



- **James & Sylvia Brown
c/o MHBC**

Hydrogeological Assessment

Project Name

12 Lot Subdivision Development
10379 Ilderton Road, Ilderton

Project Number

LON-00010753-GB

Prepared By

EXP Services Inc.
15701 Robin's Hill Road
London, ON, N5V 0A5
Canada

Date Submitted

September 5, 2018

James & Sylvia Brown c/o MHBC

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Date Submitted:

September 5, 2018

Legal Notification

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1.0 Introduction

1.1 Introduction

As requested, EXP Services Inc. (EXP) has conducted a hydrogeological assessment in conjunction with a proposed 12 lot residential subdivision development to be located southwest of the intersection of Coldstream Road and Ilderton Road in Coldstream, Ontario. It is understood that the lots will have individual wells and private septic systems and will be accessed by a local roadway. Coldstream has municipal groundwater supply to some residences. This report summarizes the results of the investigation and provides hydrogeological discussion and recommendations to support the design and construction of the proposed subdivision development.

1.2 Terms of Reference

Authorization to proceed with the investigation was received from James and Sylvia Brown via email on March 13, 2018.

Based on an interpretation of the factual test hole data, a review of soil and groundwater information from test holes advanced at and near the site, a review of available site physiographical mapping and Ministry of Environment Conservation and Parks (MOECP) well records, EXP has provided hydrogeological engineering guidelines to assist with the design and construction of the proposed subdivision development. More specifically, this report provides hydrogeological comments and discussion pertaining to potential impacts to the hydrogeological conditions at the Site, and provides design and construction measures, where applicable, to mitigate this potential for impact.

This report is provided on the basis of the Terms of Reference presented above, and on the assumption that the design will be in accordance with applicable codes and standards. If there are any changes in the design features relevant to the geotechnical analyses, or if any questions arise concerning geotechnical aspects of the codes and standards, this office should be contacted to review the design.

The information in this report in no way reflects on the environmental aspects of the soil. Should specific information in this regard be needed, additional testing may be required.

2.0 Methodology

2.1 Background

EXP has provided various assessments and reports for this Site since 2010. The current development plan includes a subdivision with 12 residential lots within 4.9 hectares (ha).

Previous assessed data and technical contents have been reviewed and incorporated, where applicable, into this report.

2.2 Fieldwork Procedures

The fieldwork for the current investigation was carried out on April 4th and 6th, 2018. In general, the site investigation consisted of drilling three (3) boreholes at the locations denoted on **Drawing 1** as MW18-1 to MW18-3, inclusive.

The three (3) boreholes were advanced to depths ranging from between 7.6 to 10.7 metres (m) below ground surface (bgs). Each of the boreholes was instrumented with groundwater monitoring wells for the purposes of determining static groundwater levels and for the collection of samples for laboratory analysis. The boreholes were advanced using continuous flight auger equipment operated by a specialist drilling subcontractor under the full-time supervision of EXP geotechnical staff. Selected disturbed samples were recovered from the flight auger and using conventional split spoon equipment and standard penetration test methods. Water level observations were made in the open boreholes during the course of the fieldwork.

During the drilling, the stratigraphy in the boreholes was examined and logged in the field by EXP geotechnical personnel. All samples recovered were transported to the London EXP laboratory for detailed examination and selective testing. Laboratory testing included grain size analyses on three selected soil samples.

Ground surface elevations at borehole locations were inferred from elevation contours indicated on a site plan by MHBC Plan No. Y288'A', Preliminary Draft Plan of Vacant Land Subdivision dated December 2, 2016.

Water level readings and samples were collected on April 6, 10, May 11, and June 4, 2018 capturing the different seasons of the groundwater conditions during spring and summer.

3.0 Site and Subsurface Conditions

3.1 Site Description

The study area is currently used for agricultural purposes and consists of open field. The parcel is approximately 4.9 ha in size and is relatively flat. A ditch runs roughly parallel to Coldstream Side Road to the east of the proposed development and crosses the Ilderton Road emptying into the Coldstream Mill Pond. The ditch is approximately 60 to 80 m east of the east property line of the proposed development. There are currently existing residential homes to the east and north of the proposed development.

3.2 Site Physiography

The physiographic mapping for the area indicates that the Site is situated near the tip of the Stratford Till Plain (Chapman and Putnam, 1984).

The Stratford Till Plain consists of ground moraine interrupted by several terminal moraines. The ground moraine throughout this region is fairly uniform, consisting of brown calcareous silt and clay tills.

Bedrock mapping and MECP Well Records for the area indicate the study area is generally underlain by limestone, dolostone, and shale (Hamilton Group) of the Middle Devonian Era, with an overburden thickness of about 71 m (233 ft).

3.3 Soil Stratigraphy

The detailed soil profiles encountered in April 2018 in each borehole are provided on the attached borehole logs (**Appendix A**). It must be noted that boundaries of soil indicated on the logs are inferred from non-continuous sampling and observations during drilling. These boundaries are intended to reflect transition zones for the purposes of geotechnical design and should not be interpreted as exact planes of geological change.

The general stratigraphy at the Site, as revealed in the boreholes, consisted of a layer of topsoil overlying silt over clayey silt till over silty sand.

A brief description of the soil stratigraphy at the Site, in order of depth, is summarized in the following sections.

3.3.1 Topsoil

Topsoil was encountered at surface in all boreholes. The topsoil layer varied in thickness from approximately 200 mm to 300.

It should be noted that topsoil quantities should not be established from the information provided at the borehole locations only. If required, a more detailed analysis (involving shallow test pits) is recommended to accurately quantify the amount of topsoil to be removed for construction purposes.

3.3.2 Silt

Silt was encountered beneath the topsoil in all boreholes. The silt was brown in colour with trace to some sand or sand partings, some clay and trace gravel and cobbles. It was in a stiff to very stiff consistency and compact relative density and moist to very moist. A grain size analysis was conducted on a sample obtained from MW18-2 near 1.0 m bgs. The composition is summarized below and found in **Appendix B** as Figure 1.

Table 1 – Grain Size Analysis Results

Sample	Composition, %			
	Gravel	Sand	Silt	Clay
MW18-2, 1.0 m bgs	8	35	42	15

3.3.3 Sandy Silt Till

Sandy silt till was observed at MW18-2 below the silt. It was described as brown with some clay, trace gravel, very stiff and very moist. It was approximately 0.8 m thick.

3.3.4 Clayey Silt Till

Clayey silt till was encountered below the silt at Boreholes MW18-1 and MW18-3 and below the sandy silt till at MW18-2. The clayey silt till was generally moist and very stiff to hard in consistency. It was brown in colour at MW18-2 and grey at the other two boreholes. It contained trace to some gravel, trace sand and occasional cobbles. The clayey silt till extended to depths of about 9.5 m bgs at MW18-1 and MW18-3 and 6.7 m bgs at MW18-2.

3.3.5 Silty Sand

All three boreholes were terminated in a silty sand. The silty sand layer occurred 9.6 m bgs, at MW18-1 and MW18-3 and 6.7 m bgs at MW18-2. It was described as grey in colour, compact and wet. Two grain size analyses were performed on samples from MW18-1 near depths of 9.1 to 9.8 m bgs and 10.7 to 11.3 m bgs. The compositions are summarized below and found in **Appendix B** as Figures 2 and 3.

Table 2 – Grain Size Analysis Results

Sample	Composition, %			
	Gravel	Sand	Silt	Clay
MW18-1, 9.1 to 9.8 m bgs	0	40	36	24
MW18-1, 10.7 to 11.3 m bgs	2	61	24	13

3.4 Groundwater

The depth to groundwater was measured in the boreholes on April 6, 10, 2018, on May 11, 2018, and on June 4, 2018. The measurements of depth (Dpt) and elevation (EI) are summarized in the table below.

Table 3 – Groundwater Level Measurements

Borehole No.	Borehole Elevation, m	Depth to Water, m							
		Apr 6/18		Apr 10/18		May 11/18		Jun 4/18	
		Dpt	EI	Dpt	EI	Dpt	EI	Dpt	EI
MW18-1	98.2	7.9	90.3	9.4	88.8	7.6	90.6	7.6	90.6
MW18-2	98.3	4.9	93.4	6.9	91.4	6.2	92.1	6.2	92.1
MW18-3	97.7	--	--	7.1	90.6	7.1	90.6	7.2	90.5

Measurements indicated an intermediate groundwater table 4.9 m to 7.6 m bgs in the clayey silt till/silty sand. The readings also capture the different seasons of the groundwater conditions at spring and summer.

The regional groundwater regime is towards the Sydenham River however the local radial flow is affected by the undulating underlying clayey silt till. The localized groundwater flow, as inferred by the elevations of ground water readings shown in the table above, is towards the north, towards the Coldstream Mill Pond. The May 2018 groundwater contours are shown on **Drawing 2**.

3.5 Potable Groundwater Supply

The Site is located within the Sydenham Headwaters of the St. Clair Region Conservation Authority watershed. To identify the depth of the potable groundwater aquifer for the area, a review of the local MECP well records within approximately 500 m radius of the site was carried out (see photograph below of location of wells on MECP website <https://www.ontario.ca/environment-and-energy/map-well-records>).

Registered MECP Wells Within a 500 m Radius



The MECP well computer data was updated as of February 2, 2018 and is summarized below.

