50	2.59	0.50	2.78
Nitrate as N	mg/L	10.0	1.0	<1.0	1.0	3.7	0.25	<0.25	0.25	<0.25
Nitrite as N	mg/L	1.0	1.0	<1.0	1.0	<1.0	0.25	<0.25	0.25	<0.25
Sulphate	mg/L	500	2.0	206	2.0	177	0.50	200	0.50	135
Phosphate as P	mg/L		2.0	<2.0	2.0	<2.0	0.50	<0.50	0.50	<0.50
Ammonia as N	mg/L		0.2	12.0	0.2	14.7	0.02	<0.02	0.02	<0.02
Total Kjeldahl Nitrogen	mg/L		0.50	17.2	0.10	17.6	0.10	0.29	0.10	0.16
Organic Nitrogen	mg/L		0.10	5.20	0.10	2.90	0.10	0.29	0.10	0.16
Dissolved Organic Carbon	mg/L	5	0.5	19.6	0.5	23.7	0.5	3.0	0.5	3.0
Calcium	mg/L		0.25	188	0.25	190	0.05	143	0.05	100
Magnesium	mg/L		0.25	124	0.25	110	0.05	26.1	0.05	32.5
Sodium	mg/L	20 (200)	0.25	186	0.25	177	0.05	2.10	0.05	4.30
Potassium	mg/L		0.25	89.6	0.25	94.9	0.05	1.37	0.05	4.35
Aluminum	mg/L	0.1	0.004	0.004	0.004	<0.004	0.004	<0.004	0.004	<0.004
Arsenic	mg/L	0.025	0.003	<0.003	0.003	<0.003	0.003	<0.003	0.003	<0.003
Barium	mg/L	1	0.002	0.070	0.002	0.099	0.002	0.020	0.002	0.029
Beryllium	mg/L		0.001	<0.001	0.001	<0.001	0.001	<0.001	0.001	<0.001
Bismuth	mg/L		0.002	<0.002	0.004	<0.004	0.002	<0.002	0.004	<0.004
Boron	mg/L	5	0.010	1.53	0.010	1.44	0.010	0.020	0.010	0.141
Cadmium	mg/L	0.005	0.002	<0.002	0.002	<0.002	0.002	<0.002	0.002	<0.002
Chromium	mg/L	0.05	0.003	0.006	0.003	0.007	0.003	<0.003	0.003	<0.003
Cobalt	mg/L		0.001	0.005	0.001	0.007	0.001	<0.001	0.001	<0.001
Copper	mg/L	1	0.003	0.005	0.003	0.010	0.003	<0.003	0.003	<0.003
Iron	mg/L	0.3	0.010	<0.010	0.010	<0.010	0.010	0.049	0.010	0.112

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Certificate of Analysis

AGAT WORK ORDER: 15T998992

PROJECT: New Liskeard GW

CLIENT NAME: AMEC FOSTER WHEELER ENVIRO&INFRASTR

ATTENTION TO: Emily Lemieux

SAMPLING SITE:

SAMPLED BY:

New Liskeard Groundwater Package

DATE RECEIVED: 2015-07-23

DATE REPORTED: 2015-08-05

		SAMPLE DESCRIPTION:		OW-1R-1		OW-1-R-III		OW-10-I		OW-10-II
		SAMPLE TYPE:		Water		Water		Water		Water
		DATE SAMPLED:		7/22/2015		7/22/2015		7/22/2015		7/22/2015
Parameter	Unit	G / S	RDL	6774914	RDL	6774996	RDL	6775021	RDL	6775028
Lead	mg/L	0.01	0.002	<0.002	0.002	<0.002	0.002	<0.002	0.002	<0.002
Manganese	mg/L	0.05	0.002	0.640	0.002	1.09	0.002	0.020	0.002	0.021
Molybdenum	mg/L		0.002	<0.002	0.002	<0.002	0.002	<0.002	0.002	<0.002
Nickel	mg/L		0.003	0.036	0.003	0.044	0.003	<0.003	0.003	<0.003
Phosphorus	mg/L		0.05	<0.05	0.05	<0.05	0.05	<0.05	0.05	<0.05
Selenium	mg/L	0.01	0.004	<0.004	0.004	<0.004	0.004	<0.004	0.004	<0.004
Silicon	mg/L		0.05	6.01	0.05	5.57	0.05	1.96	0.05	2.82
Silver	mg/L		0.002	<0.002	0.002	<0.002	0.002	<0.002	0.002	<0.002
Strontium	mg/L		0.005	2.12	0.005	1.06	0.005	0.200	0.005	0.943
Sulfur	mg/L		0.10	66.8	0.10	56.1	0.05	68.0	0.05	43.9
Thallium	mg/L		0.006	<0.006	0.006	<0.006	0.006	<0.006	0.006	<0.006
Tin	mg/L		0.002	<0.002	0.002	<0.002	0.002	<0.002	0.002	<0.002
Titanium	mg/L		0.002	0.003	0.002	0.003	0.002	0.003	0.002	0.002
Uranium	mg/L	0.02	0.002	<0.002	0.002	0.002	0.002	<0.002	0.002	<0.002
Vanadium	mg/L		0.002	<0.002	0.002	<0.002	0.002	<0.002	0.002	<0.002
Zinc	mg/L	5	0.005	0.007	0.005	0.006	0.005	0.005	0.005	<0.005

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Certificate of Analysis

AGAT WORK ORDER: 15T998992

PROJECT: New Liskeard GW

CLIENT NAME: AMEC FOSTER WHEELER ENVIRO&INFRASTR

ATTENTION TO: Emily Lemieux

SAMPLING SITE:

SAMPLED BY:

New Liskeard Groundwater Package

DATE RECEIVED: 2015-07-23

DATE REPORTED: 2015-08-05

		SAMPLE DESCRIPTION:		OW-11-II	OW-12-I		OW-12-II		OW13-I		OW-16-I
		SAMPLE TYPE:		Water	Water		Water		Water		Water
		DATE SAMPLED:		7/22/2015	7/22/2015		7/22/2015		7/22/2015		7/22/2015
Parameter	Unit	G / S	RDL	6775051	6775067	RDL	6775077	RDL	6775081	RDL	6775250
pH	pH Units	(6.5-8.5)	NA	8.11	7.98	NA	7.98	NA	8.05	NA	8.19
Alkalinity (as CaCO3)	mg/L	(30-500)	5	485	541	5	814	5	374	5	290
Electrical Conductivity	uS/cm		2	1060	1360	2	287	2	885	2	570
Total Hardness (as CaCO3)	mg/L	(80-100)	0.5	486	600	0.5	367	0.5	470	0.5	84.1
Total Dissolved Solids	mg/L	500	20	552	758	20	440	20	498	20	388
Fluoride	mg/L	1.5	0.25	<0.25	<0.25	0.50	<0.50	0.25	<0.25	0.10	1.62
Chloride	mg/L	250	0.50	28.6	49.8	1.00	38.4	0.50	3.28	0.20	5.90
Nitrate as N	mg/L	10.0	0.25	<0.25	<0.25	0.50	<0.50	0.25	<0.25	0.10	<0.10
Nitrite as N	mg/L	1.0	0.25	<0.25	<0.25	0.50	<0.50	0.25	<0.25	0.10	<0.10
Sulphate	mg/L	500	0.50	41.2	134	1.00	73.9	0.50	104	0.20	2.70
Phosphate as P	mg/L		0.50	<0.50	<0.50	1.00	<1.00	0.50	<0.50	0.20	<0.20
Ammonia as N	mg/L		0.02	0.06	0.03	0.02	<0.02	0.02	<0.02	0.02	1.34
Total Kjeldahl Nitrogen	mg/L		0.10	1.56	1.69	0.10	0.47	0.10	0.39	0.10	2.12
Organic Nitrogen	mg/L		0.10	1.50	1.66	0.10	0.47	0.10	0.39	0.10	0.78
Dissolved Organic Carbon	mg/L	5	0.5	5.6	8.6	0.5	2.6	0.5	2.0	0.5	9.4
Calcium	mg/L		0.10	124	180	0.10	86.4	0.05	121	0.05	13.9
Magnesium	mg/L		0.10	42.9	36.5	0.10	36.7	0.05	40.7	0.05	12.0
Sodium	mg/L	20 (200)	0.10	38.1	73.9	0.10	17.5	0.05	2.58	0.05	106
Potassium	mg/L		0.10	5.79	3.85	0.10	9.28	0.05	5.70	0.05	4.52
Aluminum	mg/L	0.1	0.004	0.019	<0.004	0.004	<0.004	0.004	<0.004	0.004	0.009
Arsenic	mg/L	0.025	0.003	<0.003	<0.003	0.003	<0.003	0.003	<0.003	0.003	<0.003
Barium	mg/L	1	0.002	0.027	0.044	0.002	0.055	0.002	0.039	0.002	0.034
Beryllium	mg/L		0.001	<0.001	<0.001	0.001	<0.001	0.001	<0.001	0.001	<0.001
Bismuth	mg/L		0.002	<0.002	<0.002	0.002	<0.002	0.002	<0.002	0.002	<0.002
Boron	mg/L	5	0.010	0.317	0.181	0.010	0.360	0.010	0.108	0.010	0.434
Cadmium	mg/L	0.005	0.002	<0.002	<0.002	0.002	<0.002	0.002	<0.002	0.002	<0.002
Chromium	mg/L	0.05	0.003	0.027	<0.003	0.003	<0.003	0.003	<0.003	0.003	<0.003
Cobalt	mg/L		0.001	<0.001	<0.001	0.001	<0.001	0.001	<0.001	0.001	<0.001
Copper	mg/L	1	0.003	<0.003	<0.003	0.003	<0.003	0.003	<0.003	0.003	<0.003
Iron	mg/L	0.3	0.010	0.195	0.387	0.010	<0.010	0.010	0.197	0.010	0.149

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Certificate of Analysis

AGAT WORK ORDER: 15T998992

PROJECT: New Liskeard GW

CLIENT NAME: AMEC FOSTER WHEELER ENVIRO&INFRASTR

ATTENTION TO: Emily Lemieux

SAMPLING SITE:

SAMPLED BY:

New Liskeard Groundwater Package

DATE RECEIVED: 2015-07-23

DATE REPORTED: 2015-08-05

		SAMPLE DESCRIPTION:		OW-11-II	OW-12-I		OW-12-II		OW13-I		OW-16-I
		SAMPLE TYPE:		Water	Water		Water		Water		Water
		DATE SAMPLED:		7/22/2015	7/22/2015		7/22/2015		7/22/2015		7/22/2015
Parameter	Unit	G / S	RDL	6775051	6775067	RDL	6775077	RDL	6775081	RDL	6775250
Lead	mg/L	0.01	0.002	<0.002	<0.002	0.002	<0.002	0.002	<0.002	0.002	<0.002
Manganese	mg/L	0.05	0.002	0.042	0.041	0.002	0.002	0.002	0.012	0.002	0.022
Molybdenum	mg/L		0.002	<0.002	<0.002	0.002	<0.002	0.002	<0.002	0.002	0.010
Nickel	mg/L		0.003	0.005	0.010	0.003	0.003	0.003	0.003	0.003	<0.003
Phosphorus	mg/L		0.05	<0.05	<0.05	0.05	<0.05	0.05	<0.05	0.05	0.05
Selenium	mg/L	0.01	0.004	<0.004	<0.004	0.004	<0.004	0.004	<0.004	0.004	<0.004
Silicon	mg/L		0.05	4.40	3.70	0.05	3.93	0.05	4.54	0.05	6.25
Silver	mg/L		0.002	<0.002	<0.002	0.002	<0.002	0.002	<0.002	0.002	<0.002
Strontium	mg/L		0.005	0.226	0.505	0.005	1.99	0.005	0.657	0.005	0.553
Sulfur	mg/L		0.05	13.0	40.9	0.05	25.2	0.05	35.1	0.05	1.33
Thallium	mg/L		0.006	<0.006	<0.006	0.006	<0.006	0.006	<0.006	0.006	<0.006
Tin	mg/L		0.002	<0.002	<0.002	0.002	<0.002	0.002	<0.002	0.002	<0.002
Titanium	mg/L		0.002	<0.002	0.002	0.002	<0.002	0.002	<0.002	0.002	<0.002
Uranium	mg/L	0.02	0.002	<0.002	<0.002	0.002	<0.002	0.002	<0.002	0.002	<0.002
Vanadium	mg/L		0.002	<0.002	<0.002	0.002	<0.002	0.002	<0.002	0.002	<0.002
Zinc	mg/L	5	0.005	0.006	0.007	0.005	0.006	0.005	0.007	0.005	<0.005

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Certificate of Analysis

AGAT WORK ORDER: 15T998992

PROJECT: New Liskeard GW

CLIENT NAME: AMEC FOSTER WHEELER ENVIRO&INFRASTR

ATTENTION TO: Emily Lemieux

SAMPLING SITE:

SAMPLED BY:

New Liskeard Groundwater Package

DATE RECEIVED: 2015-07-23

DATE REPORTED: 2015-08-05

		SAMPLE DESCRIPTION:		OW-16-11		OW-16-III		OW-17-I	OW-17-II		OW-17-III
		SAMPLE TYPE:		Water		Water		Water	Water		Water
		DATE SAMPLED:		7/22/2015		7/22/2015		7/22/2015	7/22/2015		7/22/2015
Parameter	Unit	G / S	RDL	6775582	RDL	6775589	RDL	6775597	6775604	RDL	6775617
pH	pH Units	(6.5-8.5)	NA	8.06	NA	8.10	NA	8.18	8.25	NA	8.13
Alkalinity (as CaCO3)	mg/L	(30-500)	5	171	5	452	5	235	298	5	319
Electrical Conductivity	uS/cm		2	603	2	853	2	486	706	2	605
Total Hardness (as CaCO3)	mg/L	(80-100)	0.5	138	0.5	424	0.5	246	222	0.5	340
Total Dissolved Solids	mg/L	500	20	332	20	426	20	254	368	20	320
Fluoride	mg/L	1.5	0.10	0.78	0.25	<0.25	0.10	0.19	1.19	0.20	<0.20
Chloride	mg/L	250	0.20	4.81	0.50	3.98	0.20	0.82	2.68	0.40	2.66
Nitrate as N	mg/L	10.0	0.10	0.15	0.25	<0.25	0.10	<0.10	<0.10	0.20	<0.20
Nitrite as N	mg/L	1.0	0.10	<0.10	0.25	<0.25	0.10	<0.10	<0.10	0.20	<0.20
Sulphate	mg/L	500	0.20	117	0.50	4.54	0.20	16.5	70.7	0.40	3.81
Phosphate as P	mg/L		0.20	<0.20	0.50	<0.50	0.20	<0.20	<0.20	0.40	<0.40
Ammonia as N	mg/L		0.02	0.02	0.02	0.68	0.02	0.07	0.08	0.02	<0.02
Total Kjeldahl Nitrogen	mg/L		0.10	0.40	0.10	1.31	0.10	<0.10	<0.10	0.10	0.39
Organic Nitrogen	mg/L		0.10	0.38	0.10	0.63	0.10	<0.10	<0.10	0.10	0.39
Dissolved Organic Carbon	mg/L	5	0.5	2.4	0.5	2.7	0.5	2.5	1.9	0.5	3.0
Calcium	mg/L		0.05	27.1	0.05	105	0.05	65.5	36.8	0.05	91.4
Magnesium	mg/L		0.05	17.2	0.05	39.2	0.05	19.9	31.7	0.05	27.2
Sodium	mg/L	20 (200)	0.05	68.5	0.05	12.2	0.05	4.91	66.8	0.05	5.85
Potassium	mg/L		0.05	7.80	0.05	9.65	0.05	3.29	4.39	0.05	0.66
Aluminum	mg/L	0.1	0.004	0.024	0.004	0.005	0.004	<0.004	<0.004	0.004	0.010
Arsenic	mg/L	0.025	0.003	<0.003	0.003	<0.003	0.003	<0.003	<0.003	0.003	<0.003
Barium	mg/L	1	0.002	0.026	0.002	0.068	0.002	0.027	0.040	0.002	0.015
Beryllium	mg/L		0.001	<0.001	0.001	<0.001	0.001	<0.001	<0.001	0.001	<0.001
Bismuth	mg/L		0.002	<0.002	0.002	<0.002	0.002	<0.002	<0.002	0.002	<0.002
Boron	mg/L	5	0.010	0.178	0.010	0.025	0.010	0.028	0.117	0.010	0.014
Cadmium	mg/L	0.005	0.002	<0.002	0.002	<0.002	0.002	<0.002	<0.002	0.002	<0.002
Chromium	mg/L	0.05	0.003	0.015	0.003	<0.003	0.003	<0.003	<0.003	0.003	0.003
Cobalt	mg/L		0.001	<0.001	0.001	<0.001	0.001	<0.001	<0.001	0.001	<0.001
Copper	mg/L	1	0.003	<0.003	0.003	<0.003	0.003	<0.003	<0.003	0.003	<0.003
Iron	mg/L	0.3	0.010	<0.010	0.010	0.804	0.010	0.371	<0.010	0.010	<0.010

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Certificate of Analysis

AGAT WORK ORDER: 15T998992

PROJECT: New Liskeard GW

CLIENT NAME: AMEC FOSTER WHEELER ENVIRO&INFRASTR

ATTENTION TO: Emily Lemieux

SAMPLING SITE:

SAMPLED BY:

New Liskeard Groundwater Package

DATE RECEIVED: 2015-07-23

DATE REPORTED: 2015-08-05

SAMPLE DESCRIPTION:				OW-16-11		OW-16-III		OW-17-I	OW-17-II		OW-17-III
SAMPLE TYPE:				Water		Water		Water	Water		Water
DATE SAMPLED:				7/22/2015		7/22/2015		7/22/2015	7/22/2015		7/22/2015
Parameter	Unit	G / S	RDL	6775582	RDL	6775589	RDL	6775597	6775604	RDL	6775617
Lead	mg/L	0.01	0.002	<0.002	0.002	<0.002	0.002	<0.002	<0.002	0.002	<0.002
Manganese	mg/L	0.05	0.002	0.003	0.002	0.069	0.002	0.024	<0.002	0.002	0.024
Molybdenum	mg/L		0.002	0.027	0.002	<0.002	0.002	<0.002	0.014	0.002	<0.002
Nickel	mg/L		0.003	<0.003	0.003	<0.003	0.003	<0.003	<0.003	0.003	<0.003
Phosphorus	mg/L		0.05	<0.05	0.05	0.14	0.05	<0.05	<0.05	0.05	<0.05
Selenium	mg/L	0.01	0.004	<0.004	0.004	0.005	0.004	<0.004	<0.004	0.004	<0.004
Silicon	mg/L		0.05	2.53	0.05	6.19	0.05	6.63	3.16	0.05	5.36
Silver	mg/L		0.002	<0.002	0.002	<0.002	0.002	<0.002	<0.002	0.002	<0.002
Strontium	mg/L		0.005	0.593	0.005	0.763	0.005	0.499	2.99	0.005	0.122
Sulfur	mg/L		0.05	40.2	0.05	4.58	0.05	5.31	22.5	0.05	0.97
Thallium	mg/L		0.006	<0.006	0.006	<0.006	0.006	<0.006	<0.006	0.006	<0.006
Tin	mg/L		0.002	<0.002	0.002	<0.002	0.002	<0.002	<0.002	0.002	<0.002
Titanium	mg/L		0.002	0.002	0.002	<0.002	0.002	<0.002	<0.002	0.002	<0.002
Uranium	mg/L	0.02	0.002	0.003	0.002	<0.002	0.002	<0.002	0.004	0.002	<0.002
Vanadium	mg/L		0.002	<0.002	0.002	<0.002	0.002	<0.002	<0.002	0.002	<0.002
Zinc	mg/L	5	0.005	0.007	0.005	<0.005	0.005	<0.005	<0.005	0.005	0.005

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Certificate of Analysis

AGAT WORK ORDER: 15T998992

PROJECT: New Liskeard GW

CLIENT NAME: AMEC FOSTER WHEELER ENVIRO&INFRASTR

ATTENTION TO: Emily Lemieux

SAMPLING SITE:

SAMPLED BY:

New Liskeard Groundwater Package

DATE RECEIVED: 2015-07-23

DATE REPORTED: 2015-08-05

		SAMPLE DESCRIPTION:		OW-23-I		OW-23-II	OW-24-I	OW-24-II	OW-24-III	OW-25-I
		SAMPLE TYPE:		Water		Water	Water	Water	Water	Water
		DATE SAMPLED:		7/22/2015		7/22/2015	7/22/2015	7/22/2015	7/22/2015	7/22/2015
Parameter	Unit	G / S	RDL	6775632	RDL	6775762	6775770	6775779	6775787	6775794
pH	pH Units	(6.5-8.5)	NA	8.17	NA	8.20	8.17	8.24	8.17	8.15
Alkalinity (as CaCO3)	mg/L	(30-500)	5	219	5	221	241	282	252	231
Electrical Conductivity	uS/cm		2	441	2	666	501	605	519	454
Total Hardness (as CaCO3)	mg/L	(80-100)	0.5	99.5	0.5	142	227	266	300	177
Total Dissolved Solids	mg/L	500	20	226	20	352	242	302	316	240
Fluoride	mg/L	1.5	0.05	1.41	0.10	1.13	0.28	0.79	0.15	0.46
Chloride	mg/L	250	0.10	2.03	0.20	10.2	2.73	12.6	3.70	1.48
Nitrate as N	mg/L	10.0	0.05	<0.05	0.10	0.17	<0.10	0.13	1.37	<0.10
Nitrite as N	mg/L	1.0	0.05	<0.05	0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Sulphate	mg/L	500	0.10	5.24	0.20	97.2	21.2	18.7	9.61	6.11
Phosphate as P	mg/L		0.10	<0.10	0.20	<0.20	<0.20	<0.20	<0.20	<0.20
Ammonia as N	mg/L		0.02	0.63	0.02	<0.02	0.09	0.06	0.37	0.22
Total Kjeldahl Nitrogen	mg/L		0.10	0.83	0.10	0.21	0.40	0.16	1.28	0.61
Organic Nitrogen	mg/L		0.10	0.20	0.10	0.21	0.31	0.10	0.91	0.39
Dissolved Organic Carbon	mg/L	5	0.5	3.1	0.5	2.3	3.3	3.2	2.6	3.2
Calcium	mg/L		0.05	15.1	0.05	22.5	57.1	49.3	85.5	39.0
Magnesium	mg/L		0.05	15.0	0.05	20.9	20.6	34.7	21.0	19.3
Sodium	mg/L	20 (200)	0.05	57.2	0.05	86.0	16.7	21.4	6.54	27.5
Potassium	mg/L		0.05	3.00	0.05	4.15	4.01	9.56	1.15	3.87
Aluminum	mg/L	0.1	0.004	0.005	0.004	0.018	0.027	0.005	0.004	0.005
Arsenic	mg/L	0.025	0.003	<0.003	0.003	<0.003	<0.003	<0.003	<0.003	<0.003
Barium	mg/L	1	0.002	0.022	0.002	0.023	0.024	0.046	0.023	0.041
Beryllium	mg/L		0.001	<0.001	0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Bismuth	mg/L		0.002	<0.002	0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Boron	mg/L	5	0.010	0.298	0.010	0.309	0.039	0.075	0.011	0.127
Cadmium	mg/L	0.005	0.002	<0.002	0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Chromium	mg/L	0.05	0.003	<0.003	0.003	0.009	<0.003	<0.003	<0.003	<0.003
Cobalt	mg/L		0.001	<0.001	0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Copper	mg/L	1	0.003	<0.003	0.003	<0.003	<0.003	<0.003	<0.003	<0.003
Iron	mg/L	0.3	0.010	0.014	0.010	<0.010	0.802	0.148	<0.010	0.151

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Certificate of Analysis

AGAT WORK ORDER: 15T998992

PROJECT: New Liskeard GW

CLIENT NAME: AMEC FOSTER WHEELER ENVIRO&INFRASTR

ATTENTION TO: Emily Lemieux

SAMPLING SITE:

SAMPLED BY:

New Liskeard Groundwater Package

DATE RECEIVED: 2015-07-23

DATE REPORTED: 2015-08-05

		SAMPLE DESCRIPTION:		OW-23-I		OW-23-II	OW-24-I	OW-24-II	OW-24-III	OW-25-I
		SAMPLE TYPE:		Water		Water	Water	Water	Water	Water
		DATE SAMPLED:		7/22/2015		7/22/2015	7/22/2015	7/22/2015	7/22/2015	7/22/2015
Parameter	Unit	G / S	RDL	6775632	RDL	6775762	6775770	6775779	6775787	6775794
Lead	mg/L	0.01	0.002	<0.002	0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Manganese	mg/L	0.05	0.002	0.008	0.002	0.003	0.061	0.126	0.037	0.024
Molybdenum	mg/L		0.002	0.013	0.002	0.035	0.009	0.018	<0.002	<0.002
Nickel	mg/L		0.003	<0.003	0.003	<0.003	<0.003	<0.003	<0.003	<0.003
Phosphorus	mg/L		0.05	<0.05	0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Selenium	mg/L	0.01	0.004	<0.004	0.004	<0.004	<0.004	<0.004	<0.004	<0.004
Silicon	mg/L		0.05	3.66	0.05	2.41	5.39	5.41	4.58	6.35
Silver	mg/L		0.002	<0.002	0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Strontium	mg/L		0.005	0.535	0.005	0.750	0.321	0.754	0.137	0.730
Sulfur	mg/L		0.05	5.29	0.05	31.6	6.01	4.69	2.75	0.54
Thallium	mg/L		0.006	<0.006	0.006	<0.006	<0.006	<0.006	<0.006	<0.006
Tin	mg/L		0.002	<0.002	0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Titanium	mg/L		0.002	<0.002	0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Uranium	mg/L	0.02	0.002	<0.002	0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Vanadium	mg/L		0.002	<0.002	0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Zinc	mg/L	5	0.005	<0.005	0.005	<0.005	<0.005	<0.005	0.006	<0.005

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Certificate of Analysis

AGAT WORK ORDER: 15T998992

PROJECT: New Liskeard GW

CLIENT NAME: AMEC FOSTER WHEELER ENVIRO&INFRASTR

ATTENTION TO: Emily Lemieux

SAMPLING SITE:

SAMPLED BY:

New Liskeard Groundwater Package

DATE RECEIVED: 2015-07-23

DATE REPORTED: 2015-08-05

		SAMPLE DESCRIPTION:		OW-25-II	OW-25-III	OW-30-14-III	OW-30-14-II		NL GW DUP-1	NL GW DUP-2	NL GW DUP-3
		SAMPLE TYPE:		Water	Water	Water	Water		Water	Water	Water
		DATE SAMPLED:		7/22/2015	7/22/2015	7/22/2015	7/22/2015		7/22/2015	7/22/2015	7/22/2015
Parameter	Unit	G / S	RDL	6775801	6775808	6775818	6775826	RDL	6775835	6775936	6775945
pH	pH Units	(6.5-8.5)	NA	8.04	8.20	8.06	8.04	NA	8.23	8.14	8.22
Alkalinity (as CaCO3)	mg/L	(30-500)	5	147	332	168	124	5	232	240	221
Electrical Conductivity	uS/cm		2	836	792	685	812	2	456	488	676
Total Hardness (as CaCO3)	mg/L	(80-100)	0.5	145	364	102	146	0.5	176	246	145
Total Dissolved Solids	mg/L	500	20	462	432	466	490	20	238	254	332
Fluoride	mg/L	1.5	0.25	0.65	0.66	0.61	1.31	0.10	0.46	0.20	1.02
Chloride	mg/L	250	0.50	10.2	1.03	8.84	18.7	0.20	1.39	0.76	10.7
Nitrate as N	mg/L	10.0	0.25	<0.25	<0.25	<0.25	<0.25	0.10	<0.10	<0.10	0.19
Nitrite as N	mg/L	1.0	0.25	<0.25	<0.25	<0.25	<0.25	0.10	<0.10	<0.10	<0.10
Sulphate	mg/L	500	0.50	237	96.6	165	245	0.20	4.32	16.5	102
Phosphate as P	mg/L		0.50	<0.50	<0.50	<0.50	<0.50	0.20	<0.20	<0.20	<0.20
Ammonia as N	mg/L		0.02	<0.02	<0.02	0.22	0.25	0.02	0.31	0.02	<0.02
Total Kjeldahl Nitrogen	mg/L		0.10	0.86	0.23	0.76	0.90	0.10	0.54	0.10	0.21
Organic Nitrogen	mg/L		0.10	0.86	0.23	0.54	0.65	0.10	0.23	<0.10	0.21
Dissolved Organic Carbon	mg/L	5	0.5	5.3	1.5	3.1	2.9	0.5	2.9	2.8	2.2
Calcium	mg/L		0.05	27.1	83.3	17.3	24.3	0.05	38.4	65.7	23.1
Magnesium	mg/L		0.05	18.7	38.0	14.2	20.8	0.05	19.4	19.9	21.1
Sodium	mg/L	20 (200)	0.05	110	29.7	112	112	0.05	27.8	4.90	85.6
Potassium	mg/L		0.05	8.11	4.89	6.29	11.8	0.05	3.95	3.27	4.17
Aluminum	mg/L	0.1	0.004	0.151	<0.004	0.007	0.010	0.004	0.006	0.007	0.052
Arsenic	mg/L	0.025	0.003	<0.003	<0.003	<0.003	<0.003	0.003	<0.003	<0.003	<0.003
Barium	mg/L	1	0.002	0.023	0.036	0.023	0.032	0.002	0.040	0.029	0.028
Beryllium	mg/L		0.001	<0.001	<0.001	<0.001	<0.001	0.001	<0.001	<0.001	<0.001
Bismuth	mg/L		0.002	<0.002	<0.002	<0.002	<0.002	0.002	<0.002	<0.002	<0.002
Boron	mg/L	5	0.010	0.176	0.027	0.162	0.375	0.010	0.125	0.032	0.349
Cadmium	mg/L	0.005	0.002	<0.002	<0.002	<0.002	<0.002	0.002	<0.002	<0.002	<0.002
Chromium	mg/L	0.05	0.003	<0.003	<0.003	<0.003	<0.003	0.003	<0.003	<0.003	0.016
Cobalt	mg/L		0.001	<0.001	<0.001	<0.001	<0.001	0.001	<0.001	<0.001	<0.001
Copper	mg/L	1	0.003	<0.003	<0.003	0.043	<0.003	0.003	<0.003	<0.003	<0.003
Iron	mg/L	0.3	0.010	0.217	<0.010	<0.010	0.030	0.010	0.164	0.379	<0.010

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Certificate of Analysis

AGAT WORK ORDER: 15T998992

PROJECT: New Liskeard GW

CLIENT NAME: AMEC FOSTER WHEELER ENVIRO&INFRASTR

ATTENTION TO: Emily Lemieux

SAMPLING SITE:

SAMPLED BY:

New Liskeard Groundwater Package

DATE RECEIVED: 2015-07-23

DATE REPORTED: 2015-08-05

		SAMPLE DESCRIPTION:		OW-25-II	OW-25-III	OW-30-14-III	OW-30-14-II		NL GW DUP-1	NL GW DUP-2	NL GW DUP-3
		SAMPLE TYPE:		Water	Water	Water	Water		Water	Water	Water
		DATE SAMPLED:		7/22/2015	7/22/2015	7/22/2015	7/22/2015		7/22/2015	7/22/2015	7/22/2015
Parameter	Unit	G / S	RDL	6775801	6775808	6775818	6775826	RDL	6775835	6775936	6775945
Lead	mg/L	0.01	0.002	<0.002	<0.002	0.002	<0.002	0.002	<0.002	<0.002	<0.002
Manganese	mg/L	0.05	0.002	0.010	<0.002	0.027	0.013	0.002	0.024	0.025	0.005
Molybdenum	mg/L		0.002	0.068	0.007	0.061	0.069	0.002	0.003	<0.002	0.037
Nickel	mg/L		0.003	<0.003	<0.003	<0.003	<0.003	0.003	<0.003	<0.003	<0.003
Phosphorus	mg/L		0.05	<0.05	<0.05	<0.05	<0.05	0.05	<0.05	<0.05	<0.05
Selenium	mg/L	0.01	0.004	<0.004	<0.004	<0.004	<0.004	0.004	<0.004	<0.004	<0.004
Silicon	mg/L		0.05	2.79	4.89	2.69	2.08	0.05	6.27	7.00	3.16
Silver	mg/L		0.002	<0.002	<0.002	<0.002	<0.002	0.002	<0.002	<0.002	<0.002
Strontium	mg/L		0.005	0.595	1.76	0.325	0.827	0.005	0.818	0.505	0.718
Sulfur	mg/L		0.05	81.4	28.2	54.9	85.4	0.05	0.63	5.27	32.5
Thallium	mg/L		0.006	<0.006	<0.006	<0.006	<0.006	0.006	<0.006	<0.006	<0.006
Tin	mg/L		0.002	<0.002	<0.002	<0.002	<0.002	0.002	<0.002	<0.002	<0.002
Titanium	mg/L		0.002	0.011	<0.002	0.003	0.004	0.002	<0.002	<0.002	0.003
Uranium	mg/L	0.02	0.002	0.003	0.004	0.005	<0.002	0.002	<0.002	<0.002	<0.002
Vanadium	mg/L		0.002	<0.002	<0.002	<0.002	<0.002	0.002	<0.002	<0.002	<0.002
Zinc	mg/L	5	0.005	0.005	<0.005	0.036	<0.005	0.005	<0.005	0.008	0.006

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard: Refers to O.Reg.169/03(mg/L)

6774914-6775945 Samples required dilution prior to analysis in order to keep the analytes within the calibration range of the instruments and/or to minimize any matrix interferences; the RDLs were adjusted to reflect the dilution.

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Certificate of Analysis

AGAT WORK ORDER: 15T998992

PROJECT: New Liskeard GW

CLIENT NAME: AMEC FOSTER WHEELER ENVIRO&INFRASTR

ATTENTION TO: Emily Lemieux

SAMPLING SITE:

SAMPLED BY:

New Liskeard Groundwater Package (Partial)

DATE RECEIVED: 2015-07-23

DATE REPORTED: 2015-08-05

		SAMPLE DESCRIPTION:		OW11-I
		SAMPLE TYPE:		Water
		DATE SAMPLED:		7/22/2015
Parameter	Unit	G / S	RDL	6775039
pH	pH Units	(6.5-8.5)	NA	8.15
Alkalinity (as CaCO3)	mg/L	(30-500)	5	228
Electrical Conductivity	uS/cm		2	590
Total Hardness (as CaCO3)	mg/L	(80-100)	0.5	286
Total Dissolved Solids	mg/L	500	20	334
Fluoride	mg/L	1.5	0.10	<0.10
Chloride	mg/L	250	0.20	9.88
Nitrate as N	mg/L	10.0	0.10	0.54
Nitrite as N	mg/L	1.0	0.10	<0.10
Sulphate	mg/L	500	0.20	71.5
Phosphate as P	mg/L		0.20	<0.20
Ammonia as N	mg/L		0.02	<0.02
Total Kjeldahl Nitrogen	mg/L		0.10	0.59
Organic Nitrogen	mg/L		0.10	0.59
Dissolved Organic Carbon	mg/L	5	0.5	1.4
Calcium	mg/L		0.05	68.4
Magnesium	mg/L		0.05	27.9
Sodium	mg/L	20 (200)	0.05	17.8
Potassium	mg/L		0.05	7.09
Aluminum	mg/L	0.1	0.004	<0.004
Arsenic	mg/L	0.025	0.003	<0.003
Barium	mg/L	1	0.002	0.030
Beryllium	mg/L		0.001	<0.001
Bismuth	mg/L		0.004	<0.004
Boron	mg/L	5	0.010	0.231
Cadmium	mg/L	0.005	0.002	<0.002
Chromium	mg/L	0.05	0.003	<0.003
Cobalt	mg/L		0.001	<0.001
Copper	mg/L	1	0.003	<0.003
Iron	mg/L	0.3	0.010	<0.010

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Certificate of Analysis

AGAT WORK ORDER: 15T998992

PROJECT: New Liskeard GW

CLIENT NAME: AMEC FOSTER WHEELER ENVIRO&INFRASTR

ATTENTION TO: Emily Lemieux

SAMPLING SITE:

SAMPLED BY:

New Liskeard Groundwater Package (Partial)

DATE RECEIVED: 2015-07-23

DATE REPORTED: 2015-08-05

		SAMPLE DESCRIPTION:		OW11-I
		SAMPLE TYPE:		Water
		DATE SAMPLED:		7/22/2015
Parameter	Unit	G / S	RDL	6775039
Lead	mg/L	0.01	0.002	<0.002
Manganese	mg/L	0.05	0.002	0.005
Molybdenum	mg/L		0.002	<0.002
Nickel	mg/L		0.003	<0.003
Phosphorus	mg/L		0.05	<0.05
Selenium	mg/L	0.01	0.004	<0.004
Silicon	mg/L		0.05	2.81
Silver	mg/L		0.002	<0.002
Strontium	mg/L		0.005	1.82
Sulfur	mg/L		0.05	24.6
Thallium	mg/L		0.006	<0.006
Tin	mg/L		0.002	<0.002
Titanium	mg/L		0.002	<0.002
Uranium	mg/L	0.02	0.002	<0.002
Vanadium	mg/L		0.002	<0.002
Zinc	mg/L	5	0.005	<0.005

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard: Refers to O.Reg.169/03(mg/L)

6775039 Samples required dilution prior to analysis in order to keep the analytes within the calibration range of the instruments and/or to minimize any matrix interferences; the RDLs were adjusted to reflect the dilution.

Certified By:

AGAT Laboratories

Guideline Violation

AGAT WORK ORDER: 15T998992

PROJECT: New Liskeard GW

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CLIENT NAME: AMEC FOSTER WHEELER ENVIRO&INFRASTR

ATTENTION TO: Emily Lemieux

SAMPLEID	SAMPLE TITLE	GUIDELINE	ANALYSIS PACKAGE	PARAMETER	GUIDEVALUE	RESULT
6774914	OW-1R-1	O.Reg.169/03(mg/L)	New Liskeard Groundwater Package	Alkalinity (as CaCO3)	(30-500)	912
6774914	OW-1R-1	O.Reg.169/03(mg/L)	New Liskeard Groundwater Package	Chloride	250	268
6774914	OW-1R-1	O.Reg.169/03(mg/L)	New Liskeard Groundwater Package	Dissolved Organic Carbon	5	19.6
6774914	OW-1R-1	O.Reg.169/03(mg/L)	New Liskeard Groundwater Package	Manganese	0.05	0.640
6774914	OW-1R-1	O.Reg.169/03(mg/L)	New Liskeard Groundwater Package	Sodium	20 (200)	186
6774914	OW-1R-1	O.Reg.169/03(mg/L)	New Liskeard Groundwater Package	Total Dissolved Solids	500	1450
6774914	OW-1R-1	O.Reg.169/03(mg/L)	New Liskeard Groundwater Package	Total Hardness (as CaCO3)	(80-100)	980
6774996	OW-1-R-III	O.Reg.169/03(mg/L)	New Liskeard Groundwater Package	Alkalinity (as CaCO3)	(30-500)	976
6774996	OW-1-R-III	O.Reg.169/03(mg/L)	New Liskeard Groundwater Package	Chloride	250	271
6774996	OW-1-R-III	O.Reg.169/03(mg/L)	New Liskeard Groundwater Package	Dissolved Organic Carbon	5	23.7
6774996	OW-1-R-III	O.Reg.169/03(mg/L)	New Liskeard Groundwater Package	Manganese	0.05	1.09
6774996	OW-1-R-III	O.Reg.169/03(mg/L)	New Liskeard Groundwater Package	Sodium	20 (200)	177
6774996	OW-1-R-III	O.Reg.169/03(mg/L)	New Liskeard Groundwater Package	Total Dissolved Solids	500	1540
6774996	OW-1-R-III	O.Reg.169/03(mg/L)	New Liskeard Groundwater Package	Total Hardness (as CaCO3)	(80-100)	927
6775021	OW-10-I	O.Reg.169/03(mg/L)	New Liskeard Groundwater Package	Total Dissolved Solids	500	548
6775021	OW-10-I	O.Reg.169/03(mg/L)	New Liskeard Groundwater Package	Total Hardness (as CaCO3)	(80-100)	465
6775028	OW-10-II	O.Reg.169/03(mg/L)	New Liskeard Groundwater Package	Total Hardness (as CaCO3)	(80-100)	384
6775039	OW11-I	O.Reg.169/03(mg/L)	New Liskeard Groundwater Package (Partial)	Total Hardness (as CaCO3)	(80-100)	286
6775051	OW-11-II	O.Reg.169/03(mg/L)	New Liskeard Groundwater Package	Dissolved Organic Carbon	5	5.6
6775051	OW-11-II	O.Reg.169/03(mg/L)	New Liskeard Groundwater Package	Sodium	20 (200)	38.1
6775051	OW-11-II	O.Reg.169/03(mg/L)	New Liskeard Groundwater Package	Total Dissolved Solids	500	552
6775051	OW-11-II	O.Reg.169/03(mg/L)	New Liskeard Groundwater Package	Total Hardness (as CaCO3)	(80-100)	486
6775067	OW-12-I	O.Reg.169/03(mg/L)	New Liskeard Groundwater Package	Alkalinity (as CaCO3)	(30-500)	541
6775067	OW-12-I	O.Reg.169/03(mg/L)	New Liskeard Groundwater Package	Dissolved Organic Carbon	5	8.6
6775067	OW-12-I	O.Reg.169/03(mg/L)	New Liskeard Groundwater Package	Iron	0.3	0.387
6775067	OW-12-I	O.Reg.169/03(mg/L)	New Liskeard Groundwater Package	Sodium	20 (200)	73.9
6775067	OW-12-I	O.Reg.169/03(mg/L)	New Liskeard Groundwater Package	Total Dissolved Solids	500	758
6775067	OW-12-I	O.Reg.169/03(mg/L)	New Liskeard Groundwater Package	Total Hardness (as CaCO3)	(80-100)	600
6775077	OW-12-II	O.Reg.169/03(mg/L)	New Liskeard Groundwater Package	Alkalinity (as CaCO3)	(30-500)	814
6775077	OW-12-II	O.Reg.169/03(mg/L)	New Liskeard Groundwater Package	Total Hardness (as CaCO3)	(80-100)	367
6775081	OW13-I	O.Reg.169/03(mg/L)	New Liskeard Groundwater Package	Total Hardness (as CaCO3)	(80-100)	470
6775250	OW-16-I	O.Reg.169/03(mg/L)	New Liskeard Groundwater Package	Dissolved Organic Carbon	5	9.4
6775250	OW-16-I	O.Reg.169/03(mg/L)	New Liskeard Groundwater Package	Fluoride	1.5	1.62
6775250	OW-16-I	O.Reg.169/03(mg/L)	New Liskeard Groundwater Package	Sodium	20 (200)	106
6775582	OW-16-11	O.Reg.169/03(mg/L)	New Liskeard Groundwater Package	Sodium	20 (200)	68.5
6775582	OW-16-11	O.Reg.169/03(mg/L)	New Liskeard Groundwater Package	Total Hardness (as CaCO3)	(80-100)	138
6775589	OW-16-III	O.Reg.169/03(mg/L)	New Liskeard Groundwater Package	Iron	0.3	0.804
6775589	OW-16-III	O.Reg.169/03(mg/L)	New Liskeard Groundwater Package	Manganese	0.05	0.069
6775589	OW-16-III	O.Reg.169/03(mg/L)	New Liskeard Groundwater Package	Total Hardness (as CaCO3)	(80-100)	424
6775597	OW-17-I	O.Reg.169/03(mg/L)	New Liskeard Groundwater Package	Iron	0.3	0.371
6775597	OW-17-I	O.Reg.169/03(mg/L)	New Liskeard Groundwater Package	Total Hardness (as CaCO3)	(80-100)	246
6775604	OW-17-II	O.Reg.169/03(mg/L)	New Liskeard Groundwater Package	Sodium	20 (200)	66.8
6775604	OW-17-II	O.Reg.169/03(mg/L)	New Liskeard Groundwater Package	Total Hardness (as CaCO3)	(80-100)	222

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Guideline Violation

AGAT WORK ORDER: 15T998992

PROJECT: New Liskeard GW

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CLIENT NAME: AMEC FOSTER WHEELER ENVIRO&INFRASTR

ATTENTION TO: Emily Lemieux

SAMPLEID	SAMPLE TITLE	GUIDELINE	ANALYSIS PACKAGE	PARAMETER	GUIDEVALUE	RESULT
6775617	OW-17-III	O.Reg.169/03(mg/L)	New Liskeard Groundwater Package	Total Hardness (as CaCO3)	(80-100)	340
6775632	OW-23-I	O.Reg.169/03(mg/L)	New Liskeard Groundwater Package	Sodium	20 (200)	57.2
6775762	OW-23-II	O.Reg.169/03(mg/L)	New Liskeard Groundwater Package	Sodium	20 (200)	86.0
6775762	OW-23-II	O.Reg.169/03(mg/L)	New Liskeard Groundwater Package	Total Hardness (as CaCO3)	(80-100)	142
6775770	OW-24-I	O.Reg.169/03(mg/L)	New Liskeard Groundwater Package	Iron	0.3	0.802
6775770	OW-24-I	O.Reg.169/03(mg/L)	New Liskeard Groundwater Package	Manganese	0.05	0.061
6775770	OW-24-I	O.Reg.169/03(mg/L)	New Liskeard Groundwater Package	Total Hardness (as CaCO3)	(80-100)	227
6775779	OW-24-II	O.Reg.169/03(mg/L)	New Liskeard Groundwater Package	Manganese	0.05	0.126
6775779	OW-24-II	O.Reg.169/03(mg/L)	New Liskeard Groundwater Package	Sodium	20 (200)	21.4
6775779	OW-24-II	O.Reg.169/03(mg/L)	New Liskeard Groundwater Package	Total Hardness (as CaCO3)	(80-100)	266
6775787	OW-24-III	O.Reg.169/03(mg/L)	New Liskeard Groundwater Package	Total Hardness (as CaCO3)	(80-100)	300
6775794	OW-25-I	O.Reg.169/03(mg/L)	New Liskeard Groundwater Package	Sodium	20 (200)	27.5
6775794	OW-25-I	O.Reg.169/03(mg/L)	New Liskeard Groundwater Package	Total Hardness (as CaCO3)	(80-100)	177
6775801	OW-25-II	O.Reg.169/03(mg/L)	New Liskeard Groundwater Package	Aluminum	0.1	0.151
6775801	OW-25-II	O.Reg.169/03(mg/L)	New Liskeard Groundwater Package	Dissolved Organic Carbon	5	5.3
6775801	OW-25-II	O.Reg.169/03(mg/L)	New Liskeard Groundwater Package	Sodium	20 (200)	110
6775801	OW-25-II	O.Reg.169/03(mg/L)	New Liskeard Groundwater Package	Total Hardness (as CaCO3)	(80-100)	145
6775808	OW-25-III	O.Reg.169/03(mg/L)	New Liskeard Groundwater Package	Sodium	20 (200)	29.7
6775808	OW-25-III	O.Reg.169/03(mg/L)	New Liskeard Groundwater Package	Total Hardness (as CaCO3)	(80-100)	364
6775818	OW-30-14-III	O.Reg.169/03(mg/L)	New Liskeard Groundwater Package	Sodium	20 (200)	112
6775818	OW-30-14-III	O.Reg.169/03(mg/L)	New Liskeard Groundwater Package	Total Hardness (as CaCO3)	(80-100)	102
6775826	OW-30-14-II	O.Reg.169/03(mg/L)	New Liskeard Groundwater Package	Sodium	20 (200)	112
6775826	OW-30-14-II	O.Reg.169/03(mg/L)	New Liskeard Groundwater Package	Total Hardness (as CaCO3)	(80-100)	146
6775835	NL GW DUP-1	O.Reg.169/03(mg/L)	New Liskeard Groundwater Package	Sodium	20 (200)	27.8
6775835	NL GW DUP-1	O.Reg.169/03(mg/L)	New Liskeard Groundwater Package	Total Hardness (as CaCO3)	(80-100)	176
6775936	NL GW DUP-2	O.Reg.169/03(mg/L)	New Liskeard Groundwater Package	Iron	0.3	0.379
6775936	NL GW DUP-2	O.Reg.169/03(mg/L)	New Liskeard Groundwater Package	Total Hardness (as CaCO3)	(80-100)	246
6775945	NL GW DUP-3	O.Reg.169/03(mg/L)	New Liskeard Groundwater Package	Sodium	20 (200)	85.6
6775945	NL GW DUP-3	O.Reg.169/03(mg/L)	New Liskeard Groundwater Package	Total Hardness (as CaCO3)	(80-100)	145

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Quality Assurance

CLIENT NAME: AMEC FOSTER WHEELER ENVIRO&INFRASTR

AGAT WORK ORDER: 15T998992

PROJECT: New Liskeard GW

ATTENTION TO: Emily Lemieux

SAMPLING SITE:

SAMPLED BY:

Water Analysis

RPT Date: Aug 05, 2015			DUPLICATE				REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD	Method Blank	Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
New Liskeard Groundwater Package															
pH	6775597	6775597	8.18	8.14	0.5%	NA	99%	90%	110%	NA			NA		
Alkalinity (as CaCO3)	6775597	6775597	235	239	1.7%	< 5	99%	80%	120%	NA			NA		
Electrical Conductivity	6775597	6775597	486	486	0.0%	< 2	103%	80%	120%	NA			NA		
Total Dissolved Solids	6774914	6774914	1450	1450	0.0%	< 20	100%	80%	120%	NA			NA		
Fluoride	6775021	6775021	< 0.25	<0.25	0.0%	< 0.05	101%	90%	110%	98%	90%	110%	99%	80%	120%
Chloride	6775021	6775021	2.59	2.52	2.7%	< 0.10	99%	90%	110%	98%	90%	110%	101%	80%	120%
Nitrate as N	6775021	6775021	< 0.25	<0.25	0.0%	< 0.05	93%	90%	110%	100%	90%	110%	101%	80%	120%
Nitrite as N	6775021	6775021	< 0.25	<0.25	0.0%	< 0.05	NA	90%	110%	95%	90%	110%	109%	80%	120%
Sulphate	6775021	6775021	200	199	0.5%	< 0.10	106%	90%	110%	102%	90%	110%	102%	80%	120%
Phosphate as P	6775021	6775021	< 0.50	<0.50	0.0%	< 0.10	109%	90%	110%	103%	90%	110%	103%	80%	120%
Ammonia as N	6775028	6775028	< 0.02	<0.02	0.0%	< 0.02	95%	90%	110%	99%	90%	110%	99%	80%	120%
Total Kjeldahl Nitrogen	6775021	6775021	0.29	0.29	0.0%	< 0.10	108%	80%	120%	106%	80%	120%	102%	70%	130%
Dissolved Organic Carbon	6774914	6774914	19.6	19.8	1.0%	< 0.5	97%	90%	110%	108%	90%	110%	117%	80%	120%
Calcium	6775021	6775021	143	144	0.7%	< 0.05	102%	90%	110%	102%	90%	110%	101%	70%	130%
Magnesium	6775021	6775021	26.1	26.5	1.5%	< 0.05	100%	90%	110%	99%	90%	110%	99%	70%	130%
Sodium	6775021	6775021	2.10	2.13	1.4%	< 0.05	101%	90%	110%	101%	90%	110%	98%	70%	130%
Potassium	6775021	6775021	1.37	1.52	10.4%	< 0.05	104%	90%	110%	104%	90%	110%	102%	70%	130%
Aluminum	6774914	6774914	0.004	<0.004	0.0%	< 0.004	108%	90%	110%	106%	90%	110%	80%	70%	130%
Arsenic	6774914	6774914	< 0.003	<0.003	0.0%	< 0.003	103%	90%	110%	100%	90%	110%	113%	70%	130%
Barium	6774914	6774914	0.070	0.063	10.5%	< 0.002	102%	90%	110%	102%	90%	110%	93%	70%	130%
Beryllium	6774914	6774914	< 0.001	<0.001	0.0%	< 0.001	105%	90%	110%	105%	90%	110%	79%	70%	130%
Bismuth	6774914	6774914	< 0.002	<0.002	0.0%	< 0.002	107%	90%	110%	104%	90%	110%	83%	70%	130%
Boron	6774914	6774914	1.53	1.32	14.7%	< 0.010	110%	90%	110%	105%	90%	110%	79%	70%	130%
Cadmium	6774914	6774914	< 0.002	<0.002	0.0%	< 0.002	101%	90%	110%	103%	90%	110%	102%	70%	130%
Chromium	6774914	6774914	0.006	0.006	0.0%	< 0.003	102%	90%	110%	101%	90%	110%	97%	70%	130%
Cobalt	6774914	6774914	0.005	0.005	0.0%	< 0.001	106%	90%	110%	106%	90%	110%	96%	70%	130%
Copper	6774914	6774914	0.005	0.004	NA	< 0.003	107%	90%	110%	104%	90%	110%	85%	70%	130%
Iron	6774914	6774914	< 0.010	<0.010	0.0%	< 0.010	109%	90%	110%	98%	90%	110%	72%	70%	130%
Lead	6774914	6774914	< 0.002	<0.002	0.0%	< 0.002	109%	90%	110%	106%	90%	110%	94%	70%	130%
Manganese	6774914	6774914	0.640	0.609	5.0%	< 0.002	102%	90%	110%	104%	90%	110%	104%	70%	130%
Molybdenum	6774914	6774914	< 0.002	<0.002	0.0%	< 0.002	94%	90%	110%	92%	90%	110%	106%	70%	130%
Nickel	6774914	6774914	0.036	0.034	5.7%	< 0.003	103%	90%	110%	102%	90%	110%	88%	70%	130%
Phosphorus	6774914	6774914	< 0.05	<0.05	0.0%	< 0.05	107%	90%	110%	104%	90%	110%	92%	70%	130%
Selenium	6774914	6774914	< 0.004	0.013	0.0%	< 0.004	99%	90%	110%	101%	90%	110%	119%	70%	130%
Silicon	6774914	6774914	6.01	5.21	14.3%	< 0.05	100%	90%	110%	93%	90%	110%	75%	70%	130%
Silver	6774914	6774914	< 0.002	<0.002	0.0%	< 0.002	101%	90%	110%	110%	90%	110%	72%	70%	130%
Strontium	6774914	6774914	2.12	2.06	2.9%	< 0.005	103%	90%	110%	102%	90%	110%	109%	70%	130%
Sulfur	6775021	6775021	68.0	68.2	0.3%	< 0.05	106%	90%	110%	105%	80%	130%	118%	70%	130%
Thallium	6774914	6774914	< 0.006	<0.006	0.0%	< 0.006	104%	90%	110%	102%	90%	110%	91%	70%	130%

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Quality Assurance

CLIENT NAME: AMEC FOSTER WHEELER ENVIRO&INFRASTR

AGAT WORK ORDER: 15T998992

PROJECT: New Liskeard GW

ATTENTION TO: Emily Lemieux

SAMPLING SITE:

SAMPLED BY:

Water Analysis (Continued)

RPT Date: Aug 05, 2015

PARAMETER	Batch	Sample Id	DUPLICATE			Method Blank	REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
			Dup #1	Dup #2	RPD		Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
Tin	6774914	6774914	< 0.002	<0.002	0.0%	< 0.002	102%	90%	110%	100%	90%	110%	97%	70%	130%
Titanium	6774914	6774914	0.003	0.003	0.0%	< 0.002	102%	90%	110%	99%	90%	110%	97%	70%	130%
Uranium	6774914	6774914	< 0.002	<0.002	0.0%	< 0.002	109%	90%	110%	104%	90%	110%	102%	70%	130%
Vanadium	6774914	6774914	< 0.002	<0.002	0.0%	< 0.002	101%	90%	110%	101%	90%	110%	99%	70%	130%
Zinc	6774914	6774914	0.007	0.006	15.4%	< 0.005	104%	90%	110%	106%	90%	110%	100%	70%	130%

Comments: NA signifies Not Applicable.
RPD Qualifier for Copper: The average for the sample and duplicate is less than 5X RDL, thus, lab's RPD acceptance criteria are not applicable.

New Liskeard Groundwater Package

pH	6773141		6.97	7.03	0.9%	NA	99%	90%	110%	NA			NA		
Alkalinity (as CaCO3)	6773141		87	87	0.0%	< 5	99%	80%	120%	NA			NA		
Electrical Conductivity	6773141		4340	4340	0.0%	< 2	103%	80%	120%	NA			NA		
Total Dissolved Solids	6775808	6775808	432	412	4.7%	< 20	100%	80%	120%	NA			NA		
Fluoride	6775826	6775826	1.31	1.34	2.3%	< 0.05	101%	90%	110%	98%	90%	110%	107%	80%	120%
Chloride	6775826	6775826	18.7	19.0	1.6%	< 0.10	99%	90%	110%	98%	90%	110%	102%	80%	120%
Nitrate as N	6775826	6775826	< 0.25	< 0.25	0.0%	< 0.05	93%	90%	110%	100%	90%	110%	104%	80%	120%
Nitrite as N	6775826	6775826	< 0.25	< 0.25	0.0%	< 0.05	NA	90%	110%	95%	90%	110%	108%	80%	120%
Sulphate	6775826	6775826	245	247	0.8%	< 0.10	106%	90%	110%	102%	90%	110%	102%	80%	120%
Phosphate as P	6775826	6775826	< 0.50	< 0.50	0.0%	< 0.10	109%	90%	110%	103%	90%	110%	104%	80%	120%
Ammonia as N	6775826	6775826	0.25	0.22	12.8%	< 0.02	95%	90%	110%	101%	90%	110%	114%	80%	120%
Total Kjeldahl Nitrogen	6775787	6775787	1.28	1.19	7.3%	< 0.10	101%	80%	120%	104%	80%	120%	109%	70%	130%
Dissolved Organic Carbon	6775081	6775081	2.0	2.0	0.0%	< 0.5	97%	90%	110%	108%	90%	110%	101%	80%	120%
Calcium	6775582	6775582	27.1	26.9	0.7%	< 0.05	105%	90%	110%	103%	90%	110%	101%	70%	130%
Magnesium	6775582	6775582	17.2	17.0	1.2%	< 0.05	102%	90%	110%	100%	90%	110%	100%	70%	130%
Sodium	6775582	6775582	68.5	68.3	0.3%	< 0.05	103%	90%	110%	101%	90%	110%	98%	70%	130%
Potassium	6775582	6775582	7.80	7.70	1.3%	< 0.05	106%	90%	110%	105%	90%	110%	103%	70%	130%
Aluminum	6775021	6775021	< 0.004	<0.004	0.0%	< 0.004	105%	90%	110%	101%	90%	110%	94%	70%	130%
Arsenic	6775021	6775021	< 0.003	<0.003	0.0%	< 0.003	101%	90%	110%	97%	90%	110%	107%	70%	130%
Barium	6775021	6775021	0.020	0.019	5.1%	< 0.002	100%	90%	110%	97%	90%	110%	97%	70%	130%
Beryllium	6775021	6775021	< 0.001	<0.001	0.0%	< 0.001	107%	90%	110%	103%	90%	110%	100%	70%	130%
Bismuth	6775021	6775021	< 0.002	<0.002	0.0%	< 0.002	104%	90%	110%	99%	90%	110%	95%	70%	130%
Boron	6775021	6775021	0.020	0.018	10.5%	< 0.010	108%	90%	110%	101%	90%	110%	91%	70%	130%
Cadmium	6775021	6775021	< 0.002	<0.002	0.0%	< 0.002	100%	90%	110%	102%	90%	110%	104%	70%	130%
Chromium	6775021	6775021	< 0.003	<0.003	0.0%	< 0.003	101%	90%	110%	101%	90%	110%	100%	70%	130%
Cobalt	6775021	6775021	< 0.001	<0.001	0.0%	< 0.001	97%	90%	110%	97%	90%	110%	93%	70%	130%
Copper	6775021	6775021	< 0.003	<0.003	0.0%	< 0.003	103%	90%	110%	102%	90%	110%	94%	70%	130%
Iron	6775021	6775021	0.049	0.050	2.0%	< 0.010	103%	90%	110%	94%	90%	110%	98%	70%	130%
Lead	6775021	6775021	< 0.002	<0.002	0.0%	< 0.002	103%	90%	110%	99%	90%	110%	95%	70%	130%
Manganese	6775021	6775021	0.020	0.021	4.9%	< 0.002	97%	90%	110%	97%	90%	110%	97%	70%	130%

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Quality Assurance

CLIENT NAME: AMEC FOSTER WHEELER ENVIRO&INFRASTR

AGAT WORK ORDER: 15T998992

PROJECT: New Liskeard GW

ATTENTION TO: Emily Lemieux

SAMPLING SITE:

SAMPLED BY:

Water Analysis (Continued)

RPT Date: Aug 05, 2015			DUPLICATE				REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD	Method Blank	Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
Molybdenum	6775021	6775021	< 0.002	<0.002	0.0%	< 0.002	102%	90%	110%	98%	90%	110%	105%	70%	130%
Nickel	6775021	6775021	< 0.003	0.003	0.0%	< 0.003	103%	90%	110%	101%	90%	110%	95%	70%	130%
Phosphorus	6775021	6775021	< 0.05	<0.05	0.0%	< 0.05	108%	90%	110%	104%	90%	110%	108%	70%	130%
Selenium	6775021	6775021	< 0.004	<0.004	0.0%	< 0.004	96%	90%	110%	96%	90%	110%	110%	70%	130%
Silicon	6775021	6775021	1.96	1.94	1.0%	< 0.05	106%	90%	110%	102%	90%	110%	89%	70%	130%
Silver	6775021	6775021	< 0.002	<0.002	0.0%	< 0.002	100%	90%	110%	106%	90%	110%	106%	70%	130%
Strontium	6775021	6775021	0.200	0.199	0.5%	< 0.005	93%	90%	110%	93%	90%	110%	81%	70%	130%
Sulfur	6775818	6775818	54.9	54.8	0.2%	< 0.05	105%	90%	110%	105%	80%	130%	111%	70%	130%
Thallium	6775021	6775021	< 0.006	<0.006	0.0%	< 0.006	103%	90%	110%	97%	90%	110%	96%	70%	130%
Tin	6775021	6775021	< 0.002	<0.002	0.0%	< 0.002	100%	90%	110%	97%	90%	110%	96%	70%	130%
Titanium	6775021	6775021	0.003	0.003	0.0%	< 0.002	102%	90%	110%	97%	90%	110%	97%	70%	130%
Uranium	6775021	6775021	< 0.002	<0.002	0.0%	< 0.002	106%	90%	110%	100%	90%	110%	105%	70%	130%
Vanadium	6775021	6775021	< 0.002	<0.002	0.0%	< 0.002	97%	90%	110%	95%	90%	110%	96%	70%	130%
Zinc	6775021	6775021	0.005	0.005	0.0%	< 0.005	100%	90%	110%	100%	90%	110%	112%	70%	130%

Comments: NA signifies Not Applicable.

Certified By:

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Method Summary

CLIENT NAME: AMEC FOSTER WHEELER ENVIRO&INFRASTR

AGAT WORK ORDER: 15T998992

PROJECT: New Liskeard GW

ATTENTION TO: Emily Lemieux

SAMPLING SITE:

SAMPLED BY:

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Water Analysis			
pH	INOR-93-6000	SM 4500-H+ B	PC TITRATE
Alkalinity (as CaCO3)	INOR-93-6000	SM 2320 B	PC TITRATE
Electrical Conductivity	INOR-93-6000	SM 2510 B	PC TITRATE
Total Hardness (as CaCO3)	MET-93-6105	EPA SW-846 6010C & 200.7	ICP/OES
Total Dissolved Solids	INOR-93-6028	SM 2540 C	BALANCE
Fluoride	INOR-93-6004	SM 4110 B	ION CHROMATOGRAPH
Chloride	INOR-93-6004	SM 4110 B	ION CHROMATOGRAPH
Nitrate as N	INOR-93-6004	SM 4110 B	ION CHROMATOGRAPH
Nitrite as N	INOR-93-6004	SM 4110 B	ION CHROMATOGRAPH
Sulphate	INOR-93-6004	SM 4110 B	ION CHROMATOGRAPH
Phosphate as P	INOR-93-6004	SM 4110 B	ION CHROMATOGRAPH
Ammonia as N	INOR-93-6059	QuikChem 10-107-06-1-J & SM 4500 NH3-F	LACHAT FIA
Total Kjeldahl Nitrogen	INOR-93-6048	QuikChem 10-107-06-2-I & SM 4500-Norg D	LACHAT FIA
Organic Nitrogen		SM 4500-Norg A	CALCULATION
Dissolved Organic Carbon	INOR-93-6049	EPA 415.1 & SM 5310 B	SHIMADZU CARBON ANALYZER
Calcium	MET-93-6105	EPA SW-846 6010C & 200.7	ICP/OES
Magnesium	MET-93-6105	EPA SW-846 6010C & 200.7	ICP/OES
Sodium	MET-93-6105	EPA SW-846 6010C & 200.7	ICP/OES
Potassium	MET-93-6105	EPA SW-846 6010C & 200.7	ICP/OES
Aluminum	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Arsenic	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Barium	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Beryllium	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Bismuth	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Boron	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Cadmium	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Chromium	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Cobalt	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Copper	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Iron	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Lead	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Manganese	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Molybdenum	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Nickel	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Phosphorus	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Selenium	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Silicon	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Silver	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Strontium	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Sulfur	MET-93-6105	EPA SW-846 6010C & 200.7	ICP/OES
Thallium	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Tin	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Titanium	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Uranium	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Vanadium	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Zinc	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS

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CLIENT NAME: AMEC FOSTER WHEELER ENVIRO&INFRASTR
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ATTENTION TO: Emily Lemieux

PROJECT: New Liskeard GW

AGAT WORK ORDER: 15T021634

WATER ANALYSIS REVIEWED BY: Mike Muneswar, BSc (Chem), Senior Inorganic Analyst

DATE REPORTED: Oct 06, 2015

PAGES (INCLUDING COVER): 21

VERSION*: 1

Should you require any information regarding this analysis please contact your client services representative at (905) 712-5100

*NOTES

All samples will be disposed of within 30 days following analysis. Please contact the lab if you require additional sample storage time.