Table 4 – MECP Well Records

UTM Well Location Eastings / Northings	MECP Well No.	Depth of Well (ft)	Depth Water Found (ft)	Static Water Level Depth (ft)	Rate of Pumping gal./min.
459253 / 4762693	4105862	15	6	6	--
459383 / 4762863	4104797	54	50	23	4
459333 / 4762823	4101055	52	42	20	10
459273 / 4762753	4104798	52	49	22	4
459433 / 4762903	4105762	65	40	16	12
459777 / 4763224	4114641	55	40	25	25
459673 / 4763071	7109379	53	40	20	15
459754 / 4763123	4104965	23	9	9	--
459774 / 4763223	4101056	58	44	18	10
459674 / 4763033	4101057*	74	37	22	12
459734 / 4763143	4107797	19	6	6	3
459734 / 4763143	4108596	68	51	24	9
459433 / 4762863	4107581	37	5	8	60
459664 / 4763048	4112039	50	28	22	10
459714 / 4763083	4107463	25	6	6	3
459694 / 4763083	4106048	32	22	20	--
459634 / 4763003	4106125	37	28	16	--
460262 / 4762730	4114605	42	25	24	12
460090 / 4762625	4113778	57	39	24	12
460090 / 4762625	4113531	50	40	22	12
460404 / 4762707	4106890	38	20 / 35	12	15
460090 / 4762625	4113014	52	9 / 40 / 47	24	30
460314 / 4762883	4108435	43	22	9	12
460300 / 4762660	4116399	43	22	--	--
459414 / 4763313	4101058*	66	60	7	4
460374 / 4762823	4105871	25	19	9	--
459253 / 4762813	4104705	58	52	8	5
459383 / 4762913	4104668	47	44	20	3
459233 / 4762853	4111421	55	42	15	10
459233 / 4762843	4109482*	53	35	16	10

UTM Well Location Eastings / Northings	MECP Well No.	Depth of Well (ft)	Depth Water Found (ft)	Static Water Level Depth (ft)	Rate of Pumping gal./min.
459554 / 4763353	4106202*	51	28	10	15
459474 / 4763053	4105024	53	35	13	12
459359 / 4762877	7107498	57	35	14	12
459639 / 4763213	4105602*	26	--	1	4
459413 / 4762943	4107334 ⁺	53	47	20	20
459313 / 4763163	4107927	58	39	11	20
459937 / 4763501	4106388	31	30	18	--
459904 / 4763463	4105446	27	25	17	--
459814 / 4763403	4107342	22	17	7	20
459785 / 4763214	7279712	53	36	20	15

Groundwater information provided by MECP well records indicates that there is a shallow aquifer (1.5 to 3.0 m deep or 5 to 10 ft) and an intermediate depth aquifer (3.0 to 18.3 m or 10 to 60 ft deep). The subsurface strata indicated in the MECP Well Records are generally clay over sand and gravel zones.

Of the wells listed above, five were described as having public use (*) and one was noted as being municipal use (+). The remaining wells were listed as either domestic use or domestic and live stock use.

3.6 Groundwater Chemical Analysis

Groundwater samples were obtained from the monitoring wells on April 10, 19, May 11 and June 4, 2018 and were submitted to Maxxam Analytics Inc. for analysis of Nitrate as Nitrogen. The Certificates of Analysis are provided in **Appendix C** and summarized below.

Table 5 – Nitrate as Nitrogen Results

Sample	Nitrate as Nitrogen, mg/L				
	April 10, 2018	April 19, 2018	May 11, 2018	June 4, 2018	Average of 4 Readings
MW18-1	0.34	0.24	2.12	0.45	0.79
MW18-2	7.37	3.63	1.01	0.57	3.15
MW18-3	0.47	0.29	1.17	1.55	0.87
Overall Average					1.60

4.0 Hydrogeological Comments and Recommendations

It is understood that a 12 lot subdivision development is proposed for the subject Site, complete with private servicing and wells. Each lot will vary in size from 0.243 ha to 0.528 ha with an average lot size of 0.33 ha. The overall Site is approximately 4.9 ha in size and is relatively flat. Based on our understanding of the proposed development, and the results of the current hydrogeological investigation, the following paragraphs provide hydrogeological comments and discussion pertaining to the proposed development.

EXP has reviewed the MECP Well Records for this area. In general, the potable wells recorded in the MECP Well Records are set at various depths ranging from approximately 1.5 m to 18.3 m in water-bearing sand and gravel layers. The depth water was found at in the wells indicates the presence of shallow and intermediate aquifers.

The shallow wells (water found at 3.0 m or less) are located approximately 100 m or more away from the Site. Based on the well records, the wells are set in different strata with sand overlying clayey soils. The shallow water table is considered “perched” over the less permeable soil stratum. Shallow groundwater flow across the site is typically affected by the soil permeability, topography and drainage. It is felt that the shallow wells are located a sufficient distance away such that they will not be impacted by the current proposed development.

The potential impact, if any, by surface conditions to the intermediate and any deep aquifers is significantly less. The wells in the area accessing potable groundwater from the intermediate aquifer are generally found at depths ranging between about 3.0 and 18.3 m bgs. Based on the water levels in the monitoring wells reported in Section 3.4, it appears that the local radial flow is in a northward direction toward the Coldstream Mill Pond (see **Drawing 2**). The monitoring wells installed within this Site confirmed that the stabilized groundwater level near them is approximately at 6.2 to 7.6 m bgs.

Based on EXP’s experience of soils in the area, this development is located in an area where the predominant soil type is glacial till. As a result of EXP’s previous findings in the area and the above comments, no significant long-term impact is anticipated on any nearby wells, either quantitatively and qualitatively since the proposed inverts of the septic systems are typically not deep enough to penetrate into the underlying aquifers. At the lowest invert levels for the house construction, the bottom of the excavations may contact shallow perched water conditions. Any temporary dewatering operations which may be required to deal with minor seepage are not expected to cause any long-term impacts to the aquifers which supply the nearby potable wells.

Intermediate and deeper aquifers are less influenced by local topographic relief. The static water levels provided in the well records indicate that the aquifers are well below potential invert levels of construction activity. Development at the site is not expected to have any significant impact on the intermediate or deep aquifers.

Sufficient water supply for potable well use is available from intermediate or deep aquifers in the area for the new residences.

A door to door well survey is recommended to be conducted to assess the locations of any potable wells in the area, including those which may not be recorded in the MECP well records, for a baseline survey.

5.0 Chemical Analysis

Groundwater samples were obtained from the monitoring wells on April 10, 19, May 11 and June 4, 2018 and were submitted to Maxxam Analytics Inc. for analysis of Nitrate as Nitrogen. The results of the laboratory testing are summarized below and Certificates of Analysis are provided in **Appendix C**.

Table 6 – Nitrate as Nitrogen Results

Sample	Nitrate as Nitrogen, mg/L				
	April 10, 2018	April 19, 2018	May 11, 2018	June 4, 2018	Average of 4 Readings
MW18-1	0.34	0.24	2.12	0.45	0.79
MW18-2	7.37	3.63	1.01	0.57	3.15
MW18-3	0.47	0.29	1.17	1.55	0.87
Overall Average					1.60

In general, the analytical testing results indicated that there was no significant health or environmental impact indicated from the water samples analyzed. The averaged value of the Nitrate concentration is 1.6 mg/L.

5.1 Boundary Nitrate Level Concentration

We have assessed the site information and are providing the following technical comments based on our investigative data.

From a technical analysis standpoint, EXP has conducted a mass balance exercise to demonstrate the feasibility of the proposed development with a septic system.

MECP D-5-4 Policy, Nitrate Impact Calculations

We have utilized the Guideline D-5-4 Predictive Assessment to quantify the risk of environmental impacts at the property boundaries and to provide any necessary recommendations to minimize such risks. The total site was assessed.

Environment Canada provides a mean annual precipitation for this area of 1010 mm/yr based on the London Airport weather station. A typical evaporation is estimated at 570 mm/yr based on regional stormwater balance calculations for the London area. A surplus water quantity of 440 mm/yr can be deduced for the analysis purpose. The dilution water was discounted using an infiltration factor of 0.8. The dilution water (DW) equals:

$$(\text{Precipitation} - \text{Evaporation}) \times \text{Site Size} \times \text{Infiltration Potential} + \text{QE}.$$

An average background nitrate level is 1.6 mg/L based on our sampling and testing program.

The nitrate concentration at the property boundary can be computed by the following equation:

$$Co = [QE (NE) + DW (NB)]/[DW + QE]$$

Where: Co = Nitrate Concentration at the property boundary (mg/L);

NE = Nitrate Concentration of the sewage effluent (mg/L) assume 40mg/L;

QE = Yearly volume of effluent produced (L/year) for assessment purpose, assume
 $365000 \text{ L/yr} \times 11 \text{ lots} = 4,015,000 \text{ L/yr}$;

DW = Dilution Water available (L/yr) assume 21,329,880 L/yr for the total site;

NB = Background Nitrate Concentration in diluting precipitation, assume 1.6 mg/L.

Based on the above values, the computed boundary condition will be at 7.7 mg/L.

Although it is actually the precipitation that dilutes the sewage, approval agencies may prefer to assume that the measured background concentration represents that of the diluting precipitation. For this case, a conservative figure of 1.6 mg/L was used.

Within the Ontario Drinking Water Quality Standards under the Ontario Safe Drinking Water Act, the maximum acceptable concentration of Nitrate is set at 10 mg/L as N. The effluent output parameter has been found in conventional septic tank out flow at concentrations of 40 mg/L, in studies conducted by MECP and available literatures.

The Nitrate concentration of 10 mg/L is treated as the boundary condition or maximum allowable limit after dilution at the site limit. The calculated Nitrate concentration at 7.7 mg/L is sufficiently less than the established boundary condition of 10 mg/L.

6.0 Conclusions

Based on the above assessment of the existing groundwater conditions, available potable water aquifers and background Nitrate levels, the proposed development will have negligible impacts to the hydrogeological conditions at the Site and neighbouring potable wells.

7.0 General Comments

The information presented in this report is based on a limited investigation designed to provide information to support an assessment of the current hydrogeological conditions within the subject property. The conclusions and recommendations presented in this report reflect site conditions existing at the time of the investigation. Consequently, during the future development of the property, conditions not observed during this investigation may become apparent. Should this occur, EXP Services Inc. should be contacted to assess the situation, and the need for additional testing and reporting. EXP has qualified personnel to provide assistance in regard to any future earth science issues related to this property.

Our undertaking at EXP, therefore, is to perform our work within limits prescribed by our clients, with the usual thoroughness and competence of the engineering profession.

The comments given in this report are intended only for the guidance of design engineers. The number of test holes required to determine the localized underground conditions between test holes affecting construction costs, techniques, sequencing, equipment, scheduling, etc. would be much greater than has been carried out for design purposes. Contractors bidding on or undertaking the works should in this light, decide on their own investigations, as well as their own interpretations of the factual borehole results, so that they may draw their own conclusions as to how the subsurface conditions may affect them.

EXP Services Inc. should be retained for a general review of the final design and specifications to verify that this report has been properly interpreted and implemented. If not afforded the privilege of making this review, EXP Services Inc. will assume no responsibility for interpretation of the recommendations in this report.



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We trust this report is satisfactory for your purposes. Should you have any questions, please do not hesitate to contact this office.

Drawings




-LEGEND-

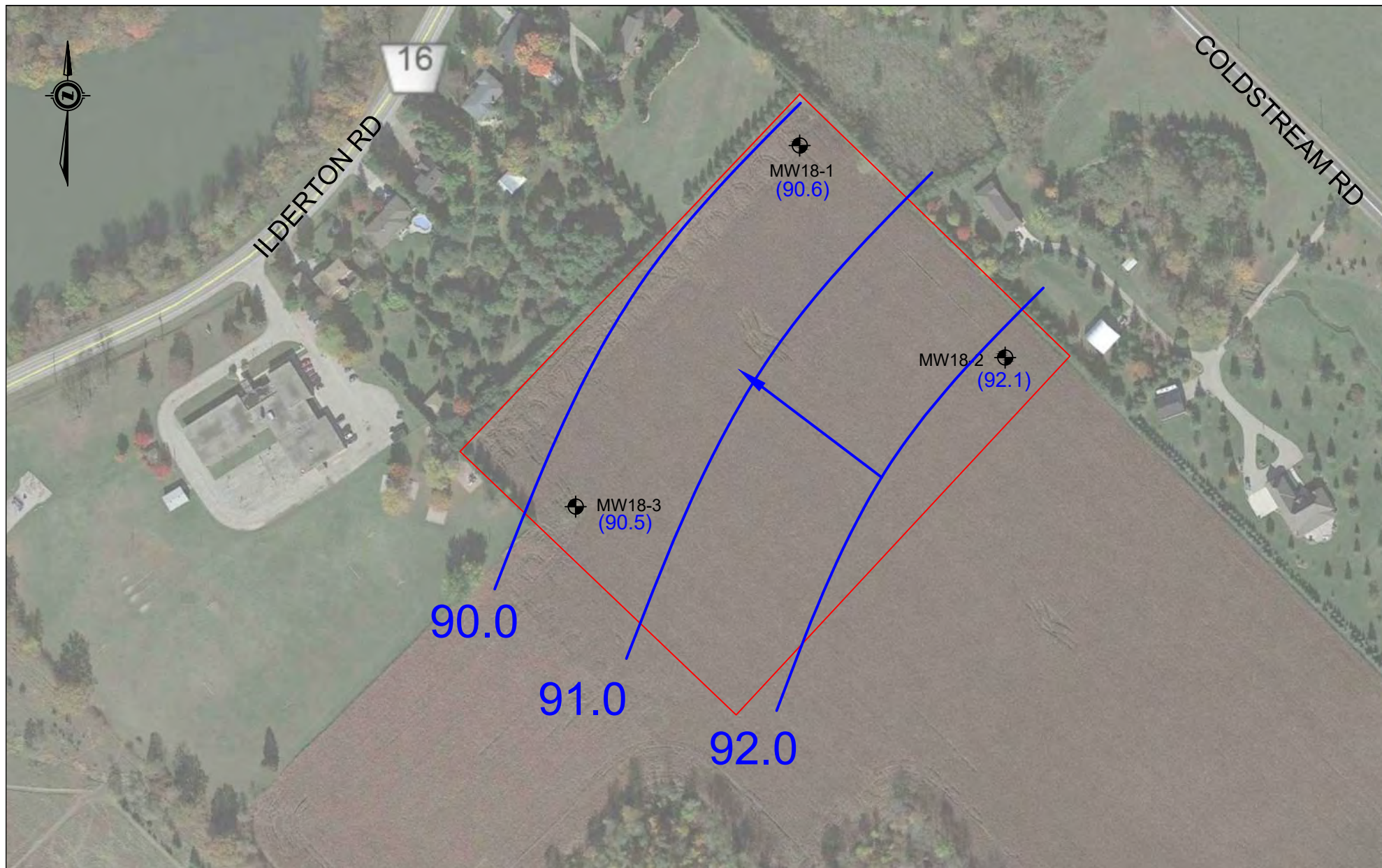
-  MW18-1 Approximate Monitoring Well Location
 Site Boundary

Hydrogeological Assessment






12 Lot Subdivision Development

10379 Ilderton Road
Ilderton, Ontario

CLIENT Jim & Sylvia Brown	
TITLE Monitoring Well Location Plan	
Prepared By: M.B.	Reviewed By: VC
 EXP Services Inc. 15701 Robin's Hill Road, London, ON, N5V 0A5	
DATE SEPTEMBER 2018	SCALE NTS
PROJECT NO. LON-00010753-GB	DWG. 1




-LEGEND-

-  MW18-1 Approximate Monitoring Well Location
-  Site Boundary
-  Groundwater Contours
-  Groundwater Elevation (May 2018)
-  Groundwater Flow Direction

Hydrogeological Assessment

Residential Development

10379 Ilderton Road
Ilderton, Ontario

CLIENT Jim & Sylvia Brown	
TITLE Groundwater Flow Direction	
Prepared By: M.B.	Reviewed By: B.C.
 EXP Services Inc. 15701 Robin's Hill Road, London, ON, N5V 0A5	
DATE September 2018	SCALE NTS
PROJECT NO. LON-00010753-GB	DWG. 2

Appendix A – Borehole Logs

NOTES ON SAMPLE DESCRIPTIONS

- All descriptions included in this report follow the 'modified' Massachusetts Institute of Technology (M.I.T.) soil classification system. The laboratory grain-size analysis also follows this classification system. Others may designate the Unified Classification System as their source; a comparison of the two is shown for your information. Please note that, with the exception of those samples where the grain size analysis has been carried out, all samples are classified visually and the accuracy of the visual examination is not sufficient to differentiate between the classification systems or exact grain sizing. The M.I.T. system has been modified and the EXP classification includes a designation for cobbles above the 75 mm size and boulders above the 200 mm size.

UNIFIED SOIL CLASSIFICATION	Fines (silt and clay)		Sand			Gravel		Cobbles
			Fine	Medium	Coarse	Fine	Coarse	
M.I.T. SOIL CLASSIFICATION	Clay	Silt	Sand			Gravel		
			Fine	Medium	Coarse			
Sieve Sizes								
<div>Particle Size (mm)</div> <div>0.0020.060.0750.20.62.05.02080</div> <div>200401043/4</div>								

- Fill:** Where fill is designated on the borehole log, it is defined as indicated by the sample recovered during the boring process. The reader is cautioned that fills are heterogeneous in nature and variable in density or degree of compaction. The borehole description therefore, may not be applicable as a general description of the site fill material. All fills should be expected to contain obstructions such as large concrete pieces or subsurface basements, floors, tanks, even though none of these obstructions may have been encountered in the borehole. Since boreholes cannot accurately define the contents of the fill, test pits are recommended to provide supplementary information. Despite the use of test pits, the heterogeneous nature of fill will leave some ambiguity as to the exact and correct composition of the fill. Most fills contain pockets, seams, or layers of organically contaminated soil. This organic material can result in the generation of methane gas and/or significant ongoing and future settlements. The fill at this site has been monitored for the presence of methane gas and the results are recorded on the borehole logs. The monitoring process neither indicates the volume of gas that can be potentially generated or pinpoints the source of the gas. These readings are to advise of a potential or existing problem (if they exist) and a detailed study is recommended for sites where any explosive gas/methane is detected. Some fill material may be contaminated by toxic waste that renders the material unacceptable for deposition in any but designated land fill sites; unless specifically stated, the fill on the site has not been tested for contaminants that may be considered hazardous. This testing and a potential hazard study can be carried out if you so request. In most residential/commercial areas undergoing reconstruction, buried oil tanks are common, but not detectable using conventional geotechnical procedures.
- Glacial Till:** The term till on the borehole logs indicates that the material originates from a geological process associated with glaciation. Because of this geological process, the till must be considered heterogeneous in composition and as such, may contain pockets and/or seams of material such as sand, gravel, silt or clay. Till often contains cobbles (75 to 200 mm in diameter) or boulders (greater than 200 mm diameter) and therefore, contractors may encounter them during excavation, even if they are not indicated on the borehole logs. It should be appreciated that normal sampling equipment can not differentiate the size or type of obstruction. Because of the horizontal and vertical variability of till, the sample description may be applicable to a very limited area; therefore, caution is essential when dealing with sensitive excavations or dewatering programs in till material.