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Certificate of Analysis

AGAT WORK ORDER: 15T021634

PROJECT: New Liskeard GW

CLIENT NAME: AMEC FOSTER WHEELER ENVIRO&INFRASTR

ATTENTION TO: Emily Lemieux

SAMPLING SITE:

SAMPLED BY:

New Liskeard Groundwater Package

DATE RECEIVED: 2015-09-22

DATE REPORTED: 2015-10-06

		SAMPLE DESCRIPTION:		OW-1R-1		OW-1-R-III		OW-10-I		OW-10-II
		SAMPLE TYPE:		Water		Water		Water		Water
		DATE SAMPLED:		9/20/2015		9/20/2015		9/20/2015		9/20/2015
Parameter	Unit	G / S	RDL	6996945	RDL	6996966	RDL	6996977	RDL	6996987
pH	pH Units	(6.5-8.5)	NA	7.98	NA	7.94	NA	7.65	NA	7.93
Alkalinity (as CaCO3)	mg/L	(30-500)	5	670	5	978	5	256	5	261
Electrical Conductivity	uS/cm		2	2040	2	2920	2	779	2	871
Total Hardness (as CaCO3)	mg/L	(80-100)	0.5	676	0.5	821	0.5	412	0.5	485
Total Dissolved Solids	mg/L	500	20	1180	20	1610	20	464	20	546
Fluoride	mg/L	1.5	0.5	<0.5	0.25	<0.25	0.25	<0.25	0.25	<0.25
Chloride	mg/L	250	1.0	173	0.50	277	0.50	3.05	0.50	2.73
Nitrate as N	mg/L	10.0	0.5	0.6	0.25	7.18	0.25	<0.25	0.25	<0.25
Nitrite as N	mg/L	1.0	0.5	<0.5	0.25	<0.25	0.25	<0.25	0.25	<0.25
Sulphate	mg/L	500	1.0	162	0.50	171	0.50	153	0.50	200
Phosphate as P	mg/L		1.0	<1.0	0.50	<0.50	0.50	<0.50	0.50	<0.50
Ammonia as N	mg/L		0.10	6.39	0.4	21.1	0.02	0.02	0.02	<0.02
Total Kjeldahl Nitrogen	mg/L		0.20	8.98	0.20	23.6	0.10	0.20	0.10	0.10
Organic Nitrogen	mg/L	0.15	0.10	2.59	0.10	2.50	0.10	0.18	0.10	0.10
Dissolved Organic Carbon	mg/L	5	0.5	14.3	0.5	28.8	0.5	2.4	0.5	2.3
Calcium	mg/L		0.25	132	0.25	149	0.05	110	0.05	150
Magnesium	mg/L		0.25	84.0	0.25	109	0.05	33.3	0.05	26.8
Sodium	mg/L	20 (200)	0.25	127	0.25	204	0.05	3.87	0.05	2.27
Potassium	mg/L		0.25	56.8	0.25	107	0.05	4.48	0.05	1.78
Aluminum	mg/L	0.1	0.004	0.006	0.004	<0.004	0.004	<0.004	0.004	0.007
Arsenic	mg/L	0.025	0.003	<0.003	0.003	<0.003	0.003	<0.003	0.003	<0.003
Barium	mg/L	1	0.002	0.067	0.002	0.125	0.002	0.035	0.002	0.022
Beryllium	mg/L		0.001	<0.001	0.001	<0.001	0.001	<0.001	0.001	<0.001
Bismuth	mg/L		0.002	<0.002	0.002	<0.002	0.002	<0.002	0.004	<0.004
Boron	mg/L	5	0.010	1.21	0.010	1.52	0.010	0.120	0.010	0.026
Cadmium	mg/L	0.005	0.002	<0.002	0.002	<0.002	0.002	<0.002	0.002	<0.002
Chromium	mg/L	0.05	0.003	<0.003	0.003	0.004	0.003	<0.003	0.003	<0.003
Cobalt	mg/L		0.001	0.003	0.001	0.005	0.001	<0.001	0.001	<0.001
Copper	mg/L	1	0.003	0.003	0.003	0.012	0.003	<0.003	0.003	<0.003
Iron	mg/L	0.3	0.010	<0.010	0.010	<0.010	0.010	0.778	0.010	<0.010

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Certificate of Analysis

AGAT WORK ORDER: 15T021634

PROJECT: New Liskeard GW

CLIENT NAME: AMEC FOSTER WHEELER ENVIRO&INFRASTR

ATTENTION TO: Emily Lemieux

SAMPLING SITE:

SAMPLED BY:

New Liskeard Groundwater Package

DATE RECEIVED: 2015-09-22

DATE REPORTED: 2015-10-06

		SAMPLE DESCRIPTION:		OW-1R-1		OW-1-R-III		OW-10-I		OW-10-II
		SAMPLE TYPE:		Water		Water		Water		Water
		DATE SAMPLED:		9/20/2015		9/20/2015		9/20/2015		9/20/2015
Parameter	Unit	G / S	RDL	6996945	RDL	6996966	RDL	6996977	RDL	6996987
Lead	mg/L	0.01	0.002	<0.002	0.002	<0.002	0.002	<0.002	0.002	<0.002
Manganese	mg/L	0.05	0.002	0.429	0.002	0.810	0.002	0.044	0.002	<0.002
Molybdenum	mg/L		0.002	<0.002	0.002	<0.002	0.002	<0.002	0.002	<0.002
Nickel	mg/L		0.003	0.030	0.003	0.040	0.003	0.005	0.003	0.006
Phosphorus	mg/L		0.05	<0.05	0.05	<0.05	0.05	<0.05	0.05	<0.05
Selenium	mg/L	0.01	0.004	<0.004	0.004	<0.004	0.004	<0.004	0.004	<0.004
Silicon	mg/L		0.05	6.19	0.05	6.59	0.05	3.04	0.05	2.33
Silver	mg/L		0.002	<0.002	0.002	<0.002	0.002	<0.002	0.002	<0.002
Strontium	mg/L		0.005	2.69	0.005	1.05	0.005	1.08	0.005	0.209
Sulfur	mg/L		0.25	60.4	0.25	56.1	0.05	59.6	0.05	71.3
Thallium	mg/L		0.006	<0.006	0.006	<0.006	0.006	<0.006	0.006	<0.006
Tin	mg/L		0.002	<0.002	0.002	<0.002	0.002	<0.002	0.002	<0.002
Titanium	mg/L		0.002	0.004	0.002	0.005	0.002	0.004	0.002	0.004
Uranium	mg/L	0.02	0.002	<0.002	0.002	<0.002	0.002	<0.002	0.002	<0.002
Vanadium	mg/L		0.002	<0.002	0.002	<0.002	0.002	<0.002	0.002	<0.002
Zinc	mg/L	5	0.005	0.006	0.005	0.006	0.005	0.005	0.005	<0.005

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Certificate of Analysis

AGAT WORK ORDER: 15T021634

PROJECT: New Liskeard GW

CLIENT NAME: AMEC FOSTER WHEELER ENVIRO&INFRASTR

ATTENTION TO: Emily Lemieux

SAMPLING SITE:

SAMPLED BY:

New Liskeard Groundwater Package

DATE RECEIVED: 2015-09-22

DATE REPORTED: 2015-10-06

		SAMPLE DESCRIPTION:		OW11-I	OW-11-II	OW-12-I		OW-12-II		OW13-I	OW-16-I
		SAMPLE TYPE:		Water	Water	Water		Water		Water	Water
		DATE SAMPLED:		9/21/2015	9/21/2015	9/21/2015		9/21/2015		9/21/2015	9/21/2015
Parameter	Unit	G / S	RDL	6996996	6997005	6997016	RDL	6997035	RDL	6997046	6997078
pH	pH Units	(6.5-8.5)	NA	8.07	8.05	7.96	NA	7.95	NA	7.93	8.12
Alkalinity (as CaCO3)	mg/L	(30-500)	5	236	412	265	5	535	5	360	304
Electrical Conductivity	uS/cm		2	601	987	738	2	1340	2	859	592
Total Hardness (as CaCO3)	mg/L	(80-100)	0.5	281	457	341	0.5	518	0.5	440	102
Total Dissolved Solids	mg/L	500	20	324	532	416	20	766	20	498	364
Fluoride	mg/L	1.5	0.25	<0.25	<0.25	<0.25	0.25	<0.25	0.25	<0.25	1.93
Chloride	mg/L	250	0.50	6.56	29.6	32.0	0.50	49.2	0.50	3.29	5.33
Nitrate as N	mg/L	10.0	0.25	<0.25	<0.25	<0.25	0.25	<0.25	0.25	<0.25	<0.25
Nitrite as N	mg/L	1.0	0.25	<0.25	<0.25	<0.25	0.25	<0.25	0.25	<0.25	<0.25
Sulphate	mg/L	500	0.50	70.3	79.2	68.9	0.50	127	0.50	107	1.82
Phosphate as P	mg/L		0.50	<0.50	<0.50	<0.50	0.50	<0.50	0.50	<0.50	<0.50
Ammonia as N	mg/L		0.02	<0.02	<0.02	<0.02	0.02	<0.02	0.02	<0.02	0.83
Total Kjeldahl Nitrogen	mg/L		0.10	0.22	0.53	0.28	0.20	1.71	0.10	0.14	1.63
Organic Nitrogen	mg/L	0.15	0.10	0.22	0.53	0.28	0.10	1.71	0.10	0.14	0.80
Dissolved Organic Carbon	mg/L	5	0.5	1.1	5.3	1.9	0.5	9.1	0.5	1.5	8.8
Calcium	mg/L		0.05	67.7	119	81.3	0.05	151	0.05	111	18.1
Magnesium	mg/L		0.05	27.2	38.8	33.6	0.05	34.3	0.05	39.6	13.7
Sodium	mg/L	20 (200)	0.05	16.0	39.2	15.4	0.05	73.7	0.05	2.49	109
Potassium	mg/L		0.05	6.96	4.76	8.59	0.05	4.62	0.05	5.77	5.94
Aluminum	mg/L	0.1	0.004	0.008	<0.004	<0.004	0.004	<0.004	0.004	<0.004	0.006
Arsenic	mg/L	0.025	0.003	<0.003	<0.003	<0.003	0.003	<0.003	0.003	<0.003	<0.003
Barium	mg/L	1	0.002	0.035	0.023	0.056	0.002	0.049	0.002	0.040	0.037
Beryllium	mg/L		0.001	<0.001	<0.001	<0.001	0.001	<0.001	0.001	<0.001	<0.001
Bismuth	mg/L		0.002	<0.002	<0.002	<0.002	0.002	<0.002	0.002	<0.002	<0.002
Boron	mg/L	5	0.010	0.296	0.326	0.390	0.010	0.240	0.010	0.104	0.418
Cadmium	mg/L	0.005	0.002	<0.002	<0.002	<0.002	0.002	<0.002	0.002	<0.002	<0.002
Chromium	mg/L	0.05	0.003	<0.003	<0.003	<0.003	0.003	<0.003	0.003	<0.003	<0.003
Cobalt	mg/L		0.001	<0.001	<0.001	<0.001	0.001	<0.001	0.001	<0.001	<0.001
Copper	mg/L	1	0.003	<0.003	<0.003	<0.003	0.003	<0.003	0.003	<0.003	<0.003
Iron	mg/L	0.3	0.010	<0.010	<0.010	<0.010	0.010	0.042	0.010	<0.010	0.090

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AGAT WORK ORDER: 15T021634

PROJECT: New Liskeard GW

CLIENT NAME: AMEC FOSTER WHEELER ENVIRO&INFRASTR

ATTENTION TO: Emily Lemieux

SAMPLING SITE:

SAMPLED BY:

New Liskeard Groundwater Package

DATE RECEIVED: 2015-09-22

DATE REPORTED: 2015-10-06

SAMPLE DESCRIPTION:				OW11-I	OW-11-II	OW-12-I		OW-12-II		OW13-I	OW-16-I
SAMPLE TYPE:				Water	Water	Water		Water		Water	Water
DATE SAMPLED:				9/21/2015	9/21/2015	9/21/2015		9/21/2015		9/21/2015	9/21/2015
Parameter	Unit	G / S	RDL	6996996	6997005	6997016	RDL	6997035	RDL	6997046	6997078
Lead	mg/L	0.01	0.002	<0.002	<0.002	<0.002	0.002	<0.002	0.002	<0.002	<0.002
Manganese	mg/L	0.05	0.002	0.009	0.005	<0.002	0.002	0.034	0.002	<0.002	0.018
Molybdenum	mg/L		0.002	<0.002	<0.002	<0.002	0.002	<0.002	0.002	<0.002	0.008
Nickel	mg/L		0.003	0.004	0.007	0.005	0.003	0.014	0.003	0.006	<0.003
Phosphorus	mg/L		0.05	<0.05	<0.05	<0.05	0.05	<0.05	0.05	<0.05	<0.05
Selenium	mg/L	0.01	0.004	<0.004	0.004	<0.004	0.004	<0.004	0.004	<0.004	<0.004
Silicon	mg/L		0.05	3.45	4.12	4.18	0.05	4.53	0.05	4.85	6.96
Silver	mg/L		0.002	<0.002	<0.002	<0.002	0.002	<0.002	0.002	<0.002	<0.002
Strontium	mg/L		0.005	2.01	0.193	1.96	0.005	0.539	0.005	0.600	0.507
Sulfur	mg/L		0.05	56.9	26.6	23.5	0.05	42.8	0.05	37.4	1.39
Thallium	mg/L		0.006	<0.006	<0.006	<0.006	0.006	<0.006	0.006	<0.006	<0.006
Tin	mg/L		0.002	<0.002	<0.002	<0.002	0.002	<0.002	0.002	<0.002	<0.002
Titanium	mg/L		0.002	<0.002	<0.002	<0.002	0.002	0.003	0.002	0.003	<0.002
Uranium	mg/L	0.02	0.002	<0.002	<0.002	<0.002	0.002	<0.002	0.002	<0.002	<0.002
Vanadium	mg/L		0.002	<0.002	<0.002	<0.002	0.002	<0.002	0.002	<0.002	<0.002
Zinc	mg/L	5	0.005	0.006	<0.005	<0.005	0.005	<0.005	0.005	<0.005	<0.005

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Certificate of Analysis

AGAT WORK ORDER: 15T021634

PROJECT: New Liskeard GW

CLIENT NAME: AMEC FOSTER WHEELER ENVIRO&INFRASTR

ATTENTION TO: Emily Lemieux

SAMPLING SITE:

SAMPLED BY:

New Liskeard Groundwater Package

DATE RECEIVED: 2015-09-22

DATE REPORTED: 2015-10-06

		SAMPLE DESCRIPTION:		OW-16-11		OW-16-III	OW-17-I	OW-17-II		OW-23-I
		SAMPLE TYPE:		Water		Water	Water	Water		Water
		DATE SAMPLED:		9/21/2015		9/21/2015	9/20/2015	9/20/2015		9/20/2015
Parameter	Unit	G / S	RDL	6997108	RDL	6997132	6997148	6997178	RDL	6997203
pH	pH Units	(6.5-8.5)	NA	7.94	NA	8.06	8.03	8.13	NA	8.20
Alkalinity (as CaCO3)	mg/L	(30-500)	5	165	5	321	228	211	5	220
Electrical Conductivity	uS/cm		2	596	2	671	471	628	2	443
Total Hardness (as CaCO3)	mg/L	(80-100)	0.5	139	0.5	345	235	134	0.5	139
Total Dissolved Solids	mg/L	500	20	326	20	356	244	336	20	236
Fluoride	mg/L	1.5	0.05	1.07	0.05	0.25	0.34	1.44	0.05	1.26
Chloride	mg/L	250	0.10	5.40	0.10	5.45	0.69	9.80	0.10	1.85
Nitrate as N	mg/L	10.0	0.05	0.28	0.05	0.31	<0.05	0.14	0.05	<0.05
Nitrite as N	mg/L	1.0	0.05	<0.05	0.05	<0.05	<0.05	<0.05	0.05	<0.05
Sulphate	mg/L	500	0.50	118	0.10	29.9	16.5	83.7	0.10	6.50
Phosphate as P	mg/L		0.10	<0.10	0.10	<0.10	<0.10	<0.10	0.10	<0.10
Ammonia as N	mg/L		0.02	0.03	0.02	0.10	<0.02	<0.02	0.02	0.46
Total Kjeldahl Nitrogen	mg/L		0.10	<0.10	0.10	0.70	<0.10	0.12	0.25	1.50
Organic Nitrogen	mg/L	0.15	0.10	<0.10	0.10	0.60	<0.10	0.12	0.10	1.04
Dissolved Organic Carbon	mg/L	5	0.5	1.7	0.5	2.2	2.1	1.8	0.5	2.7
Calcium	mg/L		0.05	26.8	0.05	94.5	62.9	21.6	0.05	24.3
Magnesium	mg/L		0.05	17.4	0.05	26.4	19.0	19.5	0.05	18.9
Sodium	mg/L	20 (200)	0.05	70.0	0.05	8.50	4.84	86.8	0.05	50.1
Potassium	mg/L		0.05	8.34	0.05	2.77	3.26	4.20	0.05	4.16
Aluminum	mg/L	0.1	0.004	0.006	0.004	<0.004	<0.004	<0.004	0.004	<0.004
Arsenic	mg/L	0.025	0.003	<0.003	0.003	<0.003	<0.003	<0.003	0.003	<0.003
Barium	mg/L	1	0.002	0.030	0.002	0.037	0.031	0.026	0.002	0.031
Beryllium	mg/L		0.001	<0.001	0.001	<0.001	<0.001	<0.001	0.001	<0.001
Bismuth	mg/L		0.002	<0.002	0.002	<0.002	<0.002	<0.002	0.002	<0.002
Boron	mg/L	5	0.010	0.211	0.010	0.013	0.031	0.338	0.010	0.310
Cadmium	mg/L	0.005	0.002	<0.002	0.002	<0.002	<0.002	<0.002	0.002	<0.002
Chromium	mg/L	0.05	0.003	<0.003	0.003	<0.003	<0.003	<0.003	0.003	<0.003
Cobalt	mg/L		0.001	<0.001	0.001	<0.001	<0.001	<0.001	0.001	<0.001
Copper	mg/L	1	0.003	<0.003	0.003	<0.003	<0.003	<0.003	0.003	<0.003
Iron	mg/L	0.3	0.010	<0.010	0.010	0.159	0.123	<0.010	0.010	<0.010

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Certificate of Analysis

AGAT WORK ORDER: 15T021634

PROJECT: New Liskeard GW

CLIENT NAME: AMEC FOSTER WHEELER ENVIRO&INFRASTR

ATTENTION TO: Emily Lemieux

SAMPLING SITE:

SAMPLED BY:

New Liskeard Groundwater Package

DATE RECEIVED: 2015-09-22

DATE REPORTED: 2015-10-06

		SAMPLE DESCRIPTION:		OW-16-11		OW-16-III	OW-17-I	OW-17-II		OW-23-I
		SAMPLE TYPE:		Water		Water	Water	Water		Water
		DATE SAMPLED:		9/21/2015		9/21/2015	9/20/2015	9/20/2015		9/20/2015
Parameter	Unit	G / S	RDL	6997108	RDL	6997132	6997148	6997178	RDL	6997203
Lead	mg/L	0.01	0.002	<0.002	0.002	<0.002	<0.002	<0.002	0.002	<0.002
Manganese	mg/L	0.05	0.002	<0.002	0.002	0.025	0.015	<0.002	0.002	0.008
Molybdenum	mg/L		0.002	0.028	0.002	<0.002	<0.002	0.033	0.002	0.009
Nickel	mg/L		0.003	<0.003	0.003	0.004	<0.003	<0.003	0.003	<0.003
Phosphorus	mg/L		0.05	<0.05	0.05	<0.05	<0.05	<0.05	0.05	<0.05
Selenium	mg/L	0.01	0.004	<0.004	0.004	<0.004	<0.004	<0.004	0.004	<0.004
Silicon	mg/L		0.05	3.39	0.05	5.19	8.43	3.04	0.05	4.38
Silver	mg/L		0.002	<0.002	0.002	<0.002	<0.002	<0.002	0.002	<0.002
Strontium	mg/L		0.005	0.602	0.005	0.241	0.484	0.725	0.005	0.438
Sulfur	mg/L		0.05	42.3	0.05	12.6	5.65	32.3	0.05	2.23
Thallium	mg/L		0.006	<0.006	0.006	<0.006	<0.006	<0.006	0.006	<0.006
Tin	mg/L		0.002	<0.002	0.002	<0.002	<0.002	<0.002	0.002	<0.002
Titanium	mg/L		0.002	0.003	0.002	<0.002	<0.002	<0.002	0.002	<0.002
Uranium	mg/L	0.02	0.002	0.003	0.002	<0.002	<0.002	<0.002	0.002	<0.002
Vanadium	mg/L		0.002	<0.002	0.002	<0.002	<0.002	<0.002	0.002	<0.002
Zinc	mg/L	5	0.005	<0.005	0.005	0.006	<0.005	0.005	0.005	<0.005

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AGAT WORK ORDER: 15T021634

PROJECT: New Liskeard GW

CLIENT NAME: AMEC FOSTER WHEELER ENVIRO&INFRASTR

ATTENTION TO: Emily Lemieux

SAMPLING SITE:

SAMPLED BY:

New Liskeard Groundwater Package

DATE RECEIVED: 2015-09-22

DATE REPORTED: 2015-10-06

		SAMPLE DESCRIPTION:		OW-23-II		OW-24-I	OW-24-II		OW-24-III		OW-25-I
		SAMPLE TYPE:		Water		Water	Water		Water		Water
		DATE SAMPLED:		9/20/2015		9/21/2015	9/21/2015		9/21/2015		9/21/2015
Parameter	Unit	G / S	RDL	6997245	RDL	6997330	6997401	RDL	6997409	RDL	6997416
pH	pH Units	(6.5-8.5)	NA	8.19	NA	8.06	8.15	NA	7.97	NA	8.13
Alkalinity (as CaCO3)	mg/L	(30-500)	5	277	5	235	292	5	211	5	225
Electrical Conductivity	uS/cm		2	672	2	497	602	2	469	2	438
Total Hardness (as CaCO3)	mg/L	(80-100)	0.5	229	0.5	234	277	0.5	249	0.5	166
Total Dissolved Solids	mg/L	500	20	342	20	256	298	20	260	20	230
Fluoride	mg/L	1.5	0.25	1.38	0.05	0.33	0.74	0.05	0.11	0.05	0.60
Chloride	mg/L	250	0.50	2.78	0.10	2.11	7.40	0.10	4.52	0.10	1.32
Nitrate as N	mg/L	10.0	0.25	<0.25	0.05	<0.05	<0.05	0.05	0.22	0.05	<0.05
Nitrite as N	mg/L	1.0	0.25	<0.25	0.05	<0.05	<0.05	0.05	<0.05	0.05	<0.05
Sulphate	mg/L	500	0.50	71.2	0.10	20.8	14.2	0.10	21.6	0.10	1.24
Phosphate as P	mg/L		0.50	<0.50	0.10	<0.10	<0.10	0.10	<0.10	0.10	<0.10
Ammonia as N	mg/L		0.02	<0.02	0.02	0.03	<0.02	0.02	0.10	0.02	0.33
Total Kjeldahl Nitrogen	mg/L		0.10	0.20	0.10	0.28	0.16	0.20	1.29	0.10	0.54
Organic Nitrogen	mg/L	0.15	0.10	0.20	0.10	0.25	0.16	0.10	1.19	0.10	0.21
Dissolved Organic Carbon	mg/L	5	0.5	1.4	0.5	2.0	1.2	0.5	3.7	0.5	2.8
Calcium	mg/L		0.05	38.2	0.05	60.5	55.1	0.05	74.9	0.05	35.7
Magnesium	mg/L		0.05	32.4	0.05	20.1	33.9	0.05	15.1	0.05	18.6
Sodium	mg/L	20 (200)	0.05	61.5	0.05	13.4	17.2	0.05	7.82	0.05	29.4
Potassium	mg/L		0.05	4.86	0.05	4.29	8.05	0.05	5.78	0.05	4.01
Aluminum	mg/L	0.1	0.004	<0.004	0.004	0.051	<0.004	0.004	<0.004	0.004	<0.004
Arsenic	mg/L	0.025	0.003	<0.003	0.003	<0.003	<0.003	0.003	<0.003	0.003	<0.003
Barium	mg/L	1	0.002	0.047	0.002	0.044	0.052	0.002	0.023	0.002	0.040
Beryllium	mg/L		0.001	<0.001	0.001	<0.001	<0.001	0.001	<0.001	0.001	<0.001
Bismuth	mg/L		0.002	<0.002	0.002	<0.002	<0.002	0.002	<0.002	0.002	<0.002
Boron	mg/L	5	0.010	0.142	0.010	0.046	0.064	0.010	0.018	0.010	0.130
Cadmium	mg/L	0.005	0.002	<0.002	0.002	<0.002	<0.002	0.002	<0.002	0.002	<0.002
Chromium	mg/L	0.05	0.003	<0.003	0.003	<0.003	<0.003	0.003	<0.003	0.003	<0.003
Cobalt	mg/L		0.001	<0.001	0.001	<0.001	<0.001	0.001	<0.001	0.001	<0.001
Copper	mg/L	1	0.003	<0.003	0.003	<0.003	<0.003	0.003	<0.003	0.003	<0.003
Iron	mg/L	0.3	0.010	<0.010	0.010	1.56	0.090	0.010	<0.010	0.010	0.137

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Certificate of Analysis

AGAT WORK ORDER: 15T021634

PROJECT: New Liskeard GW

CLIENT NAME: AMEC FOSTER WHEELER ENVIRO&INFRASTR

ATTENTION TO: Emily Lemieux

SAMPLING SITE:

SAMPLED BY:

New Liskeard Groundwater Package

DATE RECEIVED: 2015-09-22

DATE REPORTED: 2015-10-06

SAMPLE DESCRIPTION:				OW-23-II		OW-24-I	OW-24-II		OW-24-III		OW-25-I
SAMPLE TYPE:				Water		Water	Water		Water		Water
DATE SAMPLED:				9/20/2015		9/21/2015	9/21/2015		9/21/2015		9/21/2015
Parameter	Unit	G / S	RDL	6997245	RDL	6997330	6997401	RDL	6997409	RDL	6997416
Lead	mg/L	0.01	0.002	<0.002	0.002	<0.002	<0.002	0.002	<0.002	0.002	<0.002
Manganese	mg/L	0.05	0.002	<0.002	0.002	0.062	0.107	0.002	0.091	0.002	0.012
Molybdenum	mg/L		0.002	0.013	0.002	0.006	0.014	0.002	<0.002	0.002	<0.002
Nickel	mg/L		0.003	<0.003	0.003	0.004	<0.003	0.003	0.003	0.003	<0.003
Phosphorus	mg/L		0.05	<0.05	0.05	<0.05	<0.05	0.05	<0.05	0.05	<0.05
Selenium	mg/L	0.01	0.004	<0.004	0.004	<0.004	<0.004	0.004	<0.004	0.004	<0.004
Silicon	mg/L		0.05	3.99	0.05	7.02	5.85	0.05	3.86	0.05	7.43
Silver	mg/L		0.002	<0.002	0.002	<0.002	<0.002	0.002	<0.002	0.002	<0.002
Strontium	mg/L		0.005	3.15	0.005	0.403	0.735	0.005	0.119	0.005	0.722
Sulfur	mg/L		0.05	24.6	0.05	6.74	4.50	0.05	7.32	0.05	0.83
Thallium	mg/L		0.006	<0.006	0.006	<0.006	<0.006	0.006	<0.006	0.006	<0.006
Tin	mg/L		0.002	<0.002	0.002	<0.002	<0.002	0.002	<0.002	0.002	<0.002
Titanium	mg/L		0.002	<0.002	0.002	0.003	<0.002	0.002	<0.002	0.002	<0.002
Uranium	mg/L	0.02	0.002	0.004	0.002	<0.002	<0.002	0.002	<0.002	0.002	<0.002
Vanadium	mg/L		0.002	<0.002	0.002	<0.002	<0.002	0.002	<0.002	0.002	<0.002
Zinc	mg/L	5	0.005	0.009	0.005	<0.005	0.006	0.005	<0.005	0.005	0.007

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Certificate of Analysis

AGAT WORK ORDER: 15T021634

PROJECT: New Liskeard GW

CLIENT NAME: AMEC FOSTER WHEELER ENVIRO&INFRASTR

ATTENTION TO: Emily Lemieux

SAMPLING SITE:

SAMPLED BY:

New Liskeard Groundwater Package

DATE RECEIVED: 2015-09-22

DATE REPORTED: 2015-10-06

		SAMPLE DESCRIPTION:		OW-25-II	OW-25-III		OW-30-14-III		OW-30-14-II		NL GW DUP-1
		SAMPLE TYPE:		Water	Water		Water		Water		Water
		DATE SAMPLED:		9/21/2015	9/20/2015		9/21/2015		9/21/2015		9/21/2015
Parameter	Unit	G / S	RDL	6997423	6997433	RDL	6997440	RDL	6997448	RDL	6997455
pH	pH Units	(6.5-8.5)	NA	8.13	8.15	NA	8.00	NA	7.98	NA	8.22
Alkalinity (as CaCO3)	mg/L	(30-500)	5	143	314	5	174	5	123	5	234
Electrical Conductivity	uS/cm		2	793	779	2	726	2	810	2	493
Total Hardness (as CaCO3)	mg/L	(80-100)	0.5	142	365	0.5	107	0.5	132	0.5	211
Total Dissolved Solids	mg/L	500	20	476	418	20	434	20	452	20	266
Fluoride	mg/L	1.5	0.25	1.11	0.81	0.25	0.61	0.25	1.42	0.05	0.32
Chloride	mg/L	250	0.50	9.64	1.33	0.50	7.55	0.50	17.4	0.10	1.91
Nitrate as N	mg/L	10.0	0.25	0.35	<0.25	0.25	<0.25	0.25	0.41	0.05	<0.05
Nitrite as N	mg/L	1.0	0.25	<0.25	<0.25	0.25	<0.25	0.25	<0.25	0.05	<0.05
Sulphate	mg/L	500	0.50	223	116	0.50	165	0.50	222	0.10	21.3
Phosphate as P	mg/L		0.50	<0.50	<0.50	0.50	<0.50	0.50	<0.50	0.10	<0.10
Ammonia as N	mg/L		0.02	<0.02	<0.02	0.02	0.10	0.02	0.10	0.02	0.03
Total Kjeldahl Nitrogen	mg/L		0.10	0.33	0.16	0.20	0.49	0.10	0.71	0.10	0.28
Organic Nitrogen	mg/L	0.15	0.10	0.33	0.16	0.10	0.39	0.10	0.61	0.10	0.25
Dissolved Organic Carbon	mg/L	5	0.5	1.5	1.2	0.5	2.2	0.5	2.0	0.5	2.2
Calcium	mg/L		0.05	27.1	81.8	0.05	18.3	0.05	21.9	0.05	54.2
Magnesium	mg/L		0.05	18.1	39.1	0.05	15.0	0.05	18.7	0.05	18.3
Sodium	mg/L	20 (200)	0.05	115	32.4	0.05	116	0.05	117	0.05	13.4
Potassium	mg/L		0.05	8.50	5.36	0.05	7.19	0.05	10.5	0.05	3.82
Aluminum	mg/L	0.1	0.004	0.006	0.010	0.004	0.008	0.004	0.017	0.004	0.013
Arsenic	mg/L	0.025	0.003	<0.003	<0.003	0.003	<0.003	0.003	<0.003	0.003	0.004
Barium	mg/L	1	0.002	0.025	0.042	0.002	0.026	0.002	0.025	0.002	0.048
Beryllium	mg/L		0.001	<0.001	<0.001	0.001	<0.001	0.001	<0.001	0.001	<0.001
Bismuth	mg/L		0.002	<0.002	<0.002	0.002	<0.002	0.002	<0.002	0.002	<0.002
Boron	mg/L	5	0.010	0.198	0.033	0.010	0.196	0.010	0.439	0.010	0.047
Cadmium	mg/L	0.005	0.002	<0.002	<0.002	0.002	<0.002	0.002	<0.002	0.002	<0.002
Chromium	mg/L	0.05	0.003	<0.003	<0.003	0.003	<0.003	0.003	<0.003	0.003	<0.003
Cobalt	mg/L		0.001	<0.001	<0.001	0.001	<0.001	0.001	<0.001	0.001	0.001
Copper	mg/L	1	0.003	<0.003	<0.003	0.003	<0.003	0.003	<0.003	0.003	<0.003
Iron	mg/L	0.3	0.010	<0.010	<0.010	0.010	<0.010	0.010	<0.010	0.010	0.933

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AGAT WORK ORDER: 15T021634

PROJECT: New Liskeard GW

CLIENT NAME: AMEC FOSTER WHEELER ENVIRO&INFRASTR

ATTENTION TO: Emily Lemieux

SAMPLING SITE:

SAMPLED BY:

New Liskeard Groundwater Package

DATE RECEIVED: 2015-09-22

DATE REPORTED: 2015-10-06

		SAMPLE DESCRIPTION:		OW-25-II	OW-25-III		OW-30-14-III		OW-30-14-II		NL GW DUP-1
		SAMPLE TYPE:		Water	Water		Water		Water		Water
		DATE SAMPLED:		9/21/2015	9/20/2015		9/21/2015		9/21/2015		9/21/2015
Parameter	Unit	G / S	RDL	6997423	6997433	RDL	6997440	RDL	6997448	RDL	6997455
Lead	mg/L	0.01	0.002	<0.002	<0.002	0.002	<0.002	0.002	<0.002	0.002	<0.002
Manganese	mg/L	0.05	0.002	<0.002	<0.002	0.002	0.026	0.002	0.009	0.002	0.058
Molybdenum	mg/L		0.002	0.063	0.008	0.002	0.052	0.002	0.058	0.002	0.008
Nickel	mg/L		0.003	<0.003	0.004	0.003	<0.003	0.003	<0.003	0.003	0.004
Phosphorus	mg/L		0.05	<0.05	<0.05	0.05	<0.05	0.05	<0.05	0.05	<0.05
Selenium	mg/L	0.01	0.004	<0.004	<0.004	0.004	<0.004	0.004	<0.004	0.004	<0.004
Silicon	mg/L		0.05	3.20	6.29	0.05	3.40	0.05	2.58	0.05	6.45
Silver	mg/L		0.002	<0.002	<0.002	0.002	<0.002	0.002	<0.002	0.002	<0.002
Strontium	mg/L		0.005	0.559	1.57	0.005	0.350	0.005	0.780	0.005	0.395
Sulfur	mg/L		0.05	82.0	31.8	0.05	60.1	0.05	83.1	0.05	6.64
Thallium	mg/L		0.006	<0.006	<0.006	0.006	<0.006	0.006	<0.006	0.006	<0.006
Tin	mg/L		0.002	<0.002	<0.002	0.002	<0.002	0.002	<0.002	0.002	<0.002
Titanium	mg/L		0.002	0.004	0.002	0.002	0.003	0.002	0.005	0.002	<0.002
Uranium	mg/L	0.02	0.002	0.003	0.005	0.002	0.004	0.002	<0.002	0.002	<0.002
Vanadium	mg/L		0.002	<0.002	<0.002	0.002	<0.002	0.002	<0.002	0.002	<0.002
Zinc	mg/L	5	0.005	<0.005	0.012	0.005	0.005	0.005	0.009	0.005	<0.005

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AGAT WORK ORDER: 15T021634

PROJECT: New Liskeard GW

CLIENT NAME: AMEC FOSTER WHEELER ENVIRO&INFRASTR

ATTENTION TO: Emily Lemieux

SAMPLING SITE:

SAMPLED BY:

New Liskeard Groundwater Package

DATE RECEIVED: 2015-09-22

DATE REPORTED: 2015-10-06

		SAMPLE DESCRIPTION:		NL GW DUP-2		NL GW DUP-3
		SAMPLE TYPE:		Water		Water
		DATE SAMPLED:		9/20/2015		9/20/2015
Parameter	Unit	G / S	RDL	6997469	RDL	6997480
pH	pH Units	(6.5-8.5)	NA	8.14	NA	7.94
Alkalinity (as CaCO3)	mg/L	(30-500)	5	228	5	841
Electrical Conductivity	uS/cm		2	468	2	2590
Total Hardness (as CaCO3)	mg/L	(80-100)	0.5	234	0.5	798
Total Dissolved Solids	mg/L	500	20	244	20	1510
Fluoride	mg/L	1.5	0.05	0.27	0.25	<0.25
Chloride	mg/L	250	0.10	0.75	0.50	270
Nitrate as N	mg/L	10.0	0.05	0.05	0.25	10.2
Nitrite as N	mg/L	1.0	0.05	<0.05	0.25	<0.25
Sulphate	mg/L	500	0.10	16.8	0.50	173
Phosphate as P	mg/L		0.10	<0.10	0.50	<0.50
Ammonia as N	mg/L		0.02	<0.02	0.2	16.2
Total Kjeldahl Nitrogen	mg/L		0.10	0.14	0.10	18.1
Organic Nitrogen	mg/L	0.15	0.10	0.14	0.10	1.90
Dissolved Organic Carbon	mg/L	5	0.5	2.0	0.5	23.6
Calcium	mg/L		0.05	62.3	0.25	168
Magnesium	mg/L		0.05	19.0	0.25	91.8
Sodium	mg/L	20 (200)	0.05	5.09	0.25	172
Potassium	mg/L		0.05	3.50	0.25	87.7
Aluminum	mg/L	0.1	0.004	<0.004	0.004	<0.004
Arsenic	mg/L	0.025	0.003	<0.003	0.003	<0.003
Barium	mg/L	1	0.002	0.030	0.002	0.123
Beryllium	mg/L		0.001	<0.001	0.001	<0.001
Bismuth	mg/L		0.002	<0.002	0.002	<0.002
Boron	mg/L	5	0.010	0.031	0.010	1.64
Cadmium	mg/L	0.005	0.002	<0.002	0.002	<0.002
Chromium	mg/L	0.05	0.003	<0.003	0.003	<0.003
Cobalt	mg/L		0.001	<0.001	0.001	0.005
Copper	mg/L	1	0.003	<0.003	0.003	0.013
Iron	mg/L	0.3	0.010	0.111	0.010	<0.010

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AGAT WORK ORDER: 15T021634

PROJECT: New Liskeard GW

CLIENT NAME: AMEC FOSTER WHEELER ENVIRO&INFRASTR

ATTENTION TO: Emily Lemieux

SAMPLING SITE:

SAMPLED BY:

New Liskeard Groundwater Package

DATE RECEIVED: 2015-09-22

DATE REPORTED: 2015-10-06

		SAMPLE DESCRIPTION:		NL GW DUP-2		NL GW DUP-3
		SAMPLE TYPE:		Water		Water
		DATE SAMPLED:		9/20/2015		9/20/2015
Parameter	Unit	G / S	RDL	6997469	RDL	6997480
Lead	mg/L	0.01	0.002	<0.002	0.002	<0.002
Manganese	mg/L	0.05	0.002	0.014	0.002	0.862
Molybdenum	mg/L		0.002	<0.002	0.002	<0.002
Nickel	mg/L		0.003	<0.003	0.003	0.041
Phosphorus	mg/L		0.05	<0.05	0.05	<0.05
Selenium	mg/L	0.01	0.004	<0.004	0.004	<0.004
Silicon	mg/L		0.05	7.92	0.05	6.44
Silver	mg/L		0.002	<0.002	0.002	<0.002
Strontium	mg/L		0.005	0.464	0.005	1.03
Sulfur	mg/L		0.05	5.61	0.25	54.2
Thallium	mg/L		0.006	<0.006	0.006	<0.006
Tin	mg/L		0.002	<0.002	0.002	<0.002
Titanium	mg/L		0.002	<0.002	0.002	0.004
Uranium	mg/L	0.02	0.002	<0.002	0.002	<0.002
Vanadium	mg/L		0.002	<0.002	0.002	<0.002
Zinc	mg/L	5	0.005	0.006	0.005	<0.005

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard: Refers to O.Reg.169/03(mg/L)

6996945-6997480 Samples required dilution prior to analysis in order to keep the analytes within the calibration range of the instruments and/or to minimize any matrix interferences; the RDLs were adjusted to reflect the dilution.

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Guideline Violation

AGAT WORK ORDER: 15T021634

PROJECT: New Liskeard GW

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CLIENT NAME: AMEC FOSTER WHEELER ENVIRO&INFRASTR

ATTENTION TO: Emily Lemieux

SAMPLEID	SAMPLE TITLE	GUIDELINE	ANALYSIS PACKAGE	PARAMETER	GUIDEVALUE	RESULT
6996945	OW-1R-1	O.Reg.169/03(mg/L)	New Liskeard Groundwater Package	Alkalinity (as CaCO3)	(30-500)	670
6996945	OW-1R-1	O.Reg.169/03(mg/L)	New Liskeard Groundwater Package	Dissolved Organic Carbon	5	14.3
6996945	OW-1R-1	O.Reg.169/03(mg/L)	New Liskeard Groundwater Package	Manganese	0.05	0.429
6996945	OW-1R-1	O.Reg.169/03(mg/L)	New Liskeard Groundwater Package	Organic Nitrogen	0.15	2.59
6996945	OW-1R-1	O.Reg.169/03(mg/L)	New Liskeard Groundwater Package	Sodium	20 (200)	127
6996945	OW-1R-1	O.Reg.169/03(mg/L)	New Liskeard Groundwater Package	Total Dissolved Solids	500	1180
6996945	OW-1R-1	O.Reg.169/03(mg/L)	New Liskeard Groundwater Package	Total Hardness (as CaCO3)	(80-100)	676
6996966	OW-1-R-III	O.Reg.169/03(mg/L)	New Liskeard Groundwater Package	Alkalinity (as CaCO3)	(30-500)	978
6996966	OW-1-R-III	O.Reg.169/03(mg/L)	New Liskeard Groundwater Package	Chloride	250	277
6996966	OW-1-R-III	O.Reg.169/03(mg/L)	New Liskeard Groundwater Package	Dissolved Organic Carbon	5	28.8
6996966	OW-1-R-III	O.Reg.169/03(mg/L)	New Liskeard Groundwater Package	Manganese	0.05	0.810
6996966	OW-1-R-III	O.Reg.169/03(mg/L)	New Liskeard Groundwater Package	Organic Nitrogen	0.15	2.50
6996966	OW-1-R-III	O.Reg.169/03(mg/L)	New Liskeard Groundwater Package	Sodium	20 (200)	204
6996966	OW-1-R-III	O.Reg.169/03(mg/L)	New Liskeard Groundwater Package	Total Dissolved Solids	500	1610
6996966	OW-1-R-III	O.Reg.169/03(mg/L)	New Liskeard Groundwater Package	Total Hardness (as CaCO3)	(80-100)	821
6996977	OW-10-I	O.Reg.169/03(mg/L)	New Liskeard Groundwater Package	Iron	0.3	0.778
6996977	OW-10-I	O.Reg.169/03(mg/L)	New Liskeard Groundwater Package	Organic Nitrogen	0.15	0.18
6996977	OW-10-I	O.Reg.169/03(mg/L)	New Liskeard Groundwater Package	Total Hardness (as CaCO3)	(80-100)	412
6996987	OW-10-II	O.Reg.169/03(mg/L)	New Liskeard Groundwater Package	Total Dissolved Solids	500	546
6996987	OW-10-II	O.Reg.169/03(mg/L)	New Liskeard Groundwater Package	Total Hardness (as CaCO3)	(80-100)	485
6996996	OW11-I	O.Reg.169/03(mg/L)	New Liskeard Groundwater Package	Organic Nitrogen	0.15	0.22
6996996	OW11-I	O.Reg.169/03(mg/L)	New Liskeard Groundwater Package	Total Hardness (as CaCO3)	(80-100)	281
6997005	OW-11-II	O.Reg.169/03(mg/L)	New Liskeard Groundwater Package	Dissolved Organic Carbon	5	5.3
6997005	OW-11-II	O.Reg.169/03(mg/L)	New Liskeard Groundwater Package	Organic Nitrogen	0.15	0.53
6997005	OW-11-II	O.Reg.169/03(mg/L)	New Liskeard Groundwater Package	Sodium	20 (200)	39.2
6997005	OW-11-II	O.Reg.169/03(mg/L)	New Liskeard Groundwater Package	Total Dissolved Solids	500	532
6997005	OW-11-II	O.Reg.169/03(mg/L)	New Liskeard Groundwater Package	Total Hardness (as CaCO3)	(80-100)	457
6997016	OW-12-I	O.Reg.169/03(mg/L)	New Liskeard Groundwater Package	Organic Nitrogen	0.15	0.28
6997016	OW-12-I	O.Reg.169/03(mg/L)	New Liskeard Groundwater Package	Total Hardness (as CaCO3)	(80-100)	341
6997035	OW-12-II	O.Reg.169/03(mg/L)	New Liskeard Groundwater Package	Alkalinity (as CaCO3)	(30-500)	535
6997035	OW-12-II	O.Reg.169/03(mg/L)	New Liskeard Groundwater Package	Dissolved Organic Carbon	5	9.1
6997035	OW-12-II	O.Reg.169/03(mg/L)	New Liskeard Groundwater Package	Organic Nitrogen	0.15	1.71
6997035	OW-12-II	O.Reg.169/03(mg/L)	New Liskeard Groundwater Package	Sodium	20 (200)	73.7
6997035	OW-12-II	O.Reg.169/03(mg/L)	New Liskeard Groundwater Package	Total Dissolved Solids	500	766
6997035	OW-12-II	O.Reg.169/03(mg/L)	New Liskeard Groundwater Package	Total Hardness (as CaCO3)	(80-100)	518
6997046	OW13-I	O.Reg.169/03(mg/L)	New Liskeard Groundwater Package	Total Hardness (as CaCO3)	(80-100)	440
6997078	OW-16-I	O.Reg.169/03(mg/L)	New Liskeard Groundwater Package	Dissolved Organic Carbon	5	8.8
6997078	OW-16-I	O.Reg.169/03(mg/L)	New Liskeard Groundwater Package	Fluoride	1.5	1.93
6997078	OW-16-I	O.Reg.169/03(mg/L)	New Liskeard Groundwater Package	Organic Nitrogen	0.15	0.80
6997078	OW-16-I	O.Reg.169/03(mg/L)	New Liskeard Groundwater Package	Sodium	20 (200)	109
6997078	OW-16-I	O.Reg.169/03(mg/L)	New Liskeard Groundwater Package	Total Hardness (as CaCO3)	(80-100)	102
6997108	OW-16-11	O.Reg.169/03(mg/L)	New Liskeard Groundwater Package	Sodium	20 (200)	70.0
6997108	OW-16-11	O.Reg.169/03(mg/L)	New Liskeard Groundwater Package	Total Hardness (as CaCO3)	(80-100)	139

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Guideline Violation

AGAT WORK ORDER: 15T021634

PROJECT: New Liskeard GW

CLIENT NAME: AMEC FOSTER WHEELER ENVIRO&INFRASTR

ATTENTION TO: Emily Lemieux

SAMPLEID	SAMPLE TITLE	GUIDELINE	ANALYSIS PACKAGE	PARAMETER	GUIDEVALUE	RESULT
6997132	OW-16-III	O.Reg.169/03(mg/L)	New Liskeard Groundwater Package	Organic Nitrogen	0.15	0.60
6997132	OW-16-III	O.Reg.169/03(mg/L)	New Liskeard Groundwater Package	Total Hardness (as CaCO3)	(80-100)	345
6997148	OW-17-I	O.Reg.169/03(mg/L)	New Liskeard Groundwater Package	Total Hardness (as CaCO3)	(80-100)	235
6997178	OW-17-II	O.Reg.169/03(mg/L)	New Liskeard Groundwater Package	Sodium	20 (200)	86.8
6997178	OW-17-II	O.Reg.169/03(mg/L)	New Liskeard Groundwater Package	Total Hardness (as CaCO3)	(80-100)	134
6997203	OW-23-I	O.Reg.169/03(mg/L)	New Liskeard Groundwater Package	Organic Nitrogen	0.15	1.04
6997203	OW-23-I	O.Reg.169/03(mg/L)	New Liskeard Groundwater Package	Sodium	20 (200)	50.1
6997203	OW-23-I	O.Reg.169/03(mg/L)	New Liskeard Groundwater Package	Total Hardness (as CaCO3)	(80-100)	139
6997245	OW-23-II	O.Reg.169/03(mg/L)	New Liskeard Groundwater Package	Organic Nitrogen	0.15	0.20
6997245	OW-23-II	O.Reg.169/03(mg/L)	New Liskeard Groundwater Package	Sodium	20 (200)	61.5
6997245	OW-23-II	O.Reg.169/03(mg/L)	New Liskeard Groundwater Package	Total Hardness (as CaCO3)	(80-100)	229
6997330	OW-24-I	O.Reg.169/03(mg/L)	New Liskeard Groundwater Package	Iron	0.3	1.56
6997330	OW-24-I	O.Reg.169/03(mg/L)	New Liskeard Groundwater Package	Manganese	0.05	0.062
6997330	OW-24-I	O.Reg.169/03(mg/L)	New Liskeard Groundwater Package	Organic Nitrogen	0.15	0.25
6997330	OW-24-I	O.Reg.169/03(mg/L)	New Liskeard Groundwater Package	Total Hardness (as CaCO3)	(80-100)	234
6997401	OW-24-II	O.Reg.169/03(mg/L)	New Liskeard Groundwater Package	Manganese	0.05	0.107
6997401	OW-24-II	O.Reg.169/03(mg/L)	New Liskeard Groundwater Package	Organic Nitrogen	0.15	0.16
6997401	OW-24-II	O.Reg.169/03(mg/L)	New Liskeard Groundwater Package	Total Hardness (as CaCO3)	(80-100)	277
6997409	OW-24-III	O.Reg.169/03(mg/L)	New Liskeard Groundwater Package	Manganese	0.05	0.091
6997409	OW-24-III	O.Reg.169/03(mg/L)	New Liskeard Groundwater Package	Organic Nitrogen	0.15	1.19
6997409	OW-24-III	O.Reg.169/03(mg/L)	New Liskeard Groundwater Package	Total Hardness (as CaCO3)	(80-100)	249
6997416	OW-25-I	O.Reg.169/03(mg/L)	New Liskeard Groundwater Package	Organic Nitrogen	0.15	0.21
6997416	OW-25-I	O.Reg.169/03(mg/L)	New Liskeard Groundwater Package	Sodium	20 (200)	29.4
6997416	OW-25-I	O.Reg.169/03(mg/L)	New Liskeard Groundwater Package	Total Hardness (as CaCO3)	(80-100)	166
6997423	OW-25-II	O.Reg.169/03(mg/L)	New Liskeard Groundwater Package	Organic Nitrogen	0.15	0.33
6997423	OW-25-II	O.Reg.169/03(mg/L)	New Liskeard Groundwater Package	Sodium	20 (200)	115
6997423	OW-25-II	O.Reg.169/03(mg/L)	New Liskeard Groundwater Package	Total Hardness (as CaCO3)	(80-100)	142
6997433	OW-25-III	O.Reg.169/03(mg/L)	New Liskeard Groundwater Package	Organic Nitrogen	0.15	0.16
6997433	OW-25-III	O.Reg.169/03(mg/L)	New Liskeard Groundwater Package	Sodium	20 (200)	32.4
6997433	OW-25-III	O.Reg.169/03(mg/L)	New Liskeard Groundwater Package	Total Hardness (as CaCO3)	(80-100)	365
6997440	OW-30-14-III	O.Reg.169/03(mg/L)	New Liskeard Groundwater Package	Organic Nitrogen	0.15	0.39
6997440	OW-30-14-III	O.Reg.169/03(mg/L)	New Liskeard Groundwater Package	Sodium	20 (200)	116
6997440	OW-30-14-III	O.Reg.169/03(mg/L)	New Liskeard Groundwater Package	Total Hardness (as CaCO3)	(80-100)	107
6997448	OW-30-14-II	O.Reg.169/03(mg/L)	New Liskeard Groundwater Package	Organic Nitrogen	0.15	0.61
6997448	OW-30-14-II	O.Reg.169/03(mg/L)	New Liskeard Groundwater Package	Sodium	20 (200)	117
6997448	OW-30-14-II	O.Reg.169/03(mg/L)	New Liskeard Groundwater Package	Total Hardness (as CaCO3)	(80-100)	132
6997455	NL GW DUP-1	O.Reg.169/03(mg/L)	New Liskeard Groundwater Package	Iron	0.3	0.933
6997455	NL GW DUP-1	O.Reg.169/03(mg/L)	New Liskeard Groundwater Package	Manganese	0.05	0.058
6997455	NL GW DUP-1	O.Reg.169/03(mg/L)	New Liskeard Groundwater Package	Organic Nitrogen	0.15	0.25
6997455	NL GW DUP-1	O.Reg.169/03(mg/L)	New Liskeard Groundwater Package	Total Hardness (as CaCO3)	(80-100)	211
6997469	NL GW DUP-2	O.Reg.169/03(mg/L)	New Liskeard Groundwater Package	Total Hardness (as CaCO3)	(80-100)	234
6997480	NL GW DUP-3	O.Reg.169/03(mg/L)	New Liskeard Groundwater Package	Alkalinity (as CaCO3)	(30-500)	841
6997480	NL GW DUP-3	O.Reg.169/03(mg/L)	New Liskeard Groundwater Package	Chloride	250	270

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Guideline Violation

AGAT WORK ORDER: 15T021634

PROJECT: New Liskeard GW

CLIENT NAME: AMEC FOSTER WHEELER ENVIRO&INFRASTR

ATTENTION TO: Emily Lemieux

SAMPLEID	SAMPLE TITLE	GUIDELINE	ANALYSIS PACKAGE	PARAMETER	GUIDEVALUE	RESULT
6997480	NL GW DUP-3	O.Reg.169/03(mg/L)	New Liskeard Groundwater Package	Dissolved Organic Carbon	5	23.6
6997480	NL GW DUP-3	O.Reg.169/03(mg/L)	New Liskeard Groundwater Package	Manganese	0.05	0.862
6997480	NL GW DUP-3	O.Reg.169/03(mg/L)	New Liskeard Groundwater Package	Nitrate as N	10.0	10.2
6997480	NL GW DUP-3	O.Reg.169/03(mg/L)	New Liskeard Groundwater Package	Organic Nitrogen	0.15	1.90
6997480	NL GW DUP-3	O.Reg.169/03(mg/L)	New Liskeard Groundwater Package	Sodium	20 (200)	172
6997480	NL GW DUP-3	O.Reg.169/03(mg/L)	New Liskeard Groundwater Package	Total Dissolved Solids	500	1510
6997480	NL GW DUP-3	O.Reg.169/03(mg/L)	New Liskeard Groundwater Package	Total Hardness (as CaCO3)	(80-100)	798

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Quality Assurance

CLIENT NAME: AMEC FOSTER WHEELER ENVIRO&INFRASTR

AGAT WORK ORDER: 15T021634

PROJECT: New Liskeard GW

ATTENTION TO: Emily Lemieux

SAMPLING SITE:

SAMPLED BY:

Water Analysis

RPT Date: Oct 06, 2015			DUPLICATE				REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD	Method Blank	Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
New Liskeard Groundwater Package															
pH	6997423	6997423	8.13	8.09	0.5%	NA	99%	90%	110%	NA			NA		
Alkalinity (as CaCO3)	6997423	6997423	143	143	0.0%	< 5	96%	80%	120%	NA			NA		
Electrical Conductivity	6997423	6997423	793	795	0.3%	< 2	103%	80%	120%	NA			NA		
Total Dissolved Solids	6996945	6996945	1180	1180	0.0%	< 20	106%	80%	120%	NA			NA		
Fluoride	6997078	6997078	1.93	2.04	5.5%	< 0.05	109%	90%	110%	104%	90%	110%	96%	80%	120%
Chloride	6997078	6997078	5.33	5.44	2.0%	< 0.10	102%	90%	110%	103%	90%	110%	105%	80%	120%
Nitrate as N	6997078	6997078	< 0.25	<0.25	0.0%	< 0.05	96%	90%	110%	105%	90%	110%	108%	80%	120%
Nitrite as N	6997078	6997078	< 0.25	<0.25	0.0%	< 0.05	NA	90%	110%	104%	90%	110%	103%	80%	120%
Sulphate	6997078	6997078	1.82	1.93	5.9%	< 0.10	103%	90%	110%	104%	90%	110%	110%	80%	120%
Phosphate as P	6997078	6997078	< 0.50	<0.50	0.0%	< 0.10	96%	90%	110%	100%	90%	110%	95%	80%	120%
Ammonia as N	6997469	6997469	< 0.02	<0.02	0.0%	< 0.02	95%	90%	110%	101%	90%	110%	80%	80%	120%
Total Kjeldahl Nitrogen	6997440	6997440	0.49	0.47	4.2%	< 0.10	99%	80%	120%	102%	80%	120%	108%	70%	130%
Dissolved Organic Carbon	6996945	6996945	14.3	14.0	2.1%	< 0.5	96%	90%	110%	93%	90%	110%	94%	80%	120%
Calcium	6996977	6996977	110	111	0.9%	< 0.05	101%	90%	110%	102%	90%	110%	104%	70%	130%
Magnesium	6996977	6996977	33.3	34.2	2.7%	< 0.05	98%	90%	110%	99%	90%	110%	100%	70%	130%
Sodium	6996977	6996977	3.87	3.94	1.8%	< 0.05	103%	90%	110%	103%	90%	110%	102%	70%	130%
Potassium	6996977	6996977	4.48	4.64	3.5%	< 0.05	102%	90%	110%	102%	90%	110%	106%	70%	130%
Aluminum	6996977	6996977	< 0.004	<0.004	0.0%	< 0.004	94%	90%	110%	98%	90%	110%	98%	70%	130%
Arsenic	6996977	6996977	< 0.003	<0.003	0.0%	< 0.003	98%	90%	110%	99%	90%	110%	99%	70%	130%
Barium	6996977	6996977	0.035	0.035	0.0%	< 0.002	107%	90%	110%	106%	90%	110%	99%	70%	130%
Beryllium	6996977	6996977	< 0.001	<0.001	0.0%	< 0.001	92%	90%	110%	93%	90%	110%	99%	70%	130%
Bismuth	6996977	6996977	< 0.002	<0.002	0.0%	< 0.002	100%	90%	110%	101%	90%	110%	96%	70%	130%
Boron	6996977	6996977	0.120	0.117	2.5%	< 0.010	93%	90%	110%	93%	90%	110%	95%	70%	130%
Cadmium	6996977	6996977	< 0.002	<0.002	0.0%	< 0.002	100%	90%	110%	104%	90%	110%	110%	70%	130%
Chromium	6996977	6996977	< 0.003	<0.003	0.0%	< 0.003	101%	90%	110%	101%	90%	110%	101%	70%	130%
Cobalt	6996977	6996977	< 0.001	<0.001	0.0%	< 0.001	97%	90%	110%	98%	90%	110%	94%	70%	130%
Copper	6996977	6996977	< 0.003	<0.003	0.0%	< 0.003	98%	90%	110%	101%	90%	110%	84%	70%	130%
Iron	6996977	6996977	0.778	0.786	1.0%	< 0.010	97%	90%	110%	93%	90%	110%	89%	70%	130%
Lead	6996977	6996977	< 0.002	<0.002	0.0%	< 0.002	98%	90%	110%	101%	90%	110%	100%	70%	130%
Manganese	6996977	6996977	0.044	0.044	0.0%	< 0.002	96%	90%	110%	100%	90%	110%	100%	70%	130%
Molybdenum	6996977	6996977	< 0.002	<0.002	0.0%	< 0.002	93%	90%	110%	92%	90%	110%	100%	70%	130%
Nickel	6996977	6996977	0.005	0.005	0.0%	< 0.003	99%	90%	110%	99%	90%	110%	90%	70%	130%
Phosphorus	6996977	6996977	< 0.05	<0.05	0.0%	< 0.05	99%	90%	110%	102%	90%	110%	111%	70%	130%
Selenium	6996977	6996977	< 0.004	<0.004	0.0%	< 0.004	105%	90%	110%	109%	90%	110%	112%	70%	130%
Silicon	6996977	6996977	3.04	2.96	2.7%	< 0.05	102%	90%	110%	97%	90%	110%	91%	70%	130%
Silver	6996977	6996977	< 0.002	<0.002	0.0%	< 0.002	100%	90%	110%	109%	90%	110%	103%	70%	130%
Strontium	6996977	6996977	1.08	1.08	0.0%	< 0.005	101%	90%	110%	100%	90%	110%	93%	70%	130%
Sulfur	6996996	6996996	56.9	57.2	0.5%	< 0.05	109%	90%	110%	107%	80%	130%	79%	70%	130%
Thallium	6996977	6996977	< 0.006	<0.006	0.0%	< 0.006	103%	90%	110%	106%	90%	110%	107%	70%	130%

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Quality Assurance

CLIENT NAME: AMEC FOSTER WHEELER ENVIRO&INFRASTR

AGAT WORK ORDER: 15T021634

PROJECT: New Liskeard GW

ATTENTION TO: Emily Lemieux

SAMPLING SITE:

SAMPLED BY:

Water Analysis (Continued)

RPT Date: Oct 06, 2015

PARAMETER	Batch	Sample Id	DUPLICATE			Method Blank	REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
			Dup #1	Dup #2	RPD		Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
Tin	6996977	6996977	< 0.002	<0.002	0.0%	< 0.002	104%	90%	110%	105%	90%	110%	102%	70%	130%
Titanium	6996977	6996977	0.004	0.004	0.0%	< 0.002	101%	90%	110%	102%	90%	110%	101%	70%	130%
Uranium	6996977	6996977	< 0.002	<0.002	0.0%	< 0.002	98%	90%	110%	100%	90%	110%	104%	70%	130%
Vanadium	6996977	6996977	< 0.002	<0.002	0.0%	< 0.002	99%	90%	110%	101%	90%	110%	102%	70%	130%
Zinc	6996977	6996977	0.005	0.005	0.0%	< 0.005	97%	90%	110%	98%	90%	110%	93%	70%	130%
New Liskeard Groundwater Package															
pH	6996966	6996966	7.94	7.83	1.4%	NA	99%	90%	110%	NA			NA		
Alkalinity (as CaCO3)	6996966	6996966	978	978	0.0%	< 5	96%	80%	120%	NA			NA		
Electrical Conductivity	6996966	6996966	2920	2930	0.3%	< 2	102%	80%	120%	NA			NA		
Total Dissolved Solids	6997416	6997416	230	222	3.5%	< 20	106%	80%	120%	NA			NA		
Fluoride	6997448	6997448	1.42	1.51	6.1%	< 0.05	102%	90%	110%	104%	90%	110%	105%	80%	120%
Chloride	6997448	6997448	17.4	17.7	1.7%	< 0.10	98%	90%	110%	103%	90%	110%	105%	80%	120%
Nitrate as N	6997448	6997448	0.41	0.38	7.6%	< 0.05	93%	90%	110%	105%	90%	110%	108%	80%	120%
Nitrite as N	6997448	6997448	< 0.25	< 0.25	0.0%	< 0.05	NA	90%	110%	104%	90%	110%	107%	80%	120%
Sulphate	6997448	6997448	222	216	2.7%	< 0.10	103%	90%	110%	104%	90%	110%	89%	80%	120%
Phosphate as P	6997448	6997448	< 0.50	< 0.50	0.0%	< 0.10	97%	90%	110%	100%	90%	110%	99%	80%	120%
Ammonia as N	6997035	6997035	< 0.02	<0.02	0.0%	< 0.02	95%	90%	110%	103%	90%	110%	84%	80%	120%
Total Kjeldahl Nitrogen	6997046	6997046	0.14	0.10	NA	< 0.10	100%	80%	120%	102%	80%	120%	102%	70%	130%
Dissolved Organic Carbon	6997203	6997203	2.7	2.7	0.0%	< 0.5	101%	90%	110%	93%	90%	110%	88%	80%	120%
Calcium	6997448	6997448	21.9	21.8	0.5%	< 0.05	101%	90%	110%	102%	90%	110%	97%	70%	130%
Magnesium	6997448	6997448	18.7	18.5	1.1%	< 0.05	99%	90%	110%	100%	90%	110%	94%	70%	130%
Sodium	6997448	6997448	117	116	0.9%	< 0.05	103%	90%	110%	104%	90%	110%	100%	70%	130%
Potassium	6997448	6997448	10.5	10.3	1.9%	< 0.05	102%	90%	110%	102%	90%	110%	102%	70%	130%
Aluminum	6997423	6997423	0.006	0.005	18.2%	< 0.004	103%	90%	110%	106%	90%	110%	99%	70%	130%
Arsenic	6997423	6997423	< 0.003	<0.003	0.0%	< 0.003	99%	90%	110%	101%	90%	110%	106%	70%	130%
Barium	6997423	6997423	0.025	0.024	4.1%	< 0.002	101%	90%	110%	102%	90%	110%	100%	70%	130%
Beryllium	6997423	6997423	< 0.001	<0.001	0.0%	< 0.001	98%	90%	110%	100%	90%	110%	99%	70%	130%
Bismuth	6997423	6997423	< 0.002	<0.002	0.0%	< 0.002	102%	90%	110%	102%	90%	110%	91%	70%	130%
Boron	6997423	6997423	0.198	0.191	3.6%	< 0.010	104%	90%	110%	102%	90%	110%	95%	70%	130%
Cadmium	6997423	6997423	< 0.002	<0.002	0.0%	< 0.002	100%	90%	110%	107%	90%	110%	107%	70%	130%
Chromium	6997423	6997423	< 0.003	<0.003	0.0%	< 0.003	102%	90%	110%	106%	90%	110%	102%	70%	130%
Cobalt	6997423	6997423	< 0.001	<0.001	0.0%	< 0.001	99%	90%	110%	102%	90%	110%	96%	70%	130%
Copper	6997423	6997423	< 0.003	<0.003	0.0%	< 0.003	96%	90%	110%	101%	90%	110%	90%	70%	130%
Iron	6997423	6997423	< 0.010	<0.010	0.0%	< 0.010	103%	90%	110%	98%	90%	110%	77%	70%	130%
Lead	6997423	6997423	< 0.002	<0.002	0.0%	< 0.002	100%	90%	110%	104%	90%	110%	96%	70%	130%
Manganese	6997423	6997423	< 0.002	<0.002	0.0%	< 0.002	101%	90%	110%	105%	90%	110%	100%	70%	130%
Molybdenum	6997423	6997423	0.063	0.061	3.2%	< 0.002	96%	90%	110%	92%	90%	110%	97%	70%	130%
Nickel	6997423	6997423	< 0.003	<0.003	0.0%	< 0.003	98%	90%	110%	102%	90%	110%	93%	70%	130%
Phosphorus	6997423	6997423	< 0.05	<0.05	0.0%	< 0.05	100%	90%	110%	102%	90%	110%	109%	70%	130%

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Quality Assurance

CLIENT NAME: AMEC FOSTER WHEELER ENVIRO&INFRASTR
AGAT WORK ORDER: 15T021634
PROJECT: New Liskeard GW
ATTENTION TO: Emily Lemieux
SAMPLING SITE:
SAMPLED BY:

Water Analysis (Continued)

RPT Date: Oct 06, 2015			DUPLICATE				REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD	Method Blank	Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
Selenium	6997423	6997423	< 0.004	<0.004	0.0%	< 0.004	102%	90%	110%	101%	90%	110%	112%	70%	130%
Silicon	6997423	6997423	3.20	3.01	6.1%	< 0.05	105%	90%	110%	99%	90%	110%	89%	70%	130%
Silver	6997423	6997423	< 0.002	<0.002	0.0%	< 0.002	99%	90%	110%	108%	90%	110%	99%	70%	130%
Strontium	6997423	6997423	0.559	0.553	1.1%	< 0.005	98%	90%	110%	99%	90%	110%	87%	70%	130%
Sulfur	6997455	6997455	6.64	6.62	0.3%	< 0.05	105%	90%	110%	107%	80%	130%	112%	70%	130%
Thallium	6997423	6997423	< 0.006	<0.006	0.0%	< 0.006	106%	90%	110%	110%	90%	110%	102%	70%	130%
Tin	6997423	6997423	< 0.002	<0.002	0.0%	< 0.002	103%	90%	110%	103%	90%	110%	103%	70%	130%
Titanium	6997423	6997423	0.004	0.004	0.0%	< 0.002	102%	90%	110%	102%	90%	110%	101%	70%	130%
Uranium	6997423	6997423	0.003	0.003	0.0%	< 0.002	101%	90%	110%	103%	90%	110%	101%	70%	130%
Vanadium	6997423	6997423	< 0.002	<0.002	0.0%	< 0.002	101%	90%	110%	103%	90%	110%	103%	70%	130%
Zinc	6997423	6997423	< 0.005	<0.005	0.0%	< 0.005	96%	90%	110%	102%	90%	110%	102%	70%	130%

Comments: NA signifies Not Applicable.
RPD Qualifier for TKN: The average for the sample and duplicate is less than 5X RDL, thus, lab's RPD acceptance criteria are not applicable.