BOREHOLE LOG

MW18-1

Sheet 1 of 1

CLIENT **Jim and Sylvia Brown** PROJECT NO. **LON-00010753-GB**
PROJECT **Residential Development** DATUM **Assumed**
LOCATION **10379 Ilderton Road, Ilderton, ON** DATES: Boring **April 4, 2018** Water Level **April 10, 2018**

DEPTH (m bgs)	ELEVATION (~m)	STRATA DESCRIPTION	STRATA PLOT	WELL LOG	SAMPLES				MOISTURE CONTENT (%)	SHEAR STRENGTH	
					TYPE	NUMBER	RECOVERY (mm)	N VALUE (blows)		◆ S Field Vane Test (#=Sensitivity) ▲ Penetrometer ■ Torvane	Atterberg Limits and Moisture W _p W W _L ● SPT N Value × Dynamic Cone
0	98.2										
	97.9	TOPSOIL - 300 mm									
1		SILT - sandy partings, brown, trace cobbles, compact, moist									
2											
3	95.6	becoming gravelly near 2.5 m bgs CLAYEY SILT TILL - grey, trace to some gravel, trace sand, very stiff to hard, moist									
4											
5											
6											
7											
8											
9											
10	88.6	SILTY SAND - grey, occasional silty clay partings in upper portion, compact, wet			SS	S1	600	23			
	87.5				SS	S2	500	26			
11		End of Borehole at 10.7 m bgs.									

NOTES

- Borehole Log interpretation requires assistance by EXP before use by others. Borehole Logs must be read in conjunction with EXP Report LON-00010753-GB.
- bgs denotes below ground surface.
- No significant methane gas concentration was detected upon completion of drilling.
- Water Level Readings:

Date	Depth to Water (m bgs)
April 6, 2018	7.9
April 10, 2018	9.4
May 11, 2018	7.6
June 4, 2018	7.6

SAMPLE LEGEND

☒ AS Auger Sample ☒ SS Split Spoon ■ ST Shelby Tube
☐ Rock Core (eg. BQ, NQ, etc.) ☐ VN Vane Sample

OTHER TESTS

G Specific Gravity	C Consolidation
H Hydrometer	CD Consolidated Drained Triaxial
S Sieve Analysis	CU Consolidated Undrained Triaxial
γ Unit Weight	UU Unconsolidated Undrained Triaxial
P Field Permeability	UC Unconfined Compression
K Lab Permeability	DS Direct Shear

WATER LEVELS

▽ Apparent ▼ Measured ▲ Artesian (see Notes)



BOREHOLE LOG

MW18-2

Sheet 1 of 1

CLIENT Jim and Sylvia Brown PROJECT NO. LON-00010753-GB
PROJECT Residential Development DATUM Assumed
LOCATION 10379 Ilderton Road, Ilderton, ON DATES: Boring April 4, 2018 Water Level April 10, 2018

DEPTH (m bgs)	ELEVATION (~ m)	STRATA DESCRIPTION	STRATA PLOT	WELL LOG	SAMPLES				MOISTURE CONTENT (%)	SHEAR STRENGTH																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																														
					TYPE	NUMBER	RECOVERY (mm)	N VALUE (blows)		◆ S Field Vane Test (#=Sensitivity) ▲ Penetrometer ■ Torvane																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																														
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NOTES

- Borehole Log interpretation requires assistance by EXP before use by others. Borehole Logs must be read in conjunction with EXP Report LON-00010753-GB.
- bgs denotes below ground surface.
- No significant methane gas concentration was detected upon completion of drilling.
- Water Level Readings: Date Depth to Water (m bgs)
April 6, 2018 4.9
April 10, 2018 6.9
May 11, 2018 6.2
June 4, 2018 6.2

SAMPLE LEGEND

- ☒ AS Auger Sample ☒ SS Split Spoon ■ ST Shelby Tube
☐ Rock Core (eg. BQ, NQ, etc.) ☐ VN Vane Sample

OTHER TESTS

- G Specific Gravity C Consolidation
H Hydrometer CD Consolidated Drained Triaxial
S Sieve Analysis CU Consolidated Undrained Triaxial
γ Unit Weight UU Unconsolidated Undrained Triaxial
P Field Permeability UC Unconfined Compression
K Lab Permeability DS Direct Shear

WATER LEVELS

- ▽ Apparent ▼ Measured ▲ Artesian (see Notes)



BOREHOLE LOG

MW18-3

Sheet 1 of 1

CLIENT Jim and Sylvia Brown PROJECT NO. LON-00010753-GB
PROJECT Residential Development DATUM Assumed
LOCATION 10379 Ilderton Road, Ilderton, ON DATES: Boring April 6, 2018 Water Level April 10, 2018

DEPTH (m bgs)	ELEVATION (~m)	STRATA DESCRIPTION	STRATA PLOT	WELL LOG	SAMPLES				MOISTURE CONTENT (%)	SHEAR STRENGTH	
					TYPE	NUMBER	RECOVERY (mm)	N VALUE (blows)		◆ S Field Vane Test (#=Sensitivity) ▲ Penetrometer ■ Torvane	Atterberg Limits and Moisture W _p W W _L ● SPT N Value × Dynamic Cone
0	97.7										
	97.5	TOPSOIL - 250 mm									
1		SILT - brown, trace to some sand, trace gravel, trace clay, stiff, very moist									
2											
	95.0	- becoming sandy near 2.4 m bgs									
3		CLAYEY SILT TILL - grey, trace to some gravel, trace sand, hard, moist									
4											
5											
6											
7											
8											
9											
	88.1										
10		SILTY SAND - grey, compact, wet									
	87.0										
11		End of Borehole at 10.7 m bgs.									

NOTES

- Borehole Log interpretation requires assistance by EXP before use by others. Borehole Logs must be read in conjunction with EXP Report LON-00010753-GB.
- bgs denotes below ground surface.
- No significant methane gas concentration was detected upon completion of drilling.
- Water Level Readings: Date Depth to Water (m bgs)
April 6, 2018 --
April 10, 2018 7.1
May 11, 2018 7.1
June 4, 2018 7.2

SAMPLE LEGEND

☒ AS Auger Sample ☒ SS Split Spoon ■ ST Shelby Tube
☐ Rock Core (eg. BQ, NQ, etc.) ☐ VN Vane Sample

OTHER TESTS

G Specific Gravity C Consolidation
H Hydrometer CD Consolidated Drained Triaxial
S Sieve Analysis CU Consolidated Undrained Triaxial
γ Unit Weight UU Unconsolidated Undrained Triaxial
P Field Permeability UC Unconfined Compression
K Lab Permeability DS Direct Shear

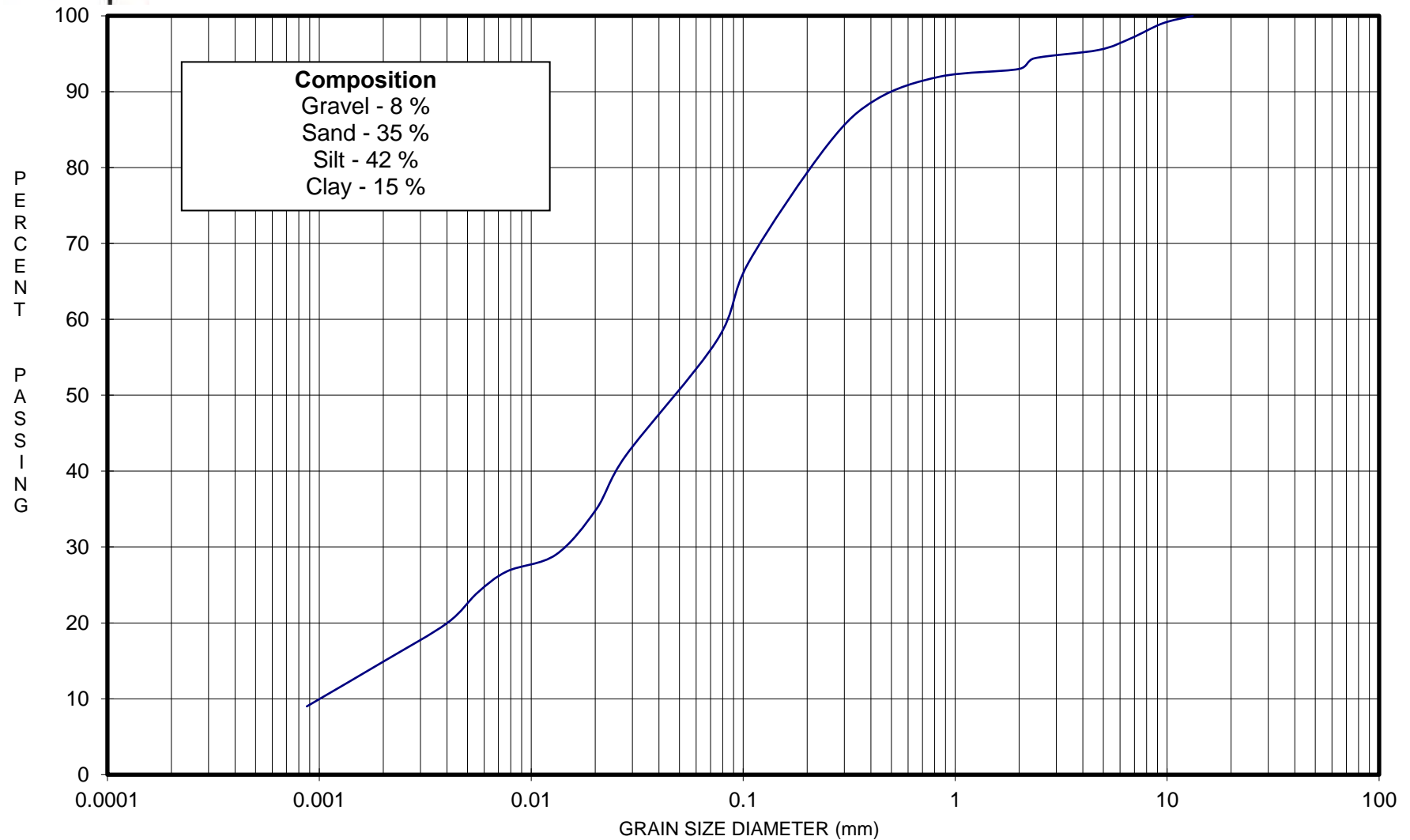
WATER LEVELS

▽ Apparent ▼ Measured ▲ Artesian (see Notes)

Appendix B – Grain Size Analyses



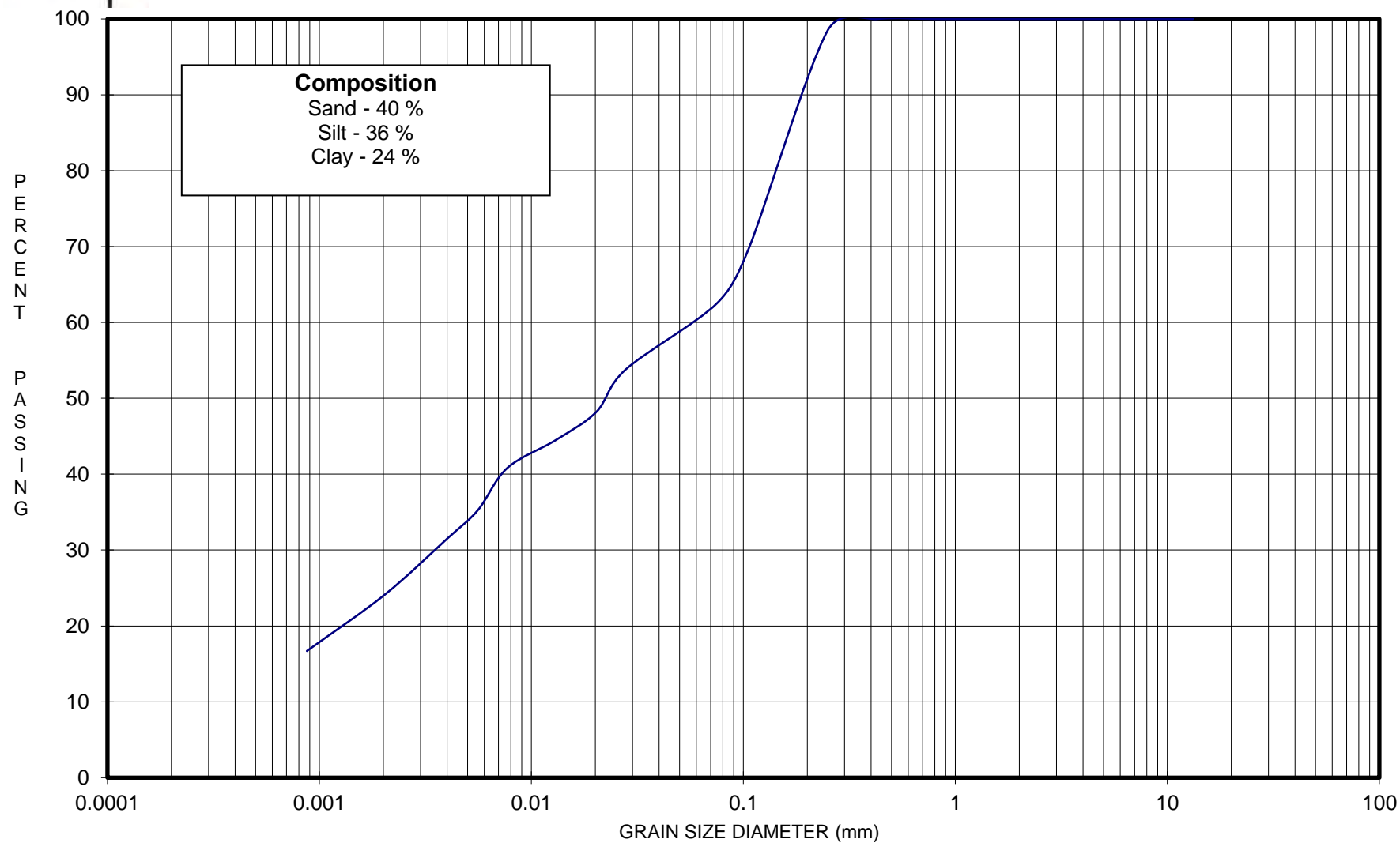
MECHANICAL GRAIN SIZE ANALYSIS



CLAY	FINE	MEDIUM	COARSE	FINE	MEDIUM	COARSE	FINE	MEDIUM	COARSE	
	SILT			SAND			GRAVEL			
MODIFIED M.I.T. CLASSIFICATION		Sample Description: MW18-2 Depth 1 m bgs ML Soil Type					Project: LON00010753GB			Figure 1



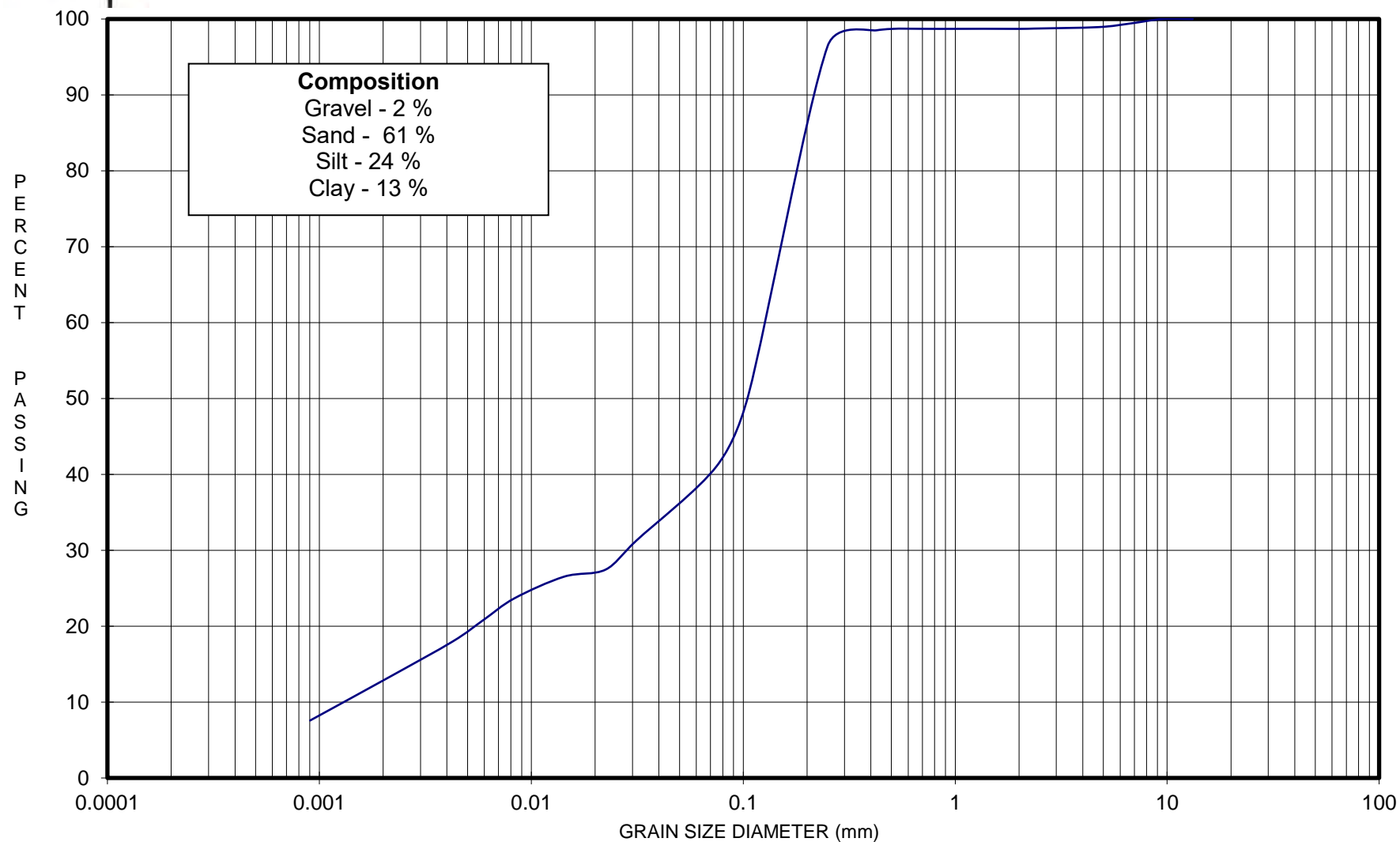
MECHANICAL GRAIN SIZE ANALYSIS



CLAY	FINE	MEDIUM	COARSE	FINE	MEDIUM	COARSE	FINE	MEDIUM	COARSE	
	SILT			SAND			GRAVEL			
MODIFIED M.I.T. CLASSIFICATION		Sample Description: MW18-1 Sa1 Depth 9.1-9.8 m bgs					Project: LON00010753GB			Figure 2



MECHANICAL GRAIN SIZE ANALYSIS



CLAY	FINE	MEDIUM	COARSE	FINE	MEDIUM	COARSE	FINE	MEDIUM	COARSE	
	SILT			SAND			GRAVEL			
MODIFIED M.I.T. CLASSIFICATION		Sample Description: MW18-1, Sa2 Depth 10.7-11.3 m bgs					Project: LON00010753GB			Figure 3

Appendix C – Certificate of Analyses

Your Project #: 11910
Site Location: 10753-GB
Your C.O.C. #: 431636-01-01

Attention: Vickie Coatsworth

exp Services Inc
London Branch
15701 Robin's Hill Rd
Unit 2
London, ON
CANADA N5V 0A5

Report Date: 2018/04/16
Report #: R5080327
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B884195

Received: 2018/04/13, 10:08

Sample Matrix: Water
Samples Received: 3

Analyses	Date		Date Analyzed	Laboratory Method	Reference
	Quantity	Extracted			
Nitrate (NO3) and Nitrite (NO2) in Water (1)	3	N/A	2018/04/16	CAM SOP-00440	SM 23 4500-NO3I/NO2B

Remarks:

Maxxam Analytics' laboratories are accredited to ISO/IEC 17025:2005 for specific parameters on scopes of accreditation. Unless otherwise noted, procedures used by Maxxam are based upon recognized Provincial, Federal or US method compendia such as CCME, MDDELCC, EPA, APHA.