Certified By:

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Method Summary

CLIENT NAME: AMEC FOSTER WHEELER ENVIRO&INFRASTR

AGAT WORK ORDER: 15T021634

PROJECT: New Liskeard GW

ATTENTION TO: Emily Lemieux

SAMPLING SITE:

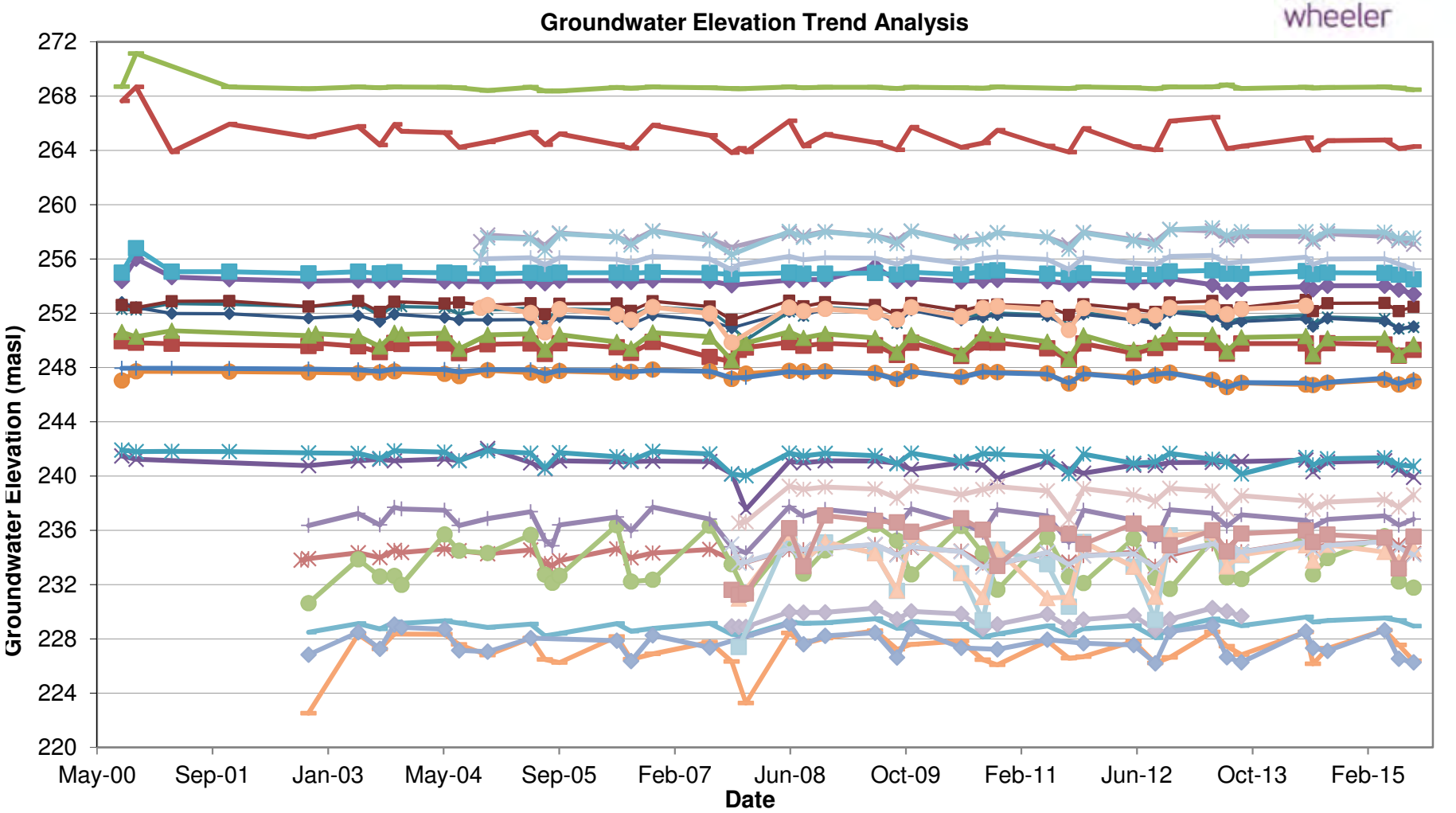
SAMPLED BY:

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Water Analysis			
pH	INOR-93-6000	SM 4500-H+ B	PC TITRATE
Alkalinity (as CaCO3)	INOR-93-6000	SM 2320 B	PC TITRATE
Electrical Conductivity	INOR-93-6000	SM 2510 B	PC TITRATE
Total Hardness (as CaCO3)	MET-93-6105	EPA SW-846 6010C & 200.7	ICP/OES
Total Dissolved Solids	INOR-93-6028	SM 2540 C	BALANCE
Fluoride	INOR-93-6004	SM 4110 B	ION CHROMATOGRAPH
Chloride	INOR-93-6004	SM 4110 B	ION CHROMATOGRAPH
Nitrate as N	INOR-93-6004	SM 4110 B	ION CHROMATOGRAPH
Nitrite as N	INOR-93-6004	SM 4110 B	ION CHROMATOGRAPH
Sulphate	INOR-93-6004	SM 4110 B	ION CHROMATOGRAPH
Phosphate as P	INOR-93-6004	SM 4110 B	ION CHROMATOGRAPH
Ammonia as N	INOR-93-6002	AQ2 EPA-103A & SM 4500 NH3-F	AQ-2 DISCRETE ANALYZER
Total Kjeldahl Nitrogen	INOR-93-6048	QuikChem 10-107-06-2-I & SM 4500-Norg D	LACHAT FIA
Organic Nitrogen		SM 4500-Norg A	CALCULATION
Dissolved Organic Carbon	INOR-93-6049	EPA 415.1 & SM 5310 B	SHIMADZU CARBON ANALYZER
Calcium	MET-93-6105	EPA SW-846 6010C & 200.7	ICP/OES
Magnesium	MET-93-6105	EPA SW-846 6010C & 200.7	ICP/OES
Sodium	MET-93-6105	EPA SW-846 6010C & 200.7	ICP/OES
Potassium	MET-93-6105	EPA SW-846 6010C & 200.7	ICP/OES
Aluminum	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Arsenic	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Barium	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Beryllium	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Bismuth	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Boron	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Cadmium	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Chromium	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Cobalt	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Copper	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Iron	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Lead	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Manganese	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Molybdenum	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Nickel	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Phosphorus	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Selenium	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Silicon	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Silver	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Strontium	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Sulfur	MET-93-6105	EPA SW-846 6010C & 200.7	ICP/OES
Thallium	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Tin	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Titanium	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Uranium	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Vanadium	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Zinc	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS

APPENDIX D

GROUNDWATER ELEVATIONS

The City of Temiskaming Shores
Hydrogeological Characterization
New Liskeard Waste Disposal Site
New Liskeard, Ontario
August 2016



Summary of Groundwater Elevations

Monitor No.	UTM Coordinates		Measuring Point Elevation prior to September 2014 (masl)[1]	Current Measuring Point Elevation (masl)[1]	Elevation of Water (masl)[1]																					
	Easting	Northing			Jun-08	Aug-08	Nov-08	Jun-09	Sep-09	Nov-09	Jun-10	Sep-10	Nov-10	Jun-11	Sep-11	Nov-11	Jun-12	Sep-12	Nov-12	May-13	Jul-13	Sep-13	Jun-14	Jul-14	Sep-14	May-15	Jul-15	Sep-15
OW-1R-I	596848	5262959	254.17	254.17	252.10	251.79	252.43	252.18	251.27	252.44	251.84	251.87	252.02	251.87	251.10	252.04	251.63	251.46	252.22	251.99	251.36	251.62	251.84	251.22	251.72	251.60	250.82	250.95
OW-1R-II	596848	5262959	254.06	254.06	252.10	251.82	252.31	252.09	251.25	252.22	251.50	251.72	251.89	251.80	251.01	251.93	251.50	251.22	252.08	251.76	251.16	251.39	251.61	251.02	251.62	251.41	250.87	251.01
OW-1R-III	596848	5262959	254.19	254.19	252.91	252.51	252.81	252.60	251.86	252.74	252.16	252.56	252.64	252.51	251.87	252.66	252.29	252.09	252.79	252.91	252.20	252.42	252.97	252.16	252.74	252.76	252.15	252.47
OW-2B	596919	5263040	247.26	247.26	246.24	246.27	246.36	246.31	245.99	246.41	246.17	246.38	245.41	246.37	245.69	246.37	246.13	246.21	246.40	246.79	246.26	246.52	ND	246.31	Decommissioned			
OW-2C	596919	5263040	247.14	247.14	244.15	245.55	245.58	245.44	245.19	245.51	245.03	245.05	245.31	245.27	244.57	245.40	245.14	245.20	245.41	245.18	245.04	245.18	ND	245.11	Decommissioned			
OW-3A	596974	5263111	244.55	244.55	243.48	243.41	243.45	243.25	242.46	243.44	242.57	243.38	243.40	243.32			242.62	242.78	243.31	243.29	242.89	243.22	243.28	242.41	Decommissioned			
OW-3B	596974	5263111	244.50	244.50	243.74	243.68			242.77	243.72	242.94	243.68	243.69	243.59	242.07	243.57	242.91	243.09	243.57	243.57	243.11	243.42	243.55	242.67	Decommissioned			
OW-4A	596978	5262870	251.20	251.20	250.17	250.12	250.21	250.19	250.21	250.19	250.10	250.18	250.18	250.12	250.13		249.96	250.05	250.11	250.07	249.62	250.14	250.14	249.23	Decommissioned			
OW-4C	596978	5262870	251.31	251.31	248.73	249.80	249.86	249.84	249.55	249.66	249.64	249.78	249.79	249.43	249.15	249.58	249.37	249.34	249.45	248.96	248.61	248.89	249.52	249.85	Decommissioned			
OW-5A	596879	5262883	253.48	253.48	252.88	252.87	253.24	253.23	253.12	253.36	253.18	253.27	253.32	253.30	253.19	253.32	253.14	253.12	253.34	250.31	250.15	250.23	250.32	250.09	Decommissioned			
OW-6A	596973	5262769	254.32	254.32	253.17	253.09	253.15	253.13	253.04	253.20	253.01	253.17	253.20	253.12	252.96		252.96	253.05	253.19	253.16	253.02	253.10	253.15	252.93	Decommissioned			
OW-6B	596973	5262769	254.35	254.35	252.25	252.71	252.69	252.64	252.59	252.72	252.53	252.64	252.71	252.56	252.43	252.68	252.51	252.61	252.76	252.29	252.23	252.30	252.34	252.28	Decommissioned			
OW-7A	596895	5262781	255.83	255.83	255.51	255.43	255.47	255.48	255.36	255.54	255.35	255.32	255.48	255.42	255.29	255.51	255.35	255.20	255.59	ND	ND	252.19	252.45	252.22	Decommissioned			
OW-7B	596895	5262781	256.01	256.01																ND	ND	252.25	252.51	252.26	Decommissioned			
OW-7C	596895	5262781	255.90	255.90															251.33	ND	ND	248.15	248.30	248.13	Decommissioned			
OW-8A	597088	5262770	249.47	249.47																248.30	247.35	Damaged	248.15	248.03	Decommissioned			
OW-8B	597088	5262770	249.54	249.54																Destroyed								
OW-9A	597071	5262876	247.25	247.25	246.29	246.21	246.30	246.11	245.37	246.32	245.55	246.29	246.30	246.26	244.85	246.25	245.83	245.55	246.27	246.11	245.15	245.72	245.45	245.45	Decommissioned			
OW-9B	597071	5262876	247.33	247.33	245.75	245.79	245.76	245.73	245.22	245.82	245.31	245.83	245.81	245.78	244.62	245.77	245.47	246.03	245.81	245.79	244.89	245.48	245.14	245.36	Decommissioned			
OW-10-I	596724	5263229	251.67	251.67	249.85	249.59	249.79	249.64	248.92	249.81	248.84	249.84	249.81	249.41	248.57	249.77	249.05	249.42	249.82	249.79	249.01	249.76	249.76	248.82	249.78	249.68	248.85	249.28
OW-10-II	596724	5263229	251.69	251.69	250.62	250.18	250.47	250.18	249.10	250.38	248.99	250.52	250.42	249.90	248.61	250.37	249.31	249.80	250.44	250.43	249.18	250.21	250.31	248.99	250.14	250.16	248.92	249.71
OW-11-I	597001	5263159	242.93	242.93	241.07	240.98	241.12	241.11	240.96	240.48	240.97	240.81	239.82	241.03	240.53	240.21	240.81	240.79	241.00	241.02	241.08	241.07	241.18	240.33	241.03	241.13	240.47	239.91
OW-11-II	597001	5263159	242.82	242.82	241.68	241.48	241.66	241.50	240.89	241.69	241.07	241.65	241.62	241.43	240.17	241.62	240.94	241.05	241.67	241.23	241.02	240.14	241.37	240.82	241.27	241.34	240.80	240.73
OW-12-I	597007	5262919	248.92	248.92	247.75	247.72	247.72	247.61	247.16	247.71	247.31	247.69	247.66	247.57	246.81	247.55	247.30	247.39	247.62	247.09	246.54	246.86	246.73	246.69	246.86	247.10	246.74	246.97
OW-12-II	597007	5262919	248.95	248.95	247.69	247.60	247.69	247.55	247.09	247.69	247.26	247.65	247.61	247.51	246.85	247.53	247.20	247.50	247.59	247.04	246.55	246.89	246.86	246.69	246.91	247.22	246.79	247.11
OW-13-I	596602	5262921	273.70	273.70	266.18	264.31	265.18	264.58	264.03	265.71	264.23	264.55	265.48	264.31	263.86	265.62	264.28	264.04	266.16	266.43	264.13	264.29	264.94	264.02	264.71	264.77	264.12	264.27
OW-13-II	596602	5262921	273.85	273.85	268.68	268.61	268.66	268.66	268.57	268.66	268.61	268.58	268.67		268.56	268.68	268.61	268.55	268.67	268.67	268.82	268.56	268.66	268.59	268.64	268.67	268.60	268.47
OW-14-I	596977	5262674	258.81	258.81	254.43	254.47	254.47	255.45	254.39	254.54	254.34	254.41	254.45	254.37	254.17	254.44	254.28	254.34	254.55	254.11	253.57	253.80	253.95	253.76	254.03	254.02	253.74	253.41
OW-14-II	596977	5262674	258.72	258.72	254.99	254.90	254.90	254.97	254.85	255.03	254.86	255.07	255.15	254.90	254.83	254.95	254.84	254.86	255.08	255.16	254.90	254.90	255.09	254.88	254.99	254.97	254.84	254.50
OW-15-I	597059	5262605	254.32	254.32	251.64	251.86	252.14	251.66	251.73	251.90	251.58	251.52	251.82	251.37	251.18	251.35	251.30	251.15	251.64	Destroyed								
OW-15-II	597059	5262605	254.40	254.40	253.35	253.17	253.37	253.11	252.73	253.39	252.82	253.37	253.42	253.32		253.33	252.81	253.08	253.34	Destroyed								
OW-16-I	597372	5263132	238.59	238.59	234.57	234.57	234.67	234.94	234.21	234.72	234.46	233.58	233.50	234.34	233.65	234.11	234.38	233.34	234.15	234.98	234.78	234.42	235.16	234.66	234.94	235.22	234.91	234.29
OW-16-II	597372	5263132	238.73	238.73	235.26	232.80	234.51	236.41	235.24	232.74	236.32	234.28	231.62	235.50	232.60	232.11	235.40	232.48	231.68	235.30	232.53	232.41	235.67	232.74	233.95	235.56	232.22	231.77
OW-16-III	597372	5263132	238.78	238.78	237.74	237.03	237.54	237.17	236.25	237.57	236.54	235.84	237.51	237.06	235.12	237.48	236.75	235.17	237.51	237.26	236.30	237.14	236.74	236.27	236.81	237.07	236.37	236.82
OW-17-I	597359	5263362	230.08	230.08	229.21	229.14	229.17	229.48	228.76	229.28	229.06	228.12	228.36	228.95	228.26	228.74	228.97	228.08	228.76	229.46	229.25	228.97	229.60	229.23	229.34	229.54	229.35	228.93
OW-17-II	597359	5263362	229.88	229.88	228.42	227.65	228.05	228.59	227.23	227.59	227.85	226.46	226.08	227.85	226.57	226.68	227.81	226.21	226.62	228.51	227.46	226.83	228.51	226.16	227.31	228.64	227.54	226.38
OW-17-III	597359	5263362	230.04	230.04	229.12	227.61	228.22	228.45	226.63	228.75	227.33		227.23	227.94		227.68	227.54	226.20	228.54	228.98	226.64	<226.26	228.54	227.32	227.11	228.64	226.54	<226.26
OW-18-I	596771	5262904	280.52	280.52		264.70														<273.48	<273.48	<273.48	<273.48	<273.48	<273.48	<273.48	<273.48	<273.48
OW-20-I	596970	5262468	259.31	259.31	257.88	257.70	258.02	257.71	257.38	258.05	257.30	257.47	257.94	257.59	257.03	257.97	257.42	257.29	258.17	258.06	257.42	257.71	257.67	257.24	257.86	257.67	257.35	257.09
OW-20-II	596970	5262468	259.19	259.19	258.03	257.60	257.98	257.70	257.12	258.04	257.19	257.45	257.94	257.62	256.71	257.94	257.34	257.02	258.16	258.30	257.71	258.02	258.01	257.45	258.06	257.98	257.52	257.55
OW-21-I	597141	526527	253.60	ND	252.42	252.14	252.31	252.03	251.53	252.43	251.75	252.37	252.50	252.28	250.76	252.38	251.78	251.85	252.40	252.44	251.92	252.30	252.54	Destroyed	ND	ND	ND	ND
OW-22-I	596974	5262607	258.63	258.63	256.19	255.94	256.10	256.05	255.61	256.13	255.66	256.04	256.14	255.96	255.23	256.10	255.69	255.60	256.19	256.26	255.68	255.79	256.13	255.59	256.01	256.02	255.63	255.25
OW-23-I	597678	5263239	202.71	202.71	196.69	196.65	196.71	197.41	196.61	197.05	196.94	196.16	196.55	197.34	196.68	196.84	197.22	196.05	196.58	197.29	197.01	196.70	197.80	197.21	197.35	197.55	197.10	196.68
OW-23-II	597678	5263239	203.02	203.02	195.62	192.52	193.16	197.18	194.48	191.66	197.21	193.17	191.44	196.86	191.49	191.54	197.29	192.25	191.24	196.07	193.50	192.52	197.51	194.78	193.80	197.93	192.35	192.56
OW-24-I	597372	5263251	236.64	ND	229.99	229.93	229.95	230.27	229.44	230.02	229.83	228.75	229.07	229.82	228.86	229.43	229.73	228.64	229.45	230.27	230.02	229.67	Destroyed		ND	ND	ND	ND
OW-24-II	597372	5263251	236.65	ND	235.75	233.70	235.09	234.31	231.53	235.59	232.82	229.36	234.57	233.49	230.36	235.13	233.32	229.39	235.62	235.82	233.35	234.16	Destroyed		ND	ND	ND	ND
OW-24-III	597372	5263251	236.66	236.66	235.83	233.69	235.13	234.30	231.57	235.65	232.84	231.08	234.59	231.01	231.08	235.13	233.32	231.09	235.63	235.81	233.34	234.20	234.89	233.77	234.93	234.41	233.68	234.63
OW-25-I	597370	5263000	240.33	240.33	234.65	234.59	234.69	234.97	234.18	234.77	234.41	233.30	233.50	234.39	233.46	234.12	234.27	233.25	234.34	235.00	234.68	234.40	235.12	234.56	234.90	235.17	234.72	234.19
OW-25-II	597370	5263000	240.38	240.38	236.14	233.35	237.08	236.69	236.58	235.89	236.87	236.03	233.36	236.49	235.75	234.98	236.49	235.76	234.89	236.01	234.44	235.76	235.98	235.13	235.68	235.46	233.18	235.53
OW-25-III	597370	5263000	240.36	240.36	239.25	239.02	239.19	239.03	238.36	239.25	238.62	239.00	239.22	238.91	236.82	239.08	238.61	238.14	239.10	238.88	237.53	238.55	238.18	237.54	238.07	238.27	237.70	238.60
OW-30-I	597401	5262836	NA	ND																					ND	ND	ND	ND
OW-30-II	597401	5262836	NA	ND																					ND	ND	ND	ND

Notes:
(1) masl - metres above sea level.
(2) ND - no current elevation data available, well re-installed in September 2014.

APPENDIX E

SUMMARY OF GROUNDWATER GEOCHEMICAL ANALYSES

Summary of Groundwater Geochemical Results OW-10-II

Parameters	Units	ODWS [1]	2007			2008			2009			2010			2011		2012			2013			2014			2015		
General Chemistry			Jul	Oct	Dec	Jun	Aug	Nov	Jun	Sep	Nov	Jun	Sep	Nov	Jun	Nov	Jun	Sep	Nov	May	July	Sep	June	July	Sep	May	July	Sep
Alkalinity	mg/L	30-500 OG [2]	262	285	250	269	267	290	260	290	286	275	273	270	240	277	260	270	270	245	268	313	249	258	269	247	262	261
Chloride	mg/L	250 AO [3]	2.49	5.7	4.19	4.0	2.0	3.0	2.0	4.0	2.0	4.0	3.0	3.0	3.0	3.0	3.0	3.0	2.0	1.84	2.53	1.85	2.06	2.37	2.43	2.14	2.78	2.73
Dissolved Organic Carbon	mg/L	5 AO	2.3	**6.8**	3.1	2.3	2.2	2.2	1.9	1.9	2.2	1.6	2.2	3.2	1.6	2.1	2.2	2.3	2.3	2.0	2.0	3.1	2.1	1.7	2.2	2.0	3.0	2.3
Fluoride	mg/L	1.5 MAC [4]	0.06	0.09	0.1					<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.10	<0.25	<0.10	<0.05	<0.25	<0.10	<0.10	<0.25	<0.25
Sulphate	mg/L	500 AO	233	211	260	163	240	171	170	220	120	200	160	170	210	160	210	240	150	144	215	191	142	218	162	126	135	200
Hardness	mg/L	80-100 OG	**480**	**467**	**492**	**410**	**480**	**420**	**410**	**500**	**420**	**520**	**460**	**490**	**460**	**440**	**490**	**490**	**430**	**396**	**497**	**480**	**393**	**499**	**409**	**363**	**384**	**485**
Nitrate	mg/L	10 MAC	0.09	0.08	0.11	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.10	<0.25	<0.10	<0.05	<0.25	<0.10	<0.10	<0.25	<0.25
Nitrite	mg/L	1 MAC	<0.05	<0.05	<0.05	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.10	<0.25	<0.10	<0.05	<0.25	<0.10	<0.10	<0.25	<0.25
Organic Nitrogen	mg/L	0.15 OG				**1.0**	**0.375**	**0.475**	**0.675**	**0.475**	**0.775**		**0.175**	**0.275**	**0.68**	**0.38**	**1.38**	**0.345**	**0.805**	**0.85**	<0.10	<0.10	**0.48**	<0.10	<0.10	0.12	**0.16**	0.10
Orthophosphate	mg/L			<0.1	<0.1	<0.01	<0.01	<0.01	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.20	<0.50	<0.20	<0.10	<0.50	<0.20	<0.20	<0.50	<0.50
pH	pH Units																			7.82	7.50	7.19	8.16	8.00	7.73	8.10	8.03	7.93
Electrical Conductivity	µS/cm																			736	840	860	716	863	814	715	744	871
Total Ammonia	mg/L		<0.02	0.2	<0.05	0.1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.02	<0.02	<0.02	0.04	0.07	0.1	<0.02	<0.02	<0.02
Total Dissolved Solids	mg/L	500 AO	**588**	**552**	**622**	484	**587**	**510**	481	**593**	459	**566**	**506**	**523**	**530**	494	**554**	**591**	483	432	**586**	**570**	436	**602**	**508**	426	426	**546**
Total Kjeldahl Nitrogen (TKN)	mg/L		<0.1	0.44	0.17	1.1	0.4	0.5	0.7	0.5	0.8	<0.5	0.2	0.3	0.7	0.4	1.4	0.37	0.83	0.85	<0.20	<0.10	0.52	<0.10	0.16	0.12	0.16	0.10
Total Phosphorus	mg/L		0.06	1.16	0.5	0.12	0.2	0.3	0.16	0.13	0.08	0.12								<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Metals																												
Aluminum	mg/L	0.1 OG	<0.004	0.011	<0.004	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.004	0.005	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	0.007
Arsenic	mg/L	0.025 IMAC [5]	<0.003	<0.003	<0.003	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
Barium	mg/L	1 MAC	0.021	0.025	0.023	0.02	0.023	0.021	0.018	0.023	0.019	0.019	0.023	0.022	0.02	0.018	0.019	0.024	0.019	0.016	0.022	0.022	0.017	0.020	0.019	0.014	0.029	0.022
Beryllium	mg/L		<0.001	<0.001	<0.002	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.001	<0.001	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Bismuth	mg/L		<0.002	<0.002	<0.002	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001		<0.001	<0.001	<0.001	<0.001	<0.001	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.004	<0.004
Boron	mg/l	5 IMAC	0.024	0.034	0.019	<0.01	0.026	0.034	0.017	0.022	0.015	0.022	0.035	0.024	0.015	0.019	0.022	0.037	0.027	0.031	0.040	0.02	0.023	0.033	0.029	0.016	0.141	0.026
Cadmium	mg/L	0.005 MAC	<0.0001	<0.002	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Calcium	mg/L		148	143	150	130	150	130	130	150	130	160	140	150	140	130	150	150	130	123	154	149	122	154	126	113	100	150
Chromium	mg/L	0.05 MAC	0.009	0.028	0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
Cobalt	mg/L		<0.0005	0.0015	<0.003	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Copper	mg/L	1 AO	<0.002	0.009	<0.003	0.002	0.002	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	<0.001	<0.001	<0.001	<0.001	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
Iron	mg/L	0.3 AO	<0.01	**0.435**	<0.01	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.010	**0.593**	<0.010	<0.010	<0.010	<0.010	<0.010	0.112	<0.010
Lead	mg/L	0.01 MAC	<0.001	<0.001	<0.001	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Magnesium	mg/L		26.9	26.8	28.6	22	27	24	23.0	28.0	23.0	29	26	27	25	24	29	30	24	21.5	27.4	26.1	21.5	27.9	22.9	19.7	32.5	26.8
Manganese	mg/L	0.05 AO	<0.002	**0.719**	0.028	0.002	0.01	0.006	0.0	0.0	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	0.0056	<0.002	<0.002	<0.002	**0.067**	0.004	<0.002	<0.002	<0.002	<0.002	0.021	<0.002
Molybdenum	mg/L		<0.002	<0.002	<0.002	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.0005	<0.0005	<0.0005	<0.0005	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Nickel	mg/L		<0.003	0.004	<0.003	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.002	<0.001	<0.001	<0.001	0.0011	<0.003	<0.003	0.003	<0.003	<0.003	<0.003	<0.003	<0.003	0.006
Potassium	mg/L		1.01	1.41	1.53	0.94	1.2	0.95	0.88	1.20	0.89	1.10	1.10	1.00	0.86	0.9	0.94	1.1	0.97	0.97	1.52	1.4	0.96	1.71	1.18	1.04	4.35	1.78
Selenium	mg/L	0.01 MAC	<0.004	<0.004	<0.004	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004
Silicon	mg/L																			1.69	2.02	2.49	1.97	2.03	2.04	2.13	2.82	2.33
Silver	mg/L		<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.0	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Sodium	mg/L	200 AO	3.17	2.51	2.89	3.6	3.1	3.3	2.7	2.4	3.6	2.2	2.6	2.9	2.1	3.1	2.2	2.1	3.1	2.55	2.33	2.54	2.4	2.18	2.25	2.21	4.30	2.27
Strontium	mg/L		0.205	0.225	0.261	0.18	0.2	0.18	0.17	0.21	0.16	0.19	0.19	0.2	0.19	0.16	0.2	0.22	0.18	0.149	0.202	0.22	0.167	0.212	0.181	0.138	0.943	0.209
Sulphur	mg/L																			49.1	73.5	66.0	41.7	73.0	60	44.8	43.9	71.3
Thallium	mg/L		<0.0003	<0.0003	<0.0003	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	0.00007	<0.00005	<0.00005	<0.00005	<0.00005	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006
Tin	mg/L		<0.002	<0.002	<0.002	<0.001			<0.001	<0.001	<0.001	<0.001	<0.001		<0.001	<0.001	<0.001	<0.001	<0.001	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Titanium	mg/L		0.003	0.003	0.004	<0.005		<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.002	<0.002	0.004	<0.002	<0.002	<0.002	0.002	0.002	0.004
Uranium	mg/L	0.02 MAC	<0.002	<0.002	<0.002	0.0002	0.0002	0.0003	0.000	0.0003	0.0002	0.0003	0.0003	0.0004	0.0003	0.0002	0.00025	0.00032	0.00022	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Vanadium	mg/L		<0.002	<0.002	<0.002	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.0005	<0.0005	<0.0005	<0.0005	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Zinc	mg/L	5 AO	<0.004	0.035	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.006	0.018	0.006	0.005	<0.005	<0.005	<0.005

Notes:
(1) MOECC Ontario Drinking Water Standards.
(2) Operational Guideline (OG) within ODWS.
(3) Aesthetic Objective (AO) within ODWS.
(4) Maximum Acceptable Concentration (MAC) within ODWS.
(5) Interim Maximum Acceptable Concentration (IMAC) within ODWS.
(6) ODWS exceedances indicated by **bold** entries.

Summary of Groundwater Geochemical Results OW-10-I

Parameters	Units	ODWS [1]	2007			2008			2009			2010			2011			2012			2013			2014			2015		
General Chemistry			**Jul**	**Oct**	**Dec**	**Jun**	**Aug**	**Nov**	**Jun**	**Sep**	**Nov**	**Jun**	**Sep**	**Nov**	**Jun**	**Sep**	**Nov**	**Jun**	**Sep**	**Nov**	**May**	**July**	**Sep**	**June**	**July**	**Sep**	**May**	**July**	**Sep**
Alkalinity	mg/L	30-500 OG [2]	260	270	256	259	264	271	263	269	268	262	268	266	258	261	265	270	270	270	253	255	338	259	253	259	253	267	256
Chloride	mg/L	250 AO [3]	2.66	6.43	4.13	4.0	4.0	3.0	3.0	3.0	4.0	4.0	3.0	3.0	3.0	3.0	4.0	3.0	3.0	3.0	3.21	2.98	2.89	3.26	3.27	3.38	3.25	2.59	3.05
Dissolved Organic Carbon	mg/L	5 AO	1.4	1.4	1.8	1.5	1.4	2.1	1.4	1.4	1.4	1.3	1.5	1.8	1.1	1.4	1.6	2.0	1.4	1.5	1.9	1.9	1.6	2.4	1.6	1.4	1.3	3.0	2.4
Fluoride	mg/L	1.5 MAC [4]	0.21	0.25	0.2					0.2	0.2	0.2	0.2	0.2	0.3	0.2	0.2	0.24	0.25	0.22	<0.10	<0.25	<0.10	<0.10	<0.25	0.26	0.18	<0.25	<0.25
Sulphate	mg/L	500 AO	157	136	212	178	187	197	170	190	190	150	170	180	140	180	180	130	150	170	182	182	158	186	192	166	137	200	153
Hardness	mg/L	80-100 OG	**408**	**384**	**439**	**490**	**450**	**450**	**450**	**480**	**460**	**460**	**480**	**500**	**390**	**430**	**460**	**460**	**420**	**450**	**435**	**439**	**422**	**440**	**455**	**400**	**361**	**465**	**412**
Nitrate	mg/L	10 MAC	<0.05	<0.05	<0.05	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.10	<0.25	<0.10	<0.10	<0.25	<0.10	<0.10	<0.25	<0.25
Nitrite	mg/L	1 MAC	<0.05	<0.05	<0.05	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.10	<0.25	<0.10	<0.10	<0.25	<0.10	<0.10	<0.25	<0.25
Organic Nitrogen	mg/L	0.15 OG				**0.34**	**0.175**	**0.33**	**0.175**	**0.175**	**0.275**	0.075	**0.175**	**0.175**	0.08	**0.18**	0.08	**0.42**	**0.32**	**4.49**	**0.72**	0.12	<0.10	**0.39**	<0.10	0.13	<0.10	**0.29**	**0.18**
Orthophosphate	mg/L			<0.1	<0.1	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.20	<0.50	<0.20	<0.20	<0.05	<0.20	<0.20	<0.50	<0.50
pH	pH Units																				7.88	7.75	7.09	8.16	8.05	7.82	8.15	7.74	7.65
Electrical Conductivity	µS/cm																				819	798	792	802	821	809	741	868	779
Total Ammonia	mg/L		0.05	0.04	<0.05	0.06	<0.05	0.07	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.11	<0.02	0.02	<0.02	0.06	0.07	0.03	<0.02	<0.02	0.02
Total Dissolved Solids	mg/L	500 AO	496	412	**572**	**522**	**518**	**533**	**504**	**535**	**529**	485	**516**	**533**	444	**503**	**516**	468	476	**503**	**506**	**574**	**516**	**512**	**568**	**500**	434	**548**	464
Total Kjeldahl Nitrogen (TKN)	mg/L		<0.1	<0.1	<0.1	0.4	0.2	0.4	0.2	0.2	0.3	0.1	0.2	0.2	0.1	0.2	0.1	0.44	0.34	4.6	0.72	0.14	<0.10	0.45	<0.10	0.16	<0.10	0.29	0.2
Total Phosphorus	mg/L		0.05	<0.05	0.14	<0.02	0.03	<0.02	0.13	0.03	0.03	0.02						24	9.0		<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Metals																													
Aluminum	mg/L	0.1 OG	<0.004	0.01	0.014	<0.005	<0.005	<0.005	<0.005	0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.017	<0.004	0.005	<0.004	0.007	<0.004	<0.004	<0.004	<0.004	<0.004
Arsenic	mg/L	0.025 IMAC [5]	<0.003	<0.003	<0.003	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
Barium	mg/L	1 MAC	0.03	0.035	0.034	0.03	0.031	0.029	0.0260	0.028	0.029	0.026	0.03	0.032	0.027	0.029	0.028	0.025	0.031	0.031	0.03	0.025	0.03	0.027	0.028	0.027	0.027	0.020	0.035
Beryllium	mg/L		<0.001	<0.001	<0.002	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Bismuth	mg/L		<0.002	<0.002	<0.002	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Boron	mg/l	5 IMAC	0.203	0.192	0.145	0.097	0.12	0.1	0.082	0.11	0.1	0.1	0.11	0.11	0.13	0.1	0.12	0.1	0.17	0.14	0.108	0.113	0.164	0.143	0.11	0.161	0.139	0.020	0.120
Cadmium	mg/L	0.005 MAC	<0.0001	<0.002	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Calcium	mg/L		109	101	116	130	120	120	120	130	120	120	130	140	100	120	120	120	110	120	116	118	112	117	122	105	93.4	143	110
Chromium	mg/L	0.05 MAC	<0.003	0.019	<0.003	0.016	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
Cobalt	mg/L		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Copper	mg/L	1 AO	0.003	<0.002	<0.003	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
Iron	mg/L	0.3 AO	<0.01	<0.1	<0.01	0.17	<0.1	<0.1	0.1	<0.1	<0.1	<0.1	0.14	<0.1	<0.1	<0.1	<0.1	0.15	<0.1	0.10	0.107	0.05	0.177	0.104	0.134	0.177	0.129	0.049	**0.778**
Lead	mg/L	0.01 MAC	<0.001	<0.001	<0.001	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Magnesium	mg/L		33.1	31.9	36.2	39	36	36	35.0	39.0	38.0	36	39	40	32	33	38	40	35	37	35.3	35.0	34.5	36.0	36.5	33.4	31.1	26.1	33.3
Manganese	mg/L	0.05 AO	0.018	0.011	0.028	0.029	0.023	0.022	0.0	0.0	0.0	0.027	0.022	0.021	0.024	0.021	0.02	0.025	0.025	0.024	0.026	0.013	0.026	0.021	0.021	0.02	0.024	0.020	0.044
Molybdenum	mg/L		<0.002	<0.002	<0.002	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.0005	<0.0005	<0.0005	<0.0005	0.00075	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Nickel	mg/L		<0.003	<0.003	<0.003	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	0.005
Potassium	mg/L		4.1	8.21	4.73	3.9	4.1	4.0	3.60	4.20	4.10	4.00	4.30	4.40	3.8	3.9	4.3	3.7	4.7	4.6	4.04	3.96	4.43	4.21	4.17	4.35	4.01	1.37	4.48
Selenium	mg/L	0.01 MAC	<0.004	<0.004	<0.004	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004
Silicon	mg/L																				2.7	2.66	3.23	2.74	2.76	2.96	3.24	1.96	3.04
Silver	mg/L		<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Sodium	mg/L	200 AO	4.58	4.73	3.5	3.7	3.4	3.5	3.1	3.5	3.4	3.6	3.5	3.7	3.8	3.2	3.5	3.8	3.9	3.6	3.38	3.13	3.71	3.4	3.25	3.63	4.15	2.10	3.87
Strontium	mg/L		0.904	0.922	1.0	0.84	0.88	0.82	0.78	0.84	0.82	0.82	0.86	0.9	0.87	0.87	0.85	0.84	0.99	1.0	0.981	0.785	1.13	0.92	0.868	0.91	0.878	0.20	1.08
Sulphur	mg/L																				61.9	62.0	56.8	55.6	64.4	60.5	49.2	68.0	59.6
Thallium	mg/L		<0.0003	<0.0003	<0.0003	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006
Tin	mg/L		<0.002	<0.002	<0.002	<0.001			<0.001	<0.001	<0.001	<0.001	<0.001		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Titanium	mg/L		0.002	<0.002	0.003	<0.005		<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.002	<0.002	0.003	<0.002	<0.002	<0.002	0.002	0.003	0.004
Uranium	mg/L	0.02 MAC	<0.002	<0.002	<0.002	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.00013	<0.0001	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Vanadium	mg/L		<0.002	<0.002	<0.002	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Zinc	mg/L	5 AO	0.029	0.022	0.041	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.01	<0.005	0.012	<0.005	<0.005	<0.005	<0.005	0.012	0.006	<0.005	0.006	0.006	0.005	<0.005	0.006	0.005	0.005

Notes:
(1) MOECC Ontario Drinking Water Standards.
(2) Operational Guideline (OG) within ODWS.
(3) Aesthetic Objective (AO) within ODWS.
(4) Maximum Acceptable Concentration (MAC) within ODWS.
(5) Interim Maximum Acceptable Concentration (IMAC) within ODWS.
(6) ODWS exceedances indicated by **bold** entries.

The City of Temiskaming Shores
Hydrogeological Characterization
New Liskeard Waste Disposal Site
New Liskeard, Ontario
August 2016

Summary of Groundwater Geochemical Results OW-13-I

Parameters	Units	ODWS [1]	2007			2008			2009			2010			2011			2012			2013			2014			2015		
General Chemistry			**Jul**	**Oct**	**Dec**	**Jun**	**Aug**	**Nov**	**Jun**	**Sep**	**Nov**	**Jun**	**Sep**	**Nov**	**Jun**	**Sep**	**Nov**	**Jun**	**Sep**	**Nov**	**May**	**July**	**Sep**	**June**	**July**	**Sep**	**May**	**July**	**Sep**
Alkalinity	mg/L	30-500 OG [2]	366	361	355	361	371	357	382	379	380	379	385	384	368	372	376	380	370	390	375	397	445	363	364	363	328	374	360
Chloride	mg/L	250 AO [3]	4.09	4.54	3.63	4.0	4.0	4.0	4.0	3.0	4.0	4.0	4.0	4.0	3.0	3.0	3.0	3.0	3.0	3.0	4.11	3.17	3.27	3.49	3.49	3.69	3.35	3.28	3.29
Dissolved Organic Carbon	mg/L	5 AO	1.4	1.4	1.2	1.1	1.4	1.2	1.1	1	1	1.2	1.1	1.5	1.1	1.2	1.2	1.5	1.2	1.1	1.2	1.3	1.4	3.3	1.5	1.3	1.9	2.0	1.5
Fluoride	mg/L	1.5 MAC [4]	0.19	0.23	0.2					0.2	0.2	0.2	0.2	0.2	0.2	0.22	0.2	0.23	0.27	0.22	<0.25	<0.25	<0.25	<0.10	<0.25	<0.25	<0.25	<0.25	<0.25
Sulphate	mg/L	500 AO	86	101	129	88	105	103	99	100	100	93	76	83	97	100	88	99	93	85	96.3	95.9	99.4	101	113	102	96.9	104	107
Hardness	mg/L	80-100 OG	**448**	**417**	**461**	**440**	**470**	**440**	**470**	**470**	**470**	**450**	**500**	**460**	**460**	**460**	**480**	**510**	**490**	**470**	**465**	**462**	**474**	**474**	**487**	**445**	**396**	**470**	**440**
Nitrate	mg/L	10 MAC	0.16	<0.05	<0.05	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.25	<0.25	<0.25	<0.10	<0.25	<0.25	<0.25	<0.25	<0.25
Nitrite	mg/L	1 MAC	<0.05	<0.05	<0.05	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.25	<0.25	<0.25	<0.10	<0.25	<0.25	<0.25	<0.25	<0.25
Organic Nitrogen	mg/L	0.15 OG				**0.275**	**0.375**	**0.275**	**0.475**	**0.275**	**0.475**	0.075	**0.175**	**0.175**	**0.18**		0.08	**0.235**	**0.433**	**0.295**	**0.70**	**0.21**	<0.10	**0.68**	<0.10	0.13	**0.39**	**0.39**	0.14
Orthophosphate	mg/L			<0.1	<0.1	<0.01	<0.01	<0.01	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.02	<0.01	<0.01	<0.01	<0.50	<0.50	<0.50	<0.20	<0.50	<0.50	<0.50	<0.50	<0.50
pH	pH Units																				8.03	7.37	7.22	8.02	8.05	7.8	7.99	8.05	7.93
Electrical Conductivity	µS/cm																				867	832	867	814	880	878	805	885	859
Total Ammonia	mg/L		<0.02	0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.067	<0.05	<0.02	<0.02	<0.02	0.06	0.42	0.03	<0.02	<0.02	<0.02
Total Dissolved Solids	mg/L	500 AO	482	448	**524**	479	**514**	488	**513**	**513**	**519**	500	**502**	495	499	**504**	**501**	**519**	**506**	**502**	492	**540**	**518**	**508**	**558**	**510**	488	498	498
Total Kjeldahl Nitrogen (TKN)	mg/L		<0.1	<0.1	<0.1	0.3	0.4	0.3	0.5	0.3	0.5	0.1	0.2	0.2	0.2	<0.5	0.1	0.26	0.5	0.32	0.70	0.21	<0.10	0.74	0.47	0.16	0.39	0.39	0.14
Total Phosphorus	mg/L		0.03	<0.05	<0.02	0.02	0.2	0.08	2.5	0.06	0.04	<0.02									<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Metals																													
Aluminum	mg/L	0.1 OG	<0.004	<0.004	<0.004	<0.005	<0.005	<0.005	<0.005	0.008	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.004	0.031	<0.004	0.005	<0.004	<0.004	0.004	<0.004	<0.004
Arsenic	mg/L	0.025 IMAC [5]	<0.003	<0.003	<0.003	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
Barium	mg/L	1 MAC	0.037	0.041	0.042	0.042	0.042	0.04	0.040	0.039	0.041	0.039	0.041	0.039	0.04	0.038	0.042	0.038	0.039	0.041	0.040	0.037	0.039	0.04	0.038	0.035	0.039	0.039	0.040
Beryllium	mg/L		<0.001	<0.001	<0.002	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Bismuth	mg/L		<0.002	<0.002	<0.002	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Boron	mg/l	5 IMAC	0.11	0.079	0.09	0.099	0.1	0.11	0.096	0.11	0.083	0.095	0.12	0.1	0.097	0.1	0.11	0.12	0.11	0.12	0.123	0.112	0.097	0.114	0.099	0.114	0.107	0.108	0.104
Cadmium	mg/L	0.005 MAC	<0.0001	<0.002	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Calcium	mg/L		117	104	118	110	120	110	120	120	120	120	130	120	120	120	120	120	120	120	121	120	124	121	126	115	96.1	121	111
Chromium	mg/L	0.05 MAC	<0.003	0.011	0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
Cobalt	mg/L		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Copper	mg/L	1 AO	<0.002	<0.002	<0.003	0.001	0.002	0.001	<0.001	<0.001	<0.001	0.002	<0.001	<0.001	0.001	<0.001	0.001	<0.001	<0.001	<0.001	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
Iron	mg/L	0.3 AO	<0.01	0.012	<0.01	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.012	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.197	<0.010
Lead	mg/L	0.01 MAC	<0.001	<0.001	<0.001	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	0.0008	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Magnesium	mg/L		37.9	38.3	40.4	37	41	39	41.0	41.0	41.0	39	44	41	38	38	44	48	43	40	39.5	39.5	39.9	41.7	41.9	38.4	38.0	40.7	39.6
Manganese	mg/L	0.05 AO	0.003	0.003	<0.002	0.01	<0.002	<0.002	<0.002	0.0	<0.002	<0.002	0.005	<0.002	<0.002	0.007	<0.002	0.0089	0.0056	<0.002	0.009	0.004	<0.002	0.003	<0.002	<0.002	<0.002	0.012	<0.002
Molybdenum	mg/L		<0.002	<0.002	<0.002	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.0008	0.0008	0.00064	0.00091	0.00078	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Nickel	mg/L		<0.003	<0.003	<0.003	0.002	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.002	<0.001	<0.001	<0.001	<0.001	0.0016	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	0.003	0.006
Potassium	mg/L		5.48	5.63	6.19	5.2	5.6	5.1	5.40	5.60	5.50	5.30	5.60	5.50	5.3	5.6	5.8	6	6	5.7	5.82	5.56	5.51	5.96	6.09	5.63	5.49	5.70	5.77
Selenium	mg/L	0.01 MAC	<0.004	<0.004	<0.004	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004
Silicon	mg/L																				5.10	4.53	5.16	5.43	4.53	4.57	5.08	4.54	4.85
Silver	mg/L		<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Sodium	mg/L	200 AO	2.61	2.25	2.21	2.2	2.3	2.2	2.3	2.3	2.4	2.2	2.6	2.5	2.2	2.2	2.3	2.6	2.6	2.4	2.82	2.26	2.45	2.74	2.58	2.53	2.66	2.58	2.49
Strontium	mg/L		0.586	0.518	0.659	0.62	0.6	0.57	0.59	0.6	0.56	0.59	0.58	0.56	0.59	0.66	0.65	0.71	0.66	0.61	0.675	0.557	0.676	0.657	0.625	0.526	0.574	0.657	0.6
Sulphur	mg/L																				31.9	32.7	31.9	29.7	38.0	33.5	34.7	35.1	37.4
Thallium	mg/L		<0.0003	<0.0003	<0.0003	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006
Tin	mg/L		<0.002	<0.002	<0.002	<0.001			<0.001	<0.001	<0.001	<0.001	<0.001		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Titanium	mg/L		<0.002	<0.002	<0.002	<0.005		<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	0.003
Uranium	mg/L	0.02 MAC	<0.002	<0.002	<0.002	0.0006	0.0005	0.0005	0.001	0.0006	0.0004	0.0005	0.0003	0.0006	0.0005	0.0005	0.0005	0.00054	0.00057	0.00047	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Vanadium	mg/L		<0.002	<0.002	<0.002	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.0005	0.0005	<0.0005	<0.0005	<0.0005	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Zinc	mg/L	5 AO	<0.004	0.006	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.007	<0.005	0.008	0.008	<0.005	0.079	0.006	0.008	0.007	0.006	0.007	0.007	<0.005

Notes:
(1) MOECC Ontario Drinking Water Standards.
(2) Operational Guideline (OG) within ODWS.
(3) Aesthetic Objective (AO) within ODWS.
(4) Maximum Acceptable Concentration (MAC) within ODWS.
(5) Interim Maximum Acceptable Concentration (IMAC) within ODWS.
(6) ODWS exceedances indicated by **bold** entries.

Summary of Groundwater Geochemical Results OW-1R-I

Parameters	Units	ODWS [1]	2007			2008			2009			2010			2011			2012			2013			2014			2015		
General Chemistry			**Jul**	**Oct**	**Dec**	**Jun**	**Aug**	**Nov**	**Jun**	**Sep**	**Nov**	**Jun**	**Sep**	**Nov**	**Jun**	**Sep**	**Nov**	**Jun**	**Sep**	**Nov**	**May**	**July**	**Sep**	**June**	**July**	**Sep**	**May**	**July**	**Sep**
Alkalinity	mg/L	30-500 OG [2]	**924**	**919**	**934**	**876**	**911**	**940**	**888**	**943**	**916**	**962**	**923**	**902**	**896**	**912**	**826**	**950**	**940**	**930**	**867**	**753**	**1000**	**908**	**951**	**917**	**951**	**912**	**670**
Chloride	mg/L	250 AO [3]	**285**	**341**	**346**	240	230	**280**	**280**	**320**	**310**	**270**	240	210	180	210	230	220	220	250	237	192	**263**	245	**261**	228	**274**	**268**	173
Dissolved Organic Carbon	mg/L	5 AO	**22.8**	**20**	**23.9**	**16.3**	**17.7**	**25.3**	**23.8**	**22.9**	**21.2**	**22.7**	**20.2**	**19.9**	**17.2**	**20.1**	**17.8**	**21**	**22**	**21**	**17.1**	**20.4**	**21.2**	**19.1**	**22.0**	**21.1**	**23.2**	**19.6**	**14.3**
Fluoride	mg/L	1.5 MAC [4]	<0.05	0.55	0.18					0.1	0.1	0.1	0.1	0.2	0.1	0.19	<0.1	0.17	0.17	0.16	<1.0	<0.5	<1.0	<0.5	<1.0	<0.25	<0.5	<1.0	<0.5
Sulphate	mg/L	500 AO	**518**	**507**	**533**	327	433	407	380	**560**	**550**	380	350	310	230	240	210	220	220	250	223	208	252	244	257	240	207	206	162
Hardness	mg/L	80-100 OG	**1120**	**1120**	**1230**	**1100**	**1000**	**1000**	**1100**	**1300**	**1300**	**1100**	**1000**	**960**	**850**	**890**	**910**	**1000**	**1000**	**1000**	**998**	**818**	**988**	**972**	**910**	**774**	**885**	**980**	**676**
Nitrate	mg/L	10 MAC	<0.05	0.22	<0.05	0.9	<0.1	<0.1	0.3	0.1	0.6	0.3	0.5	0.8	<0.1	<1	0.9	<0.1	0.41	0.41	<1.0	0.81	<1.0	<0.5	<1.0	1.0	<0.5	<1.0	0.6
Nitrite	mg/L	1 MAC	<0.05	<0.05	<0.05	0.08	0.03	0.02	0.11	0.03	0.07	0.11	0.13	0.12	0.04	0.1	0.02	0.032	0.021	0.063	<1.0	<0.5	<1.0	<0.5	<1.0	<0.25	<0.5	<1.0	<0.5
Organic Nitrogen	mg/L	0.15 OG					**1.0**									**13**	**0.8**	**2.0**	**1.3**		**2.3**	0.10	**1.6**	**0.9**	**1.6**	**1.5**	**2.3**	**5.2**	**2.59**
Orthophosphate	mg/L			<0.1	<0.1	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.15	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<2.0	<1.0	<2.0	<1.0	<2.0	<0.50	<1.0	<2.0	<1.0
pH	pH Units																				7.65	7.47	6.82	7.82	7.67	7.3	7.6	7.97	7.98
Electrical Conductivity	µS/cm																				2590	2110	2830	2620	2780	2730	2850	2730	2040
Total Ammonia	mg/L		19.7	14.2	11.4	14	13	18	15	16.0	15.0	11.0	10.00	10.00	11	13	9.2	13	9.7	15	10.9	13.3	11.9	13	15.5	13	12	12	6.39
Total Dissolved Solids	mg/L	500 AO	**2050**	**1940**	**2260**	**1830**	**1890**	**1930**	**1910**	**2290**	**2200**	**1940**	**1840**	**1720**	**1520**	**1610**	**1520**	**1690**	**1640**	**1720**	**1470**	**1330**	**1780**	**1510**	**1660**	**1600**	**1630**	**1450**	**1180**
Total Kjeldahl Nitrogen (TKN)	mg/L		21.9	17.2	19.6	14	14	16	13	16	14	11	12	12	11	26	10	15	11	15	13.2	13.4	13.5	13.9	17.1	14.5	14.3	17.2	8.98
Total Phosphorus	mg/L		0.07	0.58	0.03	0.9	0.04	0.05	0.15	<0.04	0.03	0.04									<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Metals																													
Aluminum	mg/L	0.1 OG	0.006	0.004	<0.004	0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.012	<0.005	<0.005	0.005	0.033	<0.004	<0.004	<0.004	<0.004	<0.004	0.004	0.006
Arsenic	mg/L	0.025 IMAC [5]	0.006	0.004	0.004	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
Barium	mg/L	1 MAC	0.039	0.058	0.041	0.054	0.05	0.041	0.0450	0.058	0.056	0.056	0.061	0.046	0.054	0.063	0.071	0.056	0.086	0.079	0.060	0.060	0.064	0.072	0.07	0.062	0.079	0.070	0.067
Beryllium	mg/L		<0.001	<0.001	<0.002	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Bismuth	mg/L		<0.002	<0.002	<0.002	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001		<0.001	<0.001	<0.001	<0.001	0.002	<0.001	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Boron	mg/l	5 IMAC	2.2	1.66	1.76	2.1	2.1	2.1	1.8	2.2	1.9	2.1	1.9	1.8	1.8	1.9	1.8	1.8	1.8	2.0	1.44	1.34	1.61	1.26	1.79	1.55	1.67	1.53	1.21
Cadmium	mg/L	0.005 MAC	<0.0001	<0.002	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Calcium	mg/L		193	206	201	210	190	180	200	240	250	200	200	180	170	170	180	180	200	190	200	184	201	188	178	146	163	188	132
Chromium	mg/L	0.05 MAC	0.017	**0.121**	0.015	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.003	<0.003	0.004	<0.003	<0.003	<0.003	0.008	0.006	<0.003
Cobalt	mg/L		0.0081	0.0053	0.009	0.0061	0.0064	0.0074	0.0069	0.0086	0.0084	0.007	0.0044	0.0048	0.0051	0.0047	0.004	0.0071	0.0045	0.0062	0.006	0.004	0.007	0.005	0.007	0.004	0.005	0.005	0.003
Copper	mg/L	1 AO	0.008	0.008	0.012	0.015	0.009	0.008	0.014	0.013	0.015	0.02	0.006	0.005	0.009	0.005	0.012	0.0071	0.0097	0.0064	<0.003	0.005	<0.003	0.004	0.004	<0.003	0.003	0.005	0.003
Iron	mg/L	0.3 AO	<0.01	0.071	<0.01	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.043	0.073	**0.795**	<0.010	0.021	0.125	0.157	<0.010	<0.010
Lead	mg/L	0.01 MAC	<0.001	<0.001	<0.001	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	0.0006	<0.0005	0.0005	<0.0005	<0.0005	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Magnesium	mg/L		156	148	177	150	130	140	150.0	180.0	170.0	140	130	130	100	110	110	140	120	130	121	87	118	122	113.0	99.4	116	124	84
Manganese	mg/L	0.05 AO	**1.19**	**0.816**	**1.22**	**0.94**	**0.93**	**1.1**	**1.2**	**1.4**	**1.2**	**1.1**	**0.76**	**0.77**	**0.74**	**0.7**	**0.64**	**1.0**	**0.65**	**0.85**	**0.70**	**0.535**	**0.837**	**0.686**	**0.728**	**0.569**	**0.788**	**0.64**	**0.429**
Molybdenum	mg/L		<0.002	<0.002	<0.002	0.001	0.001	0.001	<0.001	<0.001	<0.001	0.001	0.001	0.001	0.001	0.0011	0.0012	0.001	0.0019	0.001	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Nickel	mg/L		0.047	0.038	0.045	0.041	0.041	0.041	0.040	0.046	0.041	0.043	0.036	0.035	0.036	0.035	0.03	0.042	0.035	0.04	0.029	0.022	0.04	0.033	0.043	0.027	0.043	0.036	0.03
Potassium	mg/L		173	128	155	110	120	120	120.00	130.00	120.00	110.00	99.00	100.00	90	99	84	110	94	99	89.1	66.3	96.2	89.8	89.6	80.2	78.9	89.6	56.8
Selenium	mg/L	0.01 MAC	0.009	0.008	**0.013**	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	0.003	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.004	<0.004	0.005	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004
Silicon	mg/L																				6.30	7.02	8.25	7.14	7.68	6.07	8.14	6.01	6.19
Silver	mg/L		<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Sodium	mg/L	200 AO	**273**	**222**	**257**	**230**	200	200	**210**	**250**	**240**	**230**	**230**	**230**	190	**210**	190	**220**	190	200	168	115	188	187	179	168	187	186	127
Strontium	mg/L		1.16	1.51	1.23	2.3	1.4	1.3	1.7	1.6	1.4	2.2	2.1	1.2	1.5	1.5	2.4	1.4	2.7	2.4	1.40	1.01	1.2	2.05	2.13	1.57	2.25	2.12	2.69
Sulphur	mg/L																				81.9	67.2	95.9	75.6	87.1	76.4	88.9	66.8	60.4
Thallium	mg/L		0.0004	<0.003	0.0003	0.00018	0.00026	0.00043	0.000	0.00026	0.00031	0.00029	0.00017	0.00012	0.00014	0.00013	0.00008	0.00025	0.0001	0.00012	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006
Tin	mg/L		<0.002	0.002	<0.002	<0.001			<0.001	<0.001	<0.001	<0.001	<0.001		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Titanium	mg/L		0.007	0.007	0.007	<0.005		<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.002	<0.002	< 0.002	0.002	0.002	<0.002	0.004	0.003	0.004
Uranium	mg/L	0.02 MAC	<0.002	0.007	0.003	0.003	0.0027	0.0029	0.002	0.0035	0.0031	0.0027	0.0021	0.0022	0.0021	0.002	0.0021	0.0022	0.0024	0.0021	<0.002	0.002	0.002	0.002	0.003	<0.002	<0.002	<0.002	<0.002
Vanadium	mg/L		0.003	<0.002	0.004	<0.001	<0.001	<0.001	<0.001	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.0005	<0.0005	0.00079	<0.0005	<0.0005	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Zinc	mg/L	5 AO	0.025	0.027	0.008	0.007	<0.005	<0.005	<0.005	<0.005	<0.005	0.04	<0.005	<0.005	0.009	<0.005	<0.005	<0.005	<0.005	0.0052	0.007	0.013	0.012	0.007	0.007	<0.005	0.006	0.007	0.006

Notes:
(1) MOECC Ontario Drinking Water Standards.
(2) Operational Guideline (OG) within ODWS.
(3) Aesthetic Objective (AO) within ODWS.
(4) Maximum Acceptable Concentration (MAC) within ODWS.
(5) Interim Maximum Acceptable Concentration (IMAC) within ODWS.
(6) ODWS exceedances indicated by **bold** entries.

Summary of Groundwater Geochemical Results OW-1R-III

Parameters	Units	ODWS (1)	2000	2001	2002	2009			2010			2011			2012			2013			2014			2015		
General Chemistry			Sep	Apr	Nov	Jun	Sep	Nov	Jun	Sep	Nov	Jun	Sep	Nov	Jun	Sep	Nov	May	July	Sep	June	July	Sep	May	July	Sep
Alkalinity	mg/L	30-500 OG (2)	**887**	**708**	**780**	**776**	**944**	**726**	**881**	**928**	**769**	**788**	**934**	**836**	**920**	**940**	**760**	**770**	**983**	**1040**	**820**	**977**	**882**	**764**	**976**	**978**
Chloride	mg/L	250 AO (3)	**329**	101	**406**	200	**350**	200	210	240	160	140	210	200	200	230	130	174	**261**	**288**	163	**261**	215	164	**271**	**277**
Dissolved Organic Carbon	mg/L	5 AO	**16.1**	**11.2**	**13.8**	**18.7**	**24.7**	**12.6**	**21.1**	**19.1**	**14.3**	**13.7**	**22.1**	**12.6**	**20**	**24**	**12.0**	**14.6**	**21.5**	**23.4**	**15.7**	**24.8**	**20.4**	**16.2**	**23.7**	**28.8**
Fluoride	mg/L	1.5 MAC (4)					<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.11	<0.1	0.1	0.11	<0.1	<1.0	<1.0	<1.0	<0.5	<1.0	<0.25	<0.25	<1.0	<0.25
Sulphate	mg/L	500 AO	406	256	436	340	470	320	290	300	210	170	190	160	170	190	140	202	217	253	235	230	207	131	177	171
Hardness	mg/L	80-100 OG	**1050**	**708**	**1190**	**1100**	**1400**	**1000**	**1100**	**890**	**840**	**730**	**870**	**790**	**940**	**950**	**840**	**883**	**941**	**957**	**870**	**898**	**731**	**683**	**927**	**821**
Nitrate	mg/L	10 MAC	<0.2	4.8	7.6	0.5	0.5	5.2	4.7	1.8	5.0	1.8	0.8	5.5	0.93	3.6	5.2	<1.0	<1.0	<1.0	0.95	<1.0	1.17	9.87	3.70	7.18
Nitrite	mg/L	1 MAC	0.3	<0.2	<2	0.06	0.02	0.03	0.28	0.04	0.27	0.52	0.08	0.04	0.04	0.089	0.33	<1.0	<1.0	<1.0	<0.5	<1.0	<0.25	<0.25	<1.0	<0.25
Organic Nitrogen	mg/L	0.15 OG				**1.5**		**1.7**	**1.7**		**3.2**	**0.3**		**1.4**	**1.4**	**1.0**	**4.7**	**2.13**	**0.80**	**1.4**	**1.3**	**0.2**	**3.7**	**1.7**	**2.9**	**2.5**
Orthophosphate	mg/L		<0.3	<0.3	<0.3	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<2.0	<2.0	<2.0	<1.0	<2.0	<0.50	<0.50	<2.0	<0.50
pH	pH Units																	7.66	7.52	7.01	7.91	7.72	7.37	7.81	7.87	7.94
Electrical Conductivity	µS/cm																	2220	2750	2830	2270	2880	2570	2210	2840	2920
Total Ammonia	mg/L		6.6	3.42	9	2.3	16	1.4	9.3	6.9	4.1	7.2	14	4.1	8.6	14	3.4	5.49	12.90	11.1	11.8	17.6	10.3	11.5	14.7	21.1
Total Dissolved Solids	mg/L	500 AO	**1940**	**1230**	**2070**	**1580**	**2250**	**1540**	**1790**	**1710**	**1390**	**1270**	**1600**	**1370**	**1530**	**1650**	**1210**	**1280**	**1740**	**1760**	**1370**	**1650**	**1530**	**1160**	**1540**	**1610**
Total Kjeldahl Nitrogen (TKN)	mg/L					3.8	15	3.1	11	9.6	7.3	7.5	15	5.5	10	15	8.1	7.62	13.70	12.5	13.1	17.8	14	13.2	17.6	23.6
Total Phosphorus	mg/L																	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Metals																										
Aluminum	mg/L	0.1 OG	0.04	<0.01	<0.03	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.005	0.008	<0.004	<0.004	0.004	0.004	0.014	<0.004	<0.004
Arsenic	mg/L	0.025 IMAC (5)				<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
Barium	mg/L	1 MAC	0.463	0.042	0.073	0.095	0.081	0.085	0.06	0.072	0.065	0.066	0.066	0.078	0.075	0.087	0.082	0.090	0.072	0.103	0.079	0.103	0.087	0.095	0.099	0.125
Beryllium	mg/L		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Bismuth	mg/L		<0.1	<0.1	<0.2	<0.001	<0.001	<0.001	<0.001	<0.001		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.004	<0.002
Boron	mg/l	5 IMAC	1.51	0.69	1.06	0.86	1.9	0.85	1.7	1.5	1.1	1.2	2.0	1.1	1.5	1.9	1.0	1.01	1.73	1.73	1.08	1.73	1.37	1.31	1.44	1.52
Cadmium	mg/L	0.005 MAC	<0.005	<0.005	<0.005	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Calcium	mg/L		219	150	236	270	270	250	240	200	190	160	160	180	190	180	200	210	189	210	188	175	152	131	190	149
Chromium	mg/L	0.05 MAC	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.003	<0.003	0.007	<0.003	<0.003	<0.003	0.005	0.007	0.004
Cobalt	mg/L		<0.005	<0.005	<0.005	<0.0005	0.0082	0.0011	0.0067	0.0029	0.002	0.003	0.0076	0.002	0.0049	0.0068	0.0019	0.004	0.010	0.008	0.006	0.009	0.005	0.005	0.007	0.005
Copper	mg/L	1 AO	0.009	0.008	0.021	0.007	0.017	0.007	0.013	0.01	0.009	0.008	0.009	0.008	0.0082	0.012	0.0057	0.006	0.006	0.009	0.01	0.012	0.01	0.012	0.01	0.012
Iron	mg/L	0.3 AO	**1.16**	0.02	0.02	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.010	0.211	0.04	<0.010	0.043	<0.010	<0.010	<0.010	<0.010
Lead	mg/L	0.01 MAC	<0.001	0.002	<0.001	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	0.00051	<0.0005	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Magnesium	mg/L		122	80.9	147	94	160	90	130	97	90	77	110	82	110	120	83	87.0	114.0	105	97.2	112.0	85.4	86.4	110	109
Manganese	mg/L	0.05 AO	**0.537**	**0.222**	**0.528**	**0.4**	**1.9**	**0.28**	**1.5**	**0.66**	**0.58**	**0.72**	**1.2**	**0.48**	**1.1**	**1.3**	**0.35**	**0.54**	**1.27**	**1.3**	**1.04**	**1.22**	**0.85**	**0.764**	**1.09**	**0.81**
Molybdenum	mg/L		<0.02	<0.02	<0.02	<0.001	0.001	<0.001	0.001	<0.001	<0.001	<0.001	0.0013	0.0005	0.0009	0.0013	<0.0005	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Nickel	mg/L		<0.02	<0.02	0.03	0.015	0.052	0.014	0.045	0.029	0.023	0.025	0.045	0.022	0.035	0.045	0.017	0.017	0.043	0.04	0.03	0.049	0.026	0.033	0.044	0.04
Potassium	mg/L		98	73	101	62	120	51	110	82	66	72	110	59	83	110	53	61.9	96.0	82.2	81.2	101	72.4	78.1	94.9	107
Selenium	mg/L	0.01 MAC				<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.004	<0.004	0.006	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004
Silicon	mg/L																	5.78	7.65	7.19	6.58	7.55	5.92	6.43	5.57	6.59
Silver	mg/L		<0.003	<0.003	<0.005	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Sodium	mg/L	200 AO	**214**	105	**214**	120	**260**	160	**240**	200	180	140	**220**	140	190	**210**	110	127	184	171	150	199	152	155	177	**204**
Strontium	mg/L		0.957	0.574	0.971	1.2	1.3	1.0	1.0	0.95	0.87	0.76	0.9	0.91	0.99	1.0	0.91	0.972	0.924	1.26	0.985	1.03	0.845	0.802	1.06	1.05
Sulphur	mg/L																	70.4	72.2	105	70.1	81.0	70.4	50	56.1	56.1
Thallium	mg/L					0.00012	0.00045	0.0001	0.00031	0.00025	0.00017	0.00021	0.00032	0.00016	0.00026	0.00045	0.00012	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006
Tin	mg/L		<0.05	<0.05	<0.05	<0.001	<0.001	<0.001	<0.001	<0.001		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Titanium	mg/L		<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.002	<0.002	0.004	0.002	<0.002	<0.002	0.003	0.003	0.005
Uranium	mg/L	0.02 MAC				0.0022	0.0039	0.0023	0.0025	0.0024	0.0021	0.0017	0.0025	0.0017	0.0018	0.0023	0.0015	<0.002	0.003	0.002	0.002	0.002	<0.002	<0.002	0.002	<0.002
Vanadium	mg/L		<0.005	<0.005	<0.005	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.0005	0.001	0.00095	0.00098	0.00051	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Zinc	mg/L	5 AO	0.421	0.013	0.013	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.006	<0.005	<0.005	<0.005	0.007	0.006	0.007	<0.005	<0.005	0.006	0.008	0.006	0.006

Notes:
(1) MOECC Ontario Drinking Water Standards.
(2) Operational Guideline (OG) within ODWS.
(3) Aesthetic Objective (AO) within ODWS.
(4) Maximum Acceptable Concentration (MAC) within ODWS.
(5) Interim Maximum Acceptable Concentration (IMAC) within ODWS.
(6) ODWS exceedances indicated by **bold** entries.