All work recorded herein has been done in accordance with procedures and practices ordinarily exercised by professionals in Maxxam's profession using accepted testing methodologies, quality assurance and quality control procedures (except where otherwise agreed by the client and Maxxam in writing). All data is in statistical control and has met quality control and method performance criteria unless otherwise noted. All method blanks are reported; unless indicated otherwise, associated sample data are not blank corrected.

Maxxam Analytics' liability is limited to the actual cost of the requested analyses, unless otherwise agreed in writing. There is no other warranty expressed or implied. Maxxam has been retained to provide analysis of samples provided by the Client using the testing methodology referenced in this report. Interpretation and use of test results are the sole responsibility of the Client and are not within the scope of services provided by Maxxam, unless otherwise agreed in writing.

Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope dilution methods.

Results relate to samples tested.

This Certificate shall not be reproduced except in full, without the written approval of the laboratory.

Reference Method suffix "m" indicates test methods incorporate validated modifications from specific reference methods to improve performance.

* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.

(1) Values for calculated parameters may not appear to add up due to rounding of raw data and significant figures.

Your Project #: 11910
Site Location: 10753-GB
Your C.O.C. #: 431636-01-01

Attention: Vickie Coatsworth

exp Services Inc
London Branch
15701 Robin's Hill Rd
Unit 2
London, ON
CANADA N5V 0A5

Report Date: 2018/04/16
Report #: R5080327
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B884195
Received: 2018/04/13, 10:08

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Christine Gripton, Senior Project Manager
Email: CGripton@maxxam.ca
Phone# (800)268-7396 Ext:250

=====

Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

Maxxam Job #: B884195
Report Date: 2018/04/16

exp Services Inc
Client Project #: 11910
Site Location: 10753-GB
Sampler Initials: MB

RESULTS OF ANALYSES OF WATER

Maxxam ID		GLN254	GLN255	GLN256		
Sampling Date		2018/04/10 18:20	2018/04/10 18:10	2018/04/10 18:30		
COC Number		431636-01-01	431636-01-01	431636-01-01		
	UNITS	MW101	MW102	MW103	RDL	QC Batch
Inorganics						
Nitrate (N)	mg/L	0.34	7.37	0.47	0.10	5484675
RDL = Reportable Detection Limit						
QC Batch = Quality Control Batch						

Maxxam Job #: B884195
Report Date: 2018/04/16

exp Services Inc
Client Project #: 11910
Site Location: 10753-GB
Sampler Initials: MB

TEST SUMMARY

Maxxam ID: GLN254
Sample ID: MW101
Matrix: Water

Collected: 2018/04/10
Shipped:
Received: 2018/04/13

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Nitrate (NO3) and Nitrite (NO2) in Water	LACH	5484675	N/A	2018/04/16	Chandra Nandlal

Maxxam ID: GLN255
Sample ID: MW102
Matrix: Water

Collected: 2018/04/10
Shipped:
Received: 2018/04/13

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Nitrate (NO3) and Nitrite (NO2) in Water	LACH	5484675	N/A	2018/04/16	Chandra Nandlal

Maxxam ID: GLN256
Sample ID: MW103
Matrix: Water

Collected: 2018/04/10
Shipped:
Received: 2018/04/13

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Nitrate (NO3) and Nitrite (NO2) in Water	LACH	5484675	N/A	2018/04/16	Chandra Nandlal

GENERAL COMMENTS

Each temperature is the average of up to three cooler temperatures taken at receipt

Package 1	1.0°C
-----------	-------

Results relate only to the items tested.

Maxxam Job #: B884195
Report Date: 2018/04/16

QUALITY ASSURANCE REPORT

exp Services Inc
Client Project #: 11910
Site Location: 10753-GB
Sampler Initials: MB

QC Batch	Parameter	Date	Matrix Spike		SPIKED BLANK		Method Blank		RPD	
			% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits
5484675	Nitrate (N)	2018/04/16	89	80 - 120	98	80 - 120	<0.10	mg/L	0.24	20

Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.

Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate sample matrix interference.

Spiked Blank: A blank matrix sample to which a known amount of the analyte, usually from a second source, has been added. Used to evaluate method accuracy.

Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.

VALIDATION SIGNATURE PAGE

The analytical data and all QC contained in this report were reviewed and validated by the following individual(s).



Ewa Pranjić, M.Sc., C.Chem, Scientific Specialist

Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

Maxxam

Maxxam Analytics International Corporation o/a Maxxam Analytics
4053 Meadowbrook Drive, Unit 101, London, Ontario Canada N6L 1E8 Tel: (519) 652-9444 Toll-free 800-653-6266 Fax: (805) 817-5279 www.maxxam.ca

CHAIN OF CUSTODY RECORD

Page 1 of 1

INVOICE INFORMATION:		REPORT INFORMATION (if differs from invoice)		PROJECT INFORMATION:		Laboratory Use Only:	
Company Name	#28124 exp Services Inc	Company Name	Isane + Mark Bertens	Quotation #	B31817	MAXXAM JOB #	BOTTLE ORDER #
Contact Name	Vickie Coatsworth / Botel Chiu	Contact Name		P.O. #			
Address	15701 Robin's Hill Rd Unit 2 London ON N5V 0A5	Address		Project #	11910		
Phone	(519)963-3000	Phone		Project Name	10753 - G.B	CHAIN OF CUSTODY #	PROJECT MANAGER:
Email	vickie.coatsworth@exp.com / botel.chiu@exp.com	Fax	mark.bertens@exp.com	Site #			Christine Gripton
				Sampled By	Mark Bertens		

Regulation 153 (2011)		Other Regulations		SPECIAL INSTRUCTIONS		ANALYSIS REQUESTED (Please be specific)										TURNAROUND TIME (TAT) REQUIRED			
<input type="checkbox"/> Table 1 <input type="checkbox"/> Table 2 <input type="checkbox"/> Table 3 <input type="checkbox"/> Table	<input type="checkbox"/> Res/Park <input type="checkbox"/> Ind/Comm <input type="checkbox"/> Agri/Other	<input type="checkbox"/> Medium/Fine <input type="checkbox"/> Coarse <input type="checkbox"/> For RSC	<input type="checkbox"/> CCME <input type="checkbox"/> Reg. 558 <input type="checkbox"/> MISA <input type="checkbox"/> PWGO <input type="checkbox"/> Other	<input type="checkbox"/> Sanitary Sewer Bylaw <input type="checkbox"/> Storm Sewer Bylaw <input type="checkbox"/> Municipality		Regular (Standard) TAT: (will be applied if Rush TAT is not specified) Standard TAT = 5-7 Working days for most tests Please note: Standard TAT for certain tests such as BOD and Dioxin/Furans are > 5 days - contact your Project Manager for details. Job Specific Rush TAT (if applies to entire submission) Date Required: 24 hr TAT Time Required: <input checked="" type="checkbox"/> Rush Confirmation Number: (call lab for #)													
Include Criteria on Certificate of Analysis (Y/N)? Note: For MCE regulated drinking water samples - please use the Drinking Water Chain of Custody Form						SAMPLES MUST BE KEPT COOL (< 10°C) FROM TIME OF SAMPLING UNTIL DELIVERY TO MAXXAM													
Sample Barcode Label	Sample (Location) Identification	Date Sampled	Time Sampled	Matrix	Regulated Drinking Water? (Y/N)	Metals Field Filtered? (Y/N)	Chloride	Coliform/E. coli, CFU/100mL	Heterotrophic plate count, (CFU/mL)	Metals Analysis by ICPMS (as received)	Nitrate (NO3) and Nitrite (NO2) in Water	pH	Total Phosphorus (Colourimetric)	Ultraviolet as N	Unfiltered sample	# of Bottles	Comments		
1	MW 101	2018/04/10	18:20	GW	N									X	X	1			
2	MW 102	↓	18:10	↓	N									X	X	1			
3	MW 103	↓	18:30	↓	N									X	X	1			
4																			
5																			
6																			
7																			
8																			
9																			
10																			

RUSH!

REC'D IN LONDON

13-Apr-18 10:08
Christine Gripton
B884195
FCN ENV-1403

on ice

RELINQUISHED BY: (Signature/Print)	Date: (YY/MM/DD)	Time:	RECEIVED BY: (Signature/Print)	Date: (YY/MM/DD)	Time:	# Jars Used and	Laboratory Use Only		
Mark Bertens	18/04/13		Christine Gripton	2018/04/13	10:08	Not Submitted	Time Sensitive	Temperature (°C) on Receipt	Custody Seal
								0/1/2°C	Present
									Intact

* IT IS THE RESPONSIBILITY OF THE RELINQUISHER TO ENSURE THE ACCURACY OF THE CHAIN OF CUSTODY RECORD. AN INCOMPLETE CHAIN OF CUSTODY MAY RESULT IN ANALYTICAL TAT DELAYS.

Maxxam Analytics International Corporation o/a Maxxam Analytics

-1/-1/-1

MW# 421092

Your Project #: 10753 GB
Your C.O.C. #: 431636-01-01

Attention: Bo Chiu

exp Services Inc
London Branch
15701 Robin's Hill Rd
Unit 2
London, ON
CANADA N5V 0A5

Report Date: 2018/04/25
Report #: R5091549
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B893428

Received: 2018/04/24, 12:50

Sample Matrix: Water
Samples Received: 3

Analyses	Date		Date Analyzed	Laboratory Method	Reference
	Quantity	Extracted			
Nitrate (NO3) and Nitrite (NO2) in Water (1)	3	N/A	2018/04/25	CAM SOP-00440	SM 23 4500-NO3I/NO2B

Remarks:

Maxxam Analytics' laboratories are accredited to ISO/IEC 17025:2005 for specific parameters on scopes of accreditation. Unless otherwise noted, procedures used by Maxxam are based upon recognized Provincial, Federal or US method compendia such as CCME, MDDELCC, EPA, APHA.

All work recorded herein has been done in accordance with procedures and practices ordinarily exercised by professionals in Maxxam's profession using accepted testing methodologies, quality assurance and quality control procedures (except where otherwise agreed by the client and Maxxam in writing). All data is in statistical control and has met quality control and method performance criteria unless otherwise noted. All method blanks are reported; unless indicated otherwise, associated sample data are not blank corrected.

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Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope dilution methods.

Results relate to samples tested.

This Certificate shall not be reproduced except in full, without the written approval of the laboratory.

Reference Method suffix "m" indicates test methods incorporate validated modifications from specific reference methods to improve performance.

* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.

(1) Values for calculated parameters may not appear to add up due to rounding of raw data and significant figures.

Your Project #: 10753 GB
Your C.O.C. #: 431636-01-01

Attention: Bo Chiu

exp Services Inc
London Branch
15701 Robin's Hill Rd
Unit 2
London, ON
CANADA N5V 0A5

Report Date: 2018/04/25
Report #: R5091549
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B893428
Received: 2018/04/24, 12:50

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Christine Gripton, Senior Project Manager
Email: CGripton@maxxam.ca
Phone# (800)268-7396 Ext:250

=====

Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

RESULTS OF ANALYSES OF WATER

Maxxam ID		GNL484	GNL485	GNL486		
Sampling Date		2018/04/19 13:45	2018/04/19 13:20	2018/04/19 14:00		
COC Number		431636-01-01	431636-01-01	431636-01-01		
	UNITS	MW101	MW102	MW103	RDL	QC Batch
Inorganics						
Nitrate (N)	mg/L	0.24	3.63	0.29	0.10	5499397
RDL = Reportable Detection Limit						
QC Batch = Quality Control Batch						

TEST SUMMARY

Maxxam ID: GNL484
Sample ID: MW101
Matrix: Water

Collected: 2018/04/19
Shipped:
Received: 2018/04/24

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Nitrate (NO3) and Nitrite (NO2) in Water	LACH	5499397	N/A	2018/04/25	Chandra Nandlal

Maxxam ID: GNL485
Sample ID: MW102
Matrix: Water

Collected: 2018/04/19
Shipped:
Received: 2018/04/24

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Nitrate (NO3) and Nitrite (NO2) in Water	LACH	5499397	N/A	2018/04/25	Chandra Nandlal

Maxxam ID: GNL486
Sample ID: MW103
Matrix: Water

Collected: 2018/04/19
Shipped:
Received: 2018/04/24

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Nitrate (NO3) and Nitrite (NO2) in Water	LACH	5499397	N/A	2018/04/25	Chandra Nandlal

GENERAL COMMENTS

Each temperature is the average of up to three cooler temperatures taken at receipt

Package 1	3.7°C
-----------	-------

Results relate only to the items tested.

QUALITY ASSURANCE REPORT

QC Batch	Parameter	Date	Matrix Spike		SPIKED BLANK		Method Blank		RPD	
			% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits
5499397	Nitrate (N)	2018/04/25	90	80 - 120	97	80 - 120	<0.10	mg/L	0.21	20

Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.

Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate sample matrix interference.

Spiked Blank: A blank matrix sample to which a known amount of the analyte, usually from a second source, has been added. Used to evaluate method accuracy.

Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.

VALIDATION SIGNATURE PAGE

The analytical data and all QC contained in this report were reviewed and validated by the following individual(s).



Ewa Pranjić, M.Sc., C.Chem, Scientific Specialist

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INVOICE INFORMATION:				REPORT INFORMATION (if differs from invoice):				PROJECT INFORMATION:				Laboratory Use Only:			
Company Name: #28124 exp Services Inc				Company Name:				Quotation #: B31817				RUSH! MAXXAM JOB #			
Contact Name: Vickie Coatsworth Bochini				Contact Name:				P.O. #:				BOTTLE ORDER #:			
Address: 15701 Robin's Hill Rd Unit 2				Address:				Project #: 10153 GB				CHAIN OF CUSTODY #:			
London ON N5V 0A5								Project Name:				PROJECT MANAGER:			
Phone: (519)963-3000 Fax: (519)963-1152				Phone:				Site #:				Christine Gripton			
Email: vickie.coatsworth@exp.com Dotel.chimexp.com				Fax:				Sampled By:				C#431636-01-01			
Regulation 153 (2011)				Other Regulations				SPECIAL INSTRUCTIONS				TURNAROUND TIME (TAT) REQUIRED:			
<input type="checkbox"/> Table 1 <input type="checkbox"/> Res/Park <input type="checkbox"/> Medium/Fine <input type="checkbox"/> CCME <input type="checkbox"/> Sanitary Sewer Bylaw												PLEASE PROVIDE ADVANCE NOTICE FOR RUSH PROJECTS			
<input type="checkbox"/> Table 2 <input type="checkbox"/> Ind/Comm <input type="checkbox"/> Coarse <input type="checkbox"/> Reg. 558 <input type="checkbox"/> Storm Sewer Bylaw												Regular (Standard) TAT:			
<input type="checkbox"/> Table 3 <input type="checkbox"/> Agri/Other <input type="checkbox"/> For RSC <input type="checkbox"/> MISA <input type="checkbox"/> Municipality												(will be applied if Rush TAT is not specified)			
Include Criteria on Certificate of Analysis (Y/N)?												Standard TAT = 5-7 Working days for most tests.			
Note: For MOE regulated drinking water samples - please use the Drinking Water Chain of Custody Form												Please note: Standard TAT for certain tests such as BOD and Dioxins/Furans are > 5 days - contact your Project Manager for details.			
SAMPLES MUST BE KEPT COOL (< 10°C) FROM TIME OF SAMPLING UNTIL DELIVERY TO MAXXAM												Job Specific Rush TAT (if applies to entire submission)			
												Date Required: April 25/18 Time Required: [X]			
												Rush Confirmation Number: (call lab for #)			
Sample Barcode Label				Sample (Location) Identification				Date Sampled				# of Bottles			
1				MW101				2018/04/19				1			
2				MW102				1345				1			
3				MW103				1320				1			
4								1400				1			
5															
6															
7															
8															
9															
10															
RECEIVED BY: (Signature/Print)				Date: (YY/MM/DD)				Time:				# Jars Used and			
Bobbie Babbott				2018/04/24				12:50				Not Submitted			
Christine Gripton				2018/04/24				18:05				Time Sensitive			
FRANCINE CHONG				2018/04/24				18:05				Temperature (°C) on Receipt			
												Custody Seal			
												Present			
												Intact			
												Yes			
												No			

Your Project #: 10753-BG
Site Location: COLDSTREAM
Your C.O.C. #: n/a

Attention: Bo Chiu

exp Services Inc
London Branch
15701 Robin's Hill Rd
Unit 2
London, ON
CANADA N5V 0A5

Report Date: 2018/05/15
Report #: R5148196
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B8B2986

Received: 2018/05/14, 09:06

Sample Matrix: Water
Samples Received: 3

Analyses	Date		Date Analyzed	Laboratory Method	Reference
	Quantity	Extracted			
Nitrate (NO3) and Nitrite (NO2) in Water (1)	3	N/A	2018/05/15	CAM SOP-00440	SM 23 4500-NO3I/NO2B

Remarks:

Maxxam Analytics' laboratories are accredited to ISO/IEC 17025:2005 for specific parameters on scopes of accreditation. Unless otherwise noted, procedures used by Maxxam are based upon recognized Provincial, Federal or US method compendia such as CCME, MDDELCC, EPA, APHA.

All work recorded herein has been done in accordance with procedures and practices ordinarily exercised by professionals in Maxxam's profession using accepted testing methodologies, quality assurance and quality control procedures (except where otherwise agreed by the client and Maxxam in writing). All data is in statistical control and has met quality control and method performance criteria unless otherwise noted. All method blanks are reported; unless indicated otherwise, associated sample data are not blank corrected.

Maxxam Analytics' liability is limited to the actual cost of the requested analyses, unless otherwise agreed in writing. There is no other warranty expressed or implied. Maxxam has been retained to provide analysis of samples provided by the Client using the testing methodology referenced in this report. Interpretation and use of test results are the sole responsibility of the Client and are not within the scope of services provided by Maxxam, unless otherwise agreed in writing.

Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope dilution methods.

Results relate to samples tested.

This Certificate shall not be reproduced except in full, without the written approval of the laboratory.

Reference Method suffix "m" indicates test methods incorporate validated modifications from specific reference methods to improve performance.

* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.

(1) Values for calculated parameters may not appear to add up due to rounding of raw data and significant figures.