The City of Temiskaming Shores
Hydrogeological Characterization
New Liskeard Waste Disposal Site
New Liskeard, Ontario
August 2016

Summary of Groundwater Geochemical Results OW-11-I

Parameters	Units	ODWS [1]	2007			2008			2009		2010			2011			2012			2013			2014			2015		
General Chemistry			**Jul**	**Oct**	**Dec**	**Jun**	**Aug**	**Nov**	**Jun**	**Sep**	**Jun**	**Sep**	**Nov**	**Jun**	**Sep**	**Nov**	**Jun**	**Sep**	**Nov**	**May**	**July**	**Sep**	**June**	**July**	**Sep**	**May**	**July**	**Sep**
Alkalinity	mg/L	30-500 OG [2]	235	221	227	239	243	245	247	244	238	238	240	229	230	229	240	250	260	237	258	289	231	235	245	225	228	236
Chloride	mg/L	250 AO [3]	2.6	2.91	2.05	3.0	3.0	3.0	8.0	6.0	5.0	4.0	3.0	5.0	7.0	4.0	5.0	7.0	8.0	8.05	9.86	8.69	7.22	9.65	9.1	8.67	9.88	6.56
Dissolved Organic Carbon	mg/L	5 AO	0.8	0.8	0.7	0.5	0.5	0.3	0.50	0.4	0.5	0.5	0.7	0.5	0.6	0.5	1.4	0.53	0.46	0.6	0.6	1.5	1.1	2.0	0.7	0.7	1.4	1.1
Fluoride	mg/L	1.5 MAC [4]	0.3	0.32	0.29					0.3	0.3	0.3	0.3	0.3	0.31	0.3	0.33	0.35	0.36	<0.10	0.29	0.2	0.2	<0.10	0.36	0.33	<0.10	<0.25
Sulphate	mg/L	500 AO	68.9	91.4	81.9	81	63	65	54	74	48	57	67	74	74	82	64	54	40	72.3	50.9	55.5	81.2	58.7	55.7	72.3	71.5	70.3
Hardness	mg/L	80-100 OG	**260**	**270**	**256**	**250**	**270**	**260**	**280**	**280**	**290**	**290**	**280**	**280**	**270**	**280**	**280**	**290**	**290**	**282**	**277**	**286**	**279**	**287**	**265**	**265**	**286**	**281**
Nitrate	mg/L	10 MAC	0.23	0.31	0.12	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.1	<0.1	<0.1	<0.1	0.1	<0.1	<0.1	<0.10	0.25	0.22	0.25	0.11	0.25	0.53	0.54	<0.25
Nitrite	mg/L	1 MAC	<0.05	<0.05	<0.05	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.10	<0.05	<0.10	<0.05	<0.10	<0.05	<0.10	<0.10	<0.25
Organic Nitrogen	mg/L	0.15 OG				**0.22**	**0.175**	**0.175**	**0.175**	**0.275**		0.075	**0.175**	**0.18**	**0.18**		0.145	**0.185**	**0.155**	**0.86**	<0.10	**0.17**	**0.48**	**0.29**	0.11	**0.17**	**0.59**	**0.22**
Orthophosphate	mg/L			<0.1	<0.1	<0.01	<0.01	<0.01	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.20	<0.10	<0.20	<0.10	<0.20	<0.10	<0.20	<0.20	<0.50
pH	pH Units																			8.04	7.67	7.32	8.23	8.21	7.95	8.34	8.15	8.07
Electrical Conductivity	µS/cm																			616	587	606	594	584	607	599	590	601
Total Ammonia	mg/L		<0.02	0.02	<0.05	0.08	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.02	<0.02	<0.02	0.04	0.08	0.03	<0.02	<0.02	<0.02
Total Dissolved Solids	mg/L	500 AO	314	340	358	343	334	331	330	353	325	330	341	336	338	348	336	339	326	336	340	342	320	332	318	-	334	324
Total Kjeldahl Nitrogen (TKN)	mg/L		<0.1	<0.1	<0.1	0.3	0.2	0.2	0.2	0.3	<0.1	0.1	0.2	0.2	0.2	<0.1	0.17	0.21	0.18	0.86	<0.10	0.17	0.52	0.37	0.14	0.17	0.59	0.22
Total Phosphorus	mg/L		0.07	0.1	0.1	0.05	0.06	0.07	0.11	<0.1	0.06									<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Metals																												
Aluminum	mg/L	0.1 OG	<0.004	<0.004	<0.004	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.006	0.018	<0.004	<0.004	<0.004	<0.004	0.043	<0.004	0.008
Arsenic	mg/L	0.025 IMAC [5]	<0.003	<0.003	<0.003	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
Barium	mg/L	1 MAC	0.031	0.032	0.038	0.032	0.033	0.031	0.0320	0.032	0.029	0.036	0.032	0.031	0.033	0.035	0.029	0.033	0.034	0.034	0.031	0.031	0.032	0.032	0.031	0.030	0.030	0.035
Beryllium	mg/L		<0.001	<0.001	<0.002	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Bismuth	mg/L		<0.002	<0.002	<0.002	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.004	<0.002
Boron	mg/l	5 IMAC	0.251	0.267	0.279	0.28	0.29	0.32	0.27	0.33	0.27	0.33	0.3	0.26	0.28	0.3	0.25	0.27	0.32	0.307	0.264	0.324	0.264	0.241	0.279	0.257	0.231	0.296
Cadmium	mg/L	0.005 MAC	<0.0001	<0.002	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Calcium	mg/L		61.2	64.5	59.3	60	64	60	64	66	69	67	65	66	62	64	64	69	66	66.8	65.7	68.4	65.8	67.8	62.4	62.7	68.4	67.7
Chromium	mg/L	0.05 MAC	0.004	<0.003	**0.051**	0.006	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
Cobalt	mg/L		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Copper	mg/L	1 AO	<0.002	<0.002	<0.003	0.002	0.003	0.002	0.001	<0.001	0.002	<0.001	<0.001	<0.001	<0.001	0.001	<0.001	<0.001	<0.001	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
Iron	mg/L	0.3 AO	<0.01	<0.01	<0.01	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.043	<0.010	<0.010
Lead	mg/L	0.01 MAC	<0.001	<0.001	<0.001	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Magnesium	mg/L		26.1	26.5	26.1	25	27	26	28.00	29.0	29	29	29	27	27	29	29	30	29	27.9	27.5	28	27.8	28.5	26.4	26.3	27.9	27.2
Manganese	mg/L	0.05 AO	<0.002	<0.002	<0.002	0.004	<0.002	0.004	<0.002	0.0	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	0.002	<0.002	<0.002	<0.002	<0.002	0.008	0.005	0.009
Molybdenum	mg/L		<0.002	<0.002	<0.002	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.0005	0.0006	<0.0005	<0.0005	<0.0005	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Nickel	mg/L		<0.003	<0.003	<0.003	0.001	<0.001	0.001	<0.001	0.001	<0.001	<0.001	0.001	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	0.004
Potassium	mg/L		6.3	6.73	7.04	5.9	6.8	6.2	6.10	6.70	6.50	6.80	6.80	5.8	6.2	6.7	6.1	6.7	6.7	6.20	6.18	6.6	6.5	6.6	6.31	6.1	7.09	6.96
Selenium	mg/L	0.01 MAC	<0.004	<0.004	<0.004	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004
Silicon	mg/L																			2.91	3.12	3.61	2.83	3.02	3.17	2.68	2.81	3.45
Silver	mg/L		<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Sodium	mg/L	200 AO	17.7	17.3	17.4	17	18	16	17	18	18	18	19	13	17	18	17	16	15	14.9	13.3	13.9	15.6	14.1	13.1	15.3	17.8	16.0
Strontium	mg/L		1.9	1.97	2.14	2.0	2.0	1.8	2.0	2.0	1.9	2.1	2.0	1.9	2.1	2.2	2.0	2.1	2.1	2.07	1.76	2.19	2.07	1.88	1.75	1.81	1.82	2.01
Sulphur	mg/L																			24.5	17.5	16.5	23.9	18.8	19	25.7	24.6	56.9
Thallium	mg/L		<0.0003	<0.0003	<0.0003	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	0.00006	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006
Tin	mg/L		<0.002	<0.002	<0.002	<0.001			<0.001	<0.001	<0.001	<0.001		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Titanium	mg/L		<0.002	<0.002	<0.002	<0.005		<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	0.003	<0.002	<0.002
Uranium	mg/L	0.02 MAC	<0.002	<0.002	<0.002	0.0005	0.0004	0.0004	0.000	0.0004	0.0003	0.0003	0.0005	0.0003	0.0003	0.0003	0.0003	0.00037	0.00028	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Vanadium	mg/L		<0.002	<0.002	<0.002	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.0005	0.001	<0.0005	<0.0005	<0.0005	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Zinc	mg/L	5 AO	<0.002	0.006	<0.005	<0.005	0.006	<0.005	<0.005	<0.005	<0.005	0.006	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.0064	0.007	0.038	<0.005	0.008	<0.005	0.005	0.007	<0.005	0.006

Notes:
(1) MOECC Ontario Drinking Water Standards.
(2) Operational Guideline (OG) within ODWS.
(3) Aesthetic Objective (AO) within ODWS.
(4) Maximum Acceptable Concentration (MAC) within ODWS.
(5) Interim Maximum Acceptable Concentration (IMAC) within ODWS.
(6) ODWS exceedances indicated by **bold** entries.

Summary of Groundwater Geochemical Results OW-11-II

Parameters	Units	ODWS [1]	2007			2008			2009			2010			2011		2012			2013			2014			2015		
General Chemistry			Jul	Oct	Dec	Jun	Aug	Nov	Jun	Sep	Nov	Jun	Sep	Nov	Jun	Nov	Jun	Sep	Nov	May	July	Sep	June	July	Sep	May	July	Sep
Alkalinity	mg/L	30-500 OG [2]	444	303	359	456	**564**	490	442	458	352	393	291	333	401	293	380	400	350	379	456	**520**	395	470	436	411	485	412
Chloride	mg/L	250 AO [3]	46.3	40.8	48.3	43	40	42	36.0	39.0	39.0	40	35	41	40	40	37	36	33	35.4	34.9	29.7	20.1	22.3	21.0	29.9	28.6	29.6
Dissolved Organic Carbon	mg/L	5 AO	**7.7**	**7.3**	**5.3**	**8.7**	**8.6**	**7.2**	**6.6**	**5.6**	**6.1**	4.8	**9.7**	**7.8**	**5.8**	**6.3**	4.7	3.9	**7.7**	4.3	4.7	**5.9**	5.0	4.5	4.8	**7.2**	**5.6**	**5.3**
Fluoride	mg/L	1.5 MAC [4]	0.07	0.11	<0.05					<0.1	<0.1	<0.1	0.1	0.1	<0.1	0.1	<0.1	<0.1	0.17	<0.25	<0.25	<0.25	<0.10	<0.25	<0.25	<0.25	<0.25	<0.25
Sulphate	mg/L	500 AO	95.8	197	135	79	28	14	66	84	110	92	130	120	88	110	99	100	68	88.1	68.6	52.2	51.2	44.9	42.1	58.8	41.2	79.2
Hardness	mg/L	80-100 OG	**462**	**385**	**414**	**430**	**510**	**430**	**440**	**450**	**430**	**500**	**390**	**410**	**450**	**380**	**440**	**470**	**390**	**408**	**442**	**454**	**395**	**454**	**409**	**417**	**486**	**457**
Nitrate	mg/L	10 MAC	<0.05	0.27	0.36	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.36	<0.1	<0.25	<0.25	<0.25	0.12	<0.25	<0.25	<0.25	<0.25	<0.25
Nitrite	mg/L	1 MAC	<0.05	<0.05	<0.05	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.25	<0.25	<0.25	<0.10	<0.25	<0.25	<0.25	<0.25	<0.25
Organic Nitrogen	mg/L	0.15 OG				**2.59**	**1.875**	**2.94**	**9.875**	**16.88**	**2.48**	**1.98**	**2.98**	**3.08**	**2.48**		**8.69**	**0.905**	**5.03**	**1.41**	**0.55**	**0.6**	**0.87**	**0.71**	**0.59**	**1.1**	**1.5**	**0.53**
Orthophosphate	mg/L			<0.1	<0.1	<0.01	<0.01	<0.01	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.50	<0.50	<0.50	<0.20	<0.50	<0.50	<0.50	<0.50	<0.50
pH	pH Units																			7.99	7.51	7.33	8.13	8.00	7.76	8.16	8.11	8.05
Electrical Conductivity	µS/cm																			967	1010	1030	857	986	961	950	1060	987
Total Ammonia	mg/L		0.09	0.84	<0.05	0.21	<0.05	0.06	<0.05	0.1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.91	<0.05	0.072	<0.02	0.08	<0.02	0.14	0.12	0.06	<0.02	0.06	<0.02
Total Dissolved Solids	mg/L	500 AO	**610**	**570**	**612**	**613**	**658**	**553**	**580**	**614**	**563**	**605**	**533**	**561**	**584**	**514**	**585**	**609**	499	**526**	**576**	**576**	**506**	**528**	**516**	**534**	**552**	**532**
Total Kjeldahl Nitrogen (TKN)	mg/L		1.6	1.59	0.7	2.8	1.9	3.0	9.9	17	2.5	2.0	3.0	3.1	2.5	<2	9.6	0.93	5.1	1.41	0.63	0.6	1.01	0.83	0.65	1.1	1.56	0.53
Total Phosphorus	mg/L		0.21	1.51	1.25	0.03	0.2	0.7	1.3	<0.2	0.27	0.34								<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Metals																												
Aluminum	mg/L	0.1 OG	<0.004	<0.004	<0.004	<0.005	0.009	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.007	<0.005	<0.005	<0.005	<0.005	<0.005	<0.004	0.007	<0.004	0.004	<0.004	<0.004	<0.004	0.019	<0.004
Arsenic	mg/L	0.025 IMAC [5]	<0.003	<0.003	<0.003	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
Barium	mg/L	1 MAC	0.03	0.064	0.035	0.025	0.03	0.02	0.0200	0.029	0.020	0.023	0.027	0.02	0.023	0.019	0.05	0.027	0.019	0.029	0.025	0.022	0.021	0.022	0.024	0.023	0.027	0.023
Beryllium	mg/L		<0.001	<0.001	<0.002	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Bismuth	mg/L		<0.002	<0.002	<0.002	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001		<0.001	<0.001	<0.001	<0.001	<0.001	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Boron	mg/l	5 IMAC	0.485	0.212	0.252	0.51	0.58	0.3	0.340	0.35	0.28	0.38	0.5	0.3	0.56	0.29	0.4	0.39	0.31	0.416	0.491	0.439	0.365	0.361	0.346	0.295	0.317	0.326
Cadmium	mg/L	0.005 MAC	<0.0001	<0.002	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Calcium	mg/L		121	100	111	110	130	110	120	120	100	130	94	97	110	86	110	120	88	102	115	116	96.6	117	103	104	124	119
Chromium	mg/L	0.05 MAC	0.021	<0.003	<0.003	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.003	<0.003	0.003	<0.003	<0.003	<0.003	0.003	0.027	<0.003
Cobalt	mg/L		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	0.001	<0.0005	<0.0005	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Copper	mg/L	1 AO	<0.002	<0.002	<0.003	0.001	<0.001	0.003	0.001	0.001	<0.001	0.001	0.001	0.001	0.001	0.001	<0.001	<0.001	0.001	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
Iron	mg/L	0.3 AO	<0.01	**2.19**	<0.01	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	**3.4**	<0.1	<0.1	**0.597**	**0.322**	<0.010	<0.010	0.193	0.068	<0.010	0.195	<0.010
Lead	mg/L	0.01 MAC	<0.001	<0.001	<0.001	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Magnesium	mg/L		38.7	32.8	33.3	38	45	40	38	36	41	42	37	42	40	40	43	40	42	37.3	37.6	40.0	37.4	39.3	36.8	38.1	42.9	38.8
Manganese	mg/L	0.05 AO	0.046	**0.127**	<0.002	0.029	**0.13**	0.003	0.0	**0.6**	<0.002	**0.22**	**0.06**	0.036	0.03	0.027	**1.1**	0.015	<0.002	**0.162**	**0.172**	0.029	**0.162**	**0.124**	0.028	0.046	0.042	0.005
Molybdenum	mg/L		<0.002	<0.002	<0.002	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	<0.001	<0.001	0.0007	<0.0005	<0.0005	0.001	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Nickel	mg/L		0.005	0.003	<0.003	0.004	0.005	0.004	0.005	0.005	0.004	0.005	0.004	0.004	0.006	0.004	0.0046	0.0041	0.0046	<0.003	<0.003	0.004	<0.003	<0.003	<0.003	0.004	0.005	0.007
Potassium	mg/L		7.44	6.12	3.84	6.5	5.7	4.7	3.40	2.90	5.80	4.00	8.20	6.50	5.3	7	5	5.1	7.9	4.64	4.13	4.89	5.99	4.96	4.43	6.11	5.79	4.76
Selenium	mg/L	0.01 MAC		<0.004	<0.004	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	0.004
Silicon	mg/L																			3.30	4.35	4.36	4.24	4.26	3.76	4.42	4.40	4.12
Silver	mg/L		<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Sodium	mg/L	200 AO	69.5	33.5	58.2	54	59	45	49	49	44	52	46	49	49	46	56	53	45	40.6	44.6	45	32.4	41.1	36.4	34.1	38.1	39.2
Strontium	mg/L		0.22	0.336	1.95	0.21	0.23	0.19	0.19	0.21	0.18	0.19	0.18	0.18	0.2	0.17	0.19	0.23	0.18	0.189	0.208	0.231	0.199	0.204	0.231	0.192	0.226	0.193
Sulphur	mg/L																			29.5	22.8	16	14.8	15.6	15.8	21.4	13.0	26.6
Thallium	mg/L		<0.0003	<0.0003	<0.0003	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006
Tin	mg/L		<0.002	<0.002	<0.002	<0.001			<0.001	<0.001	<0.001	<0.001	<0.001		<0.001	<0.001	<0.001	<0.001	<0.001	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Titanium	mg/L		<0.002	<0.002	<0.002	<0.005		<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Uranium	mg/L	0.02 MAC	<0.002	<0.002	<0.002	0.001	0.0011	0.001	0.001	0.0006	0.0008	0.0006	0.0006	0.0008	0.0007	0.0006	0.00066	0.00069	0.00078	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Vanadium	mg/L		<0.002	<0.002	<0.002	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	<0.0005	<0.0005	<0.0005	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Zinc	mg/L	5 AO	0.005	0.03	0.006	<0.005	<0.005	<0.005	<0.005	0.006	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.008	0.007	<0.005	0.006	0.006	<0.005

Notes:
(1) MOECC Ontario Drinking Water Standards.
(2) Operational Guideline (OG) within ODWS.
(3) Aesthetic Objective (AO) within ODWS.
(4) Maximum Acceptable Concentration (MAC) within ODWS.
(5) Interim Maximum Acceptable Concentration (IMAC) within ODWS.
(6) ODWS exceedances indicated by **bold** entries.

amec foster wheeler

Summary of Groundwater Geochemical Results OW-12-I

Parameters	Units	ODWS [1]	2007			2008			2009			2010			2011			2012			2013			2014			2015		
General Chemistry			Jul	Oct	Dec	Jun	Aug	Nov	Jun	Sep	Nov	Jun	Sep	Nov	Jun	Sep	Nov	Jun	Sep	Nov	May	July	Sep	June	July	Sep	May	July	Sep
Alkalinity	mg/L	30-500 OG [2]	244	241	239	248	251	255	253	260	265	259	258	265	258	262	278	270	270	270	255	273	324	262	272	279	265	**814**	265
Chloride	mg/L	250 AO [3]	34.3	40.9	36.5	45	37	40	39	43	47	44	43	42	47	44	61	46	44	40	56.3	43.7	42.4	50.6	37.3	39.7	48.4	38.4	32.0
Dissolved Organic Carbon	mg/L	5 AO	1.2	2.3	1.2	1.0	1.2	1.1	1.1	1.3	1.0	1.4	1.3	1.6	1.2	1.4	1.6	2.1	1.5	1.4	**5.4**	1.8	1.9	1.8	2.7	2.0	1.7	2.6	1.9
Fluoride	mg/L	1.5 MAC [4]	0.46	0.47	0.47					0.5	0.4	0.4	0.4	0.5	0.4	0.46	0.4	0.43	0.45	0.46	<0.25	0.31	0.44	0.17	<0.25	0.44	0.41	<0.50	<0.25
Sulphate	mg/L	500 AO	42	57.3	53	65	52	50	56	48	59	51	47	47	64	52	59	57	58	46	82.2	69.6	69.8	84	67.8	70.9	78.5	73.9	68.9
Hardness	mg/L	80-100 OG	**302**	**307**	**294**	**330**	**320**	**300**	**320**	**300**	**330**	**380**	**340**	**350**	**340**	**350**	**350**	**370**	**370**	**360**	**376**	**357**	**361**	**365**	**355**	**355**	**348**	**367**	**341**
Nitrate	mg/L	10 MAC	0.17	0.06	<0.05	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.25	<0.10	<0.10	0.14	<0.25	0.11	<0.10	<0.50	<0.25
Nitrite	mg/L	1 MAC	<0.05	<0.05	<0.05	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.25	<0.10	<0.10	<0.10	<0.25	<0.10	<0.10	<0.50	<0.25
Organic Nitrogen	mg/L	0.15 OG				**0.17**	**0.275**	**0.175**	**0.175**	**0.275**	**0.175**	**0.175**	**0.175**	**0.275**	**0.18**	**0.18**		**0.395**	**0.355**	**0.485**	**1.03**	<0.10	<0.10	**0.52**	**0.26**	**0.45**	**0.30**	**0.47**	**0.28**
Orthophosphate	mg/L			<0.1	<0.1	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.50	<0.20	<0.20	<0.20	<0.50	<0.20	<0.20	<1.00	<0.50
pH	pH Units																				8.16	7.9	7.4	8.2	8.23	8.06	8.23	7.98	7.96
Electrical Conductivity	µS/cm																				815	769	790	784	771	817	797	287	738
Total Ammonia	mg/L		<0.02	0.03	<0.05	0.13	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.02	<0.02	<0.02	0.05	0.07	0.03	<0.02	<0.02	<0.02
Total Dissolved Solids	mg/L	500 AO	360	360	376	403	379	375	385	377	410	414	391	399	412	402	439	419	421	405	462	476	466	468	482	472	462	440	416
Total Kjeldahl Nitrogen (TKN)	mg/L		0.2	<0.1	<0.1	0.3	0.3	0.2	0.2	0.3	0.2	0.2	0.2	0.3	0.2	0.2	<0.5	0.42	0.38	0.51	1.03	<0.10	<0.10	0.57	0.33	0.48	0.30	0.47	0.28
Total Phosphorus	mg/L		<0.02	0.08	0.03	<0.04	<0.02	0.02	0.19	<0.02	0.03	0.02									<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Metals																													
Aluminum	mg/L	0.1 OG	<0.004	<0.004	0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.007	0.007	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004
Arsenic	mg/L	0.025 IMAC [5]	<0.003	<0.003	<0.003	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
Barium	mg/L	1 MAC	0.045	0.045	0.057	0.048	0.05	0.048	0.0470	0.047	0.047	0.05	0.052	0.05	0.049	0.055	0.052	0.046	0.057	0.053	0.062	0.057	0.055	0.057	0.053	0.053	0.052	0.055	0.056
Beryllium	mg/L		<0.001	<0.001	<0.002	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Bismuth	mg/L		<0.002	<0.002	<0.002	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Boron	mg/l	5 IMAC	0.366	0.364	0.403	0.4	0.41	0.43	0.350	0.38	0.41	0.37	0.41	0.4	0.34	0.37	0.41	0.35	0.39	0.41	0.375	0.401	0.35	0.332	0.351	0.407	0.309	0.360	0.390
Cadmium	mg/L	0.005 MAC	<0.0001	<0.002	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Calcium	mg/L		69.6	71.8	66.8	74	74	69	75	69	76	89	78	80	82	83	82	83	84	85	89.2	84.3	86	86.5	83.3	83.7	81.0	86.4	81.3
Chromium	mg/L	0.05 MAC	0.013	<0.003	<0.003	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
Cobalt	mg/L		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Copper	mg/L	1 AO	<0.002	<0.002	<0.003	0.002	0.002	0.001	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
Iron	mg/L	0.3 AO	<0.01	<0.01	<0.01	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.011	<0.010	<0.010
Lead	mg/L	0.01 MAC	<0.001	<0.001	<0.001	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Magnesium	mg/L		31.2	30.9	30.8	36	33	32	33	31.0	35.0	38	35	35	33	34	36	39	38	36	37.1	35.5	35.5	36.1	35.6	35.5	35.3	36.7	33.6
Manganese	mg/L	0.05 AO	0.004	<0.002	<0.002	0.011	0.011	0.037	0.0	0.0	0.0	0.009	<0.002	0.004	0.009	0.004	0.005	0.0053	<0.002	0.0027	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	0.002	<0.002
Molybdenum	mg/L		<0.002	<0.002	<0.002	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.0007	0.0005	0.00059	0.00058	0.00083	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Nickel	mg/L		<0.003	<0.003	<0.003	<0.005	<0.001	0.001	0.001	<0.001	0.001	0.001	<0.001	<0.001	0.002	0.002	<0.001	0.0012	0.0011	0.002	<0.003	<0.003	0.003	<0.003	<0.003	<0.003	<0.003	0.003	0.005
Potassium	mg/L		7.9	8.16	8.84	8	8.5	7.8	7.70	7.50	8.40	8.50	8.20	8.40	7.5	8	8.5	7.7	8.6	8.4	8.09	8.21	8.53	8.19	8.75	8.7	8.0	9.28	8.59
Selenium	mg/L	0.01 MAC	<0.004	<0.004	<0.004	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004
Silicon	mg/L																				3.87	3.81	4.45	3.8	3.81	3.97	3.75	3.93	4.18
Silver	mg/L		<0.0001	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Sodium	mg/L	200 AO	15	15.3	14.8	17	15	15	15	14	16	17	15	16	15	16	16	17	16	16	15.6	14.6	15.7	17.2	15.7	16.5	17.2	17.5	15.4
Strontium	mg/L		1.89	1.77	2.06	2.0	2.1	1.8	1.9	1.9	1.9	2.0	2.0	2.0	1.8	2.0	2.1	2.0	2.1	2.1	2.12	2.1	2.18	1.91	1.98	1.91	1.71	1.99	1.96
Sulphur	mg/L																				27.9	24.9	22.1	24.9	24.0	27.3	28.6	25.2	23.5
Thallium	mg/L		<0.0003	<0.0003	<0.0003	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006
Tin	mg/L		<0.002	<0.002	<0.002	<0.001			<0.001	<0.001	<0.001	<0.001	<0.001		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Titanium	mg/L		<0.002	<0.002	<0.002	<0.005		<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Uranium	mg/L	0.02 MAC	<0.002	<0.002	<0.002	0.0003	0.0002	0.0002	0.000	0.0001	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.00022	0.0003	0.00027	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Vanadium	mg/L		<0.002	<0.002	<0.002	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.003	<0.001	<0.001	<0.0005	0.0009	<0.0005	<0.0005	<0.0005	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Zinc	mg/L	5 AO	0.004	0.012	0.015	0.02	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.006	<0.005	<0.005	0.006	0.006	0.006	0.005	0.006	<0.005

Notes:
(1) MOECC Ontario Drinking Water Standards.
(2) Operational Guideline (OG) within ODWS.
(3) Aesthetic Objective (AO) within ODWS.
(4) Maximum Acceptable Concentration (MAC) within ODWS.
(5) Interim Maximum Acceptable Concentration (IMAC) within ODWS.
(6) ODWS exceedances indicated by **bold** entries.

Summary of Groundwater Geochemical Results OW-12-II

Parameters	Units	ODWS [1]	2007			2008			2009			2010			2011			2012			2013			2014			2015		
General Chemistry			Jul	Oct	Dec	Jun	Aug	Nov	Jun	Sep	Nov	Jun	Sep	Nov	Jun	Sep	Nov	Jun	Sep	Nov	May	July	Sep	June	July	Sep	May	July	Sep
Alkalinity	mg/L	30-500 OG [2]	**527**	**530**	484	448	480	**509**	**516**	**526**	**518**	485	**512**	**513**	493	**528**	467	**520**	**510**	**530**	**501**	**548**	**610**	**515**	**524**	**530**	477	**541**	**535**
Chloride	mg/L	250 AO [3]	91.5	91.9	99.4	97	90	99	81	79	82	67	75	69	76	70	76	78	74	79	56.4	57.4	49.3	46.5	50.0	45.2	49.1	49.8	49.2
Dissolved Organic Carbon	mg/L	5 AO	**9.5**	**8.9**	**9.7**	**8.5**	**9.0**	**9.4**	**9.0**	**8.9**	**7.9**	**8.6**	**8.4**	**9.3**	**6.9**	**8.3**	**7.5**	**7.5**	**8.0**	**7.4**	**6.7**	**7.5**	**9.1**	**7.2**	**8.5**	**8.2**	**7.9**	**8.6**	**9.1**
Fluoride	mg/L	1.5 MAC [4]	<0.05	0.07	<0.05					<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.07	<0.1	<0.1	<0.1	<0.1	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25
Sulphate	mg/L	500 AO	104	113	137	169	170	152	140	150	150	120	120	130	130	130	110	130	130	120	111	115	117	111	135	122	118	134	127
Hardness	mg/L	80-100 OG	**521**	**342**	**505**	**510**	**570**	**500**	**560**	**570**	**580**	**520**	**560**	**550**	**540**	**560**	**510**	**570**	**570**	**500**	**508**	**524**	**518**	**569**	**580**	**525**	**466**	**600**	**518**
Nitrate	mg/L	10 MAC	1.23	1.7	1.04	<0.1	<0.1	<0.1	<0.1	0.5	0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25
Nitrite	mg/L	1 MAC	<0.05	<0.05	<0.05	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25
Organic Nitrogen	mg/L	0.15 OG				**2.55**	**1.975**	**1.775**	**3.975**	**2.175**	**1.775**	**1.775**	**1.875**	**1.775**	**1.48**	**1.98**	**1.08**	**1.68**	**1.78**	**1.53**	**1.95**	**1.43**	**1.4**	**1.76**	**1.61**	**1.78**	**1.29**	**1.66**	**1.71**
Orthophosphate	mg/L			<0.1	<0.1	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
pH	pH Units																				7.88	7.24	7.12	8.02	8.10	7.52	7.90	7.98	7.95
Electrical Conductivity	µS/cm																				1290	1280	1320	1260	1320	1330	1250	1360	1340
Total Ammonia	mg/L		0.03	0.14	0.06	0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.071	<0.02	0.03	<0.02	0.07	0.07	0.05	<0.02	0.03	<0.02
Total Dissolved Solids	mg/L	500 AO	**774**	**674**	**848**	**834**	**880**	**856**	**854**	**875**	**870**	**773**	**821**	**816**	**796**	**838**	**749**	**850**	**833**	**795**	**716**	**778**	**784**	**734**	**810**	**766**	**722**	**758**	**766**
Total Kjeldahl Nitrogen (TKN)	mg/L		1.66	1.49	1.46	2.6	2.0	1.8	4.0	2.2	1.8	1.8	1.9	1.8	1.5	2.0	1.1	1.7	1.8	1.6	1.95	1.46	1.4	1.83	1.68	1.83	1.29	1.69	1.71
Total Phosphorus	mg/L		0.13	0.31	1.84	0.3	<0.1	0.09	0.22	0.1	0.05	0.04									<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Metals																													
Aluminum	mg/L	0.1 OG	<0.004	<0.004	<0.004	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.0062	0.070	0.014	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004
Arsenic	mg/L	0.025 IMAC [5]	<0.003	<0.003	<0.003	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
Barium	mg/L	1 MAC	0.024	0.027	0.025	0.023	0.03	0.023	0.0240	0.028	0.024	0.023	0.027	0.023	0.021	0.028	0.021	0.023	0.027	0.021	0.041	0.043	0.042	0.044	0.048	0.04	0.039	0.044	0.049
Beryllium	mg/L		<0.001	<0.001	<0.002	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Bismuth	mg/L		<0.002	<0.002	<0.002	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Boron	mg/l	5 IMAC	0.09	0.051	0.052	0.045	0.069	0.045	0.061	0.072	0.052	0.084	0.076	0.055	0.1	0.071	0.084	0.083	0.10	0.073	0.121	0.148	0.165	0.124	0.193	0.196	0.138	0.181	0.240
Cadmium	mg/L	0.005 MAC	<0.0001	<0.002	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Calcium	mg/L		169	97.4	162	160	180	160	180	190	180	170	180	170	170	180	160	180	180	160	151	158	155	171	174	156	133	180	151
Chromium	mg/L	0.05 MAC	0.004	<0.003	**0.084**	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.003	<0.003	0.005	<0.003	<0.003	<0.003	0.004	<0.003	<0.003
Cobalt	mg/L		<0.0005	<0.0005	0.001	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Copper	mg/L	1 AO	0.004	0.003	<0.003	<0.001	0.001	<0.001	0.002	0.001	<0.001	0.002	<0.001	<0.001	<0.001	0.001	<0.001	0.0016	<0.001	<0.001	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
Iron	mg/L	0.3 AO	<0.01	**0.602**	**0.413**	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.052	0.074	0.099	0.092	**0.308**	0.171	0.131	**0.387**	0.042
Lead	mg/L	0.01 MAC	<0.001	<0.001	<0.001	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Magnesium	mg/L		24	24.1	24.4	24	26	25	25.0	27.0	28.0	25	27	28	28	25	27	32	30	27	31.7	31.4	31.8	34.6	35.3	32.8	32.6	36.5	34.3
Manganese	mg/L	0.05 AO	**0.065**	**0.06**	**0.174**	**0.084**	**0.083**	0.036	**0.1**	**0.1**	**0.1**	**0.075**	**0.09**	**0.076**	**0.1**	**0.082**	**0.063**	0.049	0.02	**0.065**	**0.057**	**0.065**	0.042	0.044	0.035	0.033	0.046	0.041	0.034
Molybdenum	mg/L		<0.002	<0.002	<0.002	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Nickel	mg/L		0.01	0.011	0.009	0.011	0.012	0.01	0.010	0.011	0.01	0.01	0.011	0.01	0.012	0.013	0.011	0.01	0.011	0.01	0.005	0.005	0.009	0.006	0.006	0.003	0.008	0.01	0.014
Potassium	mg/L		1.7	1.35	1.78	1.0	1.4	0.95	0.95	1.50	1.10	1.10	1.30	1.00	0.71	1.4	0.85	1.0	1.4	0.77	2.86	3.53	3.69	3.31	4.32	3.88	2.92	3.85	4.62
Selenium	mg/L	0.01 MAC	<0.004	<0.004	<0.004	0.003	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004
Silicon	mg/L																				3.68	4.30	4.78	3.66	4.09	3.71	4.16	3.70	4.53
Silver	mg/L		<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Sodium	mg/L	200 AO	129	114	110	100	110	110	110	110	110	93	100	100	89	99	89	110	100	85	70.1	77.5	74.1	80.5	77.6	74.6	73.3	73.9	73.7
Strontium	mg/L		0.237	0.269	0.336	0.24	0.27	0.27	0.25	0.29	0.26	0.25	0.27	0.26	0.22	0.29	0.24	0.25	0.27	0.23	0.647	0.580	0.633	0.626	0.604	0.517	0.468	0.505	0.539
Sulphur	mg/L																				37.1	38.0	49.7	35.8	46.1	42.2	41.5	40.9	42.8
Thallium	mg/L		<0.0003	<0.0003	<0.0003	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006
Tin	mg/L		<0.002	<0.002	<0.002	<0.001			<0.001	<0.001	<0.001	<0.001	<0.001		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Titanium	mg/L		<0.002	<0.002	<0.002	<0.005		<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.002	<0.002	0.002	<0.002	<0.002	<0.002	0.002	0.002	0.003
Uranium	mg/L	0.02 MAC	<0.002	<0.002	<0.002	0.0005	0.0005	0.0006	0.001	0.0006	0.0006	0.0006	0.0006	0.0006	0.0006	0.0006	0.0008	0.00064	0.00073	0.00055	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Vanadium	mg/L		<0.002	<0.002	<0.002	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.0005	0.0005	<0.0005	<0.0005	<0.0005	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Zinc	mg/L	5 AO	0.032	0.037	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.113	0.016	<0.005	0.006	<0.005	<0.005	<0.005	0.007	<0.005

Notes:
(1) MOECC Ontario Drinking Water Standards.
(2) Operational Guideline (OG) within ODWS.
(3) Aesthetic Objective (AO) within ODWS.
(4) Maximum Acceptable Concentration (MAC) within ODWS.
(5) Interim Maximum Acceptable Concentration (IMAC) within ODWS.
(6) ODWS exceedances indicated by **bold** entries.

The City of Temiskaming Shores
Hydrogeological Characterization
New Liskeard Waste Disposal Site
New Liskeard, Ontario
August 2016

Summary of Groundwater Geochemical Results OW-25-I

Parameters	Units	ODWS [1]	2007		2008			2009			2010			2011			2012			2013			2014			2015		
General Chemistry			Oct	Dec	Jun	Aug	Nov	Jun	Sep	Nov	Jun	Sep	Nov	Jun	Sep	Nov	Jun	Sep	Nov	May	July	Sep	June	July	Sep	May	July	Sep
Alkalinity	mg/L	30-500 OG [2]	208	222	236	234	234	242	238	235	237	227	228	225	239	231	230	240	230	228	241	262	230	227	223	221	231	225
Chloride	mg/L	250 AO [3]	13.7	2.98	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	1.0	2.0	2.0	2.0	2.0	1.0	<1	1.44	1.28	1.56	1.68	1.27	1.32	1.27	1.48	1.32
Dissolved Organic Carbon	mg/L	5 AO	2.9	2.8	2.9	2.5	2.1	2.5	2.4	2.3	2.3	2.7	2.9	2.3	2.3	2.4	2.5	2.4	2.3	1.2	3.1	2.9	2.5	2.5	2.4	2.7	3.2	2.8
Fluoride	mg/L	1.5 MAC [4]	0.86	0.64					0.6	0.6	0.6	0.6	0.6	0.6	0.71	0.7	0.69	0.63	0.67	0.54	0.55	0.71	0.54	0.55	0.59	0.60	0.46	0.60
Sulphate	mg/L	500 AO	109	10.2	4.0	2.0	4.0	8.0	2.0	5.0	5.0	3.0	3.0	4.0	7.0	5.0	5.0	<1	4.0	1.64	1.6	3.88	5.3	0.89	1.38	0.90	6.11	1.24
Hardness	mg/L	80-100 OG	**280**	**157**	**160**	**170**	**160**	**160**	**170**	**170**	**180**	**170**	**160**	**160**	**160**	**160**	**160**	**160**	**160**	**166**	**159**	**164**	**164**	**181**	**165**	**163**	**177**	**166**
Nitrate	mg/L	10 MAC	0.06	<0.05	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.05	<0.05	<0.10	0.16	<0.05	<0.10	<0.05	<0.10	<0.05
Nitrite	mg/L	1 MAC	<0.05	<0.05	<0.01	<0.01	<0.01	0.01	<0.01	<0.01	0.02	<0.01	<0.01	0.01	0.03	<0.01	<0.01	<0.01	<0.01	<0.05	<0.05	<0.10	<0.05	<0.05	<0.10	<0.05	<0.10	<0.05
Organic Nitrogen	mg/L	0.15 OG			**1.58**	**0.52**	**0.64**	**0.24**	**0.68**	**0.24**		**0.83**	**0.21**	**0.61**	**0.37**	**0.22**	**0.35**	0.12	**1.53**	**0.91**	<0.10	<0.10	**0.44**	<0.10	**0.18**	**0.17**	**0.39**	**0.21**
Orthophosphate	mg/L		<0.1	<0.1	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.012	0.014	<0.01	<0.10	<0.10	<0.20	<0.10	<0.10	<0.20	0.55	<0.20	<0.10
pH	pH Units																			8.13	7.81	7.34	8.32	8.19	8.06	8.39	8.15	8.13
Electrical Conductivity	µS/cm																			441	432	450	433	432	444	432	454	438
Total Ammonia	mg/L		<0.02	0.16	0.42	0.38	0.46	0.26	0.4	0.4	0.2	0.27	0.29	0.29	0.23	0.18	0.16	0.42	0.37	0.28	0.41	0.25	0.33	0.39	0.34	0.31	0.22	0.33
Total Dissolved Solids	mg/L	500 AO	418	250	255	254	251	264	254	256	264	250	248	246	262	249	255	247	247	218	252	236	240	246	228	220	240	230
Total Kjeldahl Nitrogen (TKN)	mg/L		<0.1	0.47	2.0	0.9	1.1	0.5	1.1	0.6	<0.5	1.1	0.5	0.9	0.6	0.4	0.51	0.54	1.9	1.19	0.17	0.23	0.77	0.46	0.52	0.48	0.61	0.54
Total Phosphorus	mg/L		<0.02	0.87	2.2	1.0	0.44	0.23	0.5	0.08	0.26									<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Metals																												
Aluminum	mg/L	0.1 OG	0.023	0.006	0.006	0.013	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.0051	0.005	0.006	<0.004	<0.004	<0.004	<0.004	<0.004	0.005	<0.004
Arsenic	mg/L	0.025 IMAC [5]	<0.003	<0.003	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
Barium	mg/L	1 MAC	0.058	0.051	0.045	0.046	0.042	0.0390	0.040	0.039	0.037	0.04	0.039	0.047	0.041	0.039	0.041	0.042	0.039	0.042	0.04	0.035	0.04	0.036	0.034	0.040	0.041	0.040
Beryllium	mg/L		<0.002	<0.002	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Bismuth	mg/L		<0.002	<0.002	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001			<0.001	<0.001	<0.001	<0.001	<0.001	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Boron	mg/l	5 IMAC	0.122	0.133	0.17	0.15	0.13	0.150	0.14	0.13	0.15	0.13	0.14	0.15	0.15	0.14	0.14	0.14	0.14	0.146	0.124	0.109	0.136	0.131	0.123	0.113	0.127	0.130
Cadmium	mg/L	0.005 MAC	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Calcium	mg/L		61.9	31	32	35	34	34	35	35	37	35	33	34	35	33	33	33	34	36	34.2	35.5	34.5	39.8	34.9	34.8	39.0	35.7
Chromium	mg/L	0.05 MAC	0.004	<0.003	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
Cobalt	mg/L		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Copper	mg/L	1 AO	<0.003	<0.003	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
Iron	mg/L	0.3 AO	0.165	<0.01	<0.1	0.17	0.19	0.1	0.2	0.2	0.14	0.15	0.22	0.15	0.24	<0.1	<0.1	0.19	0.23	0.141	0.164	0.115	0.102	0.17	0.163	0.157	0.151	0.137
Lead	mg/L	0.01 MAC	<0.001	<0.001	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Magnesium	mg/L		30.5	19.4	19	19	19	19.0	20.0	19.0	20	19	19	19	19	18	20	19	19	18.6	17.8	18.4	19.0	19.8	18.8	18.4	19.3	18.6
Manganese	mg/L	0.05 AO	0.024	0.008	0.008	0.01	0.01	0.0	0.0	0.0	0.007	0.009	0.009	0.008	0.011	0.011	0.0067	0.0095	0.011	0.009	0.008	0.009	0.007	0.011	0.011	0.009	0.024	0.012
Molybdenum	mg/L		0.005	0.017	0.018	0.011	0.009	0.02	0.015	0.008	0.016	0.011	0.011	0.007	0.01	0.0069	0.0095	0.0072	0.0063	0.003	0.003	<0.002	0.004	<0.002	<0.002	<0.002	<0.002	<0.002
Nickel	mg/L		<0.003	<0.003	0.002	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
Potassium	mg/L		6.64	5.92	4.6	4.4	4	4.20	4.10	4.00	4.30	3.80	3.80	3.8	4	3.6	3.8	3.7	3.6	3.79	3.66	3.67	3.94	4.32	4.01	3.92	3.87	4.01
Selenium	mg/L	0.01 MAC	<0.004	<0.004	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004
Silicon	mg/L																			7.59	7.54	6.88	7.56	7.43	7.37	6.94	6.35	7.43
Silver	mg/L		<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Sodium	mg/L	200 AO	27.2	34.4	35	34	31	36	31	32	36	33	34	31	34	33	35	32	32	28	27	31.5	33.1	29.3	29.2	29.1	27.5	29.4
Strontium	mg/L		1.89	0.729	0.76	0.76	0.71	0.73	0.72	0.72	0.72	0.75	0.7	0.78	0.76	0.69	0.79	0.76	0.72	0.703	0.786	0.744	0.745	0.744	0.657	0.654	0.730	0.722
Sulphur	mg/L																			0.69	0.62	<0.05	1.28	0.9	1.88	0.55	0.54	0.83
Thallium	mg/L		<0.0003	<0.0003	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006
Tin	mg/L		<0.002	<0.002	<0.001			<0.001	<0.001	<0.001	<0.001	<0.001			<0.001	<0.001	<0.001	<0.001	<0.001	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Titanium	mg/L		0.002	<0.002	<0.005		<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Uranium	mg/L	0.02 MAC	<0.002	<0.002	0.0006	0.0003	0.0002	0.000	0.0002	0.0001	0.0001	<0.0001	0.0003	<0.0001	0.0001	<0.0001	0.00024	<0.0001	0.00011	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Vanadium	mg/L		0.003	<0.002	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.0005	<0.0005	0.00063	<0.0005	<0.0005	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Zinc	mg/L	5 AO	0.033	0.007	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.0051	0.006	<0.005	<0.005	0.005	<0.005	<0.005	0.006	<0.005	0.007

Notes:
(1) MOECC Ontario Drinking Water Standards.
(2) Operational Guideline (OG) within ODWS.
(3) Aesthetic Objective (AO) within ODWS.
(4) Maximum Acceptable Concentration (MAC) within ODWS.
(5) Interim Maximum Acceptable Concentration (IMAC) within ODWS.
(6) ODWS exceedances indicated by **bold** entries.

Summary of Groundwater Geochemical Results OW-25-II

Parameters	Units	ODWS (1)	2007	2008			2009			2010			2011			2012			2013			2014			2015		
General Chemistry			Dec	Jun	Aug	Nov	Jun	Sep	Nov	Jun	Sep	Nov	Jun	Sep	Nov	Jun	Sep	Nov	May	July	Sep	June	July	Sep	May	July	Sep
Alkalinity	mg/L	30-500 OG (2)	142	128	132	134	138	145	142	144	145	145	147	150	150	150	160	170	149	158	173	152	142	139	145	147	143
Chloride	mg/L	250 AO (3)	18.2	17	23	23	20	22	21	18	19	18	17	18	16	14.0	14.0	14.0	12.2	11.9	11.8	11.2	10.4	10.8	8.82	10.2	9.64
Dissolved Organic Carbon	mg/L	5 AO	**12.3**	**6.4**	4.4	2.9	2.7	2.0	1.8	1.7	1.6	1.7	1.4	1.3	1.3	1.4	1.7	1.3	2.3	1.7	1.7	1.4	1.1	1.3	1.5	**5.3**	1.5
Fluoride	mg/L	1.5 MAC (4)	0.37					0.8	0.9	0.9	0.8	0.9	0.9	0.98	1	1.04	1.06	1.04	0.89	0.89	1.16	1.00	0.43	0.96	1.16	0.65	1.11
Sulphate	mg/L	500 AO	481	471	**559**	499	390	420	390	340	320	300	280	280	250	250	240	240	252	238	235	232	230	212	218	237	223
Hardness	mg/L	80-100 OG	**368**	**340**	**360**	**300**	**260**	**260**	**230**	**210**	**190**	**190**	**170**	**170**	**180**	**170**	**160**	**150**	**151**	**144**	**152**	**141**	**149**	**135**	**141**	**145**	**142**
Nitrate	mg/L	10 MAC	<0.05	<0.1	<0.1	<0.1	0.1	0.3	0.3	0.2	0.2	0.2	0.2	0.2	0.1	0.19	0.18	0.17	<0.25	<0.25	<0.25	0.25	<0.25	0.27	<0.25	<0.25	0.35
Nitrite	mg/L	1 MAC	<0.05	0.01	0.09	0.01	<0.01	<0.01	<0.01	<0.01	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.012	<0.01	<0.25	<0.25	<0.25	<0.05	<0.25	<0.10	<0.25	<0.25	<0.25
Organic Nitrogen	mg/L	0.15 OG		**2.72**	**1.06**	**1.12**	**0.875**	**0.575**	**0.775**		**0.375**	**0.275**	**0.975**	**0.375**	**0.275**	0.105	**0.655**	**0.455**	**0.79**	<0.10	<0.10	**0.38**	<0.10	**0.20**	**0.32**	**0.86**	**0.33**
Orthophosphate	mg/L		<0.1	<0.01	<0.01	<0.01	0.01	<0.01	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.012	<0.50	<0.50	<0.50	<0.10	<0.50	<0.20	<0.50	<0.50	<0.50
pH	pH Units																		8.07	7.88	7.15	8.29	8.26	8.29	8.33	8.04	8.13
Electrical Conductivity	µS/cm																		866	837	789	808	806	795	798	836	793
Total Ammonia	mg/L		0.11	0.28	0.14	0.08	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.02	<0.02	0.03	0.06	0.05	0.03	<0.02	<0.02	<0.02
Total Dissolved Solids	mg/L	500 AO	**850**	**829**	**965**	**880**	**754**	**779**	**751**	**671**	**647**	**623**	**582**	**589**	**574**	**553**	**531**	**533**	490	**514**	**542**	474	**514**	440	408	462	476
Total Kjeldahl Nitrogen (TKN)	mg/L		0.64	3.0	1.2	1.2	0.9	0.6	0.8	<0.5	0.4	0.3	1.0	0.4	0.3	0.13	0.68	0.48	0.79	<0.10	<0.10	0.44	<0.10	0.23	0.32	0.86	0.33
Total Phosphorus	mg/L		0.87	<0.4	0.5	0.4	<0.1	0.04	0.1	0.06									<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Metals																											
Aluminum	mg/L	0.1 OG	0.014	0.007	0.007	0.007	0.005	0.007	<0.005	0.011	0.007	0.006	0.011	0.007	0.01	0.006	0.005	0.0053	0.011	0.009	0.005	0.009	0.008	0.005	0.024	**0.151**	0.006
Arsenic	mg/L	0.025 IMAC (5)	<0.003	0.001	0.002	0.002	0.0010	0.001	<0.001	0.001	0.001	0.001	0.001	0.001	<0.001	0.0014	<0.001	0.001	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
Barium	mg/L	1 MAC	0.011	0.014	0.028	0.027	0.0220	0.029	0.025	0.021	0.025	0.025	0.023	0.025	0.025	0.023	0.025	0.025	0.025	0.023	0.023	0.019	0.02	0.021	0.024	0.023	0.025
Beryllium	mg/L		<0.002	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Bismuth	mg/L		<0.002	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001			<0.001	<0.001	<0.001	<0.001	<0.001	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Boron	mg/l	5 IMAC	0.164	0.23	0.22	0.23	0.210	0.22	0.22	0.21	0.19	0.22	0.21	0.21	0.23	0.21	0.22	0.22	0.234	0.213	0.197	0.18	0.192	0.195	0.204	0.176	0.198
Cadmium	mg/L	0.005 MAC	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Calcium	mg/L		77.9	61	63	52	46	45	40	39	35	34	32	32	33	32	30	28	28.8	27.3	28.9	26.6	28.1	25.4	26.3	27.1	27.1
Chromium	mg/L	0.05 MAC	<0.003	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
Cobalt	mg/L		0.0019	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Copper	mg/L	1 AO	<0.003	0.002	0.002	0.003	<0.001	<0.001	0.001	0.001	<0.001	<0.001	0.001	0.001	0.002	0.0011	<0.001	<0.001	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
Iron	mg/L	0.3 AO	0.089	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.217	<0.010
Lead	mg/L	0.01 MAC	<0.001	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Magnesium	mg/L		42.2	45	49	40	35.0	36.0	31.0	28	26	26	23	22	24	22	19	20	19.3	18.4	19.3	18.2	19.2	17.5	18.2	18.7	18.1
Manganese	mg/L	0.05 AO	**0.209**	0.043	0.032	0.024	0.0	0.0	0.0	0.003	0.003	<0.002	<0.002	<0.002	<0.002	<0.002	0.0057	<0.002	<0.002	<0.002	<0.002	0.002	<0.002	<0.002	<0.002	0.010	<0.002
Molybdenum	mg/L		0.061	0.13	0.24	0.27	0.23	0.23	0.21	0.17	0.16	0.13	0.13	0.12	0.11	0.11	0.099	0.093	0.090	0.092	0.084	0.066	0.079	0.072	0.067	0.068	0.063
Nickel	mg/L		0.004	0.002	0.002	0.002	0.001	<0.001	0.001	<0.001	<0.001	<0.001	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
Potassium	mg/L		15.3	14	15	13	12.0	12.00	11.00	10.00	9.80	9.60	9.1	9.1	9.5	9.2	8.2	8.4	8.29	7.96	8.58	8.08	8.55	8.37	8.37	8.11	8.5
Selenium	mg/L	0.01 MAC	<0.004	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004
Silicon	mg/L																		3.13	3.26	3.65	2.89	3.11	3.17	3.24	2.79	3.2
Silver	mg/L		<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Sodium	mg/L	200 AO	110	140	170	160	160	150	160	140	140	140	130	130	140	130	110	120	110	109	119	116	117	116	115	110	115
Strontium	mg/L		0.837	1.1	1.3	1.1	0.94	0.99	0.84	0.75	0.78	0.71	0.72	0.7	0.66	0.66	0.66	0.63	0.582	0.672	0.583	0.552	0.595	0.521	0.55	0.595	0.559
Sulphur	mg/L																		82.7	81.6	87	66.9	76.7	80.9	82	81.4	82
Thallium	mg/L		<0.0003	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006
Tin	mg/L		<0.002	<0.001			<0.001	<0.001	<0.001	<0.001	<0.001			<0.001	<0.001	<0.001	<0.001	<0.001	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Titanium	mg/L		0.006	<0.005		<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.002	<0.002	0.004	0.002	<0.002	<0.002	0.005	0.011	0.004
Uranium	mg/L	0.02 MAC	0.005	0.0048	0.0044	0.0045	0.004	0.0034	0.0031	0.003	0.0028	0.003	0.0031	0.0028	0.0028	0.0032	0.0028	0.0029	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003
Vanadium	mg/L		<0.002	<0.001	0.001	<0.001	0.001	0.001	<0.001	<0.001	<0.001	0.001	<0.001	0.0011	0.0012	0.00096	0.001	0.0013	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Zinc	mg/L	5 AO	0.009	<0.005	<0.005	<0.005	<0.005	<0.005	0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.027	<0.005	0.005	<0.005	0.005	0.010	0.005	<0.005	0.005	<0.005

Notes:
(1) MOECC Ontario Drinking Water Standards.
(2) Operational Guideline (OG) within ODWS.
(3) Aesthetic Objective (AO) within ODWS.
(4) Maximum Acceptable Concentration (MAC) within ODWS.
(5) Interim Maximum Acceptable Concentration (IMAC) within ODWS.
(6) ODWS exceedances indicated by **bold** entries.

Summary of Groundwater Geochemical Results OW-25-III

Parameters	Units	ODWS [1]	2007	2008			2009			2010			2011			2012			2013			2014			2015		
General Chemistry			Dec	Jun	Aug	Nov	Jun	Sep	Nov	Jun	Sep	Nov	Jun	Sep	Nov	Jun	Sep	Nov	May	July	Sep	June	July	Sep	May	July	Sep
Alkalinity	mg/L	30-500 OG [2]	335	375	356	363	355	371	357	353	356	363	383	381	401	390	380	410	416	416	426	356	364	348	307	332	314
Chloride	mg/L	250 AO [3]	25.6	21.0	15.0	7.0	3.0	3.0	1.0	2.0	1.0	1.0	2.0	1.0	1.0	1.0	1.0	<1	1.33	1.48	1.45	1.79	1.63	2.02	1.36	1.03	1.33
Dissolved Organic Carbon	mg/L	5 AO	**12**	**7.3**	5.0	2.5	1.3	1.6	0.8	1.0	1.4	1.5	1.0	1.1	1.2	1.3	1.2	0.99	2.1	1.1	1.6	1.0	1.0	1.1	1.0	1.5	1.2
Fluoride	mg/L	1.5 MAC [4]	0.5					1.1	0.8	1.0	1.1	0.8	0.9	1.03	0.9	1.02	1.14	0.79	0.83	0.97	0.89	0.54	0.51	1.24	1.14	0.66	0.81
Sulphate	mg/L	500 AO	**578**	342	266	189	87	100	45	68	120	58	110	120	210	210	190	76	117	127	157	132	140	161	130	96.6	116
Hardness	mg/L	80-100 OG	**782**	**600**	**520**	**390**	**370**	**410**	**380**	**400**	**350**	**350**	**370**	**410**	**580**	**500**	**460**	**370**	**418**	**430**	**455**	**403**	**432**	**417**	**341**	**364**	**365**
Nitrate	mg/L	10 MAC	<0.05	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25
Nitrite	mg/L	1 MAC	<0.05	<0.01	<0.01	<0.01	0.02	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.014	<0.01	<0.01	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25
Organic Nitrogen	mg/L	0.15 OG		**2.84**	**1.9**	**0.9**	**0.875**	**0.94**	**0.275**		**0.875**	**0.24**	**0.78**	**0.975**	**0.38**	**0.695**	**0.88**	**1.325**	**0.76**	**0.18**	0.11	**0.61**	<0.10	**0.19**	<0.10	**0.23**	**0.16**
Orthophosphate	mg/L		<0.1	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
pH	pH Units																		8.15	7.68	7.47	8.22	8.15	8.01	8.15	8.20	8.15
Electrical Conductivity	µS/cm																		951	923	983	865	900	950	818	792	779
Total Ammonia	mg/L		<0.05	0.16	0.1	0.1	<0.05	0.1	<0.05	<0.05	<0.05	0.06	<0.05	<0.05	<0.05	<0.05	0.12	0.075	<0.02	0.03	<0.02	0.07	0.08	0.04	<0.02	<0.02	<0.02
Total Dissolved Solids	mg/L	500 AO	**1180**	**832**	**717**	**590**	464	**505**	421	451	**517**	452	**533**	**556**	**718**	**685**	**632**	**508**	**520**	**574**	**592**	**536**	**550**	**532**	450	432	418
Total Kjeldahl Nitrogen (TKN)	mg/L		0.47	3.0	2.0	1.0	0.9	1.0	0.3	<0.5	0.9	0.3	0.8	1.0	0.4	0.72	1.0	1.4	0.76	0.21	0.11	0.68	0.14	0.23	<0.10	0.23	0.16
Total Phosphorus	mg/L		1.04	1.0	0.8	0.6	0.3	0.4	0.15	0.24									<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Metals																											
Aluminum	mg/L	0.1 OG	0.007	0.009	0.006	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.009	0.006	<0.005	<0.005	<0.005	0.004	0.044	<0.004	<0.004	<0.004	0.024	0.005	<0.004	0.010
Arsenic	mg/L	0.025 IMAC [5]	<0.003	0.003	0.002	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
Barium	mg/L	1 MAC	0.028	0.022	0.021	0.022	0.0250	0.032	0.030	0.03	0.038	0.036	0.041	0.045	0.055	0.043	0.05	0.04	0.045	0.042	0.037	0.039	0.037	0.036	0.031	0.036	0.042
Beryllium	mg/L		<0.002	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Bismuth	mg/L		<0.002	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001			<0.001	<0.001	<0.001	<0.001	<0.001	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Boron	mg/l	5 IMAC	0.152	0.13	0.11	0.079	0.043	0.073	0.028	0.049	0.025	0.023	0.041	0.062	0.062	0.053	0.067	0.025	0.037	0.058	0.049	0.035	0.049	0.056	0.050	0.027	0.033
Cadmium	mg/L	0.005 MAC	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Calcium	mg/L		130	98	89	72	74	76	83	87	81	81	79	81	120	110	92	86	94.3	91.1	96.5	87.4	90.8	86.8	65.3	83.3	81.8
Chromium	mg/L	0.05 MAC	0.007	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
Cobalt	mg/L		0.0031	0.0021	0.0011	0.0005	0.0005	0.0006	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	0.00065	<0.0005	<0.0005	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Copper	mg/L	1 AO	0.003	0.001	0.001	<0.001	0.001	<0.001	<0.001	0.001	<0.001	<0.001	0.001	0.001	0.002	0.001	0.0011	<0.001	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
Iron	mg/L	0.3 AO	<0.01	**1.4**	**0.76**	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.019	<0.010	<0.010	<0.010	<0.010	0.018	<0.010	<0.010	<0.010
Lead	mg/L	0.01 MAC	<0.001	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Magnesium	mg/L		111	86	72	51	44.0	54.0	41.0	46	36	36	41	50	69	57	55	39	44.4	49.1	52	44.9	49.9	48.7	43.2	38.0	39.1
Manganese	mg/L	0.05 AO	**0.219**	**0.22**	**0.1**	0.04	0.0	0.0	0.0	0.036	0.005	0.003	0.014	0.022	0.002	0.033	0.017	0.0034	0.029	0.021	<0.002	<0.002	0.005	0.003	0.005	<0.002	<0.002
Molybdenum	mg/L		0.049	0.036	0.031	0.022	0.01	0.016	0.007	0.009	0.01	0.008	0.01	0.011	0.012	0.011	0.012	0.006	0.008	0.010	0.009	0.007	0.011	0.009	0.008	0.007	0.008
Nickel	mg/L		0.006	0.004	0.002	0.002	<0.001	<0.001	<0.001	0.001	<0.001	<0.001	0.002	0.002	0.003	0.0021	0.0015	0.0018	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	0.004
Potassium	mg/L		18.2	11	11	7.7	5.30	7.90	4.50	5.50	4.70	4.10	5.5	7.6	8.1	7.1	7.8	3.6	4.87	6.74	7.07	5.21	6.89	6.95	5.56	4.89	5.36
Selenium	mg/L	0.01 MAC	0.008	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004
Silicon	mg/L																		5.52	5.32	5.31	4.96	4.69	4.86	4.42	4.89	6.29
Silver	mg/L		<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Sodium	mg/L	200 AO	37	35	35	32	23	25	16	16	46	40	58	55	60	53	42	42	41.3	40.0	39.3	34.8	36.1	36.5	34.8	29.7	32.4
Strontium	mg/L		3.93	3.6	3.3	2.4	1.9	2.9	1.6	2.0	1.5	1.3	2.1	2.8	3.2	3.0	3.7	1.4	1.99	3.44	2.79	2.22	2.77	3.06	2.54	1.76	1.57
Sulphur	mg/L																		39.1	41.9	54.7	37.5	46.8	60.1	47.1	28.2	31.8
Thallium	mg/L		<0.0003	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006
Tin	mg/L		<0.002	<0.001			<0.001	<0.001	<0.001	<0.001	<0.001			<0.001	<0.001	<0.001	<0.001	<0.001	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Titanium	mg/L		0.008	<0.005		<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.002	<0.002	0.003	<0.002	<0.002	<0.002	0.002	<0.002	0.002
Uranium	mg/L	0.02 MAC	0.009	0.0067	0.0055	0.0048	0.003	0.0044	0.0029	0.0029	0.0049	0.0038	0.0056	0.0048	0.0082	0.006	0.0056	0.0042	0.005	0.005	0.005	0.005	0.004	0.004	0.003	0.004	0.005
Vanadium	mg/L		<0.002	<0.001	0.001	0.001	<0.001	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.0005	0.0005	<0.0005	<0.0005	0.0005	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Zinc	mg/L	5 AO	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.005	<0.005	<0.005	<0.005	<0.005	0.006	<0.005	<0.005	<0.005	<0.005	0.022	<0.005	<0.005	0.006	<0.005	<0.005	<0.005	0.012

Notes:
(1) MOECC Ontario Drinking Water Standards.
(2) Operational Guideline (OG) within ODWS.
(3) Aesthetic Objective (AO) within ODWS.
(4) Maximum Acceptable Concentration (MAC) within ODWS.
(5) Interim Maximum Acceptable Concentration (IMAC) within ODWS.
(6) ODWS exceedances indicated by **bold** entries.

Summary of Groundwater Geochemical Results OW-16-I

Parameters	Units	ODWS [1]	2007			2008			2009			2010			2011			2012			2013			2014			2015		
General Chemistry			Jul	Oct	Dec	Jun	Aug	Nov	Jun	Sep	Nov	Jun	Sep	Nov	Jun	Sep	Nov	Jun	Sep	Nov	May	July	Sep	June	July	Sep	May	July	Sep
Alkalinity	mg/L	30-500 OG [2]	297	299	287	314	304	311	319	314	312	384	310	304	299	307	312	310	320	310	280	293	354	285	276	278	310	290	304
Chloride	mg/L	250 AO [3]	6.09	6.12	8.25	10.0	8.0	8.0	6.0	9.0	6.0	7.0	9.0	6.0	8.0	7.0	9.0	5.0	7.0	6.0	7.86	5.86	5.38	7.64	6.85	5.97	6.69	5.90	5.33
Dissolved Organic Carbon	mg/L	5 AO	**8.5**	**7.2**	**7.8**	**7.9**	**7.5**	**8.5**	**9.6**	**9.5**	**9.7**	**9.2**	**8.6**	**9.8**	**8.7**	**9.1**	**8.9**	**9.2**	**9.8**	**9.3**	**8.8**	**8.7**	**9.7**	**7.6**	**9.4**	**9.4**	**8.9**	**9.4**	**8.8**
Fluoride	mg/L	1.5 MAC [4]	1.46	1.39	1.35					**1.7**	**1.7**	1.5	**1.6**	**1.7**	**1.7**	**1.78**	**1.7**	**1.75**	**1.74**	**1.71**	1.46	1.48	**1.73**	**1.54**	**1.54**	**1.64**	**1.65**	**1.62**	**1.93**
Sulphate	mg/L	500 AO	4.01	2.29	3.05	4.0	3.0	4.0	2.0	6.0	2.0	4.0	5.0	<1	3.0	2.0	<1	<1	2.0	2.0	3.93	2.29	1.99	4.26	4.0	2.4	3.55	2.70	1.82
Hardness	mg/L	80-100 OG	85	**78**	**73**	**74**	**73**	**71**	**73**	**77**	**78**	**78**	**78**	82	**75**	**77**	82	82	80	80	**75**	**78**	82	**79**	82	82.3	81.7	84.1	**102**
Nitrate	mg/L	10 MAC	0.14	0.07	<0.05	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.10	<0.05	<0.10	0.05	<0.10	<0.05	<0.05	<0.10	<0.25
Nitrite	mg/L	1 MAC	<0.05	<0.05	<0.05	<0.01	<0.01	<0.01	0.01	<0.01	<0.01	<0.01	<0.01	0.01	<0.01	<0.01	<0.01	<0.01	0.028	<0.01	<0.10	<0.05	<0.10	<0.05	<0.10	<0.05	<0.05	<0.10	<0.25
Organic Nitrogen	mg/L	0.15 OG				**3.5**	**1.4**	**0.9**	**1.7**	**3.5**	**1.5**	**0.8**	**1.4**	**0.9**	**1.04**	**1.7**	**0.7**	**2.6**	**1.8**	**1.8**	**1.27**	**0.16**	**0.92**	**1.47**	**0.49**	**1.04**	**0.71**	**0.78**	**0.80**
Orthophosphate	mg/L			<0.1	<0.1	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.01	0.026	<0.01	<0.01	<0.20	<0.10	<0.20	<0.10	<0.20	<0.10	<0.10	<0.20	<0.50
pH	pH Units																				8.35	8.02	7.54	8.49	8.45	8.16	8.26	8.19	8.12
Electrical Conductivity	µS/cm																				587	569	599	549	592	543	600	570	592
Total Ammonia	mg/L		2.96	1.4	0.55	1.5	1.2	1.3	1.3	1.5	1.3	1.2	1.20	1.20	0.96	1.3	1.1	1.6	1.6	1.4	1.20	1.22	0.78	1.1	1.16	1.56	1.15	1.34	0.83
Total Dissolved Solids	mg/L	500 AO	440	362	348	360	350	343	349	348	354	402	359	356	340	356	364	351	357	356	408	420	380	378	492	404	400	388	364
Total Kjeldahl Nitrogen (TKN)	mg/L		2.3	1.53	1.71	5.0	2.6	2.2	3.0	5.0	2.8	2.0	2.6	2.1	2.0	3.0	1.8	4.2	3.4	3.2	2.47	1.38	1.7	2.57	1.65	2.6	1.86	2.12	1.63
Total Phosphorus	mg/L		8.81	0.86	0.41	3.1	0.9	0.7	0.3	2.4	0.23	0.39									0.07	<0.05	0.06	0.07	0.07	<0.05	<0.05	0.05	<0.05
Metals																													
Aluminum	mg/L	0.1 OG	0.008	0.007	<0.004	0.013	<0.005	0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.014	0.0088	<0.005	0.006	0.005	0.009	0.005	0.011	0.01	0.004	0.007	0.009	0.006
Arsenic	mg/L	0.025 IMAC [5]	<0.003	<0.003	<0.003	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
Barium	mg/L	1 MAC	0.041	0.04	0.03	0.039	0.045	0.039	0.0300	0.034	0.030	0.028	0.031	0.031	0.032	0.029	0.035	0.033	0.039	0.033	0.017	0.035	0.031	0.031	0.031	0.033	0.037	0.034	0.037
Beryllium	mg/L		<0.001	<0.001	<0.002	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Bismuth	mg/L		<0.002	<0.002	<0.002	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001				<0.001	<0.001	<0.001	<0.001	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Boron	mg/l	5 IMAC	0.408	0.37	0.377	0.49	0.46	0.47	0.420	0.45	0.45	0.45	0.45	0.46	0.45	0.46	0.48	0.45	0.46	0.47	0.481	0.460	0.474	0.428	0.445	0.44	0.413	0.434	0.418
Cadmium	mg/L	0.005 MAC	<0.0001	<0.002	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Calcium	mg/L		14.6	14.1	11.8	11	11	11	11	12	12	12	12	12	12	12	13	13	13	13	12.1	13.4	14.1	13.1	13.1	14	13.6	13.9	18.1
Chromium	mg/L	0.05 MAC	0.008	0.013	<0.003	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
Cobalt	mg/L		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Copper	mg/L	1 AO	<0.002	<0.002	<0.003	<0.001	<0.001	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
Iron	mg/L	0.3 AO	0.012	0.158	0.165	0.1	0.11	0.11	0.2	0.2	0.2	0.24	0.23	**0.31**	**0.33**	0.26	0.27	**0.33**	0.26	0.26	0.085	0.036	0.171	0.204	0.281	0.226	0.157	0.149	0.090
Lead	mg/L	0.01 MAC	<0.001	<0.001	<0.001	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Magnesium	mg/L		11.8	10.4	10.5	11	11	11	11.00	12.0	12.0	11	12	12	11	12	12	12	12	12	10.9	10.7	11.3	11.2	11.9	11.5	11.6	12.0	13.7
Manganese	mg/L	0.05 AO	0.01	0.012	0.012	0.014	0.012	0.014	0.0	0.0	0.0	0.014	0.013	0.013	0.018	0.014	0.016	0.014	0.017	0.017	0.013	0.016	0.023	0.018	0.015	0.017	0.021	0.022	0.018
Molybdenum	mg/L		0.017	0.013	0.013	0.013	0.014	0.014	0.01	0.011	0.011	0.013	0.011	0.01	0.015	0.012	0.014	0.0085	0.0098	0.012	0.017	0.013	0.011	0.016	0.013	0.009	0.013	0.01	0.008
Nickel	mg/L		<0.003	<0.003	<0.003	<0.001	0.002	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.014	<0.001	<0.001	<0.001	<0.001	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
Potassium	mg/L		6.55	4.42	5.24	4.6	5.5	4.2	4.60	4.50	4.40	4.70	4.50	4.70	4.3	4.4	4.6	4.7	4.5	4.4	4.50	4.09	4.16	4.41	4.77	4.42	4.44	4.52	5.94
Selenium	mg/L	0.01 MAC	<0.004	<0.004	<0.004	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004
Silicon	mg/L																				7.00	6.77	7.83	7.62	6.86	6.86	7.41	6.25	6.96
Silver	mg/L		<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.0	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Sodium	mg/L	200 AO	118	104	112	110	110	100	110	96	110	110	110	120	110	120	120	110	110	110	100	95.6	105	108	109	106	108	106	109
Strontium	mg/L		0.434	0.424	0.48	0.48	0.49	0.46	0.47	0.5	0.49	0.47	0.48	0.51	0.47	0.48	0.47	0.53	0.55	0.51	0.482	0.493	0.562	0.53	0.497	0.499	0.491	0.553	0.507
Sulphur	mg/L																				1.77	1.00	1.23	1.8	2.0	2.79	1.8	1.33	1.39
Thallium	mg/L		<0.0003	<0.0003	<0.0003	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	0.00009	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006
Tin	mg/L		<0.002	<0.002	<0.002	<0.001			<0.001	<0.001	<0.001	<0.001	<0.001				<0.001	<0.001	<0.001	<0.001	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Titanium	mg/L		<0.002	<0.002	<0.002	<0.005		<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Uranium	mg/L	0.02 MAC	<0.002	<0.002	<0.002	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.0005	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Vanadium	mg/L		<0.002	<0.002	<0.002	0.001	0.002	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.0017	0.0008	0.00061	0.00076	0.00091	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Zinc	mg/L	5 AO	<0.004	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.0077	<0.005	<0.005	<0.005	0.005	<0.005	<0.005	<0.005	<0.005	<0.005

Notes:
(1) MOECC Ontario Drinking Water Standards.
(2) Operational Guideline (OG) within ODWS.
(3) Aesthetic Objective (AO) within ODWS.
(4) Maximum Acceptable Concentration (MAC) within ODWS.
(5) Interim Maximum Acceptable Concentration (IMAC) within ODWS.
(6) ODWS exceedances indicated by **bold** entries.

Summary of Groundwater Geochemical Results OW-16-II

Parameters	Units	ODWS [1]	2007			2008			2009			2010			2011			2012			2013			2014			2015		
General Chemistry			Jul	Oct	Dec	Jun	Aug	Nov	Jun	Sep	Nov	Jun	Sep	Nov	Jun	Sep	Nov	Jun	Sep	Nov	May	July	Sep	June	July	Sep	May	July	Sep
Alkalinity	mg/L	30-500 OG [2]	174	177	174	179	179	182	176	180	176	171	174	176	169	177	178	180	180	190	173	191	207	173	169	169	167	171	165
Chloride	mg/L	250 AO [3]	5	4.72	4.0	5.0	5.0	6.0	6.0	5.0	6.0	6.0	6.0	5.0	5.0	5.0	5.0	5.0	4.0	4.0	5.32	4.49	4.86	5.24	5.51	6.14	4.74	4.81	5.40
Dissolved Organic Carbon	mg/L	5 AO	1.5	1.9	1.4	1.2	1.2	1.2	1.1	1.1	1	1.1	1.1	1.4	1.0	1.1	1.2	1.2	1.1	1.2	1.3	1.2	1.7	1.6	1.1	1.3	1.4	2.4	1.7
Fluoride	mg/L	1.5 MAC [4]	0.64	0.7	0.64					0.8	0.8	0.8	0.8	0.8	0.8	0.84	0.8	0.86	0.88	0.84	0.59	0.73	0.83	0.77	<0.25	0.9	0.86	0.78	1.07
Sulphate	mg/L	500 AO	217	197	244	213	208	193	160	160	150	130	120	150	140	150	150	140	120	140	135	121	120	119	114	108	108	117	118
Hardness	mg/L	80-100 OG	**214**	**192**	**223**	**220**	**200**	**190**	**160**	**160**	**160**	**160**	**140**	**170**	**160**	**170**	**180**	**160**	**140**	**180**	**149**	**142**	**146**	**139**	**143**	**129**	**129**	**138**	**139**
Nitrate	mg/L	10 MAC	0.25	0.17	<0.05	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.10	0.05	<0.10	0.06	<0.25	<0.10	0.06	0.15	0.28
Nitrite	mg/L	1 MAC	<0.05	<0.05	<0.05	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.10	<0.05	<0.10	<0.05	<0.25	<0.10	<0.05	<0.10	<0.05
Organic Nitrogen	mg/L	0.15 OG				**0.35**	**0.175**	**0.175**	**0.275**	**0.175**	**0.175**	0.075	**0.275**	**0.675**	**0.88**	**0.18**	0.08	**0.155**		**0.215**	**0.67**	0.10	<0.10	**0.3**	<0.10	**0.19**	**0.23**	**0.38**	<0.10
Orthophosphate	mg/L			<0.1	<0.1	<0.01	<0.01	<0.01	0.02	<0.01	<0.01	<0.01	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.20	<0.10	<0.20	<0.10	<0.50	<0.20	<0.10	<0.20	<0.10
pH	pH Units																				7.95	7.72	7.36	8.35	8.22	8.21	8.3	8.06	7.94
Electrical Conductivity	µS/cm																				646	600	612	588	592	588	576	603	596
Total Ammonia	mg/L		<0.02	0.02	<0.05	0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.02	<0.02	<0.02	0.09	0.04	0.02	<0.02	0.02	0.03
Total Dissolved Solids	mg/L	500 AO	464	440	**516**	499	484	465	420	411	409	385	370	414	391	409	421	397	372	409	350	350	362	332	340	332	308	332	326
Total Kjeldahl Nitrogen (TKN)	mg/L		<0.1	<0.1	<0.1	0.4	0.2	0.2	0.3	0.2	0.2	0.1	0.3	0.7	0.9	0.2	0.1	0.18	<0.1	0.24	0.67	0.10	<0.10	0.39	<0.10	0.21	0.23	0.4	<0.10
Total Phosphorus	mg/L		0.03	0.18	0.06	0.04	0.06	0.2	0.03	<0.02	0.06	0.02									<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Metals																													
Aluminum	mg/L	0.1 OG	0.008	**0.199**	0.011	0.005	0.008	0.005	<0.005	0.011	0.005	0.008	0.007	0.008	0.009	0.018	0.008	<0.005	0.011	0.0055	0.008	0.010	0.006	0.017	0.005	0.005	0.008	0.024	0.006
Arsenic	mg/L	0.025 IMAC [5]	<0.003	<0.003	<0.003	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
Barium	mg/L	1 MAC	0.018	0.027	0.027	0.021	0.022	0.023	0.0190	0.021	0.023	0.023	0.025	0.028	0.029	0.031	0.031	0.027	0.029	0.033	0.027	0.026	0.027	0.026	0.026	0.026	0.026	0.026	0.030
Beryllium	mg/L		<0.001	<0.001	<0.002	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Bismuth	mg/L		<0.002	<0.002	<0.002	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001			<0.001	<0.001	<0.001	<0.001	<0.001	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Boron	mg/l	5 IMAC	0.197	0.213	0.187	0.22	0.21	0.21	0.190	0.2	0.21	0.19	0.22	0.2	0.20	0.21	0.23	0.2	0.21	0.24	0.225	0.204	0.183	0.173	0.184	0.192	0.163	0.178	0.211
Cadmium	mg/L	0.005 MAC	<0.0001	<0.002	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Calcium	mg/L		40.6	36.9	42.6	42	38	36	32	30	31	31	27	33	31	33	34	32	28	34	29.2	27.9	28.8	26.9	27.8	25.0	24.8	27.1	26.8
Chromium	mg/L	0.05 MAC	<0.003	<0.003	**0.059**	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	0.015	<0.003
Cobalt	mg/L		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Copper	mg/L	1 AO	0.002	0.003	<0.003	0.001	<0.001	0.002	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	0.001	<0.001	<0.001	<0.001	<0.001	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
Iron	mg/L	0.3 AO	<0.01	0.052	<0.01	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Lead	mg/L	0.01 MAC	<0.001	<0.001	<0.001	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	0.00093	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Magnesium	mg/L		27.4	24.2	28.4	28	26	24	21.0	22.0	21.0	20	18	21	20	21	22	20	18	22	18.5	17.5	17.9	17.5	17.9	16.1	16.2	17.2	17.4
Manganese	mg/L	0.05 AO	0.002	0.029	<0.002	<0.002	<0.002	<0.002	0.0	<0.002	<0.002	<0.002	<0.002	0.004	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	0.003	<0.002
Molybdenum	mg/L		0.048	0.049	0.045	0.046	0.045	0.046	0.05	0.044	0.042	0.044	0.041	0.038	0.041	0.037	0.035	0.038	0.033	0.033	0.039	0.036	0.03	0.031	0.034	0.031	0.028	0.027	0.028
Nickel	mg/L		<0.003	<0.003	<0.003	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	0.004	<0.001	<0.001	<0.001	<0.001	<0.001	0.0014	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
Potassium	mg/L		11.5	9.73	12.5	9.8	9.7	9.5	8.60	9.00	9.10	8.60	8.20	8.80	8.1	9.2	9.4	8.6	8.0	9.3	7.87	7.82	8.33	7.88	8.12	8.08	7.58	7.80	8.34
Selenium	mg/L	0.01 MAC	<0.004	<0.004	<0.004	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004
Silicon	mg/L																				3.17	3.18	3.62	3.03	3.1	3.17	3.04	2.53	3.39
Silver	mg/L		<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.0	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Sodium	mg/L	200 AO	94.6	80.8	91.5	86	83	80	75	69	80	76	74	78	74	79	83	76	73	81	68.8	66.9	71.3	71.3	71.2	71.3	69.7	68.5	70.0
Strontium	mg/L		0.779	0.745	0.893	0.86	0.81	0.78	0.67	0.66	0.66	0.64	0.61	0.68	0.68	0.69	0.69	0.66	0.64	0.72	0.617	0.577	0.633	0.565	0.55	0.517	0.495	0.593	0.602
Sulphur	mg/L																				45.9	42.4	43.8	35.4	39.8	41	40	40.2	42.3
Thallium	mg/L		<0.0003	<0.003	<0.0003	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006
Tin	mg/L		<0.002	<0.002	<0.002	<0.001			<0.001	<0.001	<0.001	<0.001	<0.001			<0.001	<0.001	<0.001	<0.001	<0.001	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Titanium	mg/L		0.003	0.004	0.003	<0.005		<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.002	<0.002	0.002	<0.002	<0.002	<0.002	<0.002	0.002	0.003
Uranium	mg/L	0.02 MAC	0.003	0.003	0.003	0.0035	0.0032	0.0034	0.003	0.0029	0.0028	0.0028	0.0026	0.003	0.0028	0.0026	0.0026	0.0028	0.0025	0.0027	0.002	0.002	0.002	0.003	0.003	0.002	0.002	0.003	0.003
Vanadium	mg/L		<0.002	<0.002	<0.002	<0.001	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.002	0.001	<0.001	0.0013	0.0012	0.00092	0.0016	0.0014	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Zinc	mg/L	5 AO	0.008	0.579	0.018	<0.005	<0.005	<0.005	<0.005	0.014	<0.005	<0.005	<0.005	0.017	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.005	<0.005	<0.005	0.008	0.007	<0.005

Notes:
(1) MOECC Ontario Drinking Water Standards.
(2) Operational Guideline (OG) within ODWS.
(3) Aesthetic Objective (AO) within ODWS.
(4) Maximum Acceptable Concentration (MAC) within ODWS.
(5) Interim Maximum Acceptable Concentration (IMAC) within ODWS.
(6) ODWS exceedances indicated by **bold** entries.

Summary of Groundwater Geochemical Results OW-16-III

Parameters	Units	ODWS [1]	2007			2008			2009			2010			2011			2012			2013			2014			2015		
General Chemistry			**Jul**	**Oct**	**Dec**	**Jun**	**Aug**	**Nov**	**Jun**	**Sep**	**Nov**	**Jun**	**Sep**	**Nov**	**Jun**	**Sep**	**Nov**	**Jun**	**Sep**	**Nov**	**May**	**July**	**Sep**	**June**	**July**	**Sep**	**May**	**July**	**Sep**
Alkalinity	mg/L	30-500 OG [2]	340	386	367	327	334	343	322	435	309	328	387	295	307	**515**	391	440	**630**	470	397	**514**	418	344	406	454	423	452	321
Chloride	mg/L	250 AO [3]	0.77	0.69	0.82	1.0	1.0	<1	1.0	1.0	1.0	2.0	1.0	<1	1.0	2.0	1.0	2.0	2.0	<1	1.98	2.11	1.18	2.31	2.33	3.14	3.35	3.98	5.45
Dissolved Organic Carbon	mg/L	5 AO	1.8	3.3	2.4	2.3	1.8	1.8	1.7	1.8	1.5	1.2	1.6	3	1.5	2.8	2.5	**8.4**	3.0	**18**	**25.6**	**27.2**	4.3	2.6	2.2	2.6	1.6	2.7	2.2
Fluoride	mg/L	1.5 MAC [4]	0.41	0.56	0.5					0.6	0.3	0.4	0.6	0.2	0.4	0.61	0.4	0.54	0.51	0.38	<0.10	<0.25	<0.10	0.12	<0.25	0.31	0.34	<0.25	0.25
Sulphate	mg/L	500 AO	17.3	30.6	39.7	26	47	7	5	11	7	13	66	8	8	26	55	17	33	19	1.61	0.91	2.12	5.92	7.34	4.24	7.59	4.54	29.9
Hardness	mg/L	80-100 OG	**338**	**337**	**336**	**350**		**320**	**330**	**410**	**320**	**330**	**460**	**300**	**300**	**470**	**270**	**370**	**540**	**420**	**406**	**470**	**357**	**312**	**405**	**400**	**364**	**424**	**345**
Nitrate	mg/L	10 MAC	<0.05	0.14	<0.05	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.2	<0.1	<0.1	<0.1	<0.10	<0.25	<0.10	<0.05	<0.25	<0.25	<0.10	<0.25	0.31
Nitrite	mg/L	1 MAC	<0.05	<0.05	<0.05	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.01	<0.01	<0.01	<0.01	<0.10	<0.25	<0.10	<0.05	<0.25	<0.25	<0.10	<0.25	<0.05
Organic Nitrogen	mg/L	0.15 OG				**0.28**	**0.375**	**0.275**	**0.175**	**0.275**	**0.275**	**0.375**	**0.275**	**0.275**	**0.28**	**4.83**	**0.48**	**2.17**	**0.73**	**0.615**	**0.97**	**0.42**	<0.10	**0.46**	<0.10	**0.47**	**0.23**	**0.63**	**0.60**
Orthophosphate	mg/L			<0.1	<0.1	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.20	<0.50	<0.20	<0.10	<0.50	<0.50	<0.20	<0.50	<0.10
pH	pH Units																				7.90	7.31	7.22	8.1	7.84	7.63	7.99	8.1	8.06
Electrical Conductivity	µS/cm																				773	879	682	633	770	865	804	853	671
Total Ammonia	mg/L		<0.02	0.3	<0.05	0.12	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.17	<0.05	0.23	0.37	<0.05	<0.02	<0.02	<0.02	0.09	0.15	0.15	0.41	0.68	0.1
Total Dissolved Solids	mg/L	500 AO	346	386	384	358	429	337	326	442	319	345	489	304	312	**547**	413	447	**651**	483	426	**600**	334	308	414	436	408	426	356
Total Kjeldahl Nitrogen (TKN)	mg/L		<0.1	0.17	0.56	0.4	0.4	0.3	0.2	0.3	0.3	0.4	0.3	0.3	0.3	5	0.5	2.4	1.1	0.64	0.97	0.42	<0.10	0.55	0.23	0.62	0.64	1.31	0.7
Total Phosphorus	mg/L		0.06	2.7	0.36	<0.02	0.08	0.05	<0.02	0.08	0.06	0.15									<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.12	0.14	<0.05
Metals																													
Aluminum	mg/L	0.1 OG	<0.004	<0.004	<0.004	<0.005		<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.005	0.008	<0.004	<0.004	<0.004	<0.004	<0.004	0.005	<0.004
Arsenic	mg/L	0.025 IMAC [5]	<0.003	<0.003	<0.003	<0.001		<0.001	<0.001	0.002	<0.001	<0.001	<0.001	<0.001	<0.001	0.003	<0.001	0.0017	<0.001	0.0037	0.003	0.004	0.005	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
Barium	mg/L	1 MAC	0.035	0.069	0.081	0.023		0.028	0.0260	0.076	0.025	0.042	0.094	0.025	0.031	0.11	0.026	0.067	0.16	0.07	0.071	0.092	0.071	0.036	0.046	0.08	0.063	0.068	0.037
Beryllium	mg/L		<0.001	<0.001	<0.002	<0.0005		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Bismuth	mg/L		<0.002	<0.002	<0.002	<0.001		<0.001	<0.001	<0.001	<0.001	<0.001	0.001				<0.001	<0.001	0.0017	<0.001	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Boron	mg/l	5 IMAC	0.04	0.095	0.085	<0.01		<0.01	<0.01	0.032	<0.01	0.017	0.049	<0.01	0.012	0.078	<0.01	0.02	0.081	0.02	0.028	0.030	0.016	0.015	0.013	0.058	0.015	0.025	0.013
Cadmium	mg/L	0.005 MAC	<0.0001	<0.002	<0.0001	<0.0001		<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Calcium	mg/L		83.7	63.5	57.5	88		83	85	95	83	82	98	77	78	90	69	79	98	96	106	116	97.7	83.9	108	91.1	87.7	105	94.5
Chromium	mg/L	0.05 MAC	0.003	<0.003	<0.003	<0.005		<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.003	<0.003	0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
Cobalt	mg/L		0.0007	0.0005	<0.0005	<0.0005		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Copper	mg/L	1 AO	<0.002	<0.002	<0.003	0.002		0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	<0.001	<0.001	0.002	<0.001	<0.001	<0.001	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
Iron	mg/L	0.3 AO	0.048	**0.636**	<0.1	<0.1		<0.1	<0.1	**1.0**	<0.1	0.18	<0.1	<0.1	<0.1	**2.0**	<0.1	**2.4**	<0.1	**1.7**	**5.20**	**6.04**	**4.43**	**1.7**	**2.72**	**1.24**	**0.684**	**0.804**	0.159
Lead	mg/L	0.01 MAC	<0.001	<0.001	<0.001	<0.0005		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Magnesium	mg/L		31.4	43.4	46.8	30		28	28.0	42.0	28.0	30	52	27	25	59	23	42	73	45	34.2	43.9	27.4	24.9	32.8	41.9	35.3	39.2	26.4
Manganese	mg/L	0.05 AO	0.035	0.038	0.016	0.008		<0.002	0.0	0.0	0.0	0.011	0.01	0.008	0.008	**0.08**	0.018	**0.083**	**0.061**	**0.11**	**0.190**	**0.148**	**0.114**	**0.053**	**0.093**	**0.056**	0.049	**0.069**	0.025
Molybdenum	mg/L		0.006	0.007	0.006	0.002		0.004	0.00	0.022	0.002	0.007	0.012	0.002	0.004	0.0049	0.0015	0.013	0.0036	0.0037	<0.002	<0.002	<0.002	<0.002	<0.002	0.002	<0.002	<0.002	<0.002
Nickel	mg/L		<0.003	<0.003	<0.003	<0.001		0.001	0.001	0.002	<0.001	<0.001	0.001	<0.001	0.001	<0.001	<0.001	<0.001	0.0018	0.0025	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	0.004
Potassium	mg/L		2.9	9.18	11	1.2		1.2	1.30	5.20	1.10	2.40	6.60	0.90	1.1	8.4	0.66	4.0	10.0	3.0	1.33	4.22	2.13	2.22	4.08	7.54	7.43	9.65	2.77
Selenium	mg/L	0.01 MAC	<0.004	<0.004	<0.004	<0.002		<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	**0.065**	0.005	<0.004
Silicon	mg/L																				6.83	8.61	9.23	5.22	6.98	7.53	6.01	6.19	5.19
Silver	mg/L		<0.0001	<0.0001	<0.0001	<0.0001		<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.0	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.00027	<0.0001	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Sodium	mg/L	200 AO	8.63	21.6	26	4.1		3.3	3.7	10	3.8	7	19	5.6	4.4	30	18	21	36	25	10.2	15.4	6.77	5.01	9.81	17.4	10.7	12.2	8.5
Strontium	mg/L		0.478	1.27	1.5	0.25		0.21	0.24	0.68	0.21	0.43	1.2	0.23	0.25	1.5	0.21	0.79	1.9	0.74	0.439	0.800	0.639	0.257	0.329	1.15	0.591	0.763	0.241
Sulphur	mg/L																				0.90	0.30	<0.05	<0.05	3.9	6.65	9.93	4.58	12.6
Thallium	mg/L		<0.0003	<0.0003	<0.0003	<0.00005		<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006
Tin	mg/L		<0.002	<0.002	<0.002	<0.001			<0.001	<0.001	<0.001	<0.001	<0.001				<0.001	<0.001	<0.001	<0.001	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Titanium	mg/L		<0.002	<0.002	<0.002	<0.005		<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Uranium	mg/L	0.02 MAC	<0.002	<0.002	0.002	0.0007		0.0009	0.001	0.004	0.0007	0.0015	0.0042	0.0006	0.0012	0.0017	0.0011	0.0029	0.0014	0.0024	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Vanadium	mg/L		<0.002	<0.002	<0.002	<0.001		<0.001	<0.001	0.001	<0.001	0.001	0.004	<0.001	0.001	0.0015	0.0007	<0.0005	<0.0005	0.0009	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Zinc	mg/L	5 AO	0.005	0.02	<0.005	<0.005		<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.006	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.005	<0.005	<0.005	<0.005	<0.005	0.006

Notes:
(1) MOECC Ontario Drinking Water Standards.
(2) Operational Guideline (OG) within ODWS.
(3) Aesthetic Objective (AO) within ODWS.
(4) Maximum Acceptable Concentration (MAC) within ODWS.
(5) Interim Maximum Acceptable Concentration (IMAC) within ODWS.
(6) ODWS exceedances indicated by **bold** entries.

Summary of Groundwater Geochemical Results OW-24-I

Parameters	Units	ODWS [1]	2007		2008			2009			2010			2011			2012			2013			2014			2015		
General Chemistry			Oct	Dec	Jun	Aug	Nov	Jun	Sep	Nov	Jun	Sep	Nov	Jun	Sep	Nov	Jun	Sep	Nov	May	July	Sep	June	July	Sep	May	July	Sep
Alkalinity	mg/L	30-500 OG [2]	235	205	222	223	228	230	236	236	228	226	229	226	235	235	230	240	250	221	242	253			176	213	241	235
Chloride	mg/L	250 AO [3]	3.5	6.22	2.0	1.0	<1	1.0	1.0	1.0	1.0	<1	<1	1.0	1.0	<1	<1	<1	<1	0.85	0.91	1.05			12.5	1.63	2.73	2.11
Dissolved Organic Carbon	mg/L	5 AO	3.5	2.2	1.8	2.9	2.0	1.9	2.1	1.8	2.0	1.9	2.2	1.9	1.9	2.0	2.1	2.1	2.0	2.2	2.1	2.4			**6.6**	2.2	3.3	2.0
Fluoride	mg/L	1.5 MAC [4]	0.74	0.72					0.4	0.4	0.4	0.4	0.4	0.4	0.39	0.4	0.4	0.38	0.35	0.23	0.32	0.29			0.36	0.37	0.28	0.33
Sulphate	mg/L	500 AO	31.8	36.5	19	19	18	19	20	19	19	17	19	17	17	18	18	17	16	18.4	17.8	17.1			82.1	16.9	21.2	20.8
Hardness	mg/L	80-100 OG	**180**	**194**	**220**	**220**	**220**	**230**	**230**	**240**	**240**	**240**	**230**	**230**	**230**	**240**	**240**	**220**	**240**	**230**	**226**	**230**			**225**	**206**	**227**	**234**
Nitrate	mg/L	10 MAC	<0.05	<0.05	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.05	<0.05	0.11			<0.05	<0.05	<0.10	<0.05
Nitrite	mg/L	1 MAC	<0.05	<0.05	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.01	<0.01	<0.01	<0.01	<0.01	0.01	0.011	<0.01	<0.01	<0.05	<0.05	<0.10			<0.05	<0.05	<0.10	<0.05
Organic Nitrogen	mg/L	0.15 OG			**0.37**	**0.55**		**0.87**	**1.81**	**0.92**		**1.83**	**0.87**	**0.58**		**0.175**	**0.47**		**0.20**	**0.89**	**0.55**	<0.10			**0.30**	**0.33**	**0.31**	**0.25**
Orthophosphate	mg/L		<0.1	<0.1	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.011	<0.01	<0.01	<0.10	<0.10	<0.20			<0.10	<0.10	<0.20	<0.10
pH	pH Units																			8.07	7.65	7.47			8.13	8.32	8.17	8.06
Electrical Conductivity	µS/cm																			465	454	466			558	455	501	497
Total Ammonia	mg/L		0.43	0.05	0.13	0.15	0.06	0.13	0.2	0.2	0.1	0.17	0.13	<0.05	0.05	<0.05	<0.05	<0.05	0.11	0.02	0.07	<0.02			0.29	0.04	0.09	0.03
Total Dissolved Solids	mg/L	500 AO	284	278	263	259	257	265	270	273	267	262	261	262	266	272	270	262	273	226	252	262			314	226	242	256
Total Kjeldahl Nitrogen (TKN)	mg/L		0.45	0.15	0.5	0.7	<0.5	1.0	2.0	1.1	<0.5	2.0	1.0	0.6	<1	0.2	0.49	<0.2	0.31	0.91	0.62	<0.10			0.59	0.37	0.40	0.28
Total Phosphorus	mg/L		1.07	0.69	<0.1	2.8	0.9	1.5	3.2	2.6	1.8						9	8		<0.05	<0.05	<0.05			<0.05	<0.05	<0.05	<0.05
Metals																												
Aluminum	mg/L	0.1 OG	0.014	0.006	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.006	<0.005	0.0065	<0.005	0.005	0.006	<0.004			<0.004	<0.004	0.027	0.051
Arsenic	mg/L	0.025 IMAC [5]	<0.003	<0.003	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.003	<0.003	<0.003			<0.003	<0.003	<0.003	<0.003
Barium	mg/L	1 MAC	0.07	0.041	0.045	0.04	0.041	0.0370	0.038	0.038	0.035	0.042	0.036	0.041	0.036	0.035	0.037	0.048	0.044	0.037	0.032	0.028			0.04	0.038	0.024	0.044
Beryllium	mg/L		<0.002	<0.002	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.001	<0.001	<0.001			<0.001	<0.001	<0.001	<0.001
Bismuth	mg/L		<0.002	<0.002	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001				<0.001	<0.001	<0.001	<0.001	<0.002	<0.002	<0.002			<0.002	<0.002	<0.002	<0.002
Boron	mg/l	5 IMAC	0.151	0.081	0.069	0.049	0.045	0.043	0.043	0.041	0.039	0.035	0.038	0.039	0.043	0.042	0.046	0.036	0.032	0.065	0.046	0.032			0.071	0.044	0.039	0.046
Cadmium	mg/L	0.005 MAC	<0.0001	<0.0001	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.002	<0.002	<0.002	**DESTROYED**		<0.002	<0.002	<0.002	<0.002
Calcium	mg/L		35.5	42.6	50	55	55	59	59	61	63	62	59	61	61	64	64	59	64	61.7	61.3	62.7			53	50.6	57.1	60.5
Chromium	mg/L	0.05 MAC	0.004	<0.003	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.003	<0.003	<0.003			<0.003	<0.003	<0.003	<0.003
Cobalt	mg/L		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.001	<0.001	<0.001			<0.001	<0.001	<0.001	<0.001
Copper	mg/L	1 AO	0.008	<0.003	<0.001	<0.001	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.003	<0.003	<0.003			<0.003	<0.003	<0.003	<0.003
Iron	mg/L	0.3 AO	0.111	<0.01	<0.1	0.15	<0.1	0.3	**0.4**	0.2	<0.1	0.14	<0.1	<0.1	<0.1	0.11	0.28	<0.1	<0.1	**0.314**	**0.354**	<0.010			**0.772**	**1.03**	**0.802**	**1.56**
Lead	mg/L	0.01 MAC	<0.001	<0.001	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.002	<0.002	<0.002			<0.002	<0.002	<0.002	<0.002
Magnesium	mg/L		22.2	21.4	23	21	20	20.00	20.0	21.0	20	20	19	19	19	20	19	18	20	18.5	17.6	17.8			22.5	19.3	20.6	20.1
Manganese	mg/L	0.05 AO	0.007	0.031	0.039	0.046	0.043	0.0	**0.1**	**0.1**	**0.051**	**0.053**	0.048	0.042	**0.052**	**0.054**	**0.051**	**0.052**	**0.061**	0.033	0.047	0.015			**0.054**	0.039	**0.061**	**0.062**
Molybdenum	mg/L		0.016	0.007	0.004	0.002	0.002	0.00	0.002	0.002	0.002	0.001	0.002	0.002	0.0014	0.0014	0.0015	0.0022	0.0013	<0.002	<0.002	<0.002			0.011	0.005	0.009	0.006
Nickel	mg/L		<0.003	<0.003	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.003	<0.003	0.003			<0.003	<0.003	<0.003	0.004
Potassium	mg/L		7.37	9.55	7.7	5.7	5.4	4.80	4.50	4.40	4.20	4.10	3.80	4.2	3.7	4	4.1	3.8	3.5	3.89	3.40	3.19			6.44	4.79	4.01	4.29
Selenium	mg/L	0.01 MAC	<0.004	<0.004	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.004	<0.004	<0.004			<0.004	<0.004	<0.004	<0.004
Silicon	mg/L																			7.16	6.61	6.52			5.64	6.88	5.39	7.02
Silver	mg/L		<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.002	<0.002	<0.002			<0.002	<0.002	<0.002	<0.002
Sodium	mg/L	200 AO	38.1	25.6	11	7.3	6.1	7.2	6.3	7.1	6.7	6.3	6.7	6.4	6.5	7.3	7.0	5.9	5.3	5.55	5.40	5.82			17.1	9.55	16.7	13.4
Strontium	mg/L		0.81	0.639	0.61	0.55	0.55	0.49	0.51	0.5	0.48	0.49	0.46	0.5	0.47	0.47	0.49	0.48	0.49	0.448	0.436	0.488			0.448	0.396	0.321	0.403
Sulphur	mg/L																			6.40	6.28	3.96			29.5	5.57	6.01	6.74
Thallium	mg/L		<0.0003	<0.0003	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.006	<0.006	<0.006			<0.006	<0.006	<0.006	<0.006
Tin	mg/L		<0.002	<0.002	<0.001			<0.001	<0.001	<0.001	<0.001	<0.001				<0.001	<0.001	<0.001	<0.001	<0.002	<0.002	<0.002			<0.002	<0.002	<0.002	<0.002
Titanium	mg/L		<0.002	<0.002	<0.005		<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.002	<0.002	<0.002			<0.002	<0.002	<0.002	0.003
Uranium	mg/L	0.02 MAC	<0.002	<0.002	0.0002	<0.0001	0.0002	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.0002	<0.0001	<0.0001	<0.0001	0.00047	0.00015	<0.002	<0.002	<0.002			<0.002	<0.002	<0.002	<0.002
Vanadium	mg/L		<0.002	<0.002	0.001	<0.001	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	0.0015	0.0006	<0.0005	0.0014	0.001	<0.002	<0.002	<0.002			<0.002	<0.002	<0.002	<0.002
Zinc	mg/L	5 AO	0.028	0.017	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.0057	<0.005	<0.005	<0.005			0.005	<0.005	<0.005	<0.005

Notes:
(1) MOECC Ontario Drinking Water Standards.
(2) Operational Guideline (OG) within ODWS.
(3) Aesthetic Objective (AO) within ODWS.
(4) Maximum Acceptable Concentration (MAC) within ODWS.
(5) Interim Maximum Acceptable Concentration (IMAC) within ODWS.
(6) ODWS exceedances indicated by **bold** entries.

Summary of Groundwater Geochemical Results OW-24-II

Parameters	Units	ODWS [1]	2008			2009			2010			2011			2012			2013			2014			2015		
General Chemistry			Jun	Aug	Nov	Jun	Sep	Nov	Jun	Sep	Nov	Jun	Sep	Nov	Jun	Sep	Nov	May	July	Sep	June	July	Sep	May	July	Sep
Alkalinity	mg/L	30-500 OG [2]	464	463	455	433	449	394	405	382	359	382	396	385	370	360	380	348	384	409			204	263	282	292
Chloride	mg/L	250 AO [3]	29	34	23	7.0	11.0	3.0	4.0	12.0	1.0	5.0	3.0	2.0	3.0	4.0	1.0	1.73	1.93	2.02			36.2	15.0	12.6	7.4
Dissolved Organic Carbon	mg/L	5 AO	2.3	3.0	1.5	1.1	1.9	0.8	1.0	1.8	1.4	1.1	1.1	1.0	1.2	1.2	1.1	1.1	1.2	2.5			**31.7**	1.9	3.2	1.2
Fluoride	mg/L	1.5 MAC [4]					1.2	0.7	0.9	1.2	0.6	1	1.1	0.9	0.98	1.18	0.81	<0.25	0.7	0.89			0.34	0.92	0.79	0.74
Sulphate	mg/L	500 AO	370	**554**	347	79	200	37	44	250	29	120	72	66	82	93	140	75.3	82.3	76.9			74.1	10.4	18.7	14.2
Hardness	mg/L	80-100 OG	**240**	**580**	**240**	**230**	**260**	**280**	**240**	**480**	**280**	**290**	**280**	**360**	**330**	**370**	**400**	**317**	**331**	**345**			**275**	**231**	**266**	**277**
Nitrate	mg/L	10 MAC	0.3	0.2	0.1	0.2	0.1	0.4	0.2	0.1	0.4	<0.1	<0.1	<0.1	<0.1	<0.1	0.67	<0.25	<0.25	<0.05			<0.10	<0.05	0.13	<0.05
Nitrite	mg/L	1 MAC	0.01	0.05	0.02	<0.01	<0.01	0.01	0.01	0.01	0.02	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.25	<0.25	<0.05			<0.10	<0.05	<0.10	<0.05
Organic Nitrogen	mg/L	0.15 OG	**0.93**	**0.36**	**0.45**	**0.28**	**0.78**	**0.24**	**0.275**	**1.84**	**0.375**		**0.275**	**1.9**	**0.637**		**4.15**	**0.92**	0.13	**0.18**			**0.19**	0.14	0.10	**0.16**
Orthophosphate	mg/L		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.50	<0.50	<0.10			<0.20	<0.10	<0.20	<0.10
pH	pH Units																	8.17	7.64	7.56			8.18	8.36	8.24	8.15
Electrical Conductivity	µS/cm																	795	800	825			721	571	605	602
Total Ammonia	mg/L		0.37	0.14	0.15	0.12	0.1	0.1	<0.05	0.16	<0.05	<0.05	<0.05	0.1	0.083	0.19	0.15	<0.02	<0.02	<0.02			0.13	<0.02	0.06	<0.02
Total Dissolved Solids	mg/L	500 AO	**1010**	**1310**	**895**	**581**	**724**	476	**503**	**764**	408	**535**	**508**	**521**	479	**511**	**577**	400	470	464			418	276	302	298
Total Kjeldahl Nitrogen (TKN)	mg/L		1.3	0.5	0.6	0.4	0.9	0.3	0.3	2.0	0.4	<0.5	0.3	2.0	0.72	<0.5	4.3	0.92	0.13	0.18			0.32	0.14	0.16	0.16
Total Phosphorus	mg/L		0.5	0.4	0.8	0.19	0.3	0.06	0.1									<0.05	<0.05	<0.05			<0.05	<0.05	<0.05	<0.05
Metals																										
Aluminum	mg/L	0.1 OG	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.007	<0.005	<0.005	<0.005	0.007	0.007	<0.004			0.007	0.004	0.005	<0.004
Arsenic	mg/L	0.025 IMAC [5]	0.002	0.002	0.001	0.0010	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.003	<0.003	<0.003			<0.003	<0.003	<0.003	<0.003
Barium	mg/L	1 MAC	0.014	0.024	0.011	0.0110	0.011	0.028	0.019	0.021	0.032	0.027	0.028	0.036	0.026	0.038	0.04	0.037	0.029	0.031			0.037	0.049	0.046	0.052
Beryllium	mg/L		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.001	<0.001	<0.001			<0.001	<0.001	<0.001	<0.001
Bismuth	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001			<0.001	<0.001	<0.001	<0.001	<0.001	<0.002	<0.002	<0.002			<0.002	<0.002	<0.002	<0.002
Boron	mg/l	5 IMAC	0.12	0.14	0.069	0.066	0.083	0.039	0.047	0.12	0.024	0.036	0.052	0.066	0.048	0.091	0.046	0.044	0.044	0.034			0.083	0.068	0.075	0.064
Cadmium	mg/L	0.005 MAC	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.002	<0.002	<0.002	**DESTROYED**		<0.002	<0.002	<0.002	<0.002
Calcium	mg/L		45	89	45	45	45	60	49	70	65	61	58	69	64	60	83	70.2	70.7	73.5			55.2	42.4	49.3	55.1
Chromium	mg/L	0.05 MAC	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.003	<0.003	<0.003			<0.003	<0.003	<0.003	<0.003
Cobalt	mg/L		<0.0005	0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.001	<0.001	<0.001			<0.001	<0.001	<0.001	<0.001
Copper	mg/L	1 AO	0.002	0.002	0.002	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	<0.001	<0.001	<0.001	<0.001	<0.003	<0.003	<0.003			<0.003	<0.003	<0.003	<0.003
Iron	mg/L	0.3 AO	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.010	<0.010	<0.010			0.019	<0.010	0.148	0.09
Lead	mg/L	0.01 MAC	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.002	<0.002	<0.002			<0.002	<0.002	<0.002	<0.002
Magnesium	mg/L		32	86	30	28.0	36.0	32.0	28	73	29	33	33	46	41	55	46	34.4	37.6	39.1			33.2	30.3	34.7	33.9
Manganese	mg/L	0.05 AO	0.03	0.038	0.021	0.0	0.0	0.0	0.014	0.022	0.012	0.018	0.003	0.004	0.015	0.015	<0.002	0.012	0.006	0.005			**0.093**	**0.083**	**0.126**	**0.107**
Molybdenum	mg/L		0.096	0.11	0.054	0.05	0.053	0.021	0.029	0.062	0.009	0.017	0.022	0.025	0.016	0.032	0.015	0.010	0.013	0.011			0.019	0.018	0.018	0.014
Nickel	mg/L		0.001	0.003	<0.001	0.001	0.001	<0.001	<0.001	0.001	<0.001	0.001	0.001	0.002	0.0011	0.0012	0.0025	<0.003	<0.003	<0.003			<0.003	<0.003	<0.003	<0.003
Potassium	mg/L		5	10	4.7	4.6	5.5	3.6	4.4	9.9	2.6	4.0	4.9	5.8	4.3	7.5	5.2	3.73	4.61	4.75			9.33	9.5	9.56	8.05
Selenium	mg/L	0.01 MAC	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.004	<0.004	<0.004			<0.004	<0.004	<0.004	<0.004
Silicon	mg/L																	6.07	4.86	5.12			4.62	6.15	5.41	5.85
Silver	mg/L		<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.002	<0.002	<0.002			<0.002	<0.002	<0.002	<0.002
Sodium	mg/L	200 AO	**240**	**250**	160	140	140	86	120	100	48	65	86	86	50	62	58	43.4	43.1	45.3			28.6	21.9	21.4	17.2
Strontium	mg/L		0.64	2.1	0.63	0.56	0.97	0.56	0.59	3.2	0.53	0.98	1.0	1.5	1.5	2.7	1.9	0.955	1.13	1.46			0.617	0.616	0.754	0.735
Sulphur	mg/L																	24.5	27.5	22.3			27.1	2.83	4.69	4.5
Thallium	mg/L		<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.006	<0.006	<0.006			<0.006	<0.006	<0.006	<0.006
Tin	mg/L		<0.001			<0.001	<0.001	<0.001	<0.001	<0.001	<0.001			<0.001	<0.001	<0.001	<0.001	<0.002	<0.002	<0.002			<0.002	<0.002	<0.002	<0.002
Titanium	mg/L		<0.005		<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.002	<0.002	<0.002			<0.002	<0.002	<0.002	<0.002
Uranium	mg/L	0.02 MAC	0.018	0.018	0.011	0.009	0.0087	0.0069	0.0071	0.0047	0.0047	0.0047	0.0057	0.0062	0.0037	0.0039	0.0073	0.004	0.005	0.005			<0.002	<0.002	<0.002	<0.002
Vanadium	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.0005	0.0005	0.00068	0.0011	0.00075	<0.002	<0.002	<0.002			<0.002	<0.002	<0.002	<0.002
Zinc	mg/L	5 AO	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005			<0.005	<0.005	<0.005	0.006

Notes:
(1) MOECC Ontario Drinking Water Standards.
(2) Operational Guideline (OG) within ODWS.
(3) Aesthetic Objective (AO) within ODWS.
(4) Maximum Acceptable Concentration (MAC) within ODWS.
(5) Interim Maximum Acceptable Concentration (IMAC) within ODWS.
(6) ODWS exceedances indicated by **bold** entries.

Summary of Groundwater Geochemical Results OW-24-III

Parameters	Units	ODWS [1]	2008			2009		2010		2011		2012		2013			2014			2015		
General Chemistry			**Jun**	**Aug**	**Nov**	**Jun**	**Nov**	**Jun**	**Nov**	**Jun**	**Nov**	**Jun**	**Nov**	**May**	**July**	**Sep**	**June**	**July**	**Sep**	**May**	**July**	**Sep**
Alkalinity	mg/L	30-500 OG [2]	324	325	332	318	306	315	316	304	308	310	320	289	317	373	352	309	307	227	252	211
Chloride	mg/L	250 AO [3]	2.0	2.0	<1	<1	1.0	2.0	<1	<1	<1	<1	<1	1.25	1.0	1.14	3.88	4.08	3.84	3.55	3.70	4.52
Dissolved Organic Carbon	mg/L	5 AO	1.4	1.3	1.2	1.1	1.2	1.2	1.4	1	1.1	1.1	1.1	1.4	1.3	1.6	1.5	2.7	2.0	1.9	2.6	3.7
Fluoride	mg/L	1.5 MAC [4]					0.1	0.1	0.1	0.1	0.1	0.13	0.12	<0.10	0.1	<0.10	0.07	<0.25	<0.10	<0.05	0.15	0.11
Sulphate	mg/L	500 AO	10.0	8.0	7.0	6.0	8.0	5.0	5.0	4.0	5.0	4.0	3.0	4.05	3.41	3.53	15.5	20.8	13.0	14.1	9.61	21.6
Hardness	mg/L	80-100 OG	**320**	**340**	**330**	**310**	**310**	**330**	**320**	**320**	**290**	**310**	**280**	**285**	**290**	**318**	**335**	**335**	**303**	**224**	**300**	**249**
Nitrate	mg/L	10 MAC	0.3	0.3	0.4	0.4	0.4	0.4	0.4	0.2	0.1	0.18	0.14	0.13	0.12	0.16	0.59	0.49	0.78	1.20	1.37	0.22
Nitrite	mg/L	1 MAC	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.10	<0.05	<0.10	<0.05	<0.25	<0.10	<0.05	<0.10	<0.05
Organic Nitrogen	mg/L	0.15 OG	**0.45**	**0.175**	**0.175**	**0.275**	**0.175**	**0.675**	**0.175**		**0.175**	**0.615**	**0.265**	**0.88**	<0.10	<0.10	**0.46**	**0.39**	**0.23**	**0.77**	**0.91**	**1.19**
Orthophosphate	mg/L		<0.01	<0.01	<0.01	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.20	<0.10	<0.20	<0.10	<0.50	<0.20	<0.10	<0.20	<0.10
pH	pH Units													8.02	7.47	7.23	8.08	7.95	7.75	8.25	8.17	7.97
Electrical Conductivity	µS/cm													554	563	599	655	628	637	470	519	469
Total Ammonia	mg/L		0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.02	<0.02	<0.02	0.07	0.09	0.6	0.45	0.37	0.1
Total Dissolved Solids	mg/L	500 AO	342	350	346	331	330	336	332	321	315	323	314	280	318	310	352	372	352	252	316	260
Total Kjeldahl Nitrogen (TKN)	mg/L		0.5	0.2	0.2	0.3	0.2	0.7	0.2	<1	0.2	0.64	0.29	0.88	<0.10	<0.10	0.53	0.48	0.83	1.22	1.28	1.29
Total Phosphorus	mg/L		0.05	0.04	0.6	0.08	0.03	0.1						<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Metals																						
Aluminum	mg/L	0.1 OG	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.0056	<0.005	0.007	0.018	<0.004	<0.004	<0.004	<0.004	<0.004	0.004	<0.004
Arsenic	mg/L	0.025 IMAC [5]	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
Barium	mg/L	1 MAC	0.015	0.015	0.017	0.0160	0.016	0.015	0.017	0.017	0.018	0.016	0.017	0.015	0.014	0.016	0.032	0.03	0.03	0.019	0.023	0.023
Beryllium	mg/L		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Bismuth	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001			<0.001	<0.001	<0.001	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Boron	mg/l	5 IMAC	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.015	0.010	<0.010	0.01	0.012	0.021	0.011	0.011	0.018
Cadmium	mg/L	0.005 MAC	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Calcium	mg/L		84	89	86	83	83	89	84	85	77	84	75	77.2	78.2	86.8	91.0	93.9	86.0	66.9	85.5	74.9
Chromium	mg/L	0.05 MAC	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.003	<0.003	0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
Cobalt	mg/L		0.0006	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Copper	mg/L	1 AO	0.001	0.001	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	<0.001	<0.001	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
Iron	mg/L	0.3 AO	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.010	<0.010	<0.010	<0.010	<0.010	0.018	0.156	<0.010	<0.010
Lead	mg/L	0.01 MAC	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Magnesium	mg/L		26	29	27	26.0	26.0	26	27	26	25	25	22	22.4	22.9	24.5	26.2	24.4	21.4	13.9	21.0	15.1
Manganese	mg/L	0.05 AO	0.004	0.003	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	0.002	**0.161**	**0.364**	0.037	**0.091**
Molybdenum	mg/L		0.002	0.001	<0.001	0.00	<0.001	<0.001	<0.001	<0.001	<0.0005	<0.0005	0.00085	<0.002	<0.002	<0.002	<0.002	<0.002	0.004	<0.002	<0.002	<0.002
Nickel	mg/L		0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	0.003
Potassium	mg/L		0.76	0.91	0.84	0.73	0.72	0.68	0.65	0.7	0.61	0.73	0.65	0.71	0.71	0.69	0.8	1.23	1.6	1.77	1.15	5.78
Selenium	mg/L	0.01 MAC	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004
Silicon	mg/L													6.88	6.87	7.8	6.68	6.8	6.45	3.8	4.58	3.86
Silver	mg/L		<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Sodium	mg/L	200 AO	6.4	6.6	6.2	6.1	7.1	5.7	6.1	5.4	5.8	5.5	7.1	6.25	5.35	5.64	13.4	9.64	8.99	6.67	6.54	7.82
Strontium	mg/L		0.13	0.14	0.14	0.12	0.11	0.12	0.12	0.12	0.11	0.12	0.12	0.109	0.109	0.131	0.139	0.15	0.345	0.129	0.137	0.119
Sulphur	mg/L													1.59	1.23	<0.05	4.56	8.3	6.65	6.26	2.75	7.32
Thallium	mg/L		<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006
Tin	mg/L		<0.001			<0.001	<0.001	<0.001			<0.001	<0.001	<0.001	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Titanium	mg/L		<0.005		<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Uranium	mg/L	0.02 MAC	0.0008	0.0008	0.0006	0.001	0.0006	0.0005	0.0004	0.0005	0.0004	0.00051	0.00054	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Vanadium	mg/L		<0.001	<0.001	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.0011	0.00072	0.00072	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Zinc	mg/L	5 AO	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.0064	0.007	<0.005	<0.005	0.006	0.007	<0.005	<0.005	0.006	<0.005

Notes:
(1) MOECC Ontario Drinking Water Standards.
(2) Operational Guideline (OG) within ODWS.
(3) Aesthetic Objective (AO) within ODWS.
(4) Maximum Acceptable Concentration (MAC) within ODWS.
(5) Interim Maximum Acceptable Concentration (IMAC) within ODWS.
(6) ODWS exceedances indicated by **bold** entries.

Summary of Groundwater Geochemical Results OW-17-I

Parameters	Units	ODWS [1]	2007			2008			2009			2010			2011			2012			2013			2014			2015		
General Chemistry			**Jul**	**Oct**	**Dec**	**Jun**	**Aug**	**Nov**	**Jun**	**Sep**	**Nov**	**Jun**	**Sep**	**Nov**	**Jun**	**Sep**	**Nov**	**Jun**	**Sep**	**Nov**	**May**	**July**	**Sep**	**June**	**July**	**Sep**	**May**	**July**	**Sep**
Alkalinity	mg/L	30-500 OG [2]	230	229	222	235	237	236	226	241	242	237	238	238	231	237	241	250	250	250	235	250	283	235	245	231	219	235	228
Chloride	mg/L	250 AO [3]	0.47	5.52	0.22	1.0	1.0	1.0	1.0	<1	1.0	1	<1	<1	<1	<1	<1	<1	<1	<1	0.77	0.80	0.81	0.69	0.78	0.83	0.85	0.82	0.69
Dissolved Organic Carbon	mg/L	5 AO	2.4	2.5	2.7	1.9	2.0	2.1	1.9	1.9	1.7	1.9	1.9	2.2	1.8	1.9	1.9	2.0	1.9	1.9	1.9	2.1	2.5	2.4	2.2	2.1	2.3	2.5	2.1
Fluoride	mg/L	1.5 MAC [4]	0.39	0.32	0.35					0.3	0.3	0.3	0.3	0.3	0.3	0.35	0.4	0.35	0.35	0.34	0.26	0.30	0.31	0.17	0.19	0.36	0.35	0.19	0.34
Sulphate	mg/L	500 AO	17.3	14.1	15.2	14	15	15	13	16	15	15	15	15	15	15	13	15	15	14	15.3	15.1	15.6	16.2	15.9	15.5	14.8	16.5	16.5
Hardness	mg/L	80-100 OG	**238**	**216**	**221**	**230**	**240**	**240**	**240**	**250**	**250**	**260**	**240**	**240**	**250**	**250**	**250**	**250**	**230**	**250**	**241**	**227**	**243**	**235**	**249**	**231**	**227**	**246**	**235**
Nitrate	mg/L	10 MAC	<0.05	<0.05	<0.05	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.10	<0.05	0.06	<0.05	<0.10	0.06	<0.10	<0.10	<0.05
Nitrite	mg/L	1 MAC	<0.05	<0.05	<0.05	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.01	<0.01	0.01	<0.01	0.01	<0.01	<0.01	0.01	<0.10	<0.05	<0.05	<0.05	<0.10	<0.05	<0.10	<0.10	<0.05
Organic Nitrogen	mg/L	0.15 OG				**0.84**	**0.375**	**0.44**	**0.375**	**0.175**	**0.275**		**0.275**	**0.175**	**0.93**	**0.28**	**0.18**	**0.437**	**0.295**	**0.394**	**12.6**	<0.10	<0.10	**0.39**	<0.10	**0.16**	<0.10	<0.10	<0.10
Orthophosphate	mg/L			<0.1	<0.1	<0.01	<0.01	<0.01	0.01	<0.01	<0.01	<0.01	0.01	<0.01	<0.01	<0.01	0.01	0.011	<0.01	<0.01	<0.20	<0.10	<0.10	<0.10	<0.20	<0.10	<0.20	<0.20	<0.10
pH	pH Units																				8.09	7.75	7.31	8.26	8.14	7.96	8.27	8.18	8.03
Electrical Conductivity	µS/cm																				481	462	479	459	474	483	454	486	471
Total Ammonia	mg/L		0.14	0.26	<0.05	0.16	<0.05	0.06	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.07	<0.05	<0.05	0.063	<0.05	0.066	<0.02	0.03	0.03	0.09	0.09	0.07	<0.02	0.07	<0.02
Total Dissolved Solids	mg/L	500 AO	250	226	244	260	269	266	261	273	274	279	268	266	266	269	273	282	270	279	244	264	268	258	280	254	250	254	244
Total Kjeldahl Nitrogen (TKN)	mg/L		<0.1	<0.1	0.21	1.0	0.4	0.5	0.4	0.2	0.3	<0.5	0.3	0.2	1.0	0.3	0.2	0.5	0.32	0.46	12.6	<0.10	0.12	0.48	<0.10	0.23	<0.10	<0.10	<0.10
Total Phosphorus	mg/L		1.72	2.11	1.88	1.3	0.22	0.28	0.3	0.05	0.43	0.53									<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Metals																													
Aluminum	mg/L	0.1 OG	<0.004	<0.004	<0.004	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.006	<0.005	<0.005	<0.005	<0.005	<0.005	0.005	0.016	<0.004	<0.004	<0.004	0.009	<0.004	<0.004	<0.004
Arsenic	mg/L	0.025 IMAC [5]	<0.003	<0.003	<0.003	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
Barium	mg/L	1 MAC	0.031	0.036	0.034	0.034	0.033	0.031	0.0310	0.030	0.031	0.03	0.031	0.03	0.031	0.031	0.029	0.032	0.034	0.034	0.032	0.030	0.029	0.029	0.028	0.03	0.028	0.027	0.031
Beryllium	mg/L		<0.001	<0.001	<0.002	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Bismuth	mg/L		<0.002	<0.002	<0.002	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001				<0.001	<0.001	0.0012	<0.001	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Boron	mg/l	5 IMAC	0.04	0.03	0.028	0.036	0.03	0.026	0.033	0.03	0.028	0.031	0.023	0.032	0.03	0.029	0.033	0.036	0.029	0.03	0.039	0.036	0.026	0.028	0.031	0.032	0.029	0.028	0.031
Cadmium	mg/L	0.005 MAC	<0.0001	<0.002	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Calcium	mg/L		59.9	54.3	55.9	57	62	61	62	63	63	69	63	61	65	65	66	68	62	65	64.0	59.9	64.8	63.0	66.2	61.1	61.1	65.5	62.9
Chromium	mg/L	0.05 MAC	<0.003	<0.003	0.007	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
Cobalt	mg/L		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Copper	mg/L	1 AO	<0.002	<0.002	<0.003	0.17	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
Iron	mg/L	0.3 AO	<0.01	**0.529**	<0.01	0.23	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	**0.419**	<0.010	0.052	0.129	**0.415**	**0.352**	**0.453**	**0.371**	0.123
Lead	mg/L	0.01 MAC	<0.001	<0.001	<0.001	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	0.00054	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Magnesium	mg/L		21.4	19.6	19.7	20	21	20	21.0	22.0	21.0	22	21	20	20	20	21	20	20	20	19.7	18.9	19.7	18.9	20.3	19.0	18.1	19.9	19.0
Manganese	mg/L	0.05 AO	0.027	0.021	0.024	0.024	0.025	0.026	0.0	0.0	0.0	0.035	0.033	0.031	0.032	0.031	0.038	0.031	0.032	0.03	0.027	0.014	0.013	0.023	0.024	0.038	0.024	0.024	0.015
Molybdenum	mg/L		<0.002	<0.002	<0.002	0.002	0.002	0.002	0.00	0.002	0.002	0.002	0.002	0.002	0.002	0.0019	0.0018	0.002	0.0022	0.0022	0.002	0.002	0.002	<0.002	0.002	0.003	<0.002	<0.002	<0.002
Nickel	mg/L		<0.003	<0.003	<0.003	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.003	<0.003	0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
Potassium	mg/L		4.39	9.72	4.04	3.3	3.5	3.5	3.60	3.60	3.60	3.70	3.30	3.30	3.4	3.3	3.4	3.5	3.2	3.2	3.59	3.17	3.27	3.19	3.44	3.39	3.06	3.29	3.26
Selenium	mg/L	0.01 MAC	<0.004	<0.004	<0.004	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004
Silicon	mg/L																				8.41	8.04	7.9	8.49	8.25	8.02	8.04	6.63	8.43
Silver	mg/L		<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.00019	<0.0001	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Sodium	mg/L	200 AO	5.3	5.39	4.77	4.4	5.2	5.2	5.6	4.8	5.4	5.1	5	5.5	5	4.9	6	5.6	5.8	5.9	4.95	4.74	4.67	4.61	5.21	4.64	4.49	4.91	4.84
Strontium	mg/L		0.469	0.444	0.527	0.48	0.52	0.49	0.5	0.52	0.5	0.51	0.49	0.47	0.5	0.49	0.47	0.5	0.49	0.49	0.453	0.444	0.499	0.455	0.472	0.438	0.404	0.499	0.484
Sulphur	mg/L																				5.59	5.34	3.01	4.41	5.9	5.85	5.86	5.31	5.65
Thallium	mg/L		<0.0003	<0.0003	<0.0003	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006
Tin	mg/L		<0.002	<0.002	<0.002	<0.001			<0.001	<0.001	<0.001	<0.001	<0.001				<0.001	<0.001	<0.001	<0.001	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Titanium	mg/L		<0.002	<0.002	<0.002	<0.005		<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Uranium	mg/L	0.02 MAC	<0.002	<0.002	<0.002	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.00018	<0.0001	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Vanadium	mg/L		<0.002	<0.002	<0.002	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Zinc	mg/L	5 AO	0.004	0.01	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.0058	0.006	0.005	0.006	0.006	<0.005	0.006	<0.005	<0.005	<0.005

Notes:
(1) MOECC Ontario Drinking Water Standards.
(2) Operational Guideline (OG) within ODWS.
(3) Aesthetic Objective (AO) within ODWS.
(4) Maximum Acceptable Concentration (MAC) within ODWS.
(5) Interim Maximum Acceptable Concentration (IMAC) within ODWS.
(6) ODWS exceedances indicated by **bold** entries.

Summary of Groundwater Geochemical Results OW-17-II

Parameters	Units	ODWS [1]	2007			2008			2009			2010			2011			2012			2013			2014			2015		
General Chemistry			**Jul**	**Oct**	**Dec**	**Jun**	**Aug**	**Nov**	**Jun**	**Sep**	**Nov**	**Jun**	**Sep**	**Nov**	**Jun**	**Sep**	**Nov**	**Jun**	**Sep**	**Nov**	**May**	**July**	**Sep**	**June**	**July**	**Sep**	**May**	**July**	**Sep**
Alkalinity	mg/L	30-500 OG [2]	277	274	262	287	295	296	276	299	289	281	277	268	278	290	286	290	290	290	289	310	349	277	284	279	274	298	211
Chloride	mg/L	250 AO [3]	4.06	3.32	2.89	4.0	4.0	3.0	3.0	3.0	3.0	3.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.52	2.51	2.48	2.26	2.58	2.58	2.44	2.68	9.80
Dissolved Organic Carbon	mg/L	5 AO	1.6	1.6	1.7	1.3	0.7	1.4	1.3	1.2	1.1	1.2	1.3	1.6	1.2	1.2	1.3	1.4	1.6	1.2	1.3	1.5	1.7	2.0	3.0	1.5	1.5	1.9	1.8
Fluoride	mg/L	1.5 MAC [4]	1.1	1.1	1.07					1.2	1.3	1.2	1.1	1.2	1.2	1.27	1.3	1.25	1.29	1.3	1.05	1.16	1.2	1.0	0.56	0.99	1.22	1.19	1.44
Sulphate	mg/L	500 AO	129	124	127	121	130	117	98	110	98	84	83	85	80	79	83	76	74	72	83.1	70.7	72.7	73	69.9	68.8	68.8	70.7	83.7
Hardness	mg/L	80-100 OG	**283**	**270**	**284**	**290**	**290**	**260**	**250**	**260**	**250**	**260**	**260**	**250**	**250**	**240**	**260**	**260**	**230**	**240**	**238**	**211**	**232**	**234**	**241**	**211**	**226**	**222**	**134**
Nitrate	mg/L	10 MAC	0.14	0.1	0.07	<0.1	0.1	<0.1	0.2	<0.1	0.1	<0.1	<0.1	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.10	<0.10	<0.10	<0.05	<0.25	<0.10	<0.10	<0.10	0.14
Nitrite	mg/L	1 MAC	<0.05	<0.05	<0.05	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.10	<0.10	<0.10	<0.05	<0.25	<0.10	<0.10	<0.10	<0.05
Organic Nitrogen	mg/L	0.15 OG				**0.38**	**0.675**		**0.875**		**0.575**			**0.275**	**0.48**		**0.18**		0.095	**0.692**	**7.03**	<0.10	<0.10	**0.24**	0.13	0.150	<0.10	<0.10	0.12
Orthophosphate	mg/L			<0.1	<0.1	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.20	<0.20	<0.20	<0.10	<0.50	<0.20	<0.20	<0.20	<0.10
pH	pH Units																				8.23	7.90	7.54	8.36	8.27	8.15	8.37	8.25	8.13
Electrical Conductivity	µS/cm																				713	695	705	649	674	676	673	706	628
Total Ammonia	mg/L		<0.02	0.02	0.22	0.12	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.078	<0.02	<0.02	<0.02	0.03	0.07	0.03	<0.02	0.08	<0.02
Total Dissolved Solids	mg/L	500 AO	426	412	436	459	484	454	416	439	431	407	403	400	396	407	418	406	391	401	354	406	388	354	390	358	348	368	336
Total Kjeldahl Nitrogen (TKN)	mg/L		<0.1	<0.1	<0.1	0.5	0.7	<0.5	0.9	0.5	0.6	<0.5	<0.5	0.3	0.5	0.6	0.2	<0.1	0.12	0.77	7.03	<0.10	<0.10	0.27	0.2	0.18	<0.10	<0.10	0.12
Total Phosphorus	mg/L		0.25	0.3	0.28	0.2	0.2	0.4	0.4	0.09	0.25	0.13									<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Metals																													
Aluminum	mg/L	0.1 OG	<0.004	0.004	0.004	0.006	<0.005	<0.005	0.028	0.005	<0.005	<0.005	0.005	<0.005	<0.005	<0.005	0.007	<0.005	<0.005	<0.005	0.006	0.008	<0.004	0.005	<0.004	<0.004	0.004	<0.004	<0.004
Arsenic	mg/L	0.025 IMAC [5]	<0.003	<0.003	<0.003	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
Barium	mg/L	1 MAC	0.043	0.043	0.051	0.047	0.044	0.046	0.0450	0.046	0.046	0.042	0.047	0.046	0.046	0.046	0.046	0.047	0.049	0.047	0.049	0.043	0.042	0.041	0.035	0.041	0.045	0.040	0.026
Beryllium	mg/L		<0.001	<0.001	<0.002	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Bismuth	mg/L		<0.002	<0.002	<0.002	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001			<0.001	<0.001	<0.001	<0.001	<0.001	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Boron	mg/l	5 IMAC	0.138	0.154	0.136	0.17	0.15	0.16	0.150	0.15	0.15	0.14	0.15	0.15	0.14	0.15	0.16	0.14	0.15	0.15	0.153	0.137	0.118	0.137	0.135	0.132	0.128	0.117	0.338
Cadmium	mg/L	0.005 MAC	<0.0001	<0.002	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Calcium	mg/L		47.4	45.5	47.1	49	47	43	42	43	42	44	42	41	42	41	43	45	38	39	40.6	36.0	39.6	38.7	40.9	34.8	38.4	36.8	21.6
Chromium	mg/L	0.05 MAC	<0.003	0.009	<0.003	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
Cobalt	mg/L		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Copper	mg/L	1 AO	<0.002	<0.002	0.003	0.003	0.002	0.002	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.002	<0.001	<0.001	<0.001	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
Iron	mg/L	0.3 AO	<0.01	<0.1	<0.01	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Lead	mg/L	0.01 MAC	<0.001	<0.001	<0.001	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Magnesium	mg/L		39.9	37.9	40.3	42	41	37	36.0	38.0	36.0	36	37	37	35	35	38	36	33	35	33.2	29.5	32.4	33.4	33.7	30.1	31.7	31.7	19.5
Manganese	mg/L	0.05 AO	0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Molybdenum	mg/L		0.031	0.037	0.031	0.033	0.034	0.031	0.03	0.029	0.026	0.025	0.024	0.022	0.023	0.021	0.021	0.02	0.019	0.019	0.020	0.018	0.015	0.014	0.019	0.014	0.014	0.014	0.033
Nickel	mg/L		<0.003	<0.003	<0.003	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
Potassium	mg/L		6.36	5.23	6.58	5.5	5.5	5.3	5.10	5.30	5.20	5.10	5.10	5.00	4.9	4.9	5.2	5.1	4.5	4.7	4.63	4.46	4.6	4.62	5.01	4.48	4.78	4.39	4.20
Selenium	mg/L	0.01 MAC	<0.004	<0.004	<0.004	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004
Silicon	mg/L																				3.87	3.78	4.21	3.72	4.23	3.75	4.02	3.16	3.04
Silver	mg/L		<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Sodium	mg/L	200 AO	65.2	55.2	52.9	57	69	62	57	56	63	58	57	58	56	63	63	59	57	62	57.1	65.3	65	54.5	61.3	56.9	55.3	66.8	86.8
Strontium	mg/L		3.22	3.35	3.82	3.7	3.5	3.5	3.4	3.4	3.3	3.2	3.4	3.3	3.4	3.2	3.3	3.4	3.3	3.3	3.34	3.04	3.47	3.1	3.2	3.07	2.80	2.99	0.725
Sulphur	mg/L																				27.7	24.1	25.4	21.6	24.6	25.5	25.5	22.5	32.3
Thallium	mg/L		<0.0003	<0.0003	<0.0003	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006
Tin	mg/L		<0.002	<0.002	<0.002	<0.001			<0.001	<0.001	<0.001	<0.001	<0.001			<0.001	<0.001	<0.001	<0.001	<0.001	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Titanium	mg/L		<0.002	<0.002	0.002	<0.005		<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Uranium	mg/L	0.02 MAC	0.003	0.004	0.003	0.0035	0.0042	0.004	0.003	0.0041	0.0039	0.0035	0.0037	0.0035	0.0038	0.0037	0.0038	0.0038	0.0036	0.0039	0.004	0.004	0.004	0.003	0.004	0.003	0.003	0.004	<0.002
Vanadium	mg/L		<0.002	<0.002	<0.002	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.0005	0.0006	<0.0005	0.00064	0.00088	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Zinc	mg/L	5 AO	<0.004	<0.005	0.01	<0.005	<0.005	<0.005	<0.005	0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.007	<0.005	<0.005	<0.005	<0.005	0.005	0.009	0.008	<0.005	0.006	0.005	<0.005	0.005

Notes:
(1) MOECC Ontario Drinking Water Standards.
(2) Operational Guideline (OG) within ODWS.
(3) Aesthetic Objective (AO) within ODWS.
(4) Maximum Acceptable Concentration (MAC) within ODWS.
(5) Interim Maximum Acceptable Concentration (IMAC) within ODWS.
(6) ODWS exceedances indicated by **bold** entries.

Summary of Groundwater Geochemical Results OW-17-III

Parameters	Units	ODWS [1]	2007	2008			2009		2010		2011		2012		2013			2014			2015		
General Chemistry			Jul	Jun	Aug	Nov	Jun	Nov	Jun	Nov	Jun	Nov	Jun	Nov	May	July	Sep	June	July	Sep	May	July	Sep
Alkalinity	mg/L	30-500 OG [2]	343	172	318	293	234	168	333	409	269	356	300	240	168	308	**DRY**	183		387	175	319	**DRY**
Chloride	mg/L	250 AO [3]	2.4	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	3.0	2.0	2.0	1.35	2.02		1.56	**Insufficient Water to Sample**	2.2	1.41	2.66	
Dissolved Organic Carbon	mg/L	5 AO	1.9	3.1	1.9	1.9	1.6	2.1	1.5	2.1	1.5	1.7	1.6	2.4	2.5	1.8		2.3		2.7	2.2	3.0	
Fluoride	mg/L	1.5 MAC [4]	0.1					<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.05	0.06		<0.05		<0.10	<0.05	<0.20	
Sulphate	mg/L	500 AO	7.19	5.0	7.0	8.0	3.0	7.0	6.0	9.0	5.0	9.0	5.0	7.0	3.68	9.28		3.51		6.81	2.82	3.81	
Hardness	mg/L	80-100 OG	**345**	**160**	**330**	**260**	**240**	**180**	**350**	**420**	**290**	**360**	**310**	**210**	**167**	**314**		**163**		**356**	**172**	**340**	
Nitrate	mg/L	10 MAC	<0.05	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.05	<0.05		<0.05		<0.10	<0.05	<0.20	
Nitrite	mg/L	1 MAC	<0.05	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.05	<0.05		<0.05		<0.10	<0.05	<0.20	
Organic Nitrogen	mg/L	0.15 OG		**0.32**	**0.175**	**0.55**	**0.375**	**0.275**	**0.175**	**0.175**	**0.58**	**0.175**	0.105	**0.835**	**0.36**	**0.86**		**0.65**		**0.62**	<0.10	**0.39**	
Orthophosphate	mg/L			<0.01	<0.01	<0.01	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.10	<0.10		<0.10		<0.20	<0.10	<0.40	
pH	pH Units														7.65	7.16		8		7.64	7.88	8.13	
Electrical Conductivity	µS/cm														335	620		354		709	354	605	
Total Ammonia	mg/L		<0.02	0.08	<0.05	0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.02	<0.02		0.08		0.04	<0.02	<0.02	
Total Dissolved Solids	mg/L	500 AO	338	185	336	295	247	188	352	424	287	368	318	248	176	382		196		368	178	320	
Total Kjeldahl Nitrogen (TKN)	mg/L		<0.1	0.4	0.2	0.6	0.4	0.3	0.2	0.2	0.6	0.2	0.13	0.86	0.36	0.86		0.73		0.66	<0.10	0.39	
Total Phosphorus	mg/L		0.19	0.08	0.14	0.12	0.05	0.09	0.15						<0.05	<0.05		<0.05		<0.05	<0.05	<0.05	
Metals																							
Aluminum	mg/L	0.1 OG	<0.004	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.008	<0.005	<0.005	0.028	0.008		0.011		0.008	0.012	0.010	
Arsenic	mg/L	0.025 IMAC [5]	<0.003	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.003	<0.003		<0.003		<0.003	<0.003	<0.003	
Barium	mg/L	1 MAC	0.015	0.024	0.019	0.02	0.0170	0.014	0.014	0.018	0.014	0.013	0.021	0.021	0.016	0.016		0.014		0.024	0.015	0.015	
Beryllium	mg/L		<0.001	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.001	<0.001		<0.001		<0.001	<0.001	<0.001	
Bismuth	mg/L		<0.002	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001			<0.001	<0.001	<0.001	<0.002	<0.002		<0.002		<0.002	<0.002	<0.002	
Boron	mg/l	5 IMAC	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.011	<0.01	0.012	<0.010		0.011		<0.010	<0.010	0.014	
Cadmium	mg/L	0.005 MAC	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.002	<0.002		<0.002		<0.002	<0.002	<0.002	
Calcium	mg/L		93.3	43	86	69	61	47	96	110	76	92	83	55	46.5	84.0		44.0		97.4	46.2	91.4	
Chromium	mg/L	0.05 MAC	<0.003	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.003	<0.003		<0.003		<0.003	<0.003	0.003	
Cobalt	mg/L		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.001	<0.001		<0.001		<0.001	<0.001	<0.001	
Copper	mg/L	1 AO	<0.002	<0.001	0.001	0.002	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.003	<0.003		<0.003		<0.003	<0.003	<0.003	
Iron	mg/L	0.3 AO	<0.01	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.010	<0.010		<0.010		0.011	<0.010	<0.010	
Lead	mg/L	0.01 MAC	<0.001	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.002	<0.002		<0.002		<0.002	<0.002	<0.002	
Magnesium	mg/L		27.2	12	28	22	21.0	14.0	28	32	24	31	26	17	12.3	25.2		12.8		27.3	13.7	27.2	
Manganese	mg/L	0.05 AO	<0.002	0.049	<0.002	<0.002	0.0	<0.002	0.009	<0.002	<0.002	<0.002	0.0074	0.015	0.013	0.007		0.012		0.004	0.009	0.024	
Molybdenum	mg/L		<0.002	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.0005	<0.0005	<0.0005	<0.002	<0.002		<0.002		<0.002	<0.002	<0.002	
Nickel	mg/L		<0.003	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.0035	<0.003	<0.003		<0.003		<0.003	<0.003	<0.003	
Potassium	mg/L		0.12	0.96	0.21	0.59	0.34	0.70	<0.2	0.32	0.26	0.21	0.37	0.58	0.90	0.47		1.05		0.94	0.83	0.66	
Selenium	mg/L	0.01 MAC	<0.004	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.004	<0.004		<0.004		<0.004	<0.004	<0.004	
Silicon	mg/L														5.41	6.56		5.86		6.48	5.6	5.36	
Silver	mg/L		<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.002	<0.002		<0.002		<0.002	<0.002	<0.002	
Sodium	mg/L	200 AO	4.31	4.1	4.8	5.4	4.3	4	4.7	5.4	4.6	5	5.0	9.3	4.18	4.81		4.57		5.29	3.85	5.85	
Strontium	mg/L		0.117	0.082	0.12	0.12	0.093	0.078	0.11	0.14	0.11	0.11	0.13	0.1	0.082	0.111		0.079		0.14	0.084	0.122	
Sulphur	mg/L														1.40	3.09		0.81		2.69	1.19	0.97	
Thallium	mg/L		<0.0003	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.006	<0.006		<0.006		<0.006	<0.006	<0.006	
Tin	mg/L		<0.002	<0.001			<0.001	<0.001	<0.001			<0.001	<0.001	<0.001	<0.002	<0.002		<0.002		<0.002	<0.002	<0.002	
Titanium	mg/L		<0.002	<0.005		<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.002	<0.002		<0.002		<0.002	<0.002	<0.002	
Uranium	mg/L	0.02 MAC	<0.002	0.0002	0.0004	0.0005	0.000	0.0002	0.0002	0.0004	0.0003	0.0004	0.00035	0.00036	<0.002	<0.002		<0.002		<0.002	<0.002	<0.002	
Vanadium	mg/L		<0.002	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.0005	<0.0005	<0.0005	<0.002	<0.002		<0.002		<0.002	<0.002	<0.002	
Zinc	mg/L	5 AO	<0.004	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.081	<0.005	0.005	<0.005		0.006		0.008	0.007	0.005	

Notes:
(1) MOECC Ontario Drinking Water Standards.
(2) Operational Guideline (OG) within ODWS.
(3) Aesthetic Objective (AO) within ODWS.
(4) Maximum Acceptable Concentration (MAC) within ODWS.
(5) Interim Maximum Acceptable Concentration (IMAC) within ODWS.
(6) ODWS exceedances indicated by **bold** entries.

Summary of Groundwater Geochemical Results OW-23-I

Parameters	Units	ODWS [1]	2007			2008			2009			2010			2011			2012			2013			2014			2015		
General Chemistry			**Jul**	**Oct**	**Dec**	**Jun**	**Aug**	**Nov**	**Jun**	**Sep**	**Nov**	**Jun**	**Sep**	**Nov**	**Jun**	**Sep**	**Nov**	**Jun**	**Sep**	**Nov**	**May**	**July**	**Sep**	**June**	**July**	**Sep**	**May**	**July**	**Sep**
Alkalinity	mg/L	30-500 OG [2]	219	211	200	234	219	229	236	230	236	238	225	237	222	225	234	240	230	240	220	219	271	221	214	220	228	219	220
Chloride	mg/L	250 AO [3]	1.96	1.56	1.98	2.0	3.0	2.0	1.0	2.0	2.0	2.0	2.0	1.0	3.0	2.0	2.0	2.0	2.0	2.0	2.11	2.06	1.72	1.89	1.96	2.04	1.34	2.03	1.85
Dissolved Organic Carbon	mg/L	5 AO	2.4	2.6	2.5	2.1	2.6	2.5	2.0	2.1	2.2	2.1	2.9	2.3	2.2	2.3	2.3	1.9	2.1	2.2	2.1	2.6	3.0	2.7	2.1	2.4	2.7	3.1	2.7
Fluoride	mg/L	1.5 MAC [4]	1.42	1.33	1.45					1.2	1.3	1	1.2	0.9	1.4	1.5	1.3	1.22	1.33	1.35	1.33	1.11	1.24	1.17	1.38	1.25	0.89	1.41	1.26
Sulphate	mg/L	500 AO	4.53	5.81	4.68	4	4	3	4	5	5	7	4	7	3	6	4	5.0	4.0	3.0	5.01	4.65	5.26	5.16	4.3	4.76	5.40	5.24	6.50
Hardness	mg/L	80-100 OG	**75**	96	**77**	**130**	**170**	**120**	**120**	**120**	**110**	**120**	**140**	**150**	100	84	**180**	**160**	**180**	**140**	**103**	85	**127**	96	97	99.1	**153**	99.5	**139**
Nitrate	mg/L	10 MAC	<0.05	<0.05	0.19	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.2	<0.1	<0.1	<0.1	<0.05	0.12	<0.10	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Nitrite	mg/L	1 MAC	<0.05	<0.05	0.3	<0.01	0.04	0.02	<0.01	0.02	0.02	0.01	0.01	0.08	0.06	0.07	0.02	<0.01	<0.01	0.014	<0.05	<0.05	<0.10	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Organic Nitrogen	mg/L	0.15 OG				**0.94**	**1.25**	**1.07**	**1.06**	**1.21**	**0.92**	**1.18**	**1.5**	**3.03**	**0.36**	**1.25**	**28.7**			**1.27**	**0.42**	<0.10	**0.41**	**0.62**	**0.33**	**0.51**	**0.26**	**0.20**	**1.04**
Orthophosphate	mg/L			<0.1	<0.1	0.02	0.02	<0.01	0.02	0.02	0.01	<0.01	0.02	<0.01	0.02	<0.01	0.01	0.012	<0.01	0.018	<0.10	<0.10	<0.20	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
pH	pH Units																				8.24	7.89	7.29	8.43	8.11	8.32	8.39	8.17	8.2
Electrical Conductivity	µS/cm																				439	398	448	422	428	439	457	441	443
Total Ammonia	mg/L		0.76	0.81	<0.05	0.86	0.65	0.83	0.74	0.8	0.8	0.8	0.80	0.97	0.64	0.75	1.3	0.81	0.88	0.73	0.50	0.39	0.35	0.62	0.65	0.5	0.5	0.63	0.46
Total Dissolved Solids	mg/L	500 AO	328	214	218	263	244	238	249	247	257	259	246	266	241	251	261	258	247	256	224	234	230	226	240	216	218	226	236
Total Kjeldahl Nitrogen (TKN)	mg/L		1.46	0.69	1.01	1.8	1.9	1.9	1.8	2	1.7	2	2.3	4	1	2	30	<1	0.76	2	0.92	<0.20	0.76	1.24	0.98	1.01	0.76	0.83	1.5
Total Phosphorus	mg/L		0.64	1.53	2.62	0.9	0.9	1.6	0.7	1.1	1.3	3.3									<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Metals																													
Aluminum	mg/L	0.1 OG	0.005	0.005	0.005	**0.13**	<0.005	<0.005	<0.005	<0.005	<0.005	0.005	0.039	<0.005	<0.005	<0.005	0.008	<0.005	0.006	<0.005	0.005	0.008	<0.004	0.006	<0.004	<0.004	<0.004	0.005	<0.004
Arsenic	mg/L	0.025 IMAC [5]	<0.003	<0.003	<0.003	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
Barium	mg/L	1 MAC	0.023	0.029	0.035	0.038	0.044	0.031	0.0320	0.031	0.031	0.034	0.04	0.049	0.032	0.027	0.052	0.041	0.049	0.039	0.023	0.020	0.027	0.025	0.023	0.027	0.029	0.022	0.031
Beryllium	mg/L		<0.001	<0.001	<0.002	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Bismuth	mg/L		<0.002	<0.002	<0.002	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Boron	mg/l	5 IMAC	0.36	0.324	0.278	0.34	0.21	0.25	0.270	0.3	0.3	0.3	0.25	0.25	0.33	0.4	0.22	0.24	0.18	0.27	0.388	0.310	0.291	0.316	0.325	0.307	0.272	0.298	0.310
Cadmium	mg/L	0.005 MAC	<0.0001	<0.002	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Calcium	mg/L		10.3	13.8	10.4	21	29	19	19	17	17	19	23	25	15	11	28	28	31	22	16.2	14.4	20.8	14.5	14.1	14.8	26.9	15.1	24.3
Chromium	mg/L	0.05 MAC	0.033	<0.003	<0.003	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
Cobalt	mg/L		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Copper	mg/L	1 AO	<0.002	<0.002	<0.003	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
Iron	mg/L	0.3 AO	<0.01	0.055	<0.01	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.010	<0.010	<0.010	<0.010	0.057	0.048	0.028	0.014	<0.010
Lead	mg/L	0.01 MAC	<0.001	<0.001	<0.001	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Magnesium	mg/L		11.9	14.9	12.3	20	24	18	17.0	18.0	17.0	17	20	22	16	14	27	23	24	20	15.2	12.0	18.2	14.5	14.9	15.1	20.9	15.0	18.9
Manganese	mg/L	0.05 AO	0.008	0.01	0.006	0.008	0.011	0.008	0.0	0.0	0.0	0.008	0.01	0.01	0.009	0.007	0.012	0.01	0.012	0.011	0.009	0.007	0.009	0.009	0.009	0.008	0.009	0.008	0.008
Molybdenum	mg/L		0.012	0.013	0.011	0.01	0.005	0.007	0.01	0.009	0.009	0.009	0.008	0.007	0.01	0.012	0.0045	0.0057	0.0031	0.0073	0.012	0.011	0.01	0.009	0.01	0.009	0.009	0.013	0.009
Nickel	mg/L		<0.003	<0.003	<0.003	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
Potassium	mg/L		2.96	2.79	3.28	4.1	3.6	2.9	3.20	3.20	3.20	3.30	3.30	3.80	3.1	2.9	3.8	3.7	3.5	3.3	3.22	2.74	3.34	2.99	3.16	3.2	3.50	3.0	4.16
Selenium	mg/L	0.01 MAC	<0.004	<0.004	<0.004	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004
Silicon	mg/L																				4.55	3.84	4.48	4.63	4.54	4.5	4.59	3.66	4.38
Silver	mg/L		<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.0	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Sodium	mg/L	200 AO	62.7	57.1	66	58	35	44	51	50	57	56	45	50	56	68	39	41	26	49	53.7	52.6	49.6	60.0	63.0	59.1	35.0	57.2	50.1
Strontium	mg/L		0.359	0.415	0.511	0.61	0.83	0.57	0.55	0.55	0.53	0.52	0.64	0.71	0.48	0.39	0.79	0.77	0.9	0.62	0.390	0.292	0.493	0.442	0.453	0.432	0.433	0.535	0.438
Sulphur	mg/L																				1.79	1.70	2.08	1.71	2.2	4.01	2.25	5.29	2.23
Thallium	mg/L		<0.0003	<0.0003	<0.0003	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006
Tin	mg/L		<0.002	<0.002	<0.002	<0.001			<0.001	<0.001	<0.001	<0.001	<0.001		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Titanium	mg/L		<0.002	<0.002	<0.002	<0.005		<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Uranium	mg/L	0.02 MAC	<0.002	<0.002	<0.002	0.0002	<0.0001	<0.0001	0.000	0.0002	0.0002	<0.0001	<0.0001	0.0002	<0.0001	<0.0001	0.0003	<0.0001	<0.0001	<0.0001	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Vanadium	mg/L		<0.002	<0.002	<0.002	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	<0.001	<0.0005	0.0024	0.00097	0.00055	0.0023	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Zinc	mg/L	5 AO	<0.004	0.018	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.005	<0.005	<0.005	<0.005	0.0051	<0.005	<0.005	<0.005	<0.005	0.006	<0.005	<0.005	<0.005	<0.005

Notes:
(1) MOECC Ontario Drinking Water Standards.
(2) Operational Guideline (OG) within ODWS.
(3) Aesthetic Objective (AO) within ODWS.
(4) Maximum Acceptable Concentration (MAC) within ODWS.
(5) Interim Maximum Acceptable Concentration (IMAC) within ODWS.
(6) ODWS exceedances indicated by **bold** entries.

Summary of Groundwater Geochemical Results OW-23-II

Parameters	Units	ODWS [1]	2007			2008			2009			2010			2011		2012			2013			2014			2015		
General Chemistry			**Jul**	**Oct**	**Dec**	**Jun**	**Aug**	**Nov**	**Jun**	**Sep**	**Nov**	**Jun**	**Sep**	**Nov**	**Jul**	**Sep**	**Jun**	**Sep**	**Nov**	**May**	**July**	**Sep**	**June**	**July**	**Sep**	**May**	**July**	**Sep**
Alkalinity	mg/L	30-500 OG [2]	220	216	210	244	225	225	224	226	225	222	217	222	222	226	230	230	240	228	237	261	224	218	214	220	221	277
Chloride	mg/L	250 AO [3]	25.6	21.4	18.7	19.0	18.0	16.0	15.0	14.0	13.0	14.0	13.0	11.0	12.0	10.0	12.0	10.0	8.0	11.7	9.5	9.47	10.6	10.3	9.99	11.2	10.2	2.78
Dissolved Organic Carbon	mg/L	5 AO	2.2	2.3	2.1	1.9	2.2	1.9	1.7	1.6	1.5	1.6	1.7	2	1.6	1.7	1.5	1.6	1.5	2.0	1.7	1.6	1.8	1.4	1.6	1.6	2.3	1.4
Fluoride	mg/L	1.5 MAC [4]	0.89	0.88	0.87					1	1	1.1	1.1	1.1	1.1	1.1	1.16	1.13	1.08	0.52	1.05	**1.51**	0.96	0.69	1.05	1.02	1.13	1.38
Sulphate	mg/L	500 AO	280	243	229	204	239	201	190	170	160	150	140	130	130	130	140	120	130	155	122	117	120	113	102	104	97.2	71.2
Hardness	mg/L	80-100 OG	**266**	**230**	**225**	**220**	**220**	**210**	**210**	**190**	**190**	**190**	**170**	**170**	**180**	**180**	**180**	**160**	**180**	**184**	**165**	**164**	**160**	**158**	**145**	**143**	**142**	**229**
Nitrate	mg/L	10 MAC	0.21	0.39	0.3	<0.1	0.1	0.2	<0.1	0.1	0.3	<0.1	0.1	0.2	<0.1	0.1	<0.1	<0.1	<0.1	<0.25	<0.10	<0.25	0.10	<0.25	<0.10	0.08	0.17	<0.25
Nitrite	mg/L	1 MAC	<0.05	<0.05	<0.05	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.25	<0.10	<0.25	<0.05	<0.25	<0.10	<0.05	<0.10	<0.25
Organic Nitrogen	mg/L	0.15 OG				**0.62**	**0.275**	**0.575**	**2.675**	**0.275**	**0.275**	**0.175**	**0.375**	**0.175**	**0.38**	**1.28**	**0.515**	**0.185**	**0.494**	**0.82**	<0.10	0.14	**0.47**	<0.10	0.150	0.10	**0.21**	**0.20**
Orthophosphate	mg/L			<0.1	<0.1	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.50	<0.20	<0.50	<0.10	<0.50	<0.20	<0.10	<0.20	<0.50
pH	pH Units																			8.21	7.81	7.46	8.36	8.24	8.23	8.41	8.2	8.19
Electrical Conductivity	µS/cm																			792	708	718	694	688	678	675	666	672
Total Ammonia	mg/L		<0.02	<0.02	<0.05	0.18	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.076	<0.02	<0.02	<0.02	0.06	0.07	0.03	<0.02	<0.02	<0.02
Total Dissolved Solids	mg/L	500 AO	**588**	**568**	**538**	**551**	**586**	**532**	**521**	483	480	471	445	438	451	444	452	417	444	440	418	400	364	400	358	362	352	342
Total Kjeldahl Nitrogen (TKN)	mg/L		0.36	<0.1	0.14	0.8	0.3	0.6	2.7	0.3	0.3	0.2	0.4	0.2	0.4	1.3	0.54	0.21	0.57	0.82	<0.10	0.14	0.53	<0.10	0.18	0.10	0.21	0.20
Total Phosphorus	mg/L		<0.1	0.13	0.17	0.3	0.26	1	0.1	0.17	0.07	0.05								<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Metals																												
Aluminum	mg/L	0.1 OG	0.004	0.005	0.004	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.006	0.01	0.01	0.006	<0.005	0.0059	0.0053	0.006	0.019	<0.004	<0.004	<0.004	<0.004	0.009	0.018	<0.004
Arsenic	mg/L	0.025 IMAC [5]	<0.003	<0.003	<0.003	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
Barium	mg/L	1 MAC	0.019	0.026	0.031	0.028	0.027	0.03	0.0250	0.027	0.031	0.026	0.03	0.032	0.032	0.035	0.032	0.033	0.036	0.032	0.028	0.024	0.027	0.025	0.024	0.024	0.023	0.047
Beryllium	mg/L		<0.001	<0.001	<0.002	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Bismuth	mg/L		<0.002	<0.002	<0.002	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001		<0.001	<0.001	<0.001	<0.001	<0.001	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Boron	mg/l	5 IMAC	0.35	0.34	0.337	0.4	0.36	0.36	0.370	0.36	0.37	0.36	0.34	0.36	0.37	0.37	0.38	0.37	0.36	0.398	0.383	0.304	0.327	0.346	0.360	0.285	0.309	0.142
Cadmium	mg/L	0.005 MAC	<0.0001	<0.002	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Calcium	mg/L		41.7	35.2	33.9	34	34	31	33	29	29	30	26	25	27	27	30	25	28	30.4	27.0	26.6	26.2	25.7	23.1	23.0	22.5	38.2
Chromium	mg/L	0.05 MAC	<0.003	<0.003	<0.003	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	0.009	<0.003
Cobalt	mg/L		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Copper	mg/L	1 AO	0.002	0.004	<0.003	0.002	0.002	0.002	<0.001	0.001	<0.001	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.002	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
Iron	mg/L	0.3 AO	<0.01	<0.01	<0.01	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Lead	mg/L	0.01 MAC	<0.001	<0.001	<0.001	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Magnesium	mg/L		39.4	34.5	34.2	32	33	31	30.00	30.0	29.0	28	26	26	27	26	27	23	26	26.3	23.7	23.6	22.9	22.9	21.3	20.7	20.9	32.4
Manganese	mg/L	0.05 AO	0.034	0.017	0.017	0.017	0.015	0.01	0.0	0.0	<0.002	0.005	0.004	<0.002	0.002	0.006	0.0022	<0.002	<0.002	<0.002	0.002	0.005	0.003	0.003	0.007	0.007	0.003	<0.002
Molybdenum	mg/L		0.062	0.056	0.054	0.055	0.052	0.045	0.05	0.045	0.041	0.046	0.041	0.037	0.045	0.043	0.044	0.039	0.038	0.043	0.042	0.033	0.034	0.042	0.036	0.038	0.035	0.013
Nickel	mg/L		<0.003	<0.003	<0.003	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.002	<0.001	<0.001	0.0015	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
Potassium	mg/L		7.63	5.65	7.3	5.5	5.7	5.3	5.40	5.20	5.20	5.10	4.70	4.70	4.9	4.8	5.1	4.3	4.7	4.74	4.49	4.49	4.59	4.52	4.37	4.36	4.15	4.86
Selenium	mg/L	0.01 MAC	<0.004	<0.004	<0.004	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004
Silicon	mg/L																			3.17	3.07	3.02	2.97	3.06	2.95	2.86	2.41	3.99
Silver	mg/L		<0.0001	<0.0001	<0.001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Sodium	mg/L	200 AO	133	110	116	100	110	100	100	91	100	100	96	97	100	97	98	91	93	89.8	87.0	90.1	92.4	92.7	90.7	91.1	86.0	61.5
Strontium	mg/L		1.19	1.08	1.2	1.2	1.1	1.1	1.1	1	1	0.96	0.94	0.91	0.95	0.95	0.97	0.92	0.97	0.982	0.856	0.911	0.817	0.831	0.744	0.674	0.75	3.15
Sulphur	mg/L																			51.2	40.7	43.2	35.4	38.3	38.1	38.6	31.6	24.6
Thallium	mg/L		<0.0003	<0.0003	<0.0003	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006
Tin	mg/L		<0.002	<0.002	<0.002	<0.001			<0.001	<0.001	<0.001	<0.001	<0.001		<0.001	<0.001	<0.001	<0.001	<0.001	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Titanium	mg/L		0.003	0.003	0.003	<0.005		<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Uranium	mg/L	0.02 MAC	0.003	0.003	0.003	0.003	0.0027	0.0026	0.002	0.0022	0.002	0.0021	0.0018	0.0018	0.0019	0.0019	0.0021	0.0019	0.0021	0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	0.004
Vanadium	mg/L		<0.002	<0.002	<0.002	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	0.0006	<0.0005	0.00068	0.00093	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Zinc	mg/L	5 AO	0.019	0.033	0.007	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.006	<0.005	<0.005	0.0068	0.008	0.006	<0.005	0.007	<0.005	<0.005	<0.005	<0.005	0.009

Notes:
(1) MOECC Ontario Drinking Water Standards.
(2) Operational Guideline (OG) within ODWS.
(3) Aesthetic Objective (AO) within ODWS.
(4) Maximum Acceptable Concentration (MAC) within ODWS.
(5) Interim Maximum Acceptable Concentration (IMAC) within ODWS.
(6) ODWS exceedances indicated by **bold** entries.

Summary of Groundwater Geochemical Results OW-30-I

Parameters	Units	ODWS [1]	2014	2015		
General Chemistry			**Sep**	**May**	**July**	**Sept**
Alkalinity	mg/L	30-500 OG [2]	118	137	124	123
Chloride	mg/L	250 AO [3]	41.3	24.4	18.7	17.4
Dissolved Organic Carbon	mg/L	5 AO	**8.0**	2.7	2.9	2.0
Fluoride	mg/L	1.5 MAC [4]	1.08	**1.53**	1.31	1.42
Sulphate	mg/L	500 AO	339	225	245	222
Hardness	mg/L	80-100 OG	**264**	**145**	**146**	**132**
Nitrate	mg/L	10 MAC	<0.25	<0.25	<0.25	0.41
Nitrite	mg/L	1 MAC	<0.25	<0.25	<0.25	<0.25
Organic Nitrogen	mg/L	0.15 OG	**0.65**	**0.39**	**0.65**	**0.61**
Orthophosphate	mg/L		<0.50	<0.50	<0.50	<0.50
pH	pH Units		8.22	8.34	8.04	7.98
Electrical Conductivity	µS/cm		1070	869	812	810
Total Ammonia	mg/L		1.13	0.29	0.25	0.1
Total Dissolved Solids	mg/L	500 AO	**652**	480	490	452
Total Kjeldahl Nitrogen (TKN)	mg/L		1.78	0.68	0.90	0.71
Total Phosphorus	mg/L		<0.05	<0.05	<0.05	<0.05
Metals						
Aluminum	mg/L	0.1 OG	0.006	**0.129**	0.010	0.017
Arsenic	mg/L	0.025 IMAC [5]	<0.003	<0.003	<0.003	<0.003
Barium	mg/L	1 MAC	0.063	0.039	0.032	0.025
Beryllium	mg/L		<0.001	<0.001	<0.001	<0.001
Bismuth	mg/L		<0.002	<0.002	<0.002	<0.002
Boron	mg/l	5 IMAC	0.371	0.390	0.375	0.439
Cadmium	mg/L	0.005 MAC	<0.002	<0.002	<0.002	<0.002
Calcium	mg/L		49.8	26.3	24.3	21.9
Chromium	mg/L	0.05 MAC	<0.003	<0.003	<0.003	<0.003
Cobalt	mg/L		<0.001	<0.001	<0.001	<0.001
Copper	mg/L	1 AO	<0.003	<0.003	<0.003	<0.003
Iron	mg/L	0.3 AO	0.126	0.178	0.030	<0.010
Lead	mg/L	0.01 MAC	<0.002	<0.002	<0.002	<0.002
Magnesium	mg/L		33.9	19.2	20.8	18.7
Manganese	mg/L	0.05 AO	0.030	0.021	0.013	0.009
Molybdenum	mg/L		0.044	0.069	0.069	0.058
Nickel	mg/L		<0.003	<0.003	<0.003	<0.003
Potassium	mg/L		28.2	12.9	11.8	10.5
Selenium	mg/L	0.01 MAC	<0.004	<0.004	<0.004	<0.004
Silicon	mg/L		2.9	2.95	2.08	2.58
Silver	mg/L		<0.002	<0.002	<0.002	<0.002
Sodium	mg/L	200 AO	95.7	116	112	117
Strontium	mg/L		1.07	0.673	0.827	0.78
Sulphur	mg/L		125	84.0	85.4	83.1
Thallium	mg/L		<0.006	<0.006	<0.006	<0.006
Tin	mg/L		<0.002	<0.002	<0.002	<0.002
Titanium	mg/L		0.002	0.010	0.004	0.005
Uranium	mg/L	0.02 MAC	<0.002	<0.002	<0.002	<0.002
Vanadium	mg/L		<0.002	<0.002	<0.002	<0.002
Zinc	mg/L	5 AO	<0.005	0.009	<0.005	0.009

Notes:
(1) MOECC Ontario Drinking Water Standards.
(2) Operational Guideline (OG) within ODWS.
(3) Aesthetic Objective (AO) within ODWS.
(4) Maximum Acceptable Concentration (MAC) within ODWS.
(5) Interim Maximum Acceptable Concentration (IMAC) within ODWS.
(6) ODWS exceedances indicated by **bold** entries.

Summary of Groundwater Geochemical Results OW-30-II

Parameters	Units	ODWS [1]	2014	2015		
General Chemistry			**Sep**	**May**	**July**	**Sept**
Alkalinity	mg/L	30-500 OG [2]	224	192	168	174
Chloride	mg/L	250 AO [3]	28.7	8.8	8.84	7.55
Dissolved Organic Carbon	mg/L	5 AO	**6.1**	2.5	3.1	2.2
Fluoride	mg/L	1.5 MAC [4]	1.03	0.53	0.61	0.61
Sulphate	mg/L	500 AO	277	138	165	165
Hardness	mg/L	80-100 OG	**54.8**	93.6	**102**	**107**
Nitrate	mg/L	10 MAC	<0.25	0.37	<0.25	<0.25
Nitrite	mg/L	1 MAC	<0.25	<0.05	<0.25	<0.25
Organic Nitrogen	mg/L	0.15 OG	**0.82**	**0.38**	**0.54**	**0.39**
Orthophosphate	mg/L		<0.50	<0.10	<0.50	<0.50
pH	pH Units		8.49	8.44	8.06	8.00
Electrical Conductivity	µS/cm		1080	718	685	726
Total Ammonia	mg/L		0.33	0.18	0.22	0.10
Total Dissolved Solids	mg/L	500 AO	**1300**	410	466	434
Total Kjeldahl Nitrogen (TKN)	mg/L		1.15	0.56	0.76	0.49
Total Phosphorus	mg/L		<0.05	<0.05	<0.05	<0.05
Metals						
Aluminum	mg/L	0.1 OG	**0.21**	0.006	0.007	0.008
Arsenic	mg/L	0.025 IMAC [5]	<0.003	<0.003	<0.003	<0.003
Barium	mg/L	1 MAC	0.015	0.022	0.023	0.026
Beryllium	mg/L		<0.001	<0.001	<0.001	<0.001
Bismuth	mg/L		<0.002	<0.002	<0.002	<0.002
Boron	mg/l	5 IMAC	0.172	0.145	0.162	0.196
Cadmium	mg/L	0.005 MAC	<0.002	<0.002	<0.002	<0.002
Calcium	mg/L		12.4	17.7	17.3	18.3
Chromium	mg/L	0.05 MAC	<0.003	<0.003	<0.003	<0.003
Cobalt	mg/L		<0.001	<0.001	<0.001	<0.001
Copper	mg/L	1 AO	<0.003	<0.003	0.043	<0.003
Iron	mg/L	0.3 AO	0.124	<0.010	<0.010	<0.010
Lead	mg/L	0.01 MAC	<0.002	<0.002	0.002	<0.002
Magnesium	mg/L		5.79	12.0	14.2	15.0
Manganese	mg/L	0.05 AO	0.013	0.029	0.027	0.026
Molybdenum	mg/L		0.094	0.046	0.061	0.052
Nickel	mg/L		<0.003	<0.003	<0.003	<0.003
Potassium	mg/L		6.17	5.3	6.29	7.19
Selenium	mg/L	0.01 MAC	<0.004	<0.004	<0.004	<0.004
Silicon	mg/L		3.28	3.13	2.69	3.40
Silver	mg/L		<0.002	<0.002	<0.002	<0.002
Sodium	mg/L	200 AO	197	120	112	116
Strontium	mg/L		0.128	0.208	0.325	0.35
Sulphur	mg/L		100	51.2	54.9	60.1
Thallium	mg/L		<0.006	<0.006	<0.006	<0.006
Tin	mg/L		<0.002	<0.002	<0.002	<0.002
Titanium	mg/L		0.008	0.002	0.003	0.003
Uranium	mg/L	0.02 MAC	0.005	0.003	0.005	0.004
Vanadium	mg/L		<0.002	<0.002	<0.002	<0.002
Zinc	mg/L	5 AO	<0.005	<0.005	0.036	0.005

Notes:
(1) MOECC Ontario Drinking Water Standards.
(2) Operational Guideline (OG) within ODWS.
(3) Aesthetic Objective (AO) within ODWS.
(4) Maximum Acceptable Concentration (MAC) within ODWS.
(5) Interim Maximum Acceptable Concentration (IMAC) within ODWS.
(6) ODWS exceedances indicated by **bold** entries.

Summary of Groundwater Geochemical Results OW-26-I4

Parameters	Units	ODWS [1]	2014
General Chemistry			**Sep**
Alkalinity	mg/L	30-500 OG [2]	206
Chloride	mg/L	250 AO [3]	44.4
Dissolved Organic Carbon	mg/L	5 AO	**5.4**
Fluoride	mg/L	1.5 MAC [4]	<0.25
Sulphate	mg/L	500 AO	271
Hardness	mg/L	80-100 OG	**316**
Nitrate	mg/L	10 MAC	1.46
Nitrite	mg/L	1 MAC	<0.25
Organic Nitrogen	mg/L	0.15 OG	**0.2**
Orthophosphate	mg/L		2.72
pH	pH Units		7.88
Electrical Conductivity	µS/cm		1080
Total Ammonia	mg/L		0.13
Total Dissolved Solids	mg/L	500 AO	**668**
Total Kjeldahl Nitrogen (TKN)	mg/L		0.33
Total Phosphorus	mg/L		<0.05
Metals			
Aluminum	mg/L	0.1 OG	0.007
Arsenic	mg/L	0.025 IMAC [5]	<0.003
Barium	mg/L	1 MAC	0.067
Beryllium	mg/L		<0.001
Bismuth	mg/L		<0.002
Boron	mg/l	5 IMAC	0.175
Cadmium	mg/L	0.005 MAC	<0.002
Calcium	mg/L		80.1
Chromium	mg/L	0.05 MAC	<0.003
Cobalt	mg/L		0.001
Copper	mg/L	1 AO	<0.003
Iron	mg/L	0.3 AO	<0.010
Lead	mg/L	0.01 MAC	<0.002
Magnesium	mg/L		28.2
Manganese	mg/L	0.05 AO	0.099
Molybdenum	mg/L		0.02
Nickel	mg/L		<0.003
Potassium	mg/L		4.59
Selenium	mg/L	0.01 MAC	<0.004
Silicon	mg/L		2.84
Silver	mg/L		<0.002
Sodium	mg/L	200 AO	94.6
Strontium	mg/L		1.08
Sulphur	mg/L		94.1
Thallium	mg/L		<0.006
Tin	mg/L		<0.002
Titanium	mg/L		0.007
Uranium	mg/L	0.02 MAC	0.006
Vanadium	mg/L		<0.002
Zinc	mg/L	5 AO	0.005

Notes:
(1) MOE Ontario Drinking Water Standards.
(2) Operational Guideline (OG) within ODWS.
(3) Aesthetic Objective (AO) within ODWS.
(4) Maximum Acceptable Concentration (MAC) within ODWS.
(5) Interim Maximum Acceptable Concentration (IMAC) within ODWS.
(6) ODWS exceedances indicated by **bold** entries.

Summary of Groundwater Geochemical Results OW-27-I4

Parameters	Units	ODWS [1]	2014
General Chemistry			**Sep**
Alkalinity	mg/L	30-500 OG [2]	191
Chloride	mg/L	250 AO [3]	51.3
Dissolved Organic Carbon	mg/L	5 AO	2.9
Fluoride	mg/L	1.5 MAC [4]	<0.25
Sulphate	mg/L	500 AO	213
Hardness	mg/L	80-100 OG	**363**
Nitrate	mg/L	10 MAC	0.83
Nitrite	mg/L	1 MAC	<0.25
Organic Nitrogen	mg/L	0.15 OG	**0.46**
Orthophosphate	mg/L		1.93
pH	pH Units		7.87
Electrical Conductivity	µS/cm		949
Total Ammonia	mg/L		0.41
Total Dissolved Solids	mg/L	500 AO	**550**
Total Kjeldahl Nitrogen (TKN)	mg/L		0.87
Total Phosphorus	mg/L		<0.05
Metals			
Aluminum	mg/L	0.1 OG	0.008
Arsenic	mg/L	0.025 IMAC [5]	<0.003
Barium	mg/L	1 MAC	0.023
Beryllium	mg/L		<0.001
Bismuth	mg/L		<0.002
Boron	mg/l	5 IMAC	0.073
Cadmium	mg/L	0.005 MAC	<0.002
Calcium	mg/L		97.5
Chromium	mg/L	0.05 MAC	<0.003
Cobalt	mg/L		0.009
Copper	mg/L	1 AO	<0.003
Iron	mg/L	0.3 AO	**0.505**
Lead	mg/L	0.01 MAC	<0.002
Magnesium	mg/L		29.1
Manganese	mg/L	0.05 AO	**0.686**
Molybdenum	mg/L		0.009
Nickel	mg/L		0.007
Potassium	mg/L		4.18
Selenium	mg/L	0.01 MAC	<0.004
Silicon	mg/L		2.74
Silver	mg/L		<0.002
Sodium	mg/L	200 AO	44.1
Strontium	mg/L		0.484
Sulphur	mg/L		71.1
Thallium	mg/L		<0.006
Tin	mg/L		<0.002
Titanium	mg/L		0.005
Uranium	mg/L	0.02 MAC	0.013
Vanadium	mg/L		<0.002
Zinc	mg/L	5 AO	0.025

Notes:
(1) MOE Ontario Drinking Water Standards.
(2) Operational Guideline (OG) within ODWS.
(3) Aesthetic Objective (AO) within ODWS.
(4) Maximum Acceptable Concentration (MAC) within ODWS.
(5) Interim Maximum Acceptable Concentration (IMAC) within ODWS.
(6) ODWS exceedances indicated by **bold** entries.

Summary of Groundwater Geochemical Results OW-28-I4

Parameters	Units	ODWS [1]	2014
General Chemistry			**Sep**
Alkalinity	mg/L	30-500 OG [2]	402
Chloride	mg/L	250 AO [3]	56.2
Dissolved Organic Carbon	mg/L	5 AO	**5.5**
Fluoride	mg/L	1.5 MAC [4]	0.26
Sulphate	mg/L	500 AO	159
Hardness	mg/L	80-100 OG	**396**
Nitrate	mg/L	10 MAC	<0.25
Nitrite	mg/L	1 MAC	<0.25
Organic Nitrogen	mg/L	0.15 OG	**0.7**
Orthophosphate	mg/L		1.64
pH	pH Units		7.9
Electrical Conductivity	µS/cm		1230
Total Ammonia	mg/L		0.23
Total Dissolved Solids	mg/L	500 AO	**694**
Total Kjeldahl Nitrogen (TKN)	mg/L		0.93
Total Phosphorus	mg/L		<0.05
Metals			
Aluminum	mg/L	0.1 OG	0.009
Arsenic	mg/L	0.025 IMAC [5]	<0.003
Barium	mg/L	1 MAC	0.057
Beryllium	mg/L		<0.001
Bismuth	mg/L		<0.002
Boron	mg/l	5 IMAC	0.754
Cadmium	mg/L	0.005 MAC	<0.002
Calcium	mg/L		84.4
Chromium	mg/L	0.05 MAC	<0.003
Cobalt	mg/L		0.001
Copper	mg/L	1 AO	<0.003
Iron	mg/L	0.3 AO	0.046
Lead	mg/L	0.01 MAC	<0.002
Magnesium	mg/L		44.9
Manganese	mg/L	0.05 AO	**0.198**
Molybdenum	mg/L		0.013
Nickel	mg/L		0.013
Potassium	mg/L		30.8
Selenium	mg/L	0.01 MAC	<0.004
Silicon	mg/L		7.68
Silver	mg/L		<0.002
Sodium	mg/L	200 AO	82.2
Strontium	mg/L		0.454
Sulphur	mg/L		54.4
Thallium	mg/L		<0.006
Tin	mg/L		<0.002
Titanium	mg/L		0.005
Uranium	mg/L	0.02 MAC	0.002
Vanadium	mg/L		<0.002
Zinc	mg/L	5 AO	0.007

Notes:
(1) MOE Ontario Drinking Water Standards.
(2) Operational Guideline (OG) within ODWS.
(3) Aesthetic Objective (AO) within ODWS.
(4) Maximum Acceptable Concentration (MAC) within ODWS.
(5) Interim Maximum Acceptable Concentration (IMAC) within ODWS.
(6) ODWS exceedances indicated by **bold** entries.

Summary of Residential Geochemical Results WS-7

Parameters	Units	ODWS [1]	2002	2003	2004	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
General Chemistry			**October**	**December**	**June**	**September**	**August**	**June**	**July**	**June**	**June**	**July**	**June**	**June**	**May**	**June**	**May**
Alkalinity	mg/L	30-500 OG [2]	321	308	304	315	307	305	304	324	341	328	295	320	316	306	309
Total Dissolved Solids	mg/L	500 AO [3]	439	392	428	396	362	364	406	**898**	462	394	377	406	384	364	354
Chloride	mg/L	250 AO	15.6	16.3	23.2	21.1	19.3	20.7	23.1	**290**	18	21	32	23	23.5	20.4	15.1
Dissolved Organic Carbon	mg/L	5 AO	1.4	1.2	1.0	1.0	1.0	1.0	1.4	1.8	1.4	1.5	1.3	1.5	1.3	1.8	1.6
Potassium	mg/L		<1	<1	<1	3.0	1.76	1.75	0.4	0.21	0.27	2.0	2.0	2.0	1.73	1.82	1.77
Sulphate	mg/L	500 AO	39.9	35.6	36.8	35.7	39.6	32.8	34.3	35	28	27	27	29	31	33.1	30.6
Fluoride	mg/L	1.5 MAC [4]							0.13			0.1	0.1	0.13	<0.10	<0.10	0.07
Hardness	mg/L	80 - 100 OG	**0.7**	**50.5**	**6.9**	**342**	**310**	**327**	**<10**	**<1**	**<1**	**340**	**310**	**370**	**332**	**340**	**323**
Nitrate	mg/L	10 MAC	<0.2	<0.2	<0.2	<0.2	<0.05	<0.05	<0.05	<0.1	<0.1	<0.1	<0.1	<0.1	<0.10	<0.10	<0.05
Nitrite	mg/L	1 MAC	<0.2	<0.2	<0.2	<0.2	<0.05	<0.05	<0.05	<0.01	<0.01	<0.01	<0.01	<0.01	<0.10	<0.10	<0.05
Organic Nitrogen	mg/L	0.15 OG	0.01	0.06	0.02	0.06	0.11	**0.28**		**0.18**	**0.18**	**0.18**	0.075	**0.30**	<0.10	<0.10	<0.10
Total Ammonia	mg/L		0.07	<0.03	<0.03	<0.03	<0.05	<0.05	<0.05	0.12	<0.05	<0.05	<0.05	<0.05	<0.02	0.03	<0.02
Total Kjeldahl Nitrogen (TKN)	mg/L		0.08	0.09	0.05	0.09	0.16	0.33	<0.1	0.3	0.2	0.2	0.1	0.3	<0.10	<0.10	<0.10
Orthophosphate	mg/L		<0.3	<0.3	<0.3	<0.3	<0.1			0.04	0.02	<0.01	<0.01	<0.01	<0.20	<0.20	<0.10
pH	pH Units	6.5 - 8.5 OG													8.43	8.17	7.94
Conductivity	µS/cm														716	638	671
Elements																	
Aluminum	mg/L	0.1 OG	<0.03	**0.16**	<0.05	**0.16**	<0.004	<0.004	<0.004	<0.005	<0.005	<0.005	<0.005	<0.005	0.014	<0.004	<0.004
Arsenic	mg/L	0.025 IMAC [5]								<0.001	<0.001	<0.001	<0.001	<0.001	<0.003	<0.003	<0.003
Barium	mg/L	1 MAC	<0.005	<0.005	<0.005	0.057	0.048	0.041	<0.002	<0.005	<0.005	0.065	0.062	0.061	0.059	0.056	0.060
Beryllium	mg/L		<0.0005	<0.0005	<0.0005	<0.0005	<0.001	<0.002	<0.001	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.001	<0.001	<0.001
Bismuth	mg/L		<0.2	<0.2	<0.2	<0.2	<0.002	<0.002	<0.002	<0.001	<0.001	<0.001	<0.001	<0.001	<0.002	<0.002	<0.002
Boron	mg/l	5 IMAC	<0.01	0.02	0.02	<0.01	<0.01	<0.01	0.01	0.019	<0.01	0.01	<0.01	0.012	<0.010	<0.010	<0.010
Cadmium	mg/L	0.005 MAC	<0.005	<0.005	<0.005	<0.005	<0.002	<0.002	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.002	<0.002	<0.002
Calcium	mg/L		0.2	19	2.63	87.2	80	84	<0.05	<0.2	<0.2	95	93	88	85.8	87.1	83.4
Chromium	mg/L	0.05 MAC	<0.005	<0.005	<0.005	<0.005	<0.003	<0.003	<0.003	<0.005	<0.005	<0.005	<0.005	<0.005	<0.003	<0.003	<0.003
Cobalt	mg/L		<0.005	<0.005	<0.005	<0.005	<0.001	<0.002	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.001	<0.001	<0.001
Copper	mg/L	1 AO	0.006	0.006	<0.005	<0.005	<0.002	<0.003	0.03	0.002	0.003	0.2			<0.003	<0.003	0.005
Iron	mg/L	0.3 AO	0.03	0.08	0.02	**1.6**	**1.03**	**1.86**	0.04	<0.1	<0.1	**2.0**	**5.9**	**4.6**	**2.0**	**1.48**	**2.12**
Lead	mg/L	0.01 MAC	<0.001	<0.001	<0.001	<0.001	**0.089**	<0.002	<0.001	<0.0005	<0.0005	<0.0005	0.0006	<0.0005	<0.002	<0.002	<0.002
Magnesium	mg/L		<0.05	0.76	0.08	30.2	26.8	28.5	<0.05	<0.05	<0.05	35	34	30	28.7	29.8	27.9
Manganese	mg/L	0.05 AO	<0.005	0.021	<0.005	**0.061**	0.023	0.026	<0.002	<0.002	<0.002	0.032	**0.24**	0.035	0.028	0.028	0.035
Molybdenum	mg/L		<0.02	<0.02	<0.02	<0.02	<0.002	<0.002	<0.002	<0.001	<0.001	<0.001	0.001	0.00080	<0.002	<0.002	<0.002
Nickel	mg/L		<0.02	<0.02	<0.02	<0.02	<0.003	<0.003	<0.003	<0.001	<0.001	<0.001	<0.001	0.0017	<0.003	<0.003	<0.003
Phosphorus	mg/L														<0.05	<0.05	<0.05
Selenium	mg/L	0.01 MAC								<0.002	<0.002	<0.002	<0.002	<0.002	<0.004	<0.004	<0.004
Silicon	mg/L														6.61	6.72	7.14
Silver	mg/L		<0.005	<0.005	<0.005	<0.005	<0.002	<0.002	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.002	<0.002	<0.002
Sodium	mg/L	200 AO	175	163	168	15.1	14.2	15.6	198	**370**	190	18	23	16	14.8	15.6	15.0
Strontium	mg/L		<0.001	0.013	0.002	0.146	0.131	0.125	<0.005	<0.001	<0.001	0.15	0.16	0.14	0.144	0.148	0.141
Sulphur	mg/L														10.4	9.36	9.74
Thallium	mg/L									<0.00005	<0.00005	<0.00005	0.00010	<0.00005	<0.006	<0.006	<0.006
Tin	mg/L		<0.05	<0.05	<0.05	<0.05	<0.001	<0.002	<0.002		<0.001	<0.001	<0.001	<0.001	<0.002	<0.002	<0.002
Titanium	mg/L		<0.005	<0.005	<0.005	<0.005	<0.001	<0.002	<0.002		<0.005	<0.005	<0.005	<0.005	<0.002	<0.002	<0.002
Uranium	mg/L	0.02 MAC								0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.002	<0.002	<0.002
Vanadium	mg/L		<0.005	<0.005	<0.005	<0.005	<0.001	<0.002	<0.002	<0.001	<0.001	<0.001	<0.001	0.00070	<0.002	<0.002	<0.002
Zinc	mg/L	5 AO	<0.005	0.231	0.026	<0.005	<0.004	0.022	0.01	<0.005	<0.005	0.006	<0.005	<0.005	<0.005	0.023	0.037

Notes:
(1) MOE Ontario Drinking Water Standards.
(2) Operational Guideline (OG) within ODWS.
(3) Aesthetic Objective (AO) within ODWS.
(4) Maximum Acceptable Concentration (MAC) within ODWS.
(5) Interim Maximum Acceptable Concentration (IMAC) within ODWS.
(6) ODWS exceedances indicated by **bold** entries.

The City of Temiskaming Shores
Hydrogeological Characterization
New Liskeard Waste Disposal Site
New Liskeard, Ontario
August 2016

Summary of Residential Geochemical Results WS-8

Parameters	Units	ODWS [1]	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
General Chemistry			**October**	**December**	**June**	**November**	**June**	**July**	**June**	**June**	**June**	**June**	**June**	**May**	**June**	**May**
Alkalinity	mg/L	30-500 OG [2]	285	296	296	306	305	296	302	299	299	305	310	313	312	297
Total Dissolved Solids	mg/L	500 AO [3]	367	376	409	392	350	406	373	383	391	384	385	382	380	378
Chloride	mg/L	250 AO	21.2	22.9	35.9	23.5	26.4	22.7	26	29	28	26	22	21.5	23.1	28.7
Dissolved Organic Carbon	mg/L	5 AO	1.4	0.9	1.1	1.0	1.0	1.1	1.1	1.1	1.3	1.0	1.0	1.1	1.5	1.3
Potassium	mg/L		2.0	2.0	3.0	1.94	2.17	2.37	2.3	2.2	2.3	2.6	2.4	2.47	2.37	2.28
Sulphate	mg/L	500 AO	28.3	25.8	29.4	26.8	26.5	26.0	26.0	31.0	29.0	24.0	23.0	26.2	27.5	30.3
Fluoride	mg/L	1.5 MAC [4]						0.26			0.2	0.2	0.25	<0.10	<0.10	0.16
Hardness	mg/L	80 - 100 OG	**354**	**358**	**401**	**318**	**336**	**351**	**330**	**340**	**370**	**360**	**360**	**372**	**360**	**342**
Nitrate	mg/L	10 MAC	<0.2	<0.2	<0.2	<0.05	<0.05	<0.05	<0.1	<0.1	<0.1	<0.1	<0.1	<0.10	<0.10	<0.05
Nitrite	mg/L	1 MAC	<0.2	<0.2	<0.2	<0.05	<0.05	<0.05	<0.01	<0.01	<0.01	<0.01	<0.01	<0.10	<0.10	<0.05
Organic Nitrogen	mg/L	0.15 OG	0.13	<0.01	0.12	0.10	**0.24**		**0.17**	**0.19**	**0.25**	**0.17**	**0.265**	<0.10	<0.10	<0.10
Total Ammonia	mg/L		<0.03	0.08	0.12	0.08	0.07	<0.05	0.23	0.11	0.05	0.13	0.085	0.08	0.10	0.06
Total Kjeldahl Nitrogen (TKN)	mg/L		0.16	0.07	0.24	0.18	0.31	<0.1	0.4	0.3	0.3	0.3	0.35	0.16	0.13	0.1
Orthophosphate	mg/L		<0.3	<0.3	<0.3	<0.1			<0.01	<0.01	<0.01	<0.01	<0.01	<0.20	<0.20	<0.10
pH	pH Units	6.5 - 8.5 OG												8.41	8.25	7.88
Conductivity	µS/cm													691	675	692
Elements																
Aluminum	mg/L	0.1 OG	<0.03	0.05	0.06	0.027	<0.004	<0.004	<0.005	0.016	<0.005	**5.1**	<0.005	<0.004	<0.004	<0.004
Arsenic	mg/L	0.025 IMAC [5]							<0.001	<0.001	<0.001	<0.001	<0.001	<0.003	<0.003	<0.003
Barium	mg/L	1 MAC	0.05	0.051	0.055	0.051	0.038	0.05	0.056	0.054	0.055	0.059	0.057	0.057	0.056	0.060
Beryllium	mg/L		<0.0005	<0.0005	<0.0005	<0.001	<0.002	<0.001	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.001	<0.001	<0.001
Bismuth	mg/L		<0.2	<0.2	<0.2	<0.002	<0.002	<0.002	<0.001	<0.001	<0.001	<0.001	<0.001	<0.002	<0.002	<0.002
Boron	mg/l	5 IMAC	0.02	0.02	0.02	0.051	0.01	0.02	0.015	0.02	0.014	0.02	0.029	0.012	0.014	0.014
Cadmium	mg/L	0.005 MAC	<0.005	<0.005	<0.005	<0.002	<0.002	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.002	<0.002	<0.002
Calcium	mg/L		82.7	86.2	101	73.4	79.1	82.6	78	85	86	92	87	87.5	84.8	82.2
Chromium	mg/L	0.05 MAC	<0.005	<0.005	<0.005	<0.003	<0.003	<0.003	<0.005	<0.005	<0.005	<0.005	<0.005	<0.003	<0.003	<0.003
Cobalt	mg/L		<0.005	<0.005	<0.005	<0.001	<0.002	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.001	<0.001	<0.001
Copper	mg/L	1 AO	<0.005	<0.005	<0.005	<0.002	0.003	<0.002	0.002	0.006	0.003	0.003	0.0019	<0.003	<0.003	<0.003
Iron	mg/L	0.3 AO	**1.77**	**2.7**	**2.42**	**1.57**	**2.33**	**1.26**	**1.9**	**1.9**	**1.7**	**1.6**	**1.4**	**1.37**	**1.47**	**1.27**
Lead	mg/L	0.01 MAC	<0.001	<0.001	<0.001	<0.002	<0.002	<0.001	<0.0005	0.0005	0.0006	<0.0005	<0.0005	<0.002	<0.002	<0.002
Magnesium	mg/L		35.7	34.6	36.1	32.8	33.7	35.1	33	35	36	40	37	37.2	36.1	33.3
Manganese	mg/L	0.05 AO	0.026	0.047	0.05	0.038	0.03	0.02	0.03	0.026	0.024	**0.056**	0.026	0.026	0.030	0.027
Molybdenum	mg/L		<0.02	0.02	<0.02	<0.002	<0.002	<0.002	<0.001	<0.001	<0.001	0.001	0.0011	<0.002	<0.002	<0.002
Nickel	mg/L													<0.003	<0.003	<0.003
Phosphorus	mg/L													<0.05	<0.05	<0.05
Selenium	mg/L	0.01 MAC							<0.002	<0.002	<0.002	<0.002	<0.002	<0.004	<0.004	<0.004
Silicon	mg/L													8.86	9.27	9.61
Silver	mg/L		<0.005	<0.005	<0.005	<0.002	<0.002	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.002	<0.002	<0.002
Sodium	mg/L	200 AO	5.6	5.2	5.5	4.36	5.24	5.75	5.0	6.1	6.4	6.6	6.2	6.44	7.21	7.66
Strontium	mg/L		0.165	0.178	0.182	0.197	0.172	0.2	0.19	0.18	0.19	0.22	0.22	0.219	0.228	0.231
Sulphur	mg/L													7.7	7.80	9.94
Thallium	mg/L								<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.006	<0.006	<0.006
Tin	mg/L		<0.05	<0.05	<0.05	<0.001	<0.002	<0.002		<0.001	<0.001	<0.001	<0.001	<0.002	<0.002	<0.002
Titanium	mg/L		<0.005	<0.005	<0.005	<0.001	<0.002	<0.002		<0.005	<0.005	<0.005	<0.005	<0.002	<0.002	<0.002
Uranium	mg/L	0.02 MAC							0.0002	0.0002	0.0002	0.0002	0.00020	<0.002	<0.002	<0.002
Vanadium	mg/L		<0.005	<0.005	<0.005	<0.001	<0.002	<0.002	<0.001	<0.001	<0.001	<0.001	<0.0005	<0.002	<0.002	<0.002
Zinc	mg/L	5 AO	<0.005	0.072	0.179	0.066	0.009	0.01	<0.005	<0.005	<0.005	<0.005	0.0056	<0.005	<0.005	<0.005

Notes:
(1) MOE Ontario Drinking Water Standards.
(2) Operational Guideline (OG) within ODWS.
(3) Aesthetic Objective (AO) within ODWS.
(4) Maximum Acceptable Concentration (MAC) within ODWS.
(5) Interim Maximum Acceptable Concentration (IMAC) within ODWS.
(6) ODWS exceedances indicated by **bold** entries.

Summary of Residential Geochemical Results WS-9

Parameters	Units	ODWS [1]	2002	2003	2004	2005	2006	2007	2008	2009	2013	2014	2015
General Chemistry			**October**	**December**	**June**	**June**	**August**	**July**	**June**	**June**	**May**	**June**	**May**
Alkalinity	mg/L	30-500 OG [2]	279	272	272	270	269	259	271	274	271	275	**No Sample**
Total Dissolved Solids	mg/L	500 AO [3]	412	394	423	366	398	394	412	413	386	424	**Obtained**
Chloride	mg/L	250 AO	8.2	7.4	8.4	7.65	8.99	9.78	9.0	8.0	9.72	8.25	
Dissolved Organic Carbon	mg/L	5 AO	1.2	0.9	0.6	0.9	1.2	1.1	1.2	1.1	1.2	1.5	
Potassium	mg/L		4.0	4.0	4.0	4.0	3.71	4.31	3.9	4.0	3.86	1.09	
Sulphate	mg/L	500 AO	85.2	89.8	93.0	69.8	90.3	89.3	101	88.0	81.4	87.9	
Fluoride	mg/L	1.5 MAC [4]						0.94			0.68	0.68	
Hardness	mg/L	80 - 100 OG	**322**	**309**	**336**	**270**	**282**	**300**	**290**	**320**	**297**	**31**	
Nitrate	mg/L	10 MAC	<0.2	<0.2	<0.2	<0.1	<0.05	<0.05	<0.1	<0.1	<0.10	<0.10	
Nitrite	mg/L	1 MAC	<0.2	<0.2	<0.2	<0.1	<0.05	<0.05	<0.01	<0.01	<0.10	<0.10	
Organic Nitrogen	mg/L	0.15 OG	0.12	0.09	0.09	**0.17**	<0.38		**0.34**	0.09	<0.10	<0.10	
Total Ammonia	mg/L		0.18	0.19	0.21	0.23	0.18	0.11	0.36	0.21	0.23	0.04	
Total Kjeldahl Nitrogen (TKN)	mg/L		0.3	0.28	0.3	0.4	<0.5	0.13	0.7	0.3	0.28	<0.10	
Orthophosphate	mg/L		<0.3	<0.3	<0.3	<0.3			<0.01	<0.01	<0.20	<0.20	
pH	pH Units	6.5 - 8.5 OG									8.41	8.36	
Conductivity	µS/cm										697	735	
Elements													
Aluminum	mg/L	0.1 OG	<0.03	<0.05	<0.05	<0.1	0.006	<0.004	<0.005	<0.005	0.010	<0.004	
Arsenic	mg/L	0.025 IMAC [5]							<0.001	<0.001	<0.003	<0.003	
Barium	mg/L	1 MAC	0.05	0.052	0.054	0.05	0.03	0.05	0.053	0.053	0.056	0.005	
Beryllium	mg/L		<0.0005	<0.0005	<0.0005	<0.005	<0.002	<0.001	<0.0005	<0.0005	<0.001	<0.001	
Bismuth	mg/L		<0.2	<0.2	<0.2	<0.2	<0.002	<0.002	<0.001	<0.001	<0.002	<0.002	
Boron	mg/l	5 IMAC	0.37	0.36	0.36		0.29	0.36	0.40	0.37	0.347	0.358	
Cadmium	mg/L	0.005 MAC	<0.005	<0.005	<0.005	<0.005	<0.002	<0.0001	<0.0001	<0.0001	<0.002	<0.002	
Calcium	mg/L		71.7	68.5	77.5	58.1	61.9	66.6	64.0	66.0	66.0	6.94	
Chromium	mg/L	0.05 MAC	<0.005	<0.005	<0.005	<0.01	<0.003	<0.003	<0.005	<0.005	<0.003	<0.003	
Cobalt	mg/L		<0.005	<0.005	<0.005	<0.02	<0.002	<0.0005	<0.0005	<0.0005	<0.001	<0.001	
Copper	mg/L	1 AO	<0.005	<0.005	<0.005	<0.02	<0.003	<0.002	<0.001	0.002	0.003	<0.003	
Iron	mg/L	0.3 AO	**0.49**	**0.54**	**0.44**	**0.41**	**0.566**	**0.34**	**0.44**	**0.50**	**0.574**	0.036	
Lead	mg/L	0.01 MAC	<0.001	0.006	<0.001	<0.05	<0.002	<0.001	<0.0005	<0.0005	0.002	<0.002	
Magnesium	mg/L		34.8	33.5	34.6	31.1	30.9	32.4	31.0	32.0	32.2	3.43	
Manganese	mg/L	0.05 AO	0.019	0.02	0.024	0.02	0.014	0.02	0.016	0.016	0.019	0.003	
Molybdenum	mg/L		<0.02	<0.02	<0.02		0.004	0.01	0.005	0.005	0.005	0.004	
Nickel	mg/L		<0.02	<0.02	<0.02		<0.003	<0.003	<0.001	<0.001	<0.003	<0.003	
Phosphorus	mg/L										<0.05	<0.05	
Selenium	mg/L	0.01 MAC							<0.002	<0.002	<0.004	<0.004	
Silicon	mg/L										6.56	5.84	
Silver	mg/L		<0.005	<0.005	<0.005		<0.002	<0.0001	<0.0001	<0.0001	<0.002	<0.002	
Sodium	mg/L	200 AO	27.6	27.4	28.8	32.1	28.2	31.3	27.0	27.0	26.9	160	
Strontium	mg/L		4.92	5.5	5.47		6.06	5.36	5.6	5.4	5.6	0.558	
Sulphur	mg/L										27.6	25.6	
Thallium	mg/L								<0.00005	<0.00005	<0.006	<0.006	
Tin	mg/L		<0.05	<0.05	<0.05		<0.002	<0.002		<0.001	0.052	<0.002	
Titanium	mg/L		<0.005	<0.005	<0.005		<0.002	<0.002		<0.005	0.002	<0.002	
Uranium	mg/L	0.02 MAC							0.0002	0.0002	<0.002	<0.002	
Vanadium	mg/L		<0.005	<0.005	<0.005		<0.002	<0.002	<0.001	<0.001	0.002	<0.002	
Zinc	mg/L	5 AO	0.034	0.018	0.083	<0.01	0.011	0.01	<0.005	0.006	0.271	<0.005	

Notes:
(1) MOE Ontario Drinking Water Standards.
(2) Operational Guideline (OG) within ODWS.
(3) Aesthetic Objective (AO) within ODWS.
(4) Maximum Acceptable Concentration (MAC) within ODWS.
(5) Interim Maximum Acceptable Concentration (IMAC) within ODWS.
(6) ODWS exceedances indicated by **bold** entries.

The City of Temiskaming Shores
Hydrogeological Characterization
New Liskeard Waste Disposal Site
New Liskeard, Ontario
August 2016

Summary of Residential Geochemical Results WS-13

Parameters	Units	ODWS [1]	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
General Chemistry			**November**	**December**	**December**	**November**	**June**	**October**	**June**	**June**	**June**	**June**	**June**	**May**	**June**	**May**
Alkalinity	mg/L	30-500 OG [2]	289	261	280	247	288	249	280	294	298	284	290	264	271	265
Total Dissolved Solids	mg/L	500 AO [3]	379	278	320	388	294	264	301	305	327	311	326	270	274	280
Chloride	mg/L	250 AO	6.0	4.8	4.3	13.5	2.88	1.97	5.0	3.0	3.0	4.0	4.0	4.47	3.22	2.93
Dissolved Organic Carbon	mg/L	5 AO	3.8	2.8	2.3	5.0	3.0	2.4	3.5	2.4	2.5	2.4	2.3	2.6	2.6	2.6
Potassium	mg/L		<1	<1	2.7	0.94	1.1	1.05	1.2	0.9	1.2	1.2	1.0	1.02	0.96	0.99
Sulphate	mg/L	500 AO	29.8	17.3	27	63.4	18.7	19.2	16.0	10.0	19.0	15.0	21.0	11.3	9.92	9.01
Fluoride	mg/L	1.5 MAC [4]			0.34			0.09			<0.1	<0.1	<0.1	<0.05	<0.10	<0.05
Hardness	mg/L	80 - 100 OG	**14**	**29**	**280**	**270**	**282**	**268**	**260**	**290**	**320**	**300**	**310**	**291**	**277**	**265**
Nitrate	mg/L	10 MAC	<0.2	<0.2	<0.05	<0.05	0.06	<0.05	<0.1	<0.1	<0.1	<0.1	<0.1	<0.05	<0.10	<0.05
Nitrite	mg/L	1 MAC	<0.2	<0.2	<0.01	<0.05	<0.05	<0.05	<0.01	<0.01	<0.01	<0.01	<0.01	<0.05	<0.10	<0.05
Organic Nitrogen	mg/L	0.15 OG		0.14	**0.2**	**0.2**	**0.19**		**0.19**	**0.18**	**0.18**	**0.18**	**0.34**	<0.10	<0.10	<0.10
Total Ammonia	mg/L		0.03	<0.03	<0.02	<0.05	<0.05	<0.02	0.21	<0.05	<0.05	<0.05	<0.05	<0.02	<0.02	<0.02
Total Kjeldahl Nitrogen (TKN)	mg/L			0.17	0.23	0.25	0.24	<0.1	0.4	0.2	0.2	0.2	0.34	<0.10	<0.10	<0.10
Orthophosphate	mg/L		<0.3	<0.3	<0.5	<0.1		<0.1	<0.01	<0.01	<0.01	<0.01	<0.01	<0.10	<0.20	<0.10
pH	pH Units	6.5 - 8.5 OG												8.20	8.13	7.76
Conductivity	µS/cm													530	520	525
Elements																
Aluminum	mg/L	0.1 OG	<0.03	0.08	<0.05	0.014	0.006	0.006	0.007	0.006	<0.005	0.009	0.0073	0.016	0.007	<0.004
Arsenic	mg/L	0.025 IMAC [5]							<0.001	<0.001	<0.001	<0.001	<0.001	<0.003	<0.003	<0.003
Barium	mg/L	1 MAC	<0.005	<0.005	0.034	0.018	0.012	0.016	0.017	0.016	0.018	0.018	0.017	0.016	0.015	0.016
Beryllium	mg/L		<0.0005	<0.0005	<0.001	<0.001	<0.002	<0.002	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.001	<0.001	<0.001
Bismuth	mg/L		<0.2	<0.2	<0.1	<0.002	<0.002	<0.002	<0.001	<0.001	<0.001	<0.001	<0.001	<0.002	<0.002	<0.002
Boron	mg/l	5 IMAC	1.07	0.02	0.04	0.045	<0.01	0.015	0.033	0.02	0.014	0.03	0.021	0.026	0.036	0.022
Cadmium	mg/L	0.005 MAC	<0.005	<0.005	<0.005	<0.002	<0.002	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.002	<0.002	<0.002
Calcium	mg/L		3.44	10.9	71	73.4	74.3	70.7	71	74	84	87	81	78.1	73.2	70.6
Chromium	mg/L	0.05 MAC	<0.005	<0.005	0.005	<0.003	<0.003	0.003	<0.005	<0.005	<0.005	<0.005	<0.005	<0.003	<0.003	<0.003
Cobalt	mg/L		<0.005	<0.005	<0.01	<0.001	<0.002	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.001	<0.001	<0.001
Copper	mg/L	1 AO	0.431	0.116	0.14	0.019	0.12	0.011	0.01	0.003	0.003	0.006	0.0097	0.004	0.02	0.006
Iron	mg/L	0.3 AO	0.03	0.04	<0.01	0.292	0.237	0.17	<0.1	<0.1	<0.1	<0.1	<0.1	<0.010	<0.010	<0.010
Lead	mg/L	0.01 MAC	0.007	<0.001	**0.021**	0.002	0.004	<0.001	0.0008	<0.0005	<0.0005	<0.0005	0.00060	<0.002	<0.002	<0.002
Magnesium	mg/L		1.3	0.44	24	20.9	23.5	22.2	21	22	26	26	25	23.4	22.9	21.5
Manganese	mg/L	0.05 AO	0.008	0.01	0.008	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Molybdenum	mg/L		<0.02	<0.02	<0.01	<0.002	<0.002	<0.002	<0.001	<0.001	<0.001	<0.001	<0.0005	<0.002	<0.002	<0.002
Nickel	mg/L		<0.02	<0.02	<0.01	<0.003	<0.003	<0.003	<0.001	<0.001	<0.001	<0.001	<0.001	<0.003	<0.003	<0.003
Phosphorus	mg/L													<0.05	<0.05	<0.05
Selenium	mg/L	0.01 MAC							<0.002	<0.002	<0.002	<0.002	<0.002	<0.004	<0.004	<0.004
Silicon	mg/L													4.73	4.42	4.78
Silver	mg/L		<0.005	<0.005	<0.01	<0.002	<0.002	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.002	<0.002	<0.002
Sodium	mg/L	200 AO	149	129	6.8	8.8	5.25	4.07	7.7	5.3	5.8	7.1	6.9	6.41	6.12	4.92
Strontium	mg/L		0.004	0.01	0.45	0.127	0.114	0.118	0.12	0.1	0.13	0.13	0.12	0.114	0.121	0.118
Sulphur	mg/L													3.53	2.59	3.04
Thallium	mg/L								<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.006	<0.006	<0.006
Tin	mg/L		<0.05	<0.05	<0.05	0.001	<0.002	<0.002		<0.001	<0.001	<0.001	<0.001	<0.002	<0.002	<0.002
Titanium	mg/L		<0.005	<0.005	<0.01	0.001	<0.002	<0.002		<0.005	<0.005	<0.005	<0.005	<0.002	<0.002	<0.002
Uranium	mg/L	0.02 MAC							0.0004	0.0004	0.0006	0.0006	0.00060	<0.002	<0.002	<0.002
Vanadium	mg/L		<0.005		<0.005	<0.001	<0.002	<0.002	<0.001	<0.001	<0.001	<0.001	0.00060	<0.002	<0.002	<0.002
Zinc	mg/L	5 AO	0.021	0.138	0.011	0.052	0.046	0.019	0.009	<0.005	<0.005	<0.005	0.013	<0.005	0.009	0.005

Notes:
(1) MOE Ontario Drinking Water Standards.
(2) Operational Guideline (OG) within ODWS.
(3) Aesthetic Objective (AO) within ODWS.
(4) Maximum Acceptable Concentration (MAC) within ODWS.
(5) Interim Maximum Acceptable Concentration (IMAC) within ODWS.
(6) ODWS exceedances indicated by **bold** entries.

Summary of Residential Geochemical Results WS-14

Parameters	Units	ODWS [1]	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
General Chemistry			**November**	**December**	**September**	**June**	**August**	**July**	**June**	**June**	**June**	**June**	**June**	**May**	**June**	**May**
Alkalinity	mg/L	30-500 OG [2]	325	329	333	337	328	313	325	325	327	316	330	319	351	310
Total Dissolved Solids	mg/L	500 AO [3]	337	356	345	321	294	288	329	328	341	324	335	294	304	302
Chloride	mg/L	250 AO	0.5	<0.5	0.7	0.79	0.83	0.96	2.0	1.0	1.0	<1	1.0	1.3	1.43	1.38
Dissolved Organic Carbon	mg/L	5 AO	1.0	1.2	1.1	1.0	1.6	1.2	1.2	1.2	1.3	1.1	1.4	1.1	1.5	1.3
Potassium	mg/L		2.0	<1	3.0	3.0	2.95	3.32	3.0	3.1	3.2	3.3	3.3	3.13	3.15	3.1
Sulphate	mg/L	500 AO	8.1	8.3	8.5	8.0	8.37	8.48	9.0	9.0	8.0	7.0	9.0	8.91	9.18	8.53
Fluoride	mg/L	1.5 MAC [4]						0.44			0.4	0.4	0.44	0.32	0.27	0.37
Hardness	mg/L	80 - 100 OG	**326**	**1.4**	**331**	**290**	**285**	**301**	**290**	**300**	**330**	**300**	**310**	**303**	**306**	**291**
Nitrate	mg/L	10 MAC	<0.2	<0.2	<0.2	<0.1	<0.05	<0.05	<0.1	<0.1	<0.1	<0.1	<0.1	<0.05	<0.10	<0.05
Nitrite	mg/L	1 MAC	<0.2	<0.2	<0.2	<0.1	<0.05	<0.05	<0.01	<0.01	<0.01	<0.01	<0.01	<0.05	<0.10	<0.05
Organic Nitrogen	mg/L	0.15 OG		0.05	0.01	0.07	<0.26		0.14	**2.51**	**0.16**		**0.22**	<0.10	0.10	<0.10
Total Ammonia	mg/L		0.26	<0.03	0.3	0.33	0.24	0.12	0.36	0.29	0.24	0.3	0.21	0.25	0.22	0.22
Total Kjeldahl Nitrogen (TKN)	mg/L			0.08	0.31	0.4	<0.5	<0.1	0.5	2.8	0.4	0.3	0.43	0.23	0.32	0.23
Orthophosphate	mg/L		<0.3	<0.3	<0.3	<0.3			<0.01	<0.01	<0.01	<0.01	<0.01	<0.10	<0.20	<0.10
pH	pH Units	6.5 - 8.5 OG												8.31	8.19	7.83
Conductivity	µS/cm													611	594	596
Elements																
Aluminum	mg/L	0.1 OG	<0.03	<0.05	<0.05	<0.1	0.005	<0.004	<0.005	<0.005	<0.005	<0.005	<0.005	<0.004	<0.004	<0.004
Arsenic	mg/L	0.025 IMAC [5]								0.003	0.004	0.003	0.0038	0.004	0.003	0.003
Barium	mg/L	1 MAC	0.087	<0.005	0.081	0.08	0.065	0.08	0.079	0.079	0.083	0.082	0.086	0.081	0.076	0.079
Beryllium	mg/L		<0.0005	<0.0005	<0.0005	<0.005	<0.002	<0.001	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.001	<0.001	<0.001
Bismuth	mg/L		<0.2	<0.2	<0.2	<0.2	<0.002	<0.002	<0.001	<0.001	<0.001	<0.001	<0.001	<0.002	<0.002	<0.002
Boron	mg/l	5 IMAC	0.07	0.08	0.07		0.078	0.09	0.069	0.08	0.09	0.08	0.075	0.082	0.086	0.083
Cadmium	mg/L	0.005 MAC	<0.005	<0.005	<0.005	<0.005	<0.002	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.002	<0.002	<0.002
Calcium	mg/L		72.6	0.45	75.3	61.7	62.9	67.3	66	67	74	73	73	68.5	68.2	65.5
Chromium	mg/L	0.05 MAC	<0.005	<0.005	<0.005	<0.01	<0.003	<0.003	<0.005	<0.005	<0.005	<0.005	<0.005	<0.003	<0.003	<0.003
Cobalt	mg/L		<0.005	<0.005	<0.005	<0.02	<0.002	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.001	<0.001	<0.001
Copper	mg/L	1 AO	0.015	<0.005	<0.005	<0.02	<0.003	0.02	0.011	0.13	0.001	0.02	0.03	0.005	0.064	<0.003
Iron	mg/L	0.3 AO	**1.81**	0.01	**1.6**	**1.44**	**1.55**	**1.33**	**1.9**	**1.6**	**1.6**	**2.6**	**1.9**	**1.46**	**1.36**	**1.55**
Lead	mg/L	0.01 MAC	0.001	<0.001	<0.001	<0.05	<0.002	<0.001	<0.0005	<0.0005	<0.0005	<0.0005	0.00060	<0.002	0.006	<0.002
Magnesium	mg/L		35.2	0.07	34.7	31.9	31	32.4	32	34	35	36	35	32.1	33.0	30.9
Manganese	mg/L	0.05 AO	0.013	<0.005	0.015	0.01	0.01	0.01	0.015	0.011	0.012	0.02	0.014	0.012	0.012	0.015
Molybdenum	mg/L		<0.02	<0.02	<0.02		0.002	0.003	0.003	0.003	0.002	0.003	0.0026	0.003	0.003	0.003
Nickel	mg/L													<0.003	<0.003	<0.003
Phosphorus	mg/L													<0.05	<0.05	<0.05
Selenium	mg/L	0.01 MAC							<0.002	<0.002	<0.002	<0.002	<0.002	<0.004	<0.004	<0.004
Silicon	mg/L													4.93	4.74	4.92
Silver	mg/L		<0.005	<0.005	<0.005		<0.002	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.0001	<0.002	<0.002	<0.002
Sodium	mg/L	200 AO	11.8	152	11.2	10.6	11.3	12.1	10.0	11.0	10.0	12.0	11.0	11.1	11.8	11.2
Strontium	mg/L		1.19	0.002	1.22		1.39	1.24	1.3	1.2	1.3	1.4	1.4	1.4	1.37	1.40
Sulphur	mg/L													2.99	2.38	3.02
Thallium	mg/L								<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.006	<0.006	<0.006
Tin	mg/L		<0.05	<0.05	<0.05		<0.002	<0.002	<0.001	<0.001	<0.001	<0.001	<0.001	<0.002	<0.002	<0.002
Titanium	mg/L		<0.005	<0.005	<0.005		<0.002	<0.002	<0.005	<0.005	<0.005	<0.005	<0.005	<0.002	<0.002	<0.002
Uranium	mg/L	0.02 MAC							0.0008	0.0007	0.0008	0.0008	0.00080	<0.002	<0.002	<0.002
Vanadium	mg/L		<0.005	<0.005	<0.005		<0.002	<0.002	<0.001	<0.001	<0.001	<0.001	0.0006	<0.002	<0.002	<0.002
Zinc	mg/L	5 AO	0.021	<0.005	0.038	<0.01	0.012	0.02	0.007	0.009	0.01	0.011	0.02	0.016	0.034	0.019

Notes:
(1) MOE Ontario Drinking Water Standards.
(2) Operational Guideline (OG) within ODWS.
(3) Aesthetic Objective (AO) within ODWS.
(4) Maximum Acceptable Concentration (MAC) within ODWS.
(5) Interim Maximum Acceptable Concentration (IMAC) within ODWS.
(6) ODWS exceedances indicated by **bold** entries.

The City of Temiskaming Shores
Hydrogeological Characterization
New Liskeard Waste Disposal Site
New Liskeard, Ontario
August 2016

Summary of Residential Geochemical Results WS-15

Parameters	Units	ODWS [1]	2002	2003	2004	2005	2007	2008	2009	2010	2011	2012	2013	2014	2015
General Chemistry			**October**	**December**	**June**	**June**	**July**	**June**	**June**	**June**	**June**	**June**	**May**	**June**	**May**
Alkalinity	mg/L	30-500 OG [2]	278	258	273	280	261	269	271	270	261	270	270	271	264
Total Dissolved Solids	mg/L	500 AO [3]	405	394	412	377	380	409	404	393	379	396	378	392	384
Chloride	mg/L	250 AO	7.8	7.6	8.7	7.02	8.54	9.0	8.0	8.0	9.0	9.0	8.52	8.11	7.75
Dissolved Organic Carbon	mg/L	5 AO	1.0	1.1	1.2	0.9	1.1	1.0	1.0	1.1	1.1	1.4	1.0	1.4	1.4
Potassium	mg/L		4.0	4.0	4.0	4.0	4.5	4.1	4.2	4.1	4.1	4.3	3.98	3.98	3.86
Sulphate	mg/L	500 AO	80.4	85.0	86.2	75.7	82.2	93.0	91.0	74.0	74.0	81.0	82.3	87.1	95.0
Fluoride	mg/L	1.5 MAC [4]					0.9			0.9	1.0	0.94	0.70	0.63	0.79
Hardness	mg/L	80 - 100 OG	**320**	**329**	**322**	**270**	**294**	**290**	**290**	**300**	**280**	**290**	**295**	**297**	**287**
Nitrate	mg/L	10 MAC	<0.2	<0.2	<0.2	<0.1	<0.05	<0.1	<0.1	<0.1	<0.1	<0.1	<0.10	<0.10	<0.05
Nitrite	mg/L	1 MAC	<0.2	<0.2	<0.2	<0.1	<0.05	<0.01	<0.01	<0.01	<0.01	<0.01	<0.10	<0.10	<0.05
Organic Nitrogen	mg/L	0.15 OG	0.10	0.05	0.05	0.05		0.13	0.06	**0.17**	0.09	**0.33**	0.10	<0.10	<0.10
Total Ammonia	mg/L		0.19	0.22	0.23	0.25	0.07	0.37	0.24	0.23	0.21	0.15	0.18	0.15	0.16
Total Kjeldahl Nitrogen (TKN)	mg/L		0.29	0.27	0.28	0.3	<0.1	0.5	0.3	0.4	0.3	0.48	0.28	<0.10	0.17
Orthophosphate	mg/L		<0.3	<0.3	<0.3	<0.3		<0.01	<0.01	<0.01	<0.01	<0.01	<0.20	<0.20	<0.10
pH	pH Units	6.5 - 8.5 OG											8.20	8.16	7.95
Conductivity	µS/cm												698	676	680
Elements															
Aluminum	mg/L	0.1 OG	0.05	0.08	<0.05	<0.1	0.01	<0.005	<0.005	<0.005	0.008	<0.005	0.032	<0.004	0.010
Arsenic	mg/L	0.025 IMAC [5]						<0.001	<0.001	<0.001	<0.001	<0.001	<0.003	<0.003	<0.003
Barium	mg/L	1 MAC	0.049	0.052	0.053	0.05	0.06	0.055	0.055	0.051	0.054	0.057	0.053	0.050	0.052
Beryllium	mg/L		<0.0005	<0.0005	<0.0005	<0.005	<0.001	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.001	<0.001	<0.001
Bismuth	mg/L		<0.2	<0.2	<0.2	<0.2	<0.002	<0.001	<0.001	<0.001	<0.001	<0.001	<0.002	<0.002	<0.002
Boron	mg/l	5 IMAC	0.36	0.37	0.38		0.36	0.44	0.38	0.36	0.36	0.39	0.352	0.361	0.330
Cadmium	mg/L	0.005 MAC	<0.005	<0.005	<0.005	<0.005	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.002	<0.002	<0.002
Calcium	mg/L		70.8	75.9	72.4	57.1	64	64	67	67	65	70	64.8	64.2	63.0
Chromium	mg/L	0.05 MAC	<0.005	<0.005	<0.005	<0.01	<0.003	<0.005	<0.005	<0.005	<0.005	<0.005	<0.003	<0.003	<0.003
Cobalt	mg/L		<0.005	<0.005	<0.005	<0.02	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.001	<0.001	<0.001
Copper	mg/L	1 AO	<0.005	<0.005	<0.005	<0.02	0.07	<0.001	0.003	0.006	0.003	0.005	<0.003	0.006	0.004
Iron	mg/L	0.3 AO	**2.69**	**2.88**	**2.83**	**3.53**	**5.77**	**2.3**	**1.4**	**1.1**	**1.5**	**0.95**	**0.808**	**0.722**	**1.06**
Lead	mg/L	0.01 MAC	<0.001	<0.001	<0.001	<0.05	0.001	<0.0005	<0.0005	<0.0005	<0.0005	0.0006	<0.002	<0.002	<0.002
Magnesium	mg/L		34.9	33.9	34.3	31.9	32.7	32	34	33	35	36	32.4	33.2	31.4
Manganese	mg/L	0.05 AO	0.043	**0.054**	0.047	0.04	0.03	0.035	0.027	0.024	0.026	0.024	0.024	0.024	0.026
Molybdenum	mg/L		<0.02	0.02	<0.02		0.01	0.005	0.005	0.005	0.004	0.0053	0.005	0.004	0.005
Nickel	mg/L												<0.003	<0.003	<0.003
Phosphorus	mg/L												<0.05	<0.05	<0.05
Selenium	mg/L	0.01 MAC						<0.002	<0.002	<0.002	<0.002	<0.002	<0.004	<0.004	<0.004
Silicon	mg/L												5.85	5.64	5.89
Silver	mg/L		<0.005	<0.005	<0.005		<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.002	<0.002	<0.002
Sodium	mg/L	200 AO	28.2	28.9	30.2	28.3	32.0	29.0	30.0	29.0	31.0	32.0	28.7	29.6	28.1
Strontium	mg/L		4.76	5.34	5.34		5.36	5.6	5.6	5.3	5.5	5.7	5.54	5.47	5.34
Sulphur	mg/L												26.3	24.8	28.2
Thallium	mg/L							<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.006	<0.006	<0.006
Tin	mg/L		<0.05	<0.05	<0.05		<0.002		<0.001	<0.001	<0.001	<0.001	<0.002	<0.002	<0.002
Titanium	mg/L		<0.005	<0.005	<0.005		<0.002		<0.005	<0.005	<0.005	<0.005	0.002	<0.002	0.002
Uranium	mg/L	0.02 MAC						0.0003	0.0003	0.0002	0.0002	0.0003	<0.002	<0.002	<0.002
Vanadium	mg/L		<0.005	<0.005	<0.005		<0.002	<0.001	<0.001	<0.001	<0.001	0.0005	<0.002	<0.002	<0.002
Zinc	mg/L	5 AO	0.133	0.252	0.122	0.04	0.94	0.037	0.034	0.023	0.027	0.014	0.062	0.016	0.251

Notes:
(1) MOE Ontario Drinking Water Standards.
(2) Operational Guideline (OG) within ODWS.
(3) Aesthetic Objective (AO) within ODWS.
(4) Maximum Acceptable Concentration (MAC) within ODWS.
(5) Interim Maximum Acceptable Concentration (IMAC) within ODWS.
(6) ODWS exceedances indicated by **bold** entries.

The City of Temiskaming Shores
Hydrogeological Characterization
New Liskeard Waste Disposal Site
New Liskeard, Ontario
August 2016

Summary of Residential Geochemical Results WS-16

Parameters	Units	ODWS (1)	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
General Chemistry			**November**	**December**	**September**	**June**	**June**	**July**	**June**	**June**	**July**	**June**	**June**	**May**	**June**	**May**
Alkalinity	mg/L	30-500 OG (2)	355	350	361	349	346	337	339	350	347	333	360	358	**No sample**	341
Total Dissolved Solids	mg/L	500 AO (3)	371	360	374	340	316	328	345	373	366	350	372	344	**obtained due to**	328
Chloride	mg/L	250 AO	0.8	1.0	1.7	1.6	1.27	1.38	2.0	2.0	2.0	1.0	2.0	2.06	**pump malfunction**	1.98
Dissolved Organic Carbon	mg/L	5 AO	0.8	1.1	1.5	1.1	1	1.2	1.2	1.2	1.3	1.2	1.7	1.2		1.4
Potassium	mg/L		1.0	2.0	3.0	2.0	2.13	2.25	2.2	2.1	2.3	2.4	2.2	2.14		2.06
Sulphate	mg/L	500 AO	12.8	13.0	12.7	12.3	13.4	13.5	12.0	13.0	12.0	11.0	13.0	13.7		13.9
Fluoride	mg/L	1.5 MAC (4)						0.22			0.2	0.3	0.24	0.12		0.18
Hardness	mg/L	80 - 100 OG	**368**	**349**	**362**	**320**	**341**	**346**	**310**	**370**	**360**	**340**	**360**	**360**		**334**
Nitrate	mg/L	10 MAC	<0.2	<0.2	<0.2	<0.1	<0.05	<0.05	<0.1	<0.1	<0.1	<0.1	<0.1	<0.10		<0.05
Nitrite	mg/L	1 MAC	<0.2	<0.2	<0.2	<0.1	<0.05	<0.05	0.01	<0.01	<0.01	<0.01	<0.01	<0.10		<0.05
Organic Nitrogen	mg/L	0.15 OG		0.04	0.05	0.08	**0.55**		**0.16**	**0.22**	**0.19**			<0.10		<0.10
Total Ammonia	mg/L		0.06	0.08	0.09	0.12	0.1	<0.05	0.24	0.08	0.11	0.1	<0.05	0.05		0.03
Total Kjeldahl Nitrogen (TKN)	mg/L			0.12	0.14	0.2	0.65	<0.1	0.4	0.3	0.3	<0.1	<0.1	0.12		<0.10
Orthophosphate	mg/L		<0.3	<0.3	<0.3	<0.3			<0.01	<0.01	<0.01	<0.01	<0.01	<0.20		<0.10
pH	pH Units	6.5 - 8.5 OG												8.23		7.78
Conductivity	µS/cm													679		661
Elements																
Aluminum	mg/L	0.1 OG	<0.03	<0.05	**0.2**	<0.1	<0.004	<0.004	<0.005	<0.005	0.005	<0.005	<0.005	0.005		<0.004
Arsenic	mg/L	0.025 IMAC (5)							0.003	0.003	0.003	0.003	0.0039	0.003		0.004
Barium	mg/L	1 MAC	0.09	0.081	0.085	0.08	0.061	0.07	0.087	0.083	0.086	0.095	0.092	0.091		0.088
Beryllium	mg/L		<0.0005	<0.0005	<0.0005	<0.005	<0.002	<0.001	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.001		<0.001
Bismuth	mg/L		<0.2	<0.2	<0.2	<0.2	<0.002	<0.002	<0.001	<0.001	<0.001	<0.001	<0.001	<0.002		<0.002
Boron	mg/l	5 IMAC	0.02	0.03	0.03		0.015	0.04	0.037	0.03	0.03	0.03	0.024	0.026		0.030
Cadmium	mg/L	0.005 MAC	<0.005	<0.005	<0.005	<0.005	<0.002	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.002		<0.002
Calcium	mg/L		88.5	83.7	86.1	74.2	82.4	83.9	76	88	85	93	89	87.7		81.3
Chromium	mg/L	0.05 MAC	<0.005	<0.005	<0.005	<0.01	<0.003	0.01	<0.005	<0.005	<0.005	<0.005	<0.005	<0.003		<0.003
Cobalt	mg/L		<0.005	<0.005	<0.005	<0.02	<0.002	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.001		<0.001
Copper	mg/L	1 AO	0.017	<0.005	0.011	<0.02	0.016	0.004	0.004	0.009	0.011	0.004	0.0034	0.008		0.009
Iron	mg/L	0.3 AO	**1.87**	**2.34**	**1.95**	**1.55**	**1.97**	<0.005	**1.9**	**1.7**	**2.2**	**2.1**	**1.7**	**2.11**		**1.30**
Lead	mg/L	0.01 MAC	0.004	<0.001	0.001	<0.05	0.003	<0.001	0.0007	<0.0005	0.0006	<0.0005	<0.0005	<0.002		<0.002
Magnesium	mg/L		35.6	33.9	35.7	32.7	32.9	33.2	30	36	37	38	36	34.3		31.8
Manganese	mg/L	0.05 AO	0.019	0.023	**0.056**	0.02	0.019	0.02	0.018	0.018	0.02	0.019	0.018	0.022		0.018
Molybdenum	mg/L		<0.02	<0.02	<0.02		<0.002	<0.002	0.002	0.002	0.002	0.002	0.0019	<0.002		<0.002
Nickel	mg/L													<0.003		<0.003
Phosphorus	mg/L													<0.05		<0.05
Selenium	mg/L	0.01 MAC							<0.002	<0.002	<0.002	<0.002	<0.002	<0.004		<0.004
Silicon	mg/L													5.21		5.32
Silver	mg/L		<0.005	<0.005	<0.005		<0.002	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.002		<0.002
Sodium	mg/L	200 AO	7.2	6.9	7.5	6.8	7.19	7.45	6.7	8.1	8.1	8.6	7.7	7.32		7.23
Strontium	mg/L		0.336	0.331	0.383		0.359	0.34	0.48	0.35	0.41	0.51	0.4	0.379		0.446
Sulphur	mg/L													4.54		4.52
Thallium	mg/L								<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.006		<0.006
Tin	mg/L		<0.05	<0.05	<0.05		<0.002	<0.002		<0.001	<0.001	<0.001	<0.001	<0.002		<0.002
Titanium	mg/L		<0.005	<0.005	<0.005		<0.002	<0.002		<0.005	<0.005	<0.005	<0.005	<0.002		<0.002
Uranium	mg/L	0.02 MAC							0.0012	0.0015	0.0014	0.0014	0.0015	<0.002		<0.002
Vanadium	mg/L		<0.005	<0.005	<0.005		<0.002	<0.002	<0.001	<0.001	<0.001	<0.001	0.00070	<0.002		<0.002
Zinc	mg/L	5 AO	0.156	0.204	0.085	0.08	0.14	0.09	0.14	0.11	0.18	0.065	0.04	0.104		0.735

Notes:
(1) MOE Ontario Drinking Water Standards.
(2) Operational Guideline (OG) within ODWS.
(3) Aesthetic Objective (AO) within ODWS.
(4) Maximum Acceptable Concentration (MAC) within ODWS.
(5) Interim Maximum Acceptable Concentration (IMAC) within ODWS.
(6) ODWS exceedances indicated by **bold** entries.

May 2015 Groundwater Duplicate Data

Parameters	Units	May-15								
		OW-16-I	NL GW DUP-1	Relative Percent Difference (%)	OW-25-III	NL GW DUP-2	Relative Percent Difference (%)	OW-23-II	NL GW DUP-3	Relative Percent Difference (%)
General Chemistry										
Alkalinity	mg/L	310	298	3.947	307	296	3.648	220	214	2.765
Chloride	mg/L	6.69	6.43	3.963	1.36	1.31	3.745	11.2	10.9	2.715
Dissolved Organic Carbon	mg/L	8.9	8.7	2.273	1.0	1.2	(18.182)	1.6	1.8	(11.765)
Fluoride	mg/L	1.7	1.58	4.334	1.14	1.17	(2.597)	1.02	1.22	(17.857)
Sulphate	mg/L	3.55	3.58	(0.842)	130	128	1.550	104	102	1.942
Hardness	mg/L	81.7	81.9	(0.244)	341	335	1.775	143	141	1.408
Nitrate	mg/L	<0.05	<0.05	**NC**	<0.25	<0.25	**NC**	0.08	<0.10	**NC**
Nitrite	mg/L	<0.05	<0.05	**NC**	<0.25	<0.25	**NC**	<0.05	<0.10	**NC**
Organic Nitrogen	mg/L	0.71	0.76	(6.803)	<0.10	<0.10	**NC**	0.1	<0.10	**NC**
Orthophosphate	mg/L	<0.10	<0.10	**NC**	<0.50	<0.50	**NC**	<0.10	<0.20	**NC**
pH	pH Units	8.26	8.45	(2.274)	8.15	8.17	(0.245)	8.41	8.46	(0.593)
Electrical Conductivity	µS/cm	600	608	(1.325)	818	801	2.100	675	680	(0.738)
Total Ammonia	mg/L	1.15	1.18	(2.575)	<0.02	<0.02	**NC**	<0.02	<0.02	**NC**
Total Dissolved Solids	mg/L	400	418	(4.401)	450	444	1.342	362	370	(2.186)
Total Kjeldahl Nitrogen (TKN)	mg/L	1.86	1.94	(4.211)	<0.10	<0.10	**NC**	0.10	<0.10	**NC**
Total Phosphorus	mg/L	<0.05	0.05	**NC**	<0.05	<0.05	**NC**	<0.05	<0.05	**NC**
Metals										
Aluminum	mg/L	0.007	0.017	**(83.333)**	0.005	0.004	22.222	0.009	0.010	(10.526)
Arsenic	mg/L	<0.003	<0.003	**NC**	<0.003	<0.003	**NC**	<0.003	<0.003	**NC**
Barium	mg/L	0.037	0.035	5.556	0.031	0.030	3.279	0.024	0.026	(8.000)
Beryllium	mg/L	<0.001	<0.001	**NC**	<0.001	<0.001	**NC**	<0.001	<0.001	**NC**
Bismuth	mg/L	<0.002	<0.002	**NC**	<0.002	<0.002	**NC**	<0.002	<0.002	**NC**
Boron	mg/l	0.413	0.446	(7.683)	0.05	0.05	0.000	0.285	0.333	(15.534)
Cadmium	mg/L	<0.002	<0.002	**NC**	<0.002	<0.002	**NC**	<0.002	<0.002	**NC**
Calcium	mg/L	13.6	13.5	0.738	65.3	64.5	1.233	23.0	22.8	0.873
Chromium	mg/L	<0.003	<0.003	**NC**	<0.003	<0.003	**NC**	<0.003	<0.003	**NC**
Cobalt	mg/L	<0.001	<0.001	**NC**	<0.001	<0.001	**NC**	<0.001	<0.001	**NC**
Copper	mg/L	<0.003	<0.003	**NC**	<0.003	<0.003	**NC**	<0.003	<0.003	**NC**
Iron	mg/L	0.157	0.164	(4.361)	<0.010	<0.010	**NC**	<0.010	<0.010	**NC**
Lead	mg/L	<0.002	<0.002	**NC**	<0.002	<0.002	**NC**	<0.002	<0.002	**NC**
Magnesium	mg/L	11.6	11.7	(0.858)	43.2	42.3	2.105	20.7	20.3	1.951
Manganese	mg/L	0.021	0.021	0.000	0.005	0.006	(18.182)	0.007	0.007	0.000
Molybdenum	mg/L	0.013	0.013	0.000	0.008	0.008	0.000	0.038	0.042	(10.000)
Nickel	mg/L	<0.003	<0.003	**NC**	<0.003	<0.003	**NC**	<0.003	<0.003	**NC**
Potassium	mg/L	4.44	4.47	(0.673)	5.56	5.43	2.366	4.36	4.25	2.555
Selenium	mg/L	<0.004	<0.004	**NC**	<0.004	<0.004	**NC**	<0.004	<0.004	**NC**
Silicon	mg/L	7.41	7.52	(1.474)	4.42	4.67	(5.501)	2.86	3.10	(8.054)
Silver	mg/L	<0.002	<0.002	**NC**	<0.002	<0.002	**NC**	<0.002	<0.002	**NC**
Sodium	mg/L	108	108	0.000	34.8	34.1	2.032	91.1	88.6	2.782
Strontium	mg/L	0.491	0.470	4.370	2.54	2.66	(4.615)	0.674	0.724	(7.153)
Sulphur	mg/L	1.80	1.83	(1.653)	47.1	47.9	(1.684)	38.6	38.4	0.519
Thallium	mg/L	<0.006	<0.006	**NC**	<0.006	<0.006	**NC**	<0.006	<0.006	**NC**
Tin	mg/L	<0.002	<0.002	**NC**	<0.002	<0.002	**NC**	<0.002	<0.002	**NC**
Titanium	mg/L	<0.002	<0.002	**NC**	0.002	0.002	0.000	<0.002	0.002	**NC**
Uranium	mg/L	<0.002	<0.002	**NC**	0.003	0.003	0.000	<0.002	<0.002	**NC**
Vanadium	mg/L	<0.002	<0.002	**NC**	<0.002	<0.002	**NC**	<0.002	<0.002	**NC**
Zinc	mg/L	<0.005	<0.005	**NC**	<0.005	<0.005	**NC**	<0.005	<0.005	**NC**

Notes:
(1) NC - not calculable as one or both concentrations are below the laboratory method detection limit.

July 2015 Groundwater Duplicate Data

Parameters	Units	Jul-15								
		OW-25-I	NL GW DUP-1	Relative Percent Difference (%)	OW-17-I	NL GW DUP-2	Relative Percent Difference (%)	OW-23-II	NL GW DUP-3	Relative Percent Difference (%)
General Chemistry										
Alkalinity	mg/L	231	232	(0.432)	235	240	(2.105)	221	221	0.000
Chloride	mg/L	1.48	1.39	6.272	0.82	0.76	7.595	10.2	10.7	(4.785)
Dissolved Organic Carbon	mg/L	3.2	2.9	9.836	2.5	2.8	(11.321)	2.3	2.2	4.444
Fluoride	mg/L	0.46	0.46	0.000	0.19	0.20	(5.128)	1.13	1.02	10.233
Sulphate	mg/L	6.11	4.32	34.324	16.5	16.5	0.000	97.2	102	(4.819)
Hardness	mg/L	177	176	0.567	246	246	0.000	142	145	(2.091)
Nitrate	mg/L	<0.10	<0.10	**NC**	<0.10	<0.10	**NC**	0.17	0.19	(11.111)
Nitrite	mg/L	<0.10	<0.10	**NC**	<0.10	<0.10	**NC**	<0.10	<0.10	**NC**
Organic Nitrogen	mg/L	0.39	0.23	**51.613**	<0.10	<0.10	**NC**	0.21	0.21	0.000
Orthophosphate	mg/L	<0.20	<0.20	**NC**	<0.20	<0.20	**NC**	<0.20	<0.20	**NC**
pH	pH Units	8.15	8.23	(0.977)	8.18	8.14	0.490	8.2	8.22	(0.244)
Electrical Conductivity	µS/cm	454	456	(0.440)	486	488	(0.411)	666	676	(1.490)
Total Ammonia	mg/L	0.22	0.31	(33.962)	0.07	0.02	**111.111**	<0.02	<0.02	**NC**
Total Dissolved Solids	mg/L	240	238	0.837	254	254	0.000	352	332	5.848
Total Kjeldahl Nitrogen (TKN)	mg/L	0.61	0.54	12.174	<0.10	0.10	**NC**	0.21	0.21	0.000
Total Phosphorus	mg/L	<0.05	<0.05	**NC**	<0.05	<0.05	**NC**	<0.05	<0.05	**NC**
Metals										
Aluminum	mg/L	0.005	0.006	(18.182)	<0.004	0.007	**NC**	0.018	0.052	**(97.143)**
Arsenic	mg/L	<0.003	<0.003	**NC**	<0.003	<0.003	**NC**	<0.003	<0.003	**NC**
Barium	mg/L	0.041	0.04	2.469	0.027	0.029	(7.143)	0.023	0.028	(19.608)
Beryllium	mg/L	<0.001	<0.001	**NC**	<0.001	<0.001	**NC**	<0.001	<0.001	**NC**
Bismuth	mg/L	<0.002	<0.002	**NC**	<0.002	<0.002	**NC**	<0.002	<0.002	**NC**
Boron	mg/l	0.127	0.125	1.587	0.028	0.032	(13.333)	0.309	0.349	(12.158)
Cadmium	mg/L	<0.002	<0.002	**NC**	<0.002	<0.002	**NC**	<0.002	<0.002	**NC**
Calcium	mg/L	39.0	38.4	1.550	65.5	65.7	(0.305)	22.5	23.1	(2.632)
Chromium	mg/L	<0.003	<0.003	**NC**	<0.003	<0.003	**NC**	0.009	0.016	**(56.000)**
Cobalt	mg/L	<0.001	<0.001	**NC**	<0.001	<0.001	**NC**	<0.001	<0.001	**NC**
Copper	mg/L	<0.003	<0.003	**NC**	<0.003	<0.003	**NC**	<0.003	<0.003	**NC**
Iron	mg/L	0.151	0.164	(8.254)	0.371	0.379	(2.133)	<0.010	<0.010	**NC**
Lead	mg/L	<0.002	<0.002	**NC**	<0.002	<0.002	**NC**	<0.002	<0.002	**NC**
Magnesium	mg/L	19.3	19.4	(0.517)	19.9	19.9	0.000	20.9	21.1	(0.952)
Manganese	mg/L	0.024	0.024	0.000	0.024	0.025	(4.082)	0.003	0.005	(50.000)
Molybdenum	mg/L	<0.002	0.003	**NC**	<0.002	<0.002	**NC**	0.035	0.037	(5.556)
Nickel	mg/L	<0.003	<0.003	**NC**	<0.003	<0.003	**NC**	<0.003	<0.003	**NC**
Potassium	mg/L	3.87	3.95	(2.046)	3.29	3.27	0.610	4.15	4.17	(0.481)
Selenium	mg/L	<0.004	<0.004	**NC**	<0.004	<0.004	**NC**	<0.004	<0.004	**NC**
Silicon	mg/L	6.35	6.27	1.268	6.63	7.0	(5.429)	2.41	3.16	(26.930)
Silver	mg/L	<0.002	<0.002	**NC**	<0.002	<0.002	**NC**	<0.002	<0.002	**NC**
Sodium	mg/L	27.5	27.8	(1.085)	4.91	4.90	0.204	86.0	85.6	0.466
Strontium	mg/L	0.73	0.818	(11.370)	0.499	0.505	(1.195)	0.75	0.718	4.360
Sulphur	mg/L	0.54	0.63	(15.385)	5.31	5.27	0.756	31.6	32.5	(2.808)
Thallium	mg/L	<0.006	<0.006	**NC**	<0.006	<0.006	**NC**	<0.006	<0.006	**NC**
Tin	mg/L	<0.002	<0.002	**NC**	<0.002	<0.002	**NC**	<0.002	<0.002	**NC**
Titanium	mg/L	<0.002	<0.002	**NC**	<0.002	<0.002	**NC**	<0.002	0.003	**NC**
Uranium	mg/L	<0.002	<0.002	**NC**	<0.002	<0.002	**NC**	<0.002	<0.002	**NC**
Vanadium	mg/L	<0.002	<0.002	**NC**	<0.002	<0.002	**NC**	<0.002	<0.002	**NC**
Zinc	mg/L	<0.005	<0.005	**NC**	<0.005	0.008	**NC**	<0.005	0.006	**NC**

Notes:
(1) NC - not calculable as one or both concentrations are below the laboratory method detection limit.

September 2015 Groundwater Duplicate Data

Parameters	Units	Sep-15								
		OW-24-I	NL GW DUP-1	Relative Percent Difference (%)	OW-17-I	NL GW DUP-2	Relative Percent Difference (%)	OW-1R-III	NL GW DUP-3	Relative Percent Difference (%)
General Chemistry										
Alkalinity	mg/L	235	234	0.426	228	228	0.000	978	841	15.063
Chloride	mg/L	2.1	1.91	9.950	0.69	0.75	(8.333)	277	270	2.559
Dissolved Organic Carbon	mg/L	2.0	2.2	(9.524)	2.1	2.0	4.878	28.8	23.6	19.847
Fluoride	mg/L	0.33	0.32	3.077	0.34	0.27	22.951	<0.25	<0.25	**NC**
Sulphate	mg/L	20.8	21.3	(2.375)	16.5	16.8	(1.802)	171	173	(1.163)
Hardness	mg/L	234	211	10.337	235	234	0.426	821	798	2.841
Nitrate	mg/L	<0.05	<0.05	**NC**	<0.05	0.05	**NC**	7.18	10.2	(34.753)
Nitrite	mg/L	<0.05	<0.05	**NC**	<0.05	<0.05	**NC**	<0.25	<0.25	**NC**
Organic Nitrogen	mg/L	0.25	0.25	0.000	<0.10	0.14	**NC**	2.5	1.9	27.273
Orthophosphate	mg/L	<0.10	<0.10	**NC**	<0.10	<0.10	**NC**	<0.50	<0.50	**NC**
pH	pH Units	8.06	8.22	(1.966)	8.03	8.14	(1.361)	7.94	7.94	0.000
Electrical Conductivity	µS/cm	497	493	0.808	471	468	0.639	2920	2590	11.978
Total Ammonia	mg/L	0.03	0.03	0.000	<0.02	<0.02	**NC**	21.1	16.2	26.273
Total Dissolved Solids	mg/L	256	266	(3.831)	244	244	0.000	1610	1510	6.410
Total Kjeldahl Nitrogen (TKN)	mg/L	0.28	0.28	0.000	<0.10	0.14	**NC**	23.6	18.1	26.379
Total Phosphorus	mg/L	<0.05	<0.05	**NC**	<0.05	<0.05	**NC**	<0.05	<0.05	**NC**
Metals										
Aluminum	mg/L	0.051	0.013	**118.750**	<0.004	<0.004	**NC**	<0.004	<0.004	**NC**
Arsenic	mg/L	<0.003	0.004	**NC**	<0.003	<0.003	**NC**	<0.003	<0.003	**NC**
Barium	mg/L	0.044	0.048	(8.696)	0.031	0.030	3.279	0.125	0.123	1.613
Beryllium	mg/L	<0.001	<0.001	**NC**	<0.001	<0.001	**NC**	<0.001	<0.001	**NC**
Bismuth	mg/L	<0.002	<0.002	**NC**	<0.002	<0.002	**NC**	<0.002	<0.002	**NC**
Boron	mg/l	0.046	0.047	(2.151)	0.031	0.031	0.000	1.52	1.64	(7.595)
Cadmium	mg/L	<0.002	<0.002	**NC**	<0.002	<0.002	**NC**	<0.002	<0.002	**NC**
Calcium	mg/L	60.5	54.2	10.985	62.9	62.3	0.958	149	168	(11.987)
Chromium	mg/L	<0.003	<0.003	**NC**	<0.003	<0.003	**NC**	0.004	<0.003	**NC**
Cobalt	mg/L	<0.001	0.001	**NC**	<0.001	<0.001	**NC**	0.005	0.005	0.000
Copper	mg/L	<0.003	<0.003	**NC**	<0.003	<0.003	**NC**	0.012	0.013	(8.000)
Iron	mg/L	1.56	0.93	**50.301**	0.123	0.111	10.256	<0.010	<0.010	**NC**
Lead	mg/L	<0.002	<0.002	**NC**	<0.002	<0.002	**NC**	<0.002	<0.002	**NC**
Magnesium	mg/L	20.1	18.3	9.375	19.0	19.0	0.000	109	91.8	17.131
Manganese	mg/L	0.062	0.058	6.667	0.015	0.014	6.897	0.810	0.862	(6.220)
Molybdenum	mg/L	0.006	0.008	(28.571)	<0.002	<0.002	**NC**	<0.002	<0.002	**NC**
Nickel	mg/L	0.004	0.004	0.000	<0.003	<0.003	**NC**	0.040	0.041	(2.469)
Potassium	mg/L	4.29	3.82	11.591	3.26	3.50	(7.101)	107.0	87.7	19.825
Selenium	mg/L	<0.004	<0.004	**NC**	<0.004	<0.004	**NC**	<0.004	<0.004	**NC**
Silicon	mg/L	7.02	6.45	8.463	8.43	7.92	6.239	6.59	6.44	2.302
Silver	mg/L	<0.002	<0.002	**NC**	<0.002	<0.002	**NC**	<0.002	<0.002	**NC**
Sodium	mg/L	13.4	13.4	0.000	4.84	5.09	(5.035)	204	172	17.021
Strontium	mg/L	0.403	0.395	2.005	0.484	0.464	4.219	1.05	1.03	1.923
Sulphur	mg/L	6.74	6.64	1.495	5.65	5.61	0.710	56.1	54.2	3.445
Thallium	mg/L	<0.006	<0.006	**NC**	<0.006	<0.006	**NC**	<0.006	<0.006	**NC**
Tin	mg/L	<0.002	<0.002	**NC**	<0.002	<0.002	**NC**	<0.002	<0.002	**NC**
Titanium	mg/L	0.003	<0.002	**NC**	<0.002	<0.002	**NC**	0.005	0.004	22.222
Uranium	mg/L	<0.002	<0.002	**NC**	<0.002	<0.002	**NC**	<0.002	<0.002	**NC**
Vanadium	mg/L	<0.002	<0.002	**NC**	<0.002	<0.002	**NC**	<0.002	<0.002	**NC**
Zinc	mg/L	<0.005	<0.005	**NC**	<0.005	0.006	**NC**	0.006	<0.005	**NC**

Notes:
(1) NC - not calculable as one or both concentrations are below the laboratory method detection limit.

The City of Temiskaming Shores
Hydrogeological Characterization
New Liskeard Waste Disposal Site
New Liskeard, Ontario
August 2016

2015 Residential Supply Well Duplicate Data

Parameters	Units	May-15		
		WS-8	NL RES DUP	Relative Percent Difference (%)
General Chemistry				
Alkalinity	mg/L	297	295	0.676
Total Dissolved Solids	mg/L	378	366	3.226
Chloride	mg/L	28.7	28.60	0.349
Dissolved Organic Carbon	mg/L	1.3	1.4	(7.407)
Potassium	mg/L	2.28	2.24	1.770
Sulphate	mg/L	30.3	30.2	0.331
Fluoride	mg/L	0.16	0.15	6.452
Hardness	mg/L	342	339	0.881
Nitrate	mg/L	<0.05	<0.05	**NC**
Nitrite	mg/L	<0.05	<0.05	**NC**
Organic Nitrogen	mg/L	<0.10	<0.10	**NC**
Total Ammonia	mg/L	0.06	0.06	0.000
Total Kjeldahl Nitrogen (TKN)	mg/L	0.10	<0.10	**NC**
Orthophosphate	mg/L	<0.10	<0.10	**NC**
pH	pH Units	7.88	7.95	(0.884)
Conductivity	µS/cm	692	708	(2.286)
Elements				
Aluminum	mg/L	<0.004	<0.004	**NC**
Arsenic	mg/L	<0.003	<0.003	**NC**
Barium	mg/L	0.060	0.061	(1.653)
Beryllium	mg/L	<0.001	<0.001	**NC**
Bismuth	mg/L	<0.002	<0.002	**NC**
Boron	mg/l	0.014	0.015	(6.897)
Cadmium	mg/L	<0.002	<0.002	**NC**
Calcium	mg/L	82.2	81.0	1.471
Chromium	mg/L	<0.003	<0.003	**NC**
Cobalt	mg/L	<0.001	<0.001	**NC**
Copper	mg/L	<0.003	<0.003	**NC**
Iron	mg/L	1.27	1.29	(1.563)
Lead	mg/L	<0.002	<0.002	**NC**
Magnesium	mg/L	33.3	33.2	0.301
Manganese	mg/L	0.027	0.027	0.000
Molybdenum	mg/L	<0.002	<0.002	**NC**
Nickel	mg/L	<0.003	<0.003	**NC**
Phosphorus	mg/L	<0.05	<0.05	**NC**
Selenium	mg/L	<0.004	<0.004	**NC**
Silicon	mg/L	9.61	9.52	0.941
Silver	mg/L	<0.002	<0.002	**NC**
Sodium	mg/L	7.66	7.64	0.261
Strontium	mg/L	0.231	0.23	2.632
Sulphur	mg/L	9.94	10.0	(0.201)
Thallium	mg/L	<0.006	<0.006	**NC**
Tin	mg/L	<0.002	<0.002	**NC**
Titanium	mg/L	<0.002	<0.002	**NC**
Uranium	mg/L	<0.002	<0.002	**NC**
Vanadium	mg/L	<0.002	<0.002	**NC**
Zinc	mg/L	<0.005	<0.005	**NC**

Notes:
(1) NC - not calculable as one or both concentrations are below the laboratory method detection limit.

APPENDIX F

GROUNDWATER IONIC BALANCE AND PIPER PLOT DATA TABLE

Groundwater Ionic Balance and Piper Plot Data - May 2015

Raw Data (mg/L)	OW-1R-I	OW-1R-III	OW-10-I	OW-10-II	OW-25-I	OW-25-II	OW-25-III	OW-16-I	OW-16-II	OW-16-III	OW-24-I	OW-24-II	OW-24-III	OW-17-I	OW-17-II	OW-17-III	OW-30-I	OW-30-II
Ca	163	131	93	113	34.8	26.3	65.3	13.6	24.8	87.7	50.6	42.4	66.9	61.1	38.4	46.2	26.3	17.7
Mg	116	86.4	31.1	19.7	18.4	18.2	43.2	11.6	16.2	35.3	19.3	30.3	13.9	18.1	31.7	13.7	19.2	12.0
Na	187	155	4.2	2.2	29.1	115	34.8	108	69.7	10.7	9.6	21.9	6.7	4.5	55.3	3.9	116	120
K	78.9	78.1	4.0	1.0	3.9	8.4	5.6	4.4	7.6	7.4	4.8	9.5	1.8	3.1	4.8	0.83	12.9	5.3
Cl	274	164	3.3	2.1	1.3	8.8	1.4	6.7	4.7	3.4	1.6	15.0	3.6	0.9	2.4	1.4	24.4	8.8
SO4	207	131	137	126	0.90	218	130	3.6	108	7.6	16.9	10.4	14.1	14.8	68.8	2.8	225	138
ALK	951	764	253	247	221	145	307	310	167	423	213	263	227	219	274	175	137	192
pH	7.60	7.81	8.15	8.10	8.39	8.33	8.15	8.26	8.30	7.99	8.32	8.36	8.25	8.27	8.37	7.88	8.34	8.44
Ion Balance Data and Piper Plot (%)																		
Cations:	27.83	22.39	7.50	7.38	4.62	8.03	8.47	6.44	5.80	7.94	4.65	5.80	4.82	4.81	7.05	3.62	8.27	7.23
Anions:	31.04	22.62	8.00	7.62	4.47	7.68	8.88	6.46	5.72	8.70	4.65	5.89	4.93	4.71	6.97	3.59	8.11	6.96
CBE (%):	-5.45	-0.52	-3.19	-1.57	1.63	2.19	-2.36	-0.08	0.69	-4.61	-0.01	-0.75	-1.13	1.11	0.56	0.37	0.98	1.91
Mg:	34.3	31.8	34.1	22.0	32.8	18.7	42.0	14.8	23.0	36.6	34.1	43.0	23.7	31.0	37.0	31.1	19.1	13.7
Ca:	29.2	29.2	62.1	76.4	37.6	16.4	38.5	10.5	21.3	55.1	54.3	36.4	69.3	63.4	27.2	63.7	15.9	12.2
Na+K:	36.5	39.0	3.8	1.7	29.6	65.0	19.6	74.7	55.7	8.3	11.6	20.6	7.0	5.7	35.8	5.2	65.0	74.1
Cl:	24.9	20.5	1.1	0.8	0.8	3.2	0.4	2.9	2.3	1.1	1.0	7.2	2.0	0.5	1.0	1.1	8.5	3.6
SO4:	13.9	12.1	35.7	34.4	0.4	59.1	30.5	1.1	39.3	1.8	7.6	3.7	6.0	6.5	20.5	1.6	57.8	41.3
HCO3+CO3:	61.2	67.5	63.2	64.8	98.8	37.7	69.1	95.9	58.3	97.1	91.4	89.1	92.0	92.9	78.5	97.3	33.7	55.1

Groundwater Ionic Balance and Piper Plot Data - July 2015

Raw Data (mg/L)	OW-1R-I	OW-1R-III	OW-10-I	OW-10-II	OW-25-I	OW-25-II	OW-25-III	OW-16-I	OW-16-II	OW-16-III	OW-24-I	OW-24-II	OW-24-III	OW-17-I	OW-17-II	OW-17-III	OW-30-I	OW-30-II
Ca	188	190	143	100	39.0	27.1	83.3	13.9	27.1	105	57.1	49.3	85.5	65.5	36.8	91.4	24.3	17.3
Mg	124	110	26.1	32.5	19.3	18.7	38.0	12.0	17.2	39.2	20.6	34.7	21.0	19.9	31.7	27.2	20.8	14.2
Na	186	177	2.1	4.3	27.5	110	29.7	106	68.5	12.2	16.7	21.4	6.5	4.9	66.8	5.9	112	112
K	89.6	94.9	1.4	4.4	3.9	8.1	4.9	4.5	7.8	9.7	4.0	9.6	1.2	3.3	4.4	0.66	11.8	6.3
Cl	268	271	2.6	2.8	1.5	10.2	1.0	5.9	4.8	4.0	2.7	12.6	3.7	0.8	2.7	2.7	18.7	8.8
SO4	206	177	200	135	6.1	237	97	2.7	117	4.5	21.2	18.7	9.6	16.5	70.7	3.8	245	165
ALK	912	976	267	262	231	147	332	290	171	452	241	282	252	235	298	319	124	168
pH	7.97	7.87	7.74	8.03	8.15	8.04	8.20	8.19	8.06	8.10	8.17	8.24	8.17	8.18	8.25	8.13	8.04	8.06
Ion Balance Data and Piper Plot (%)																		
Cations:	29.97	28.66	9.41	7.96	4.83	7.88	8.70	6.41	5.95	9.24	5.37	6.49	6.31	5.20	7.46	7.07	8.10	7.06
Anions:	30.07	30.83	9.57	8.12	4.78	8.16	8.67	6.02	5.99	9.24	5.33	6.38	5.34	5.06	7.50	6.53	8.11	7.04
CBE (%):	-0.17	-3.65	-0.85	-1.00	0.48	-1.71	0.16	3.15	-0.34	0.03	0.38	0.88	8.33	1.39	-0.25	3.99	-0.04	0.17
Mg:	34.0	31.6	22.8	33.6	32.9	19.5	35.9	15.4	23.8	34.9	31.5	44.0	27.4	31.5	35.0	31.7	21.1	16.5
Ca:	31.3	33.1	75.8	62.7	40.3	17.2	47.8	10.8	22.7	56.7	53.0	37.9	67.6	62.8	24.6	64.5	15.0	12.2
Na+K:	34.6	35.3	1.3	3.7	26.8	63.3	16.3	73.8	53.5	8.4	15.4	18.1	5.0	5.7	40.4	3.8	63.9	71.2
Cl:	25.1	24.8	0.8	1.0	0.9	3.5	0.3	2.8	2.3	1.2	1.4	5.6	2.0	0.5	1.0	1.1	6.5	3.5
SO4:	14.3	12.0	43.5	34.6	2.7	60.5	23.2	0.9	40.7	1.0	8.3	6.1	3.7	6.8	19.6	1.2	62.9	48.8
HCO3+CO3:	60.6	63.3	55.7	64.4	96.5	36.0	76.5	96.3	57.1	97.8	90.3	88.3	94.3	92.8	79.4	97.6	30.6	47.7

Groundwater Ionic Balance and Piper Plot Data - September 2015

Raw Data (mg/L)	OW-1R-I	OW-1R-III	OW-10-I	OW-10-II	OW-25-I	OW-25-II	OW-25-III	OW-16-I	OW-16-II	OW-16-III	OW-24-I	OW-24-II	OW-24-III	OW-17-I	OW-17-II	OW-30-I	OW-30-II
Ca	132	149	110	150	35.7	27.1	81.8	18.1	26.8	94.5	60.5	55.1	74.9	62.9	21.6	21.9	18.3
Mg	84	109	33.3	26.8	18.6	18.1	39.1	13.7	17.4	26.4	20.1	33.9	15.1	19.0	19.5	18.7	15.0
Na	127	204	3.9	2.3	29.4	115	32.4	109	70.0	8.5	13.4	17.2	7.8	4.8	86.8	117	116
K	56.8	107	4.5	1.8	4.0	8.5	5.4	5.9	8.3	2.8	4.3	8.1	5.8	3.3	4.2	10.5	7.2
Cl	173	277	3.1	2.7	1.3	9.6	1.3	5.3	5.4	5.5	2.1	7.4	4.5	0.69	9.8	17.4	7.6
SO4	162	171	153	200	1.2	223	116	1.8	118	29.9	20.8	14.2	21.6	16.5	83.7	222	165
ALK	670	978	256	261	225	143	314	304	165	321	235	292	211	228	211	123	174
pH	7.98	7.94	7.65	7.93	8.13	8.13	8.15	8.12	7.94	8.06	8.06	8.15	7.97	8.03	8.13	7.98	8.00
Ion Balance Data and Piper Plot (%)																	
Cations:	20.48	28.02	8.51	9.83	4.69	8.06	8.85	6.92	6.03	7.33	5.37	6.49	5.47	5.00	6.57	7.99	7.38
Anions:	21.64	30.92	8.39	9.46	4.56	7.77	8.73	6.26	5.91	7.19	5.19	6.34	4.79	4.92	6.23	7.57	7.12
CBE (%):	-2.76	-4.92	0.74	1.96	1.47	1.84	0.68	5.02	1.02	0.96	1.69	1.21	6.58	0.79	2.59	2.70	1.75
Mg:	33.8	32.0	32.2	22.4	32.6	18.5	36.4	16.3	23.8	29.6	30.8	43.0	22.7	31.3	24.4	19.3	16.7
Ca:	32.2	26.5	64.5	76.1	38.0	16.8	46.1	13.0	22.2	64.3	56.3	42.3	68.4	62.8	16.4	13.7	12.4
Na+K:	34.1	41.4	3.3	1.5	29.4	64.7	17.5	70.7	54.1	6.0	12.9	14.7	8.9	5.9	59.1	67.1	70.9
Cl:	22.6	25.3	1.0	0.8	0.8	3.5	0.4	2.4	2.6	2.1	1.1	3.3	2.7	0.4	4.4	6.5	3.0
SO4:	15.6	11.5	38.0	44.0	0.6	59.7	27.7	0.6	41.6	8.7	8.3	4.7	9.4	7.0	28.0	61.1	48.2
HCO3+CO3:	61.9	63.2	61.0	55.1	98.6	36.8	71.9	97.0	55.8	89.2	90.5	92.0	88.0	92.6	67.6	32.5	48.8

Residential Groundwater Ionic Balance and Piper Plot Data - May 2015

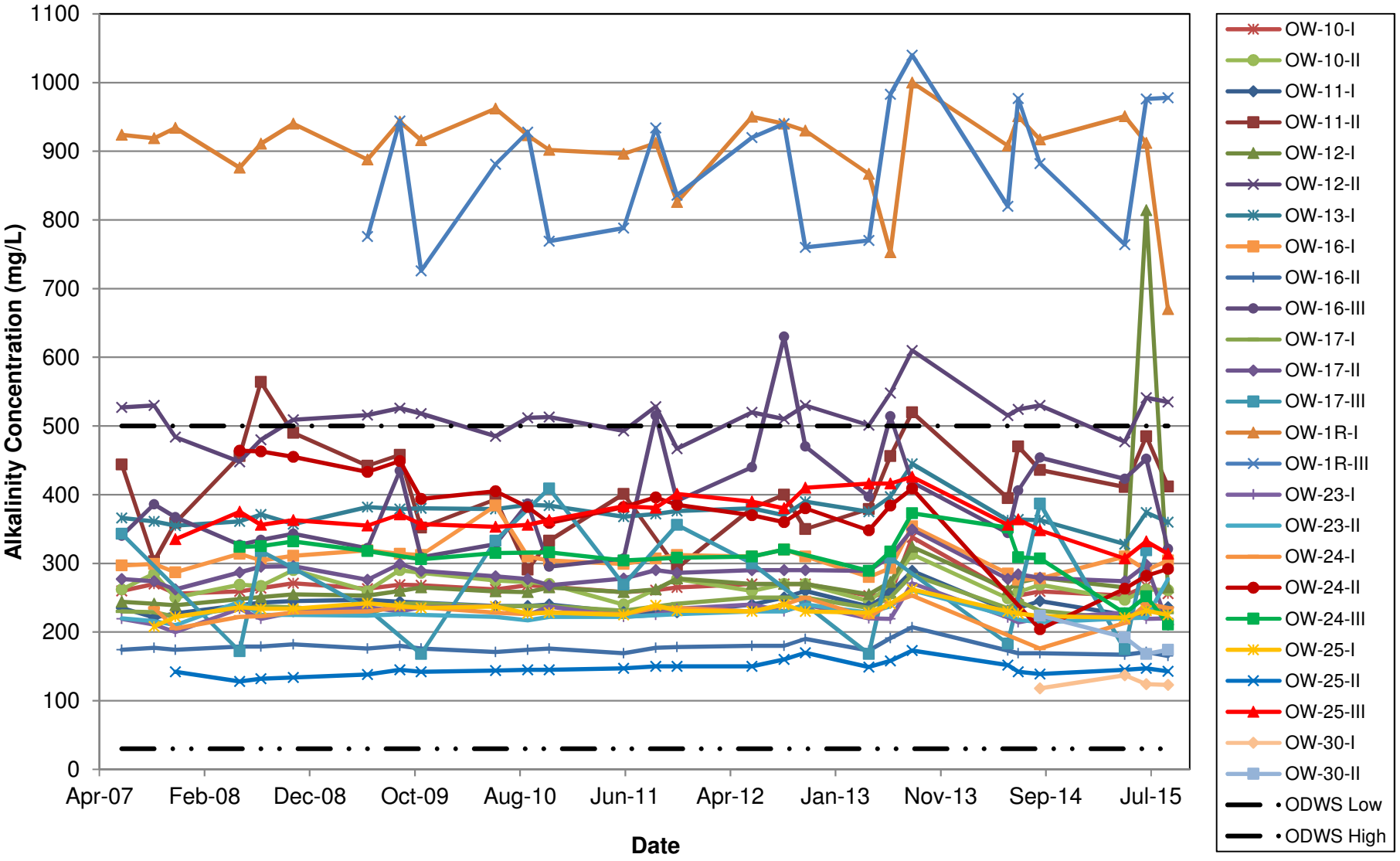
Raw Data (mg/L)	OW-1R-I	OW-1R-III	OW-10-I	OW-10-II	WS-7	WS-8	WS-13	WS-14	WS-15
Ca	163	131	93	113	83.4	82.2	70.6	65.5	63.0
Mg	116	86.4	31.1	19.7	27.9	33.3	21.5	30.9	31.4
Na	187	155	4.2	2.2	15.0	7.7	4.9	11.2	28.1
K	78.9	78.1	4.0	1.0	1.8	2.3	1.0	3.1	3.9
Cl	274	164	3.3	2.1	15.1	28.7	2.9	1.4	7.8
SO4	207	131	137	126	30.6	30.3	9.0	8.5	95.0
ALK	951	764	253	247	309	297	265	310	264
pH	7.60	7.81	8.15	8.10	7.94	7.88	7.76	7.83	7.95
Ion Balance Data and Piper Plot (%)									
Cations:	27.83	22.39	7.50	7.38	7.16	7.23	5.53	6.38	7.05
Anions:	31.04	22.62	8.00	7.62	7.24	7.4	5.57	6.41	7.47
CBE (%):	-5.45	-0.52	-3.19	-1.57	-0.57	-0.97	-0.30	-0.26	-2.91
Mg:	34.3	31.8	34.1	22.0	32.1	37.9	32.0	39.9	36.7
Ca:	29.2	29.2	62.1	76.4	58.2	56.7	63.7	51.2	44.6
Na+K:	36.5	39.0	3.8	1.7	9.8	5.4	4	8.9	18.7
Cl:	24.9	20.5	1.1	0.8	5.9	11.0	1.5	0.6	2.9
SO4:	13.9	12.1	35.7	34.4	8.8	8.6	3.4	2.8	26.5
HCO3+CO3:	61.2	67.5	63.2	64.8	85.3	80.5	95.1	96.6	70.6

APPENDIX G

TREND ANALYSIS

amec foster wheeler

Alkalinity Trend Analysis - Groundwater



The City of Temiskaming Shores
Hydrogeological Characterization
New Liskeard Waste Disposal Site
New Liskeard, Ontario
August 2016

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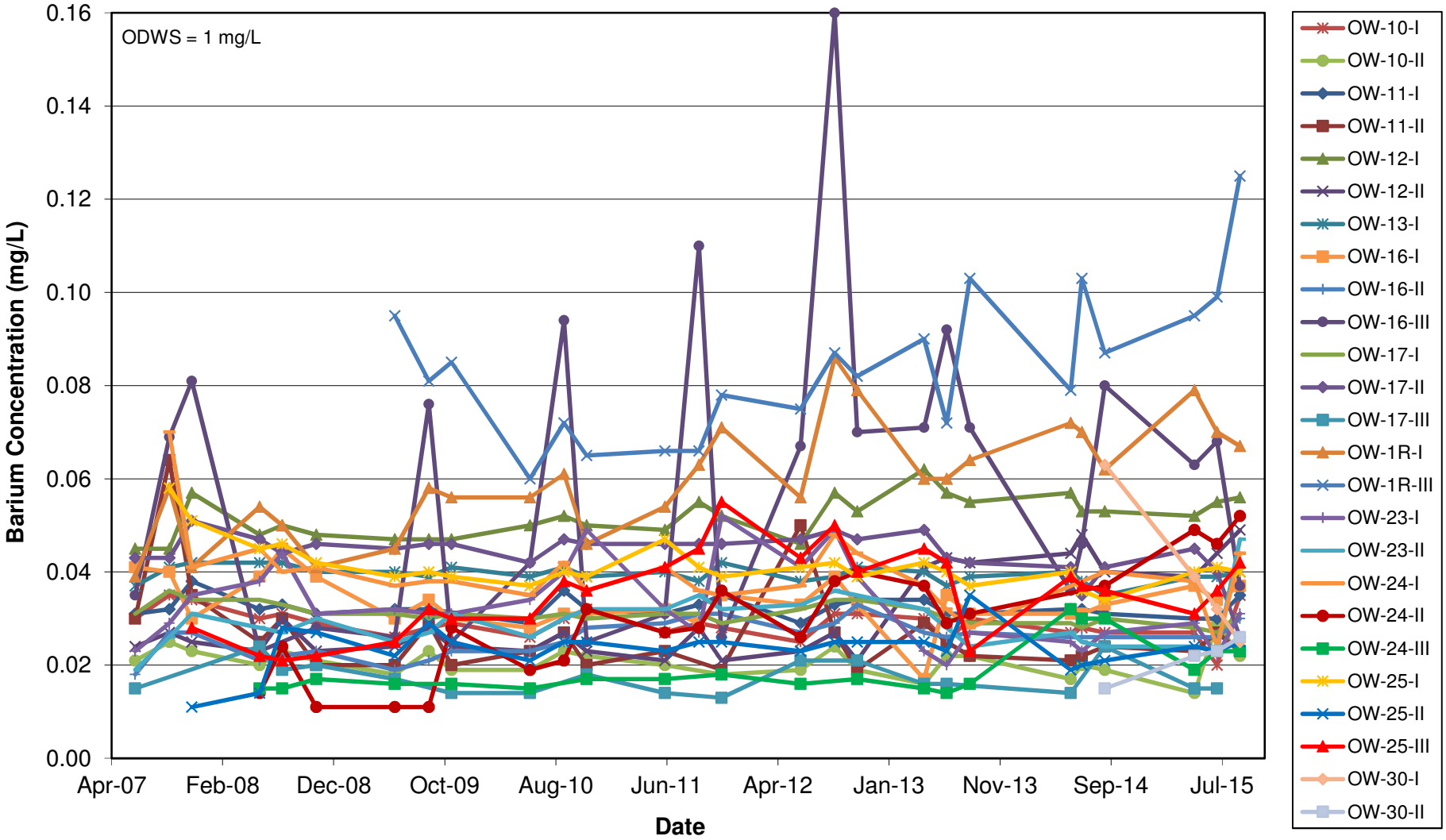
Barium Trend Analysis - Groundwater



Amec Foster Wheeler Project No.: **TY1910491.4000**

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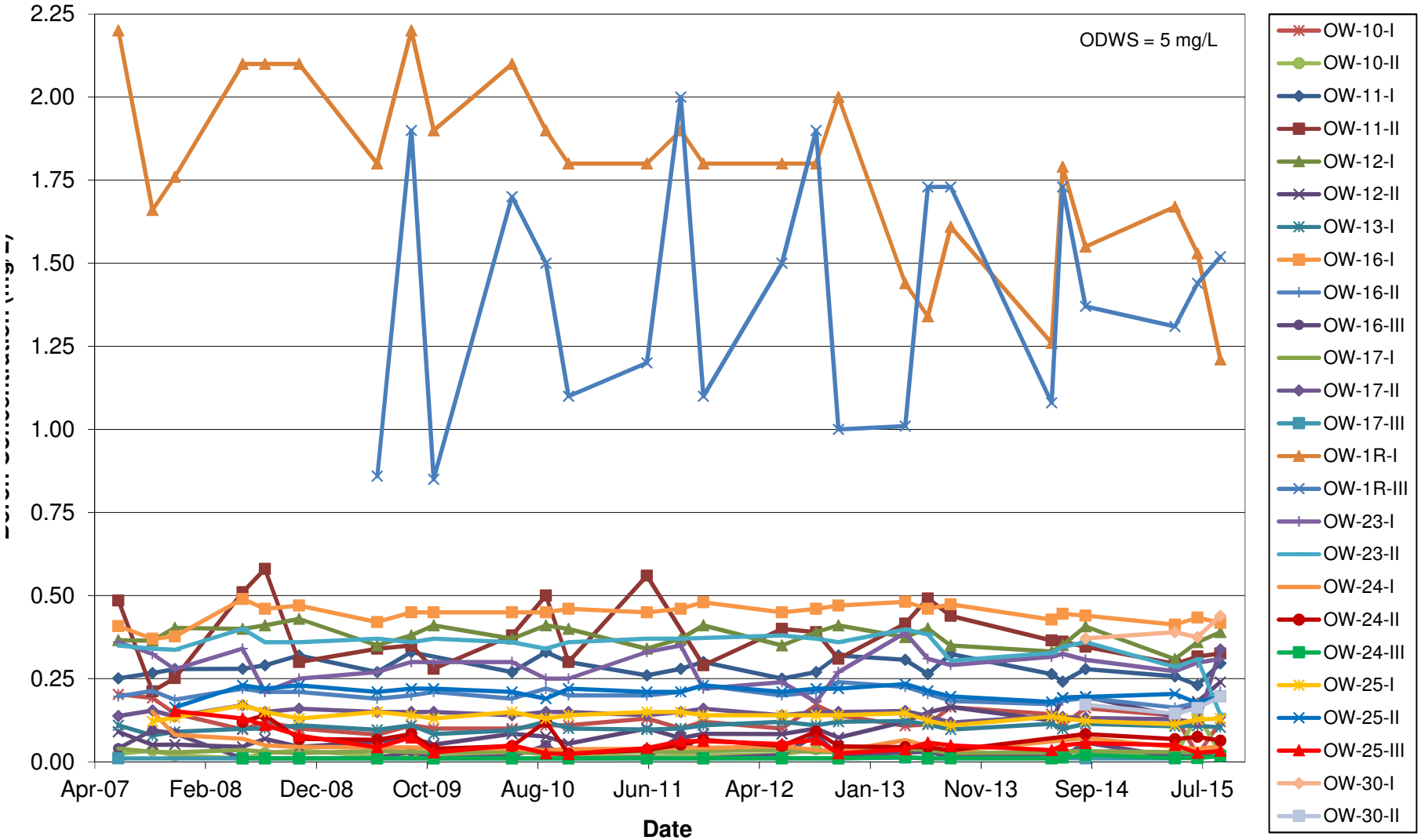
Hydrogeological Characterization
New Liskeard Waste Disposal Site
New Liskeard, Ontario
August 2016

Boron Trend Analysis - Groundwater



Amec Foster Wheeler Project No.: **TY1910491.4000**

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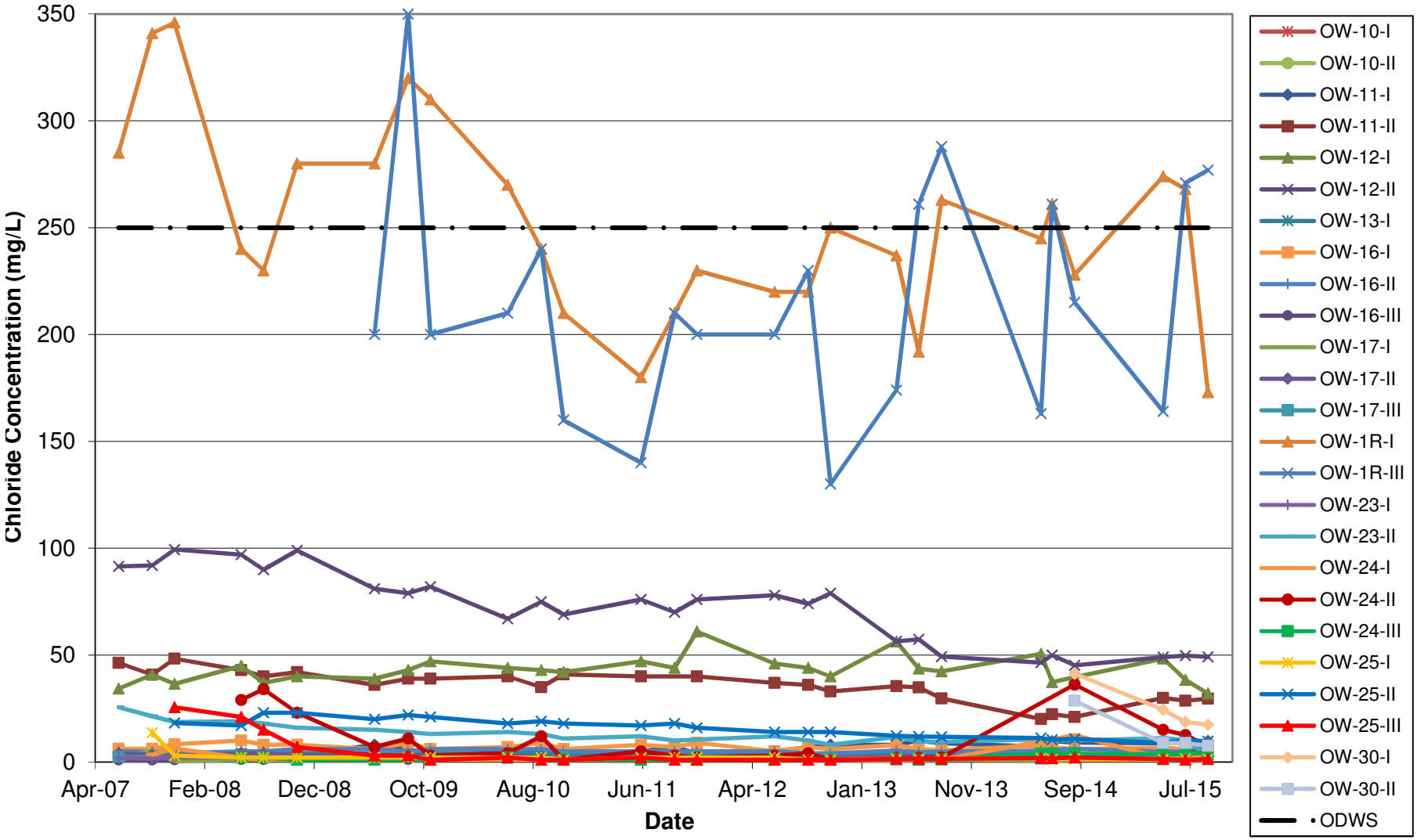
Chloride Trend Analysis - Groundwater



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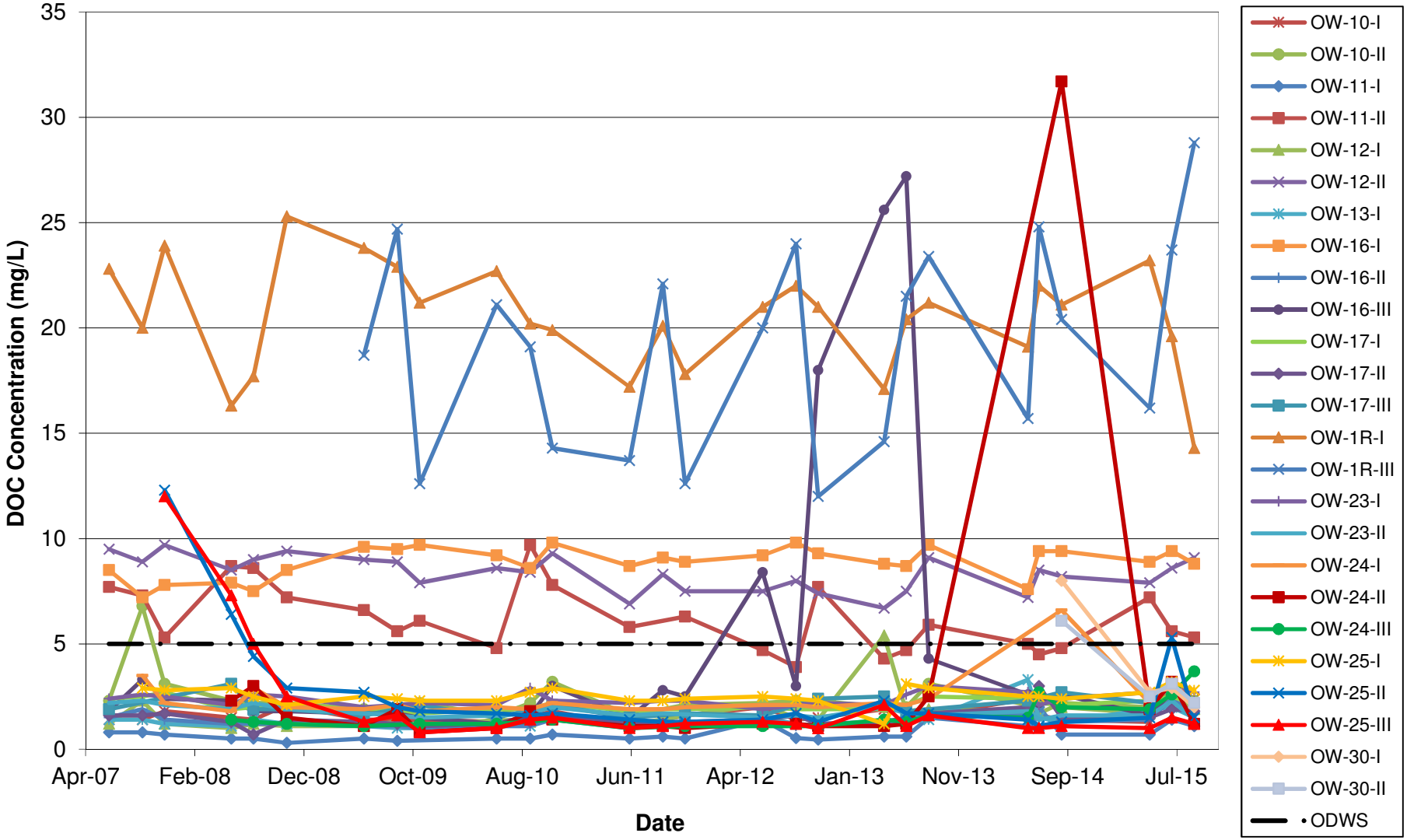
Dissolved Organic Carbon Trend Analysis - Groundwater



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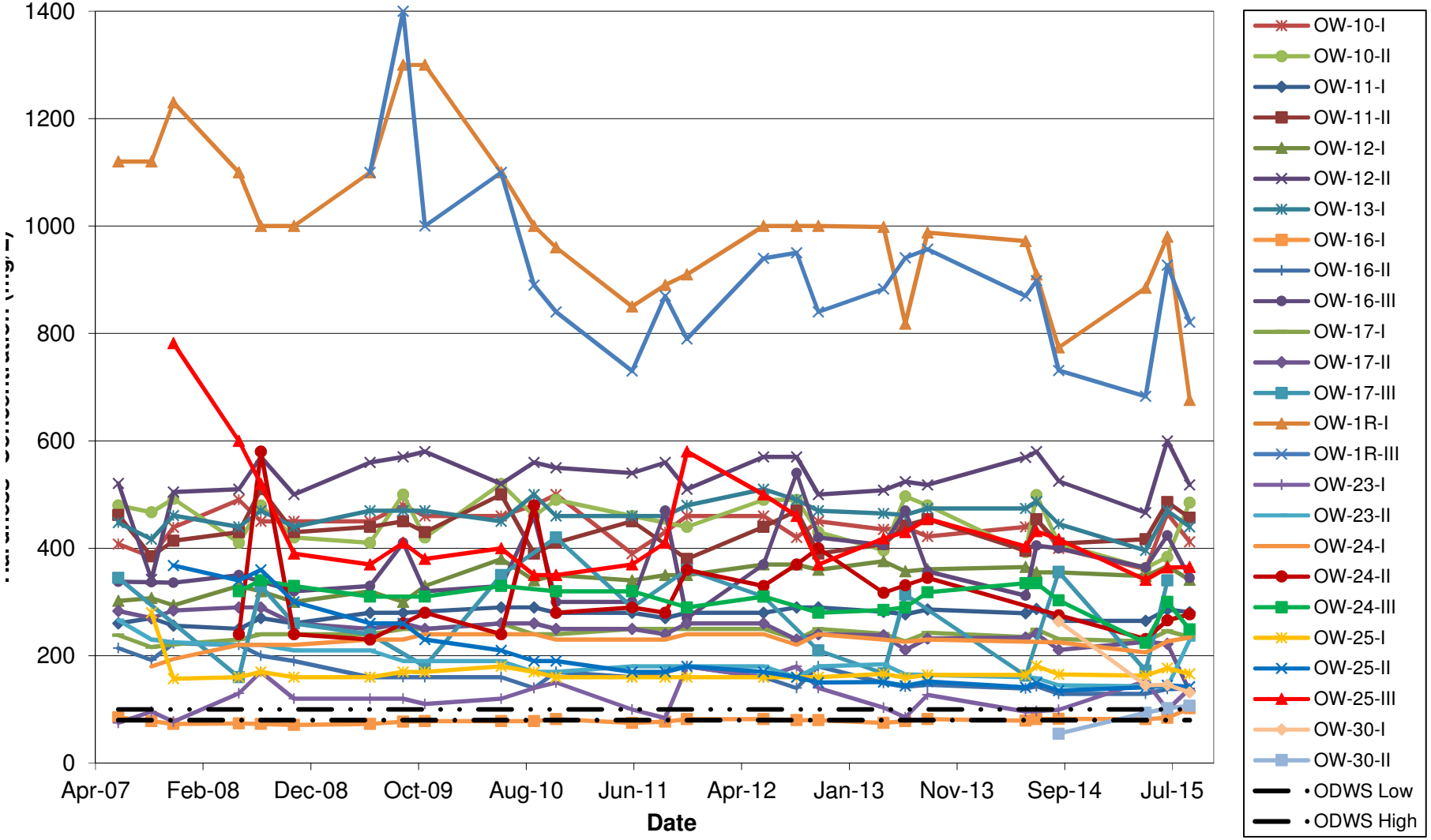
Hardness Trend Analysis - Groundwater



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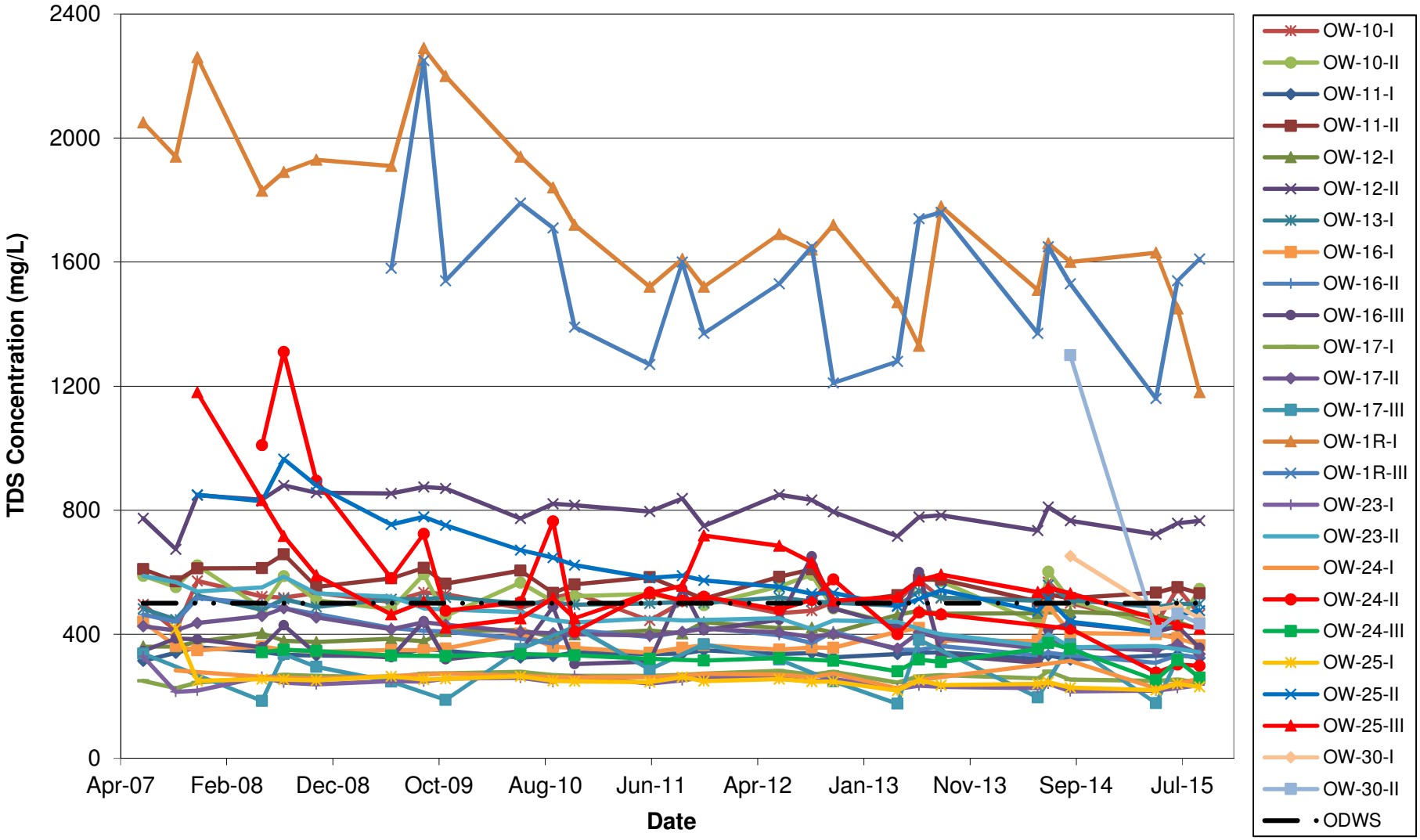
Hydrogeological Characterization
New Liskeard Waste Disposal Site
New Liskeard, Ontario
August 2016

Total Dissolved Solids Trend Analysis - Groundwater



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Hydrogeological Characterization
New Liskeard Waste Disposal Site
New Liskeard, Ontario
August 2016

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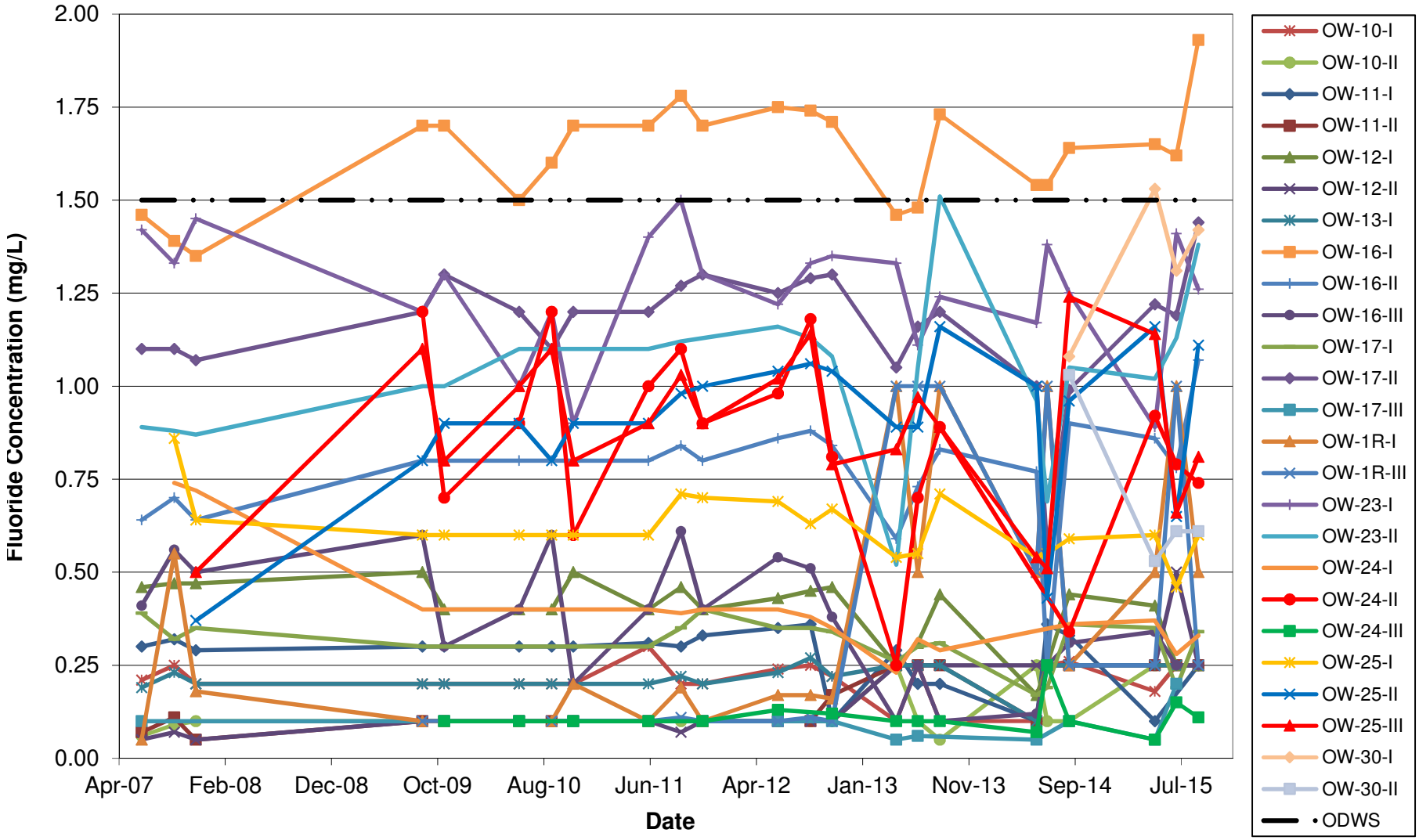
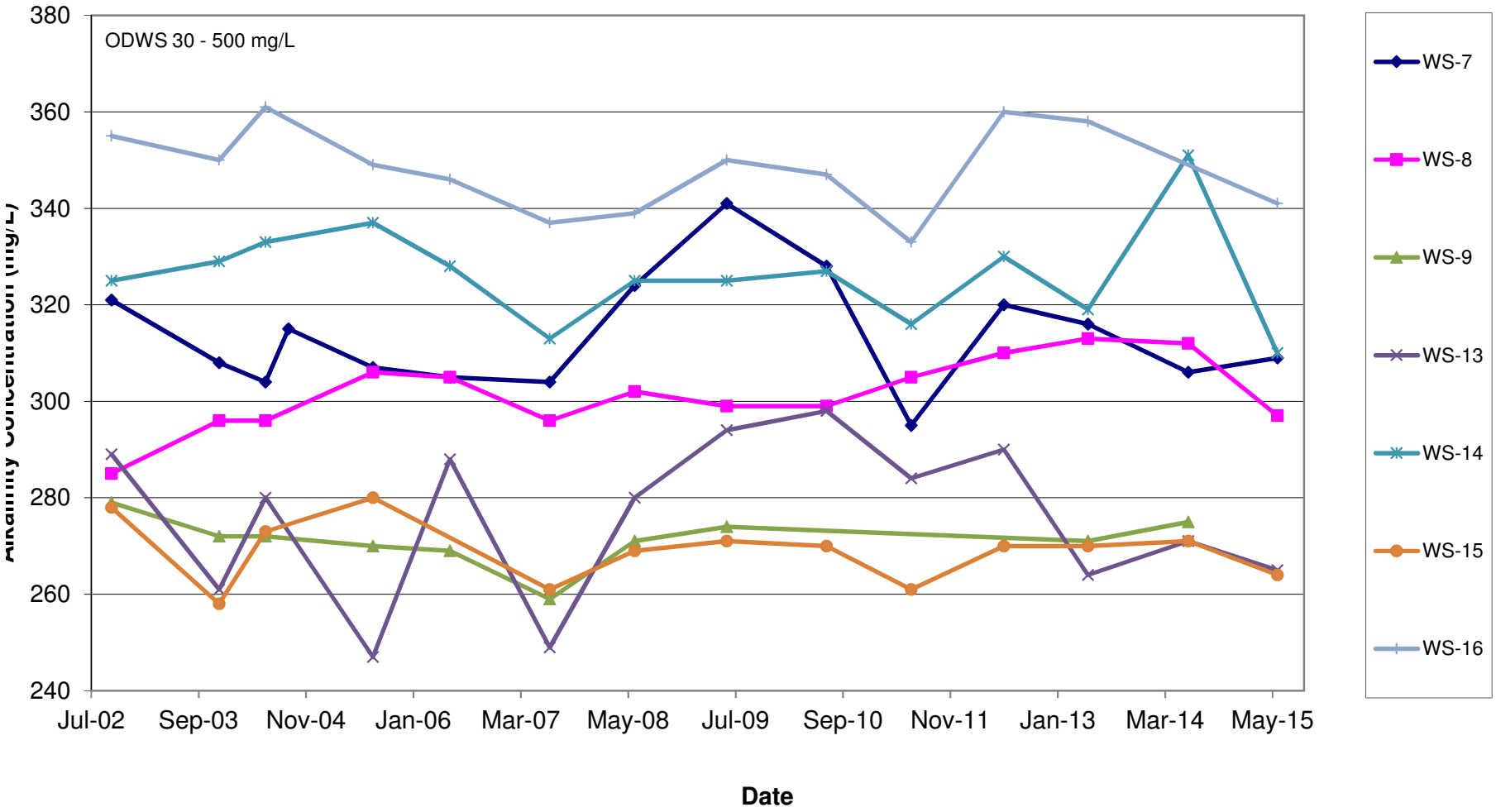
FluorideTrend Analysis - Groundwater

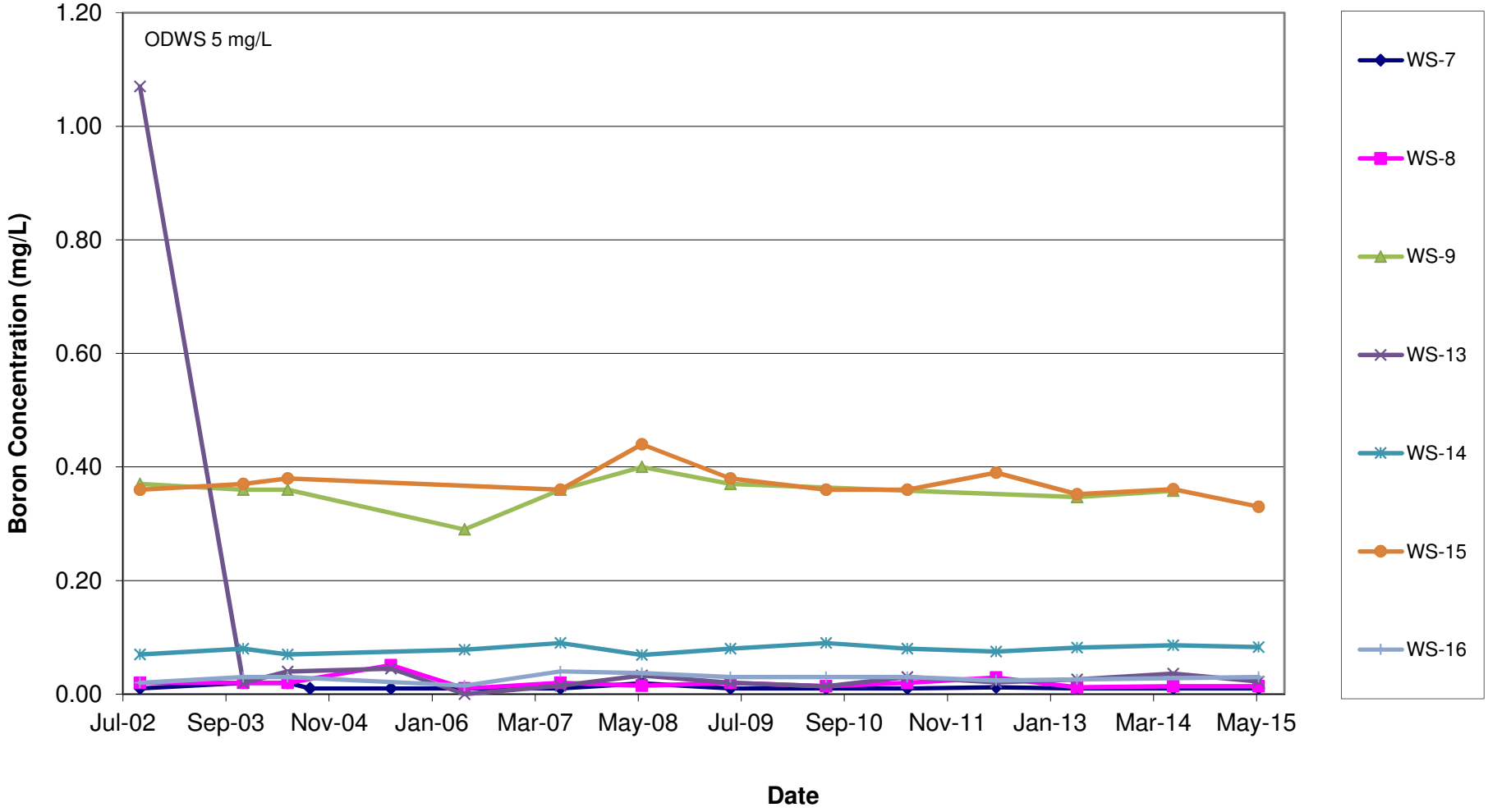


Amec Foster Wheeler Project No.: **TY1910491.4000**

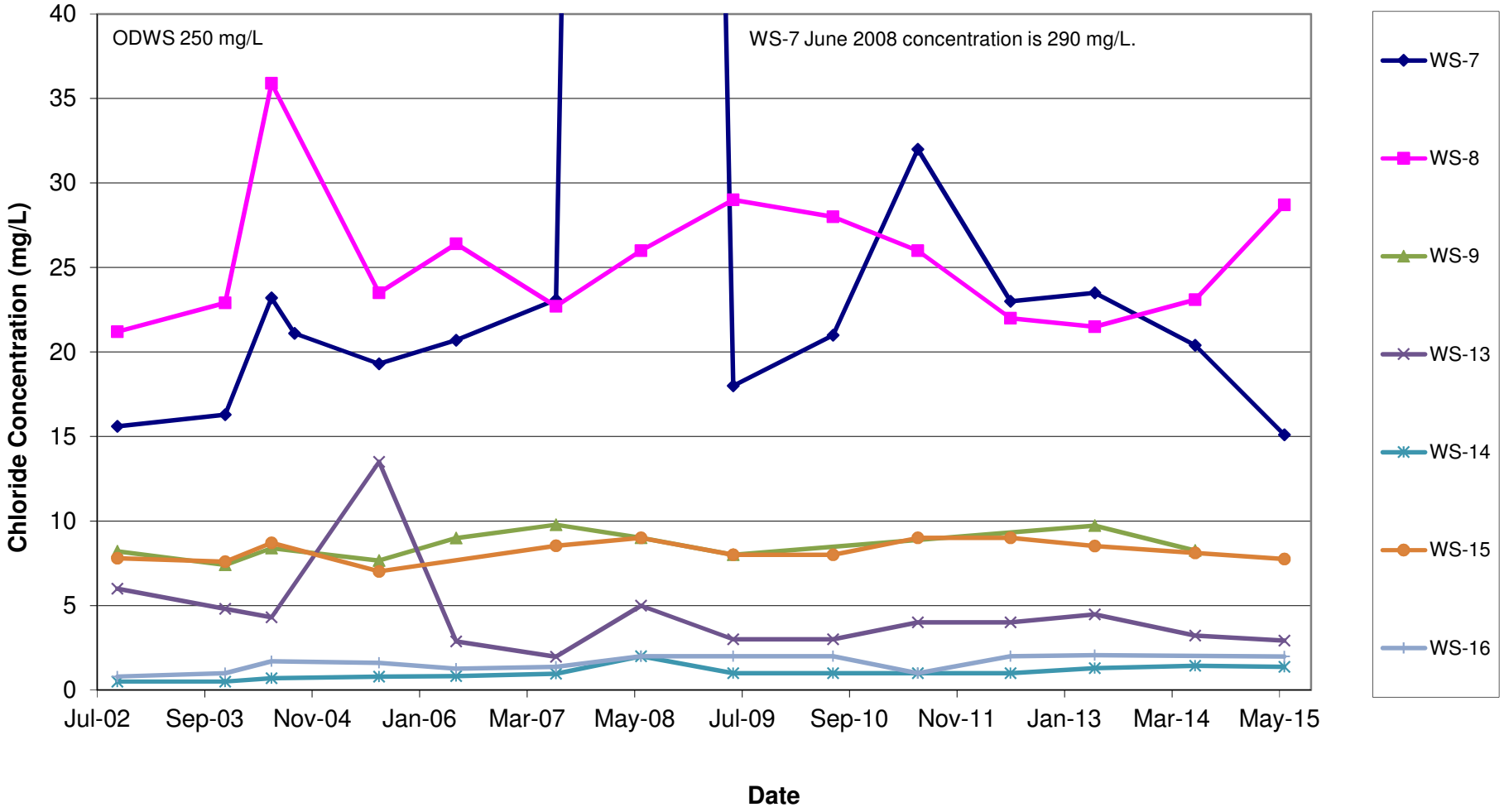
Alkalinity Trend Analysis - Groundwater



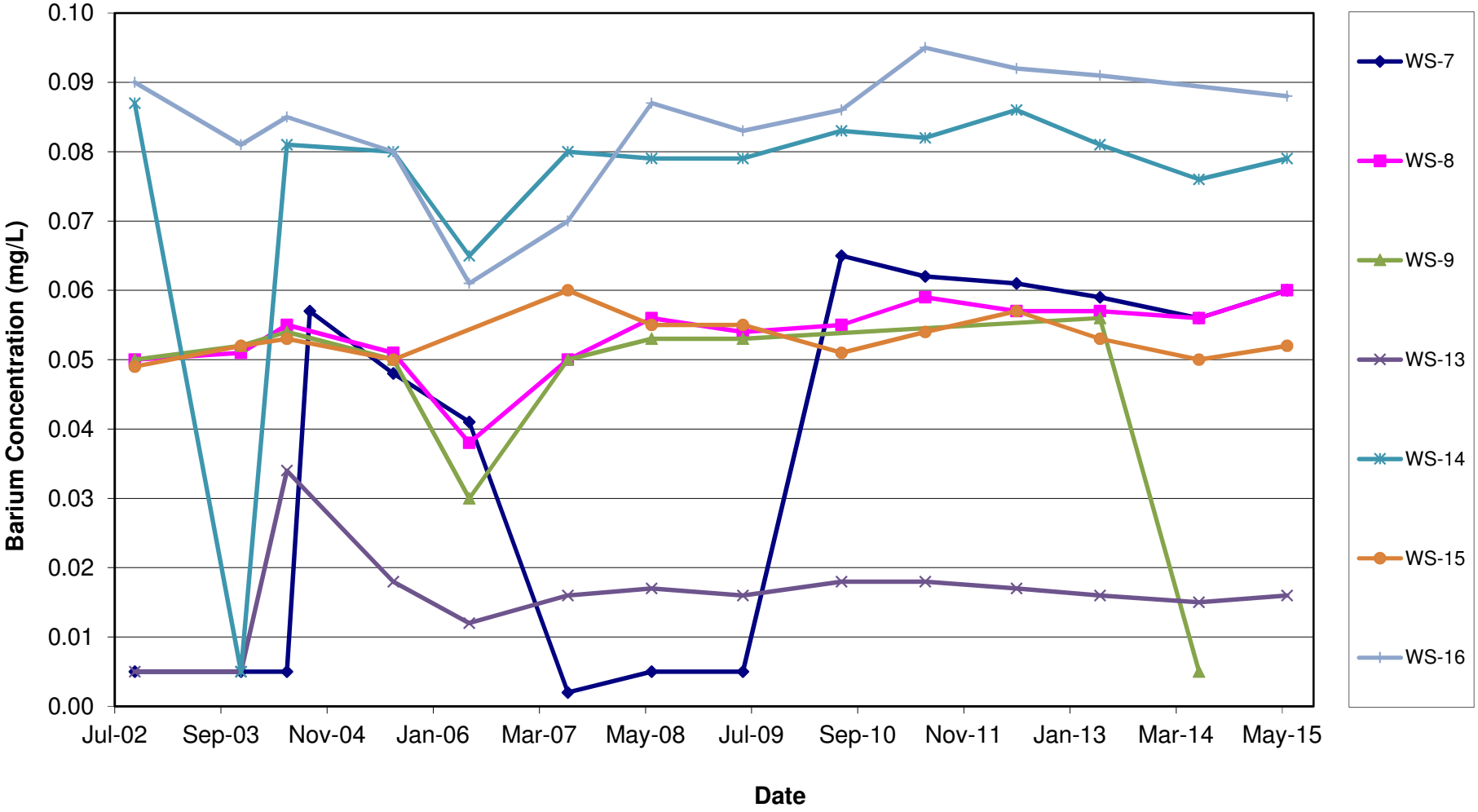
Boron Trend Analysis - Groundwater



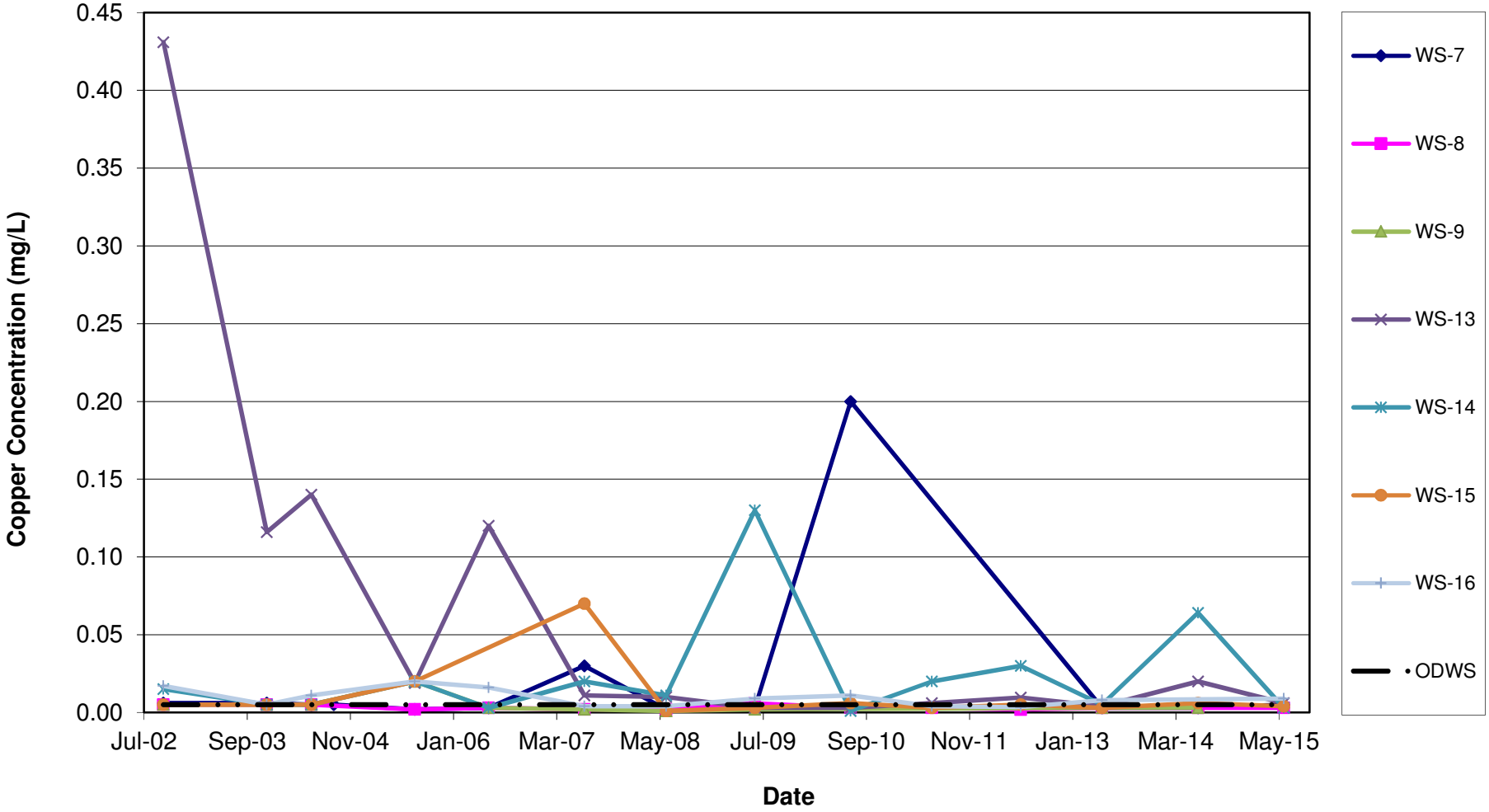
Chloride Trend Analysis - Groundwater



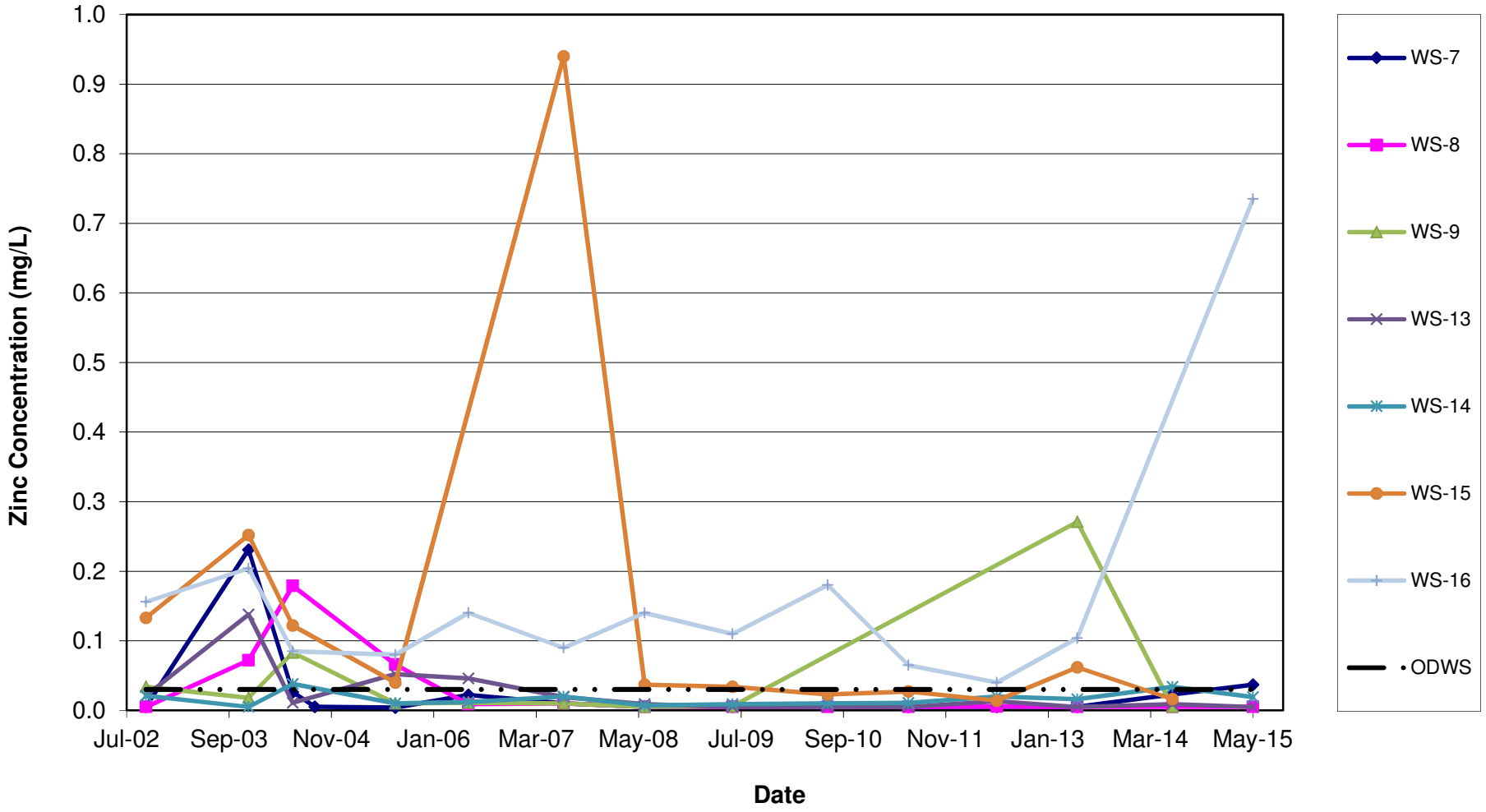
Barium Trend Analysis - Groundwater



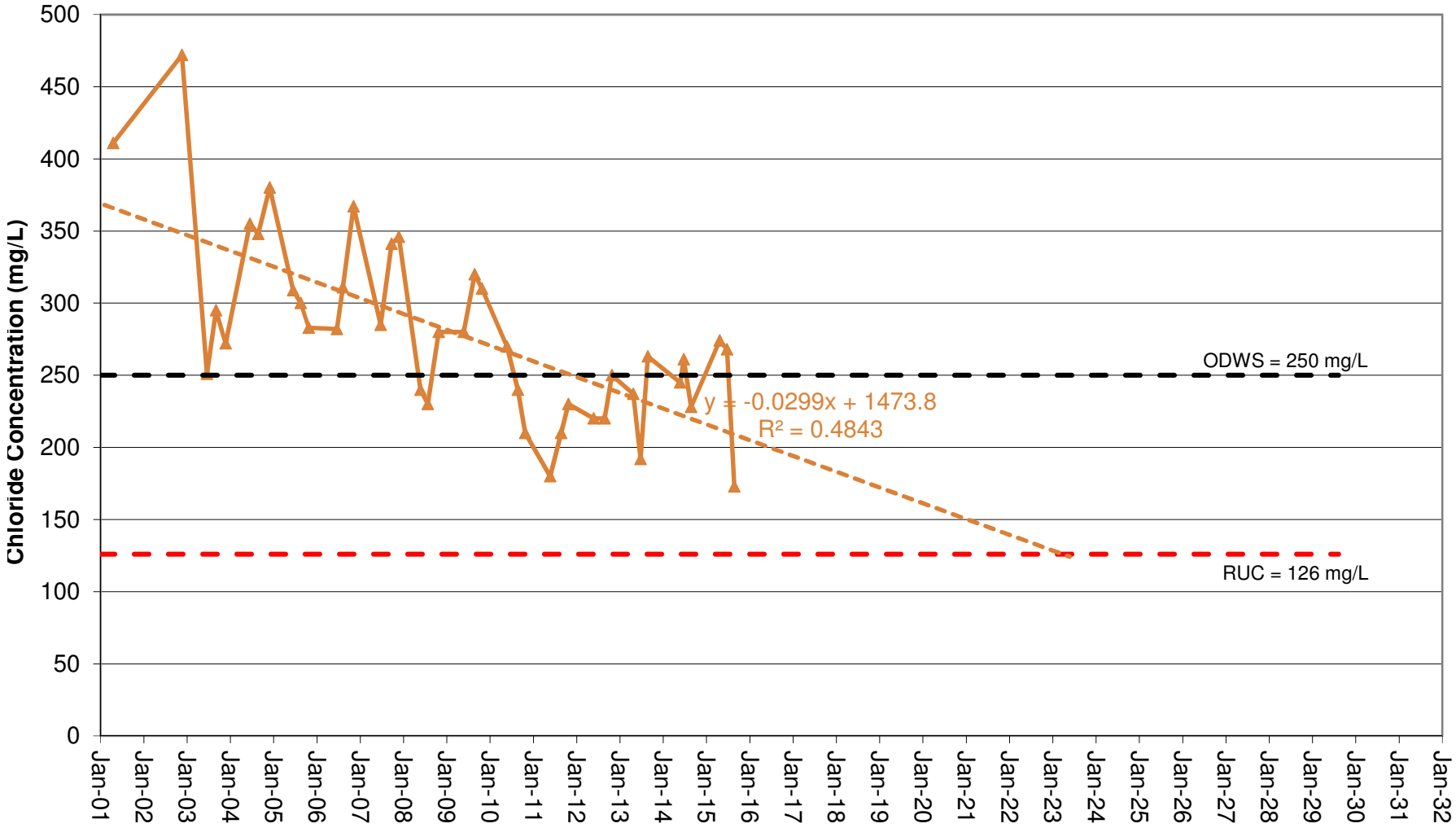
Copper Trend Analysis - Groundwater



Zinc Trend Analysis - Groundwater



Chloride Trend Analysis - OW-1R-I



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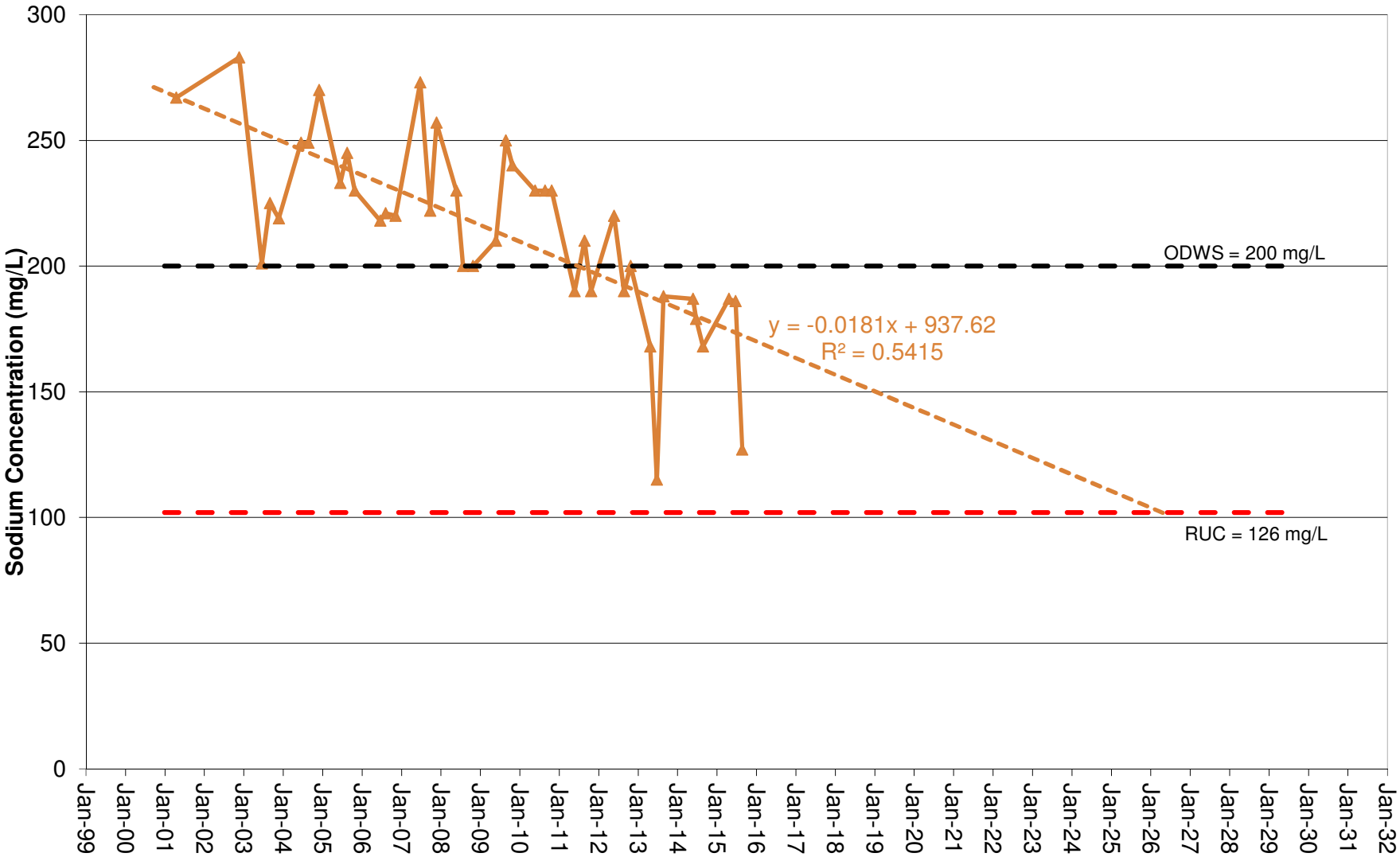
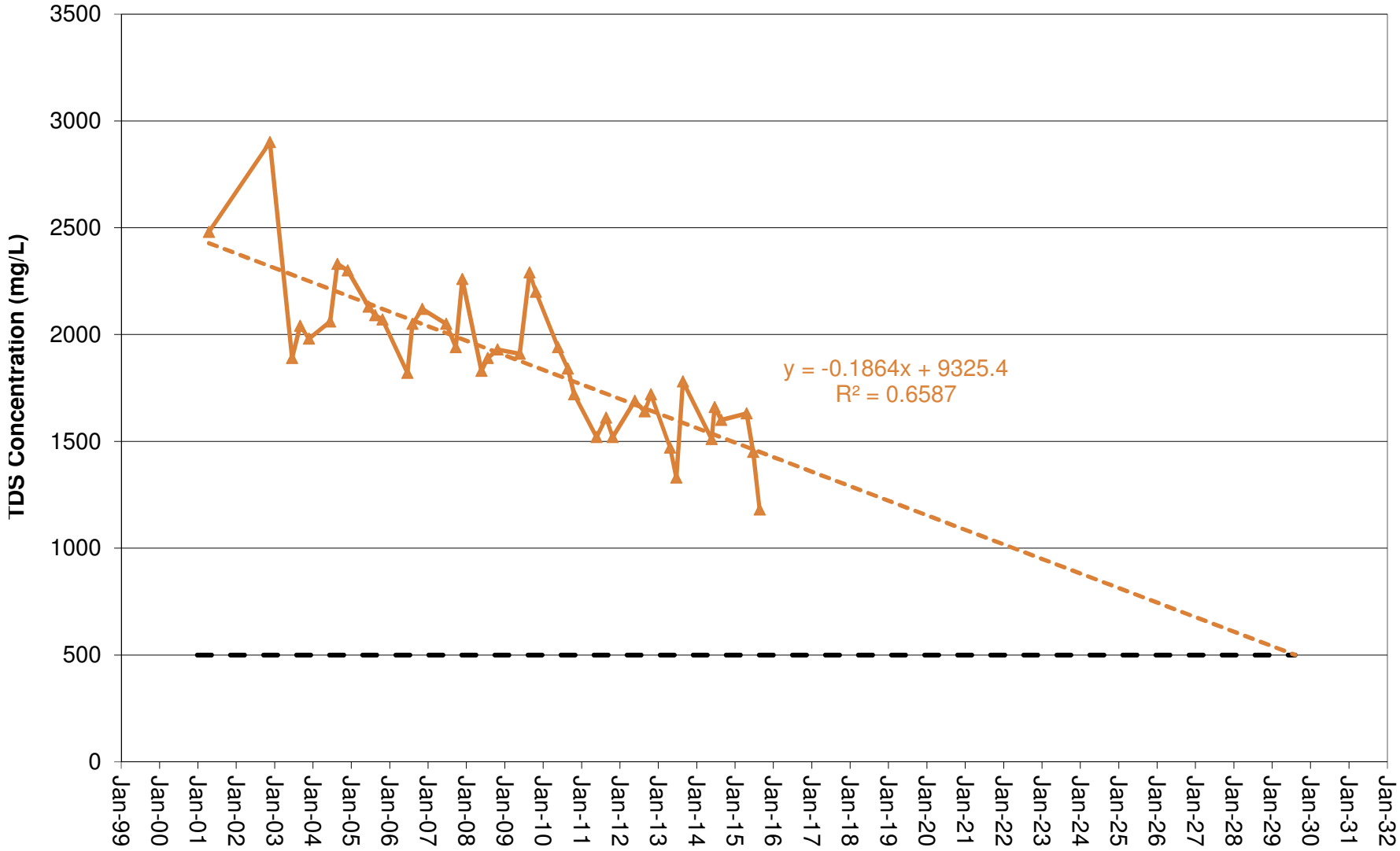
SodiumTrend Analysis - OW-1R-I



Total Dissolved Solids Trend Analysis - OW-1R-I



APPENDIX H

REASONABLE USE CALCULATIONS
(GUIDELINE B-7)

Reasonable Use Calculations (Guideline B-7)
Spring 2015 Monitoring Event Shallow Aquifer

Reasonable Use Calculation (Guideline B-7)				Downgradient Well Concentrations			
Parameter	**ODWS [3] C_r (mg/L)**	**Background Concentration C_b [1] (mg/L)**	**Maximum Concentration $C_m=C_b+x(C_r-C_b)$ (mg/L)**	**OW-25-III [5] (mg/L)**	**OW-16-III [5] (mg/L)**	**OW-24-III [5] (mg/L)**	**OW-17-III (mg/L)**
Health Related			x=0.25 [2]				
Arsenic	0.025	0.0008	0.0068	<0.003	<0.003	<0.003	<0.003
Barium	1	0.020	0.265	0.031	0.063	0.019	0.015
Boron	5	0.023	1.27	0.050	0.015	0.011	<0.010
Cadmium	0.005	0.0001	0.0014	<0.002	<0.002	<0.002	<0.002
Chromium	0.05	0.0026	0.0144	<0.003	<0.003	<0.003	<0.003
Lead	0.01	0.0004	0.003	<0.002	<0.002	<0.002	<0.003
Nitrate-N	10	0.057	2.5	<0.25	<0.10	1.20	<0.05
Nitrite-N	1	0.013	0.26	<0.25	<0.10	<0.05	<0.05
Non-Health Related			x=0.50 [2]				
Chloride	250	2.73	126	1.36	3.35	3.55	1.41
Copper	1	0.001	0.50	<0.003	<0.003	<0.003	<0.003
DOC	5	2.27	3.64	1.0	1.6	1.9	2.2
Sodium	200	2.63	101	34.8	10.7	6.7	3.85
Sulphate	500	183	341	130	7.6	14.1	2.82
TDS	500	525	525 [6]	450	408	252	178
Zinc	5	0.003	2.50	<0.005	<0.005	<0.005	0.007

Notes:
(1) Average of valid sampling rounds at OW-10-II.
(2) Defined according to Guideline B-7 (MOECC, 1994).
(3) ODWS - Ontario Drinking Water Standards (MOECC, 2001).
(4) **BOLD and shaded** indicates an exceedance of the Maximum Concentration.
(5) Downgradient property boundary well (i.e., compliance point).
(6) Background exceeds the ODWS, therefore the maximum concentration has been set at background.

Reasonable Use Calculations (Guideline B-7)
Spring 2015 Monitoring Event Deep Aquifer

Reasonable Use Calculation (Guideline B-7)				Downgradient Well Concentrations											
Parameter	**ODWS [3] C_r (mg/L)**	**Background Concentration $C_{b\,(1)}$ (mg/L)**	**Maximum Concentration $C_m=C_b+x(C_r-C_b)$ (mg/L)**	**OW-25-I [5] (mg/L)**	**OW-25-II [5] (mg/L)**	**OW-16-I [5] (mg/L)**	**OW-16-II [5] (mg/L)**	**OW-24-I [5] (mg/L)**	**OW-24-II [5] (mg/L)**	**OW-17-I (mg/L)**	**OW-17-II (mg/L)**	**OW-23-I (mg/L)**	**OW-23-II (mg/L)**	**OW-30-I [5] (mg/L)**	**OW-30-II [5] (mg/L)**
Health Related			x=0.25 [2]												
Arsenic	0.025	0.0008	0.0068	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
Barium	1	0.029	0.272	0.040	0.024	0.037	0.026	0.038	0.049	0.028	0.045	0.029	0.024	0.039	0.022
Boron	5	0.123	1.34	0.113	0.204	0.413	0.163	0.044	0.068	0.029	0.128	0.272	0.285	0.390	0.145
Cadmium	0.005	0.0001	0.0014	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Chromium	0.05	0.0024	0.014	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
Lead	0.01	0.0004	0.0028	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.003	<0.002	<0.002	<0.002	<0.002	<0.002
Nitrate-N	10	0.050	2.5	<0.05	<0.25	<0.05	0.06	<0.05	<0.05	<0.10	<0.10	<0.05	0.08	<0.25	0.37
Nitrite-N	1	0.012	0.26	<0.05	<0.25	<0.05	<0.05	<0.05	<0.05	<0.10	<0.10	<0.05	<0.05	<0.25	<0.05
Non-Health Related			x=0.50 [2]												
Chloride	250	3.35	127	1.27	8.82	6.69	4.74	1.63	15.0	0.85	2.44	1.34	11.2	24.4	8.80
Copper	1	0.0008	0.50	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
DOC	5	1.56	3.3	2.7	1.5	**8.9**	1.4	2.2	1.9	2.3	1.5	2.7	1.6	2.7	2.5
Sodium	200	3.61	102	29.1	**115**	**108**	69.7	9.6	21.9	4.49	55.3	35.0	91.1	**116**	**120**
Sulphate	500	169.5	335	0.90	218	3.55	108	16.9	10.4	14.8	68.8	5.40	104	225	138
TDS	500	505	505 [6]	220	408	400	308	226	276	250	348	218	362	480	410
Zinc	5	0.005	2.50	0.006	<0.005	<0.005	0.008	<0.005	<0.005	<0.005	0.005	<0.005	<0.005	0.009	<0.005

Notes:
(1) Average of valid sampling rounds at OW-10-I.
(2) Defined according to Guideline B-7 (MOECC, 1994).
(3) ODWS - Ontario Drinking Water Standards (MOECC, 2001).
(4) **BOLD and shaded** indicates an exceedance of the Maximum Concentration.
(5) Downgradient property boundary well (i.e., compliance point).
(6) Background exceeds the ODWS, therefore the maximum concentration has been set at background.

Reasonable Use Calculations (Guideline B-7)
Summer 2015 Monitoring Event Shallow Aquifer

Reasonable Use Calculation (Guideline B-7)				Downgradient Well Concentrations			
Parameter	**ODWS [3] C_r (mg/L)**	**Background Concentration $C_{b\,(1)}$ (mg/L)**	**Maximum Concentration $C_m=C_b+x(C_r-C_b)$ (mg/L)**	**OW-25-III [5] (mg/L)**	**OW-16-III [5] (mg/L)**	**OW-24-III [5] (mg/L)**	**OW-17-III (mg/L)**
Health Related			x=0.25 [2]				
Arsenic	0.025	0.0008	0.007	<0.003	<0.003	<0.003	<0.003
Barium	1	0.0204	0.265	0.036	0.068	0.023	0.015
Boron	5	0.0245	1.27	0.027	0.025	0.011	0.014
Cadmium	0.005	0.0001	0.0014	<0.002	<0.002	<0.002	<0.002
Chromium	0.05	0.0025	0.014	<0.003	<0.003	<0.003	0.003
Lead	0.01	0.0004	0.003	<0.002	<0.002	<0.002	0.003
Nitrate-N	10	0.0584	2.5	<0.25	<0.25	1.37	<0.20
Nitrite-N	1	0.0138	0.26	<0.25	<0.25	<0.10	<0.20
Non-Health Related			x=0.50 [2]				
Chloride	250	2.73	126	1.03	3.98	3.70	2.66
Copper	1	0.001	0.50	<0.003	<0.003	<0.003	<0.003
DOC	5	2.30	3.65	1.5	2.7	2.6	3.0
Sodium	200	2.68	101	29.7	12.2	6.54	5.85
Sulphate	500	180.8	340	96.6	4.5	9.6	3.81
TDS	500	521	521 [6]	432	426	316	320
Zinc	5	0.014	2.51	<0.005	<0.005	0.006	0.005

Notes:
(1) Average of valid sampling rounds at OW-10-II.
(2) Defined according to Guideline B-7 (MOECC, 1994).
(3) ODWS - Ontario Drinking Water Standards (MOECC, 2001).
(4) **BOLD and shaded** indicates an exceedance of the Maximum Concentration.
(5) Downgradient property boundary well (i.e., compliance point).
(6) Background exceeds the ODWS, therefore the maximum concentration has been set at background.

Reasonable Use Calculations (Guideline B-7)
Summer 2015 Monitoring Event Deep Aquifer

Reasonable Use Calculation (Guideline B-7)				Downgradient Well Concentrations											
Parameter	**ODWS [3] C_r (mg/L)**	**Background Concentration C_b [1] (mg/L)**	**Maximum Concentration $C_m=C_b+x(C_r-C_b)$ (mg/L)**	**OW-25-I [5] (mg/L)**	**OW-25-II [5] (mg/L)**	**OW-16-I [5] (mg/L)**	**OW-16-II [5] (mg/L)**	**OW-24-I [5] (mg/L)**	**OW-24-II [5] (mg/L)**	**OW-17-I (mg/L)**	**OW-17-II (mg/L)**	**OW-23-I (mg/L)**	**OW-23-II (mg/L)**	**OW-30-I [5] (mg/L)**	**OW-30-II [5] (mg/L)**
Health Related			x=0.25 [2]												
Arsenic	0.025	0.0008	0.007	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
Barium	1	0.0285	0.271	0.041	0.023	0.034	0.026	0.024	0.046	0.027	0.040	0.022	0.023	0.032	0.023
Boron	5	0.1150	1.34	0.127	0.176	0.434	0.178	0.039	0.075	0.028	0.117	0.298	0.309	0.375	0.162
Cadmium	0.005	0.0001	0.0014	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Chromium	0.05	0.0024	0.014	<0.003	<0.003	<0.003	0.015	<0.003	<0.003	<0.003	<0.003	<0.003	0.009	<0.003	<0.003
Lead	0.01	0.0004	0.003	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.003	<0.002	<0.002	<0.002	<0.002	0.002
Nitrate-N	10	0.0513	2.5	<0.10	<0.25	<0.10	0.15	<0.10	0.13	<0.10	<0.10	<0.05	0.17	<0.25	<0.25
Nitrite-N	1	0.0136	0.26	<0.10	<0.25	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.05	<0.10	<0.25	<0.25
Non-Health Related			x=0.50 [2]												
Chloride	250	3.32	127	1.48	10.2	5.90	4.81	2.7	12.6	0.82	2.68	2.03	10.2	18.7	8.8
Copper	1	0.00	0.50	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	0.043
DOC	5	1.60	3.3	3.2	**5.3**	**9.4**	2.4	3.3	3.2	2.5	1.9	3.1	2.3	2.9	3.1
Sodium	200	3.53	102	27.5	**110**	**106**	68.5	16.7	21.4	4.91	66.8	57.2	86.0	**112**	**112**
Sulphate	500	170.6	335	6.11	237	2.70	117	21.2	18.7	16.5	70.7	5.24	97.2	245	165
TDS	500	507	507 [6]	240	462	388	332	242	302	254	368	226	352	490	466
Zinc	5	0.0048	2.50	<0.005	0.005	<0.005	0.007	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.036

Notes:
(1) Average of valid sampling rounds at OW-10-I.
(2) Defined according to Guideline B-7 (MOECC, 1994).
(3) ODWS - Ontario Drinking Water Standards (MOECC, 2001).
(4) **BOLD and shaded** indicates an exceedance of the Maximum Concentration.
(5) Downgradient property boundary well (i.e., compliance point).
(6) Background exceeds the ODWS, therefore the maximum concentration has been set at background.

Reasonable Use Calculations (Guideline B-7)
Fall 2015 Monitoring Event Shallow Aquifer

Reasonable Use Calculation (Guideline B-7)				Downgradient Well Concentrations			
Parameter	**ODWS [3] C_r (mg/L)**	**Background Concentration $C_{b\,(1)}$ (mg/L)**	**Maximum Concentration $C_m=C_b+x(C_r-C_b)$ (mg/L)**	**OW-25-III [5] (mg/L)**	**OW-16-III [5] (mg/L)**	**OW-24-III [5] (mg/L)**	**OW-17-III (mg/L)**
Health Related			x=0.25 [2]				
Arsenic	0.025	0.0008	0.007	<0.003	<0.003	<0.003	**DRY**
Barium	1	0.020	0.265	0.042	0.037	0.023	
Boron	5	0.025	1.27	0.033	0.013	0.018	
Cadmium	0.005	0.0002	0.0014	<0.002	<0.002	<0.002	
Chromium	0.05	0.0025	0.014	<0.003	<0.003	<0.003	
Lead	0.01	0.0004	0.003	<0.002	<0.002	<0.002	
Nitrate-N	10	0.060	2.5	<0.25	0.31	0.22	
Nitrite-N	1	0.015	0.26	<0.25	<0.05	<0.05	
Non-Health Related			x=0.50 [2]				
Chloride	250	2.73	126	1.33	5.45	4.52	
Copper	1	0.0010	0.50	<0.003	<0.003	<0.003	
DOC	5	2.30	3.65	1.2	2.2	**3.70**	
Sodium	200	2.67	101	32.4	8.5	7.82	
Sulphate	500	181.5	341	116	29.9	21.6	
TDS	500	522	522 [6]	418	356	260	
Zinc	5	0.003	2.50	0.012	0.006	<0.005	

Notes:
(1) Average of valid sampling rounds at OW-10-II.
(2) Defined according to Guideline B-7 (MOECC, 1994).
(3) ODWS - Ontario Drinking Water Standards (MOECC, 2001).
(4) **BOLD and shaded** indicates an exceedance of the Maximum Concentration.
(5) Downgradient property boundary well (i.e., compliance point).
(6) Background exceeds the ODWS, therefore the maximum concentration has been set at background.

Reasonable Use Calculations (Guideline B-7)
Fall 2015 Monitoring Event Deep Aquifer

Reasonable Use Calculation (Guideline B-7)				Downgradient Well Concentrations											
Parameter	**ODWS [3] C_r (mg/L)**	**Background Concentration $C_{b\,(1)}$ (mg/L)**	**Maximum Concentration $C_m=C_b+x(C_r-C_b)$ (mg/L)**	**OW-25-I [5] (mg/L)**	**OW-25-II [5] (mg/L)**	**OW-16-I [5] (mg/L)**	**OW-16-II [5] (mg/L)**	**OW-24-I [5] (mg/L)**	**OW-24-II [5] (mg/L)**	**OW-17-I (mg/L)**	**OW-17-II (mg/L)**	**OW-23-I (mg/L)**	**OW-23-II (mg/L)**	**OW-30-I [5] (mg/L)**	**OW-30-II [5] (mg/L)**
Health Related			x=0.25 [2]												
Arsenic	0.025	0.0008	0.007	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
Barium	1	0.029	0.272	0.040	0.025	0.037	0.030	0.044	0.052	0.031	0.026	0.031	0.047	0.025	0.026
Boron	5	0.115	1.34	0.130	0.198	0.418	0.211	0.046	0.064	0.031	0.338	0.310	0.142	0.439	0.196
Cadmium	0.005	0.0002	0.0014	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Chromium	0.05	0.0023	0.014	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
Lead	0.01	0.0004	0.003	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.003	<0.002	<0.002	<0.002	<0.002	<0.002
Nitrate-N	10	0.053	2.5	<0.05	0.35	<0.25	0.28	<0.05	<0.05	<0.05	0.14	<0.05	<0.25	0.41	<0.25
Nitrite-N	1	0.015	0.26	<0.05	<0.25	<0.25	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.25	<0.25	<0.25
Non-Health Related			x=0.50 [2]												
Chloride	250	3.31	127	1.32	9.64	5.33	5.40	2.11	7.40	0.69	9.80	1.85	2.78	17.4	7.55
Copper	1	0.0008	0.50	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
DOC	5	1.62	3.3	2.8	1.5	**8.8**	1.7	2.0	1.2	2.1	1.8	2.7	1.4	2.0	2.2
Sodium	200	3.61	102	29.4	**115**	**109**	70.0	13.4	17.2	4.84	86.8	50.1	61.5	**117**	**116**
Sulphate	500	169.9	335	1.24	223	1.82	118	20.8	14.2	16.5	83.7	6.50	71.2	222	165
TDS	500	505	505 [6]	230	476	364	326	256	298	244	336	236	342	452	434
Zinc	5	0.005	2.50	0.007	<0.005	<0.005	<0.005	<0.005	0.006	<0.005	0.005	<0.005	0.009	0.009	0.005

Notes:
(1) Average of valid sampling rounds at OW-10-I.
(2) Defined according to Guideline B-7 (MOECC, 1994).
(3) ODWS - Ontario Drinking Water Standards (MOECC, 2001).
(4) **BOLD and shaded** indicates an exceedance of the Maximum Concentration.
(5) Downgradient property boundary well (i.e., compliance point).
(6) Background exceeds the ODWS, therefore the maximum concentration has been set at background.

APPENDIX I

REPORT LIMITATIONS

Limitation of Liability and Scope of Work

1. The work performed in this report was carried out in accordance with the Standard Terms and Conditions made part of our contract. The conclusions presented herein are based solely upon the scope of services and time and budgetary limitations described in our contract.

2. The report has been prepared in accordance with generally accepted environmental study and/or engineering practices. No other warranties, either expressed or implied, are made as to the professional services provided under the terms of our contract and included in this report.

3. The services performed and outlined in this report were based, in part, upon a previously installed monitoring network, established by others and approved by the applicable regulatory agencies. Our opinion cannot be extended to portions of the Site which were unavailable for direct observations, reasonably beyond the control of Amec Foster Wheeler Environment & Infrastructure.

4. The objective of this report was to assess the environmental conditions at the Site, given the context of our contract, with respect to existing environmental regulations within the applicable jurisdiction.

5. The Site history performed herein relies on information supplied by others, such as local, provincial and federal agencies as well as Site personnel. No attempt has been made to independently verify the accuracy of such information, unless specifically noted in our report.

6. Our observations relating to potential contaminant materials in the environment at the Site are described in this report. Where testing was performed, it was executed in accordance with our contract for these services. It should be noted that other compounds or materials not tested for may be present in the Site environment.

7. The conclusions of this report are based, in part, on the information provided by others. The possibility remains that unexpected environmental conditions may be encountered at the Site in locations not specifically investigated. Should such an event occur, Amec Foster Wheeler Environment & Infrastructure must be notified in order that we may determine if modifications to our conclusions are necessary.

8. The utilization of Amec Foster Wheeler Environment & Infrastructure's services during the implementation of any remedial measures will allow Amec Foster Wheeler Environment & Infrastructure to observe compliance with the conclusions and recommendations contained herein. It will also provide for changes as necessary to suit field conditions as they are encountered.

9. Any use which a third party makes of this report, or any reliance on or decisions to be made based on it, are the responsibility of such third parties. Amec Foster Wheeler Environment & Infrastructure accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this report.