Your Project #: 10753-BG
Site Location: COLDSTREAM
Your C.O.C. #: n/a

Attention: Bo Chiu

exp Services Inc
London Branch
15701 Robin's Hill Rd
Unit 2
London, ON
CANADA N5V 0A5

Report Date: 2018/05/15
Report #: R5148196
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B8B2986
Received: 2018/05/14, 09:06

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Christine Gripton, Senior Project Manager
Email: CGripton@maxxam.ca
Phone# (800)268-7396 Ext:250

=====

Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

Maxxam Job #: B8B2986
Report Date: 2018/05/15

exp Services Inc
Client Project #: 10753-BG
Site Location: COLDSTREAM
Sampler Initials: MB

RESULTS OF ANALYSES OF WATER

Maxxam ID		GRQ091	GRQ092	GRQ093		
Sampling Date		2018/05/11 09:00	2018/05/11 08:45	2018/05/11 09:15		
COC Number		n/a	n/a	n/a		
	UNITS	BH102	BH103	BH101	RDL	QC Batch
Inorganics						
Nitrate (N)	mg/L	2.12	1.01	1.17	0.10	5531257
RDL = Reportable Detection Limit						
QC Batch = Quality Control Batch						

Maxxam Job #: B8B2986
Report Date: 2018/05/15

exp Services Inc
Client Project #: 10753-BG
Site Location: COLDSTREAM
Sampler Initials: MB

TEST SUMMARY

Maxxam ID: GRQ091
Sample ID: BH102
Matrix: Water

Collected: 2018/05/11
Shipped:
Received: 2018/05/14

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Nitrate (NO3) and Nitrite (NO2) in Water	LACH	5531257	N/A	2018/05/15	Chandra Nandlal

Maxxam ID: GRQ092
Sample ID: BH103
Matrix: Water

Collected: 2018/05/11
Shipped:
Received: 2018/05/14

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Nitrate (NO3) and Nitrite (NO2) in Water	LACH	5531257	N/A	2018/05/15	Chandra Nandlal

Maxxam ID: GRQ093
Sample ID: BH101
Matrix: Water

Collected: 2018/05/11
Shipped:
Received: 2018/05/14

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Nitrate (NO3) and Nitrite (NO2) in Water	LACH	5531257	N/A	2018/05/15	Chandra Nandlal

GENERAL COMMENTS

Each temperature is the average of up to three cooler temperatures taken at receipt

Package 1	4.7°C
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Results relate only to the items tested.

Maxxam Job #: B8B2986
Report Date: 2018/05/15

QUALITY ASSURANCE REPORT

exp Services Inc
Client Project #: 10753-BG
Site Location: COLDSTREAM
Sampler Initials: MB

QC Batch	Parameter	Date	Matrix Spike		SPIKED BLANK		Method Blank		RPD	
			% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits
5531257	Nitrate (N)	2018/05/15	95	80 - 120	97	80 - 120	<0.10	mg/L	NC	20

Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.

Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate sample matrix interference.

Spiked Blank: A blank matrix sample to which a known amount of the analyte, usually from a second source, has been added. Used to evaluate method accuracy.

Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.

NC (Duplicate RPD): The duplicate RPD was not calculated. The concentration in the sample and/or duplicate was too low to permit a reliable RPD calculation (absolute difference $\leq 2 \times \text{RDL}$).

VALIDATION SIGNATURE PAGE

The analytical data and all QC contained in this report were reviewed and validated by the following individual(s).


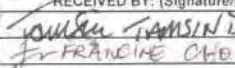
Cristina Carriere

Cristina Carriere, Scientific Service Specialist

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CHAIN OF CUSTODY RECORD

Page [of]

INVOICE INFORMATION:				REPORT INFORMATION (if differs from invoice):				PROJECT INFORMATION:				MAXXAM JOB NUMBER	
Company Name: <u>exp</u> Contact Name: <u>Botel China</u> Office: <input type="checkbox"/> Brampton <input type="checkbox"/> Kingston <input type="checkbox"/> T.Bay <input type="checkbox"/> Stoney Ck. <input type="checkbox"/> Ottawa <input checked="" type="checkbox"/> London <input type="checkbox"/> Markham <input type="checkbox"/> Kitchen Email: <u>botel.china@exp.ca</u>				Company Name: <u>Botel China</u> Contact Name: <u>Vickie Galsworth</u> Address: <u>vickie.galsworth@exp.ca</u> Phone: _____ Fax: _____ Email: <u>botel.china@exp.ca</u>				Contract Rates: <input type="checkbox"/> OR Quote #: P.O. #: Project # <u>1510753-GB</u> Project Name: <u>Coldstream</u> Location: Sampled By: <u>Mark Berkens</u>				7000104 CHAIN OF CUSTODY #	
REGULATORY CRITERIA				ANALYSIS REQUESTED (Please be specific):				TURNAROUND TIME (TAT) REQUIRED:					
Note: For regulated drinking water samples - please use the Drinking Water Chain of Custody Form Reg 153 <input type="checkbox"/> MISA <input type="checkbox"/> 2004 <input type="checkbox"/> 2009 <input type="checkbox"/> Sewer Use <input type="checkbox"/> PWQO <input type="checkbox"/> Table 1 <input type="checkbox"/> Residential/Parkland <input type="checkbox"/> Sanitary <input type="checkbox"/> Table 2 <input type="checkbox"/> Industrial/Commercial <input type="checkbox"/> Storm <input type="checkbox"/> Table 3 <input type="checkbox"/> Medium/Fine <input type="checkbox"/> Combined <input type="checkbox"/> Reg. 55 <input type="checkbox"/> Table 6 <input type="checkbox"/> Coarse <input type="checkbox"/> Municipality Other (specify): _____ Report Criteria on C of A? <input type="checkbox"/>				Regulated Drinking Water? (Y/N) _____ Metals Field Filtered? (Y/N) _____ BTEX, COME PHCs F1 (D6-C10) COME PHCs F2-4 (C10-C50) O'Reg 153 Metals (incl Hg, B and Cr VI) O'Reg 153 Metals & Inorgs Complete O'Reg 153 PAHs VOCs VOC-RSC** <u>Nitrates as N</u>				PLEASE PROVIDE ADVANCE NOTICE FOR RUSH PROJECTS Regular (Standard) TAT: <input type="checkbox"/> 5 to 7 Working Days Rush TAT: Rush # _____ PN _____ (call Lab for #) <input checked="" type="checkbox"/> 1 day <input type="checkbox"/> 2 days <input type="checkbox"/> 3 days DATE Required: _____ TIME Required: _____ Please note that TAT for certain tests such as BOD and Dissolved/Free are > 5 days - contact your Project Manager for details.					
SAMPLES MUST BE KEPT COOL (< 10 °C) FROM TIME OF SAMPLING UNTIL DELIVERY TO MAXXAM								# of Cont. COMMENTS / TAT COMMENTS					
Sample Identification		Date Sampled	Time Sampled	Matrix (GW, SW, Soil, etc.)									
1 BH102		2018/05/11	9:00am	GW					1				
2 BH103			8:45am						1				
3 BH101			9:15						1				
4													
5													
6													
7													
8													
9													
10													
11													
12													
RELINQUISHED BY: (Signature/Print)				RECEIVED BY: (Signature/Print)				Date:		Time:		Laboratory Use Only	
 Natasha Uyey				 Christine Gipton FRANCESCA CHONG				2018/05/14		09:06		Temperature (°C) on Receipt: 3/4/7°C Custody Seal Present: <input checked="" type="checkbox"/> Intact: <input checked="" type="checkbox"/> Yes: <input checked="" type="checkbox"/> No: <input type="checkbox"/>	

* MANDATORY SECTIONS IN GREY MUST BE FILLED OUT. AN INCOMPLETE CHAIN OF CUSTODY MAY RESULT IN ANALYTICAL TAT DELAYS

*VOC-MDL Maxxam will run water samples for best possible MDL for 8 chlorinated solvents in the case of highly impacted samples

Wyre Maxxam Fellow Client

4/116 #436741

Your Project #: 0753-GB
Site Location: COLDSTREAM
Your C.O.C. #: 101979

Attention: Bo Chiu

exp Services Inc
London Branch
15701 Robin's Hill Rd
Unit 2
London, ON
CANADA N5V 0A5

Report Date: 2018/06/12
Report #: R5233374
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B8E1319

Received: 2018/06/11, 09:04

Sample Matrix: Water
Samples Received: 3

Analyses	Date		Date Analyzed	Laboratory Method	Reference
	Quantity	Extracted			
Nitrate (NO3) and Nitrite (NO2) in Water (1)	3	N/A	2018/06/12	CAM SOP-00440	SM 23 4500-NO3I/NO2B

Remarks:

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Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope dilution methods.

Results relate to samples tested.

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Reference Method suffix "m" indicates test methods incorporate validated modifications from specific reference methods to improve performance.

* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.

(1) Values for calculated parameters may not appear to add up due to rounding of raw data and significant figures.

Your Project #: 0753-GB
Site Location: COLDSTREAM
Your C.O.C. #: 101979

Attention: Bo Chiu

exp Services Inc
London Branch
15701 Robin's Hill Rd
Unit 2
London, ON
CANADA N5V 0A5

Report Date: 2018/06/12
Report #: R5233374
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B8E1319
Received: 2018/06/11, 09:04

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Christine Gripton, Senior Project Manager
Email: CGripton@maxxam.ca
Phone# (800)268-7396 Ext:250

=====

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Maxxam Job #: B8E1319
Report Date: 2018/06/12

exp Services Inc
Client Project #: 0753-GB
Site Location: COLDSTREAM

RESULTS OF ANALYSES OF WATER

Maxxam ID		GXS960	GXS961	GXS962		
Sampling Date		2018/06/04 15:55	2018/06/04 15:20	2018/06/04 15:35		
COC Number		101979	101979	101979		
	UNITS	BH 103	BH 101	BH 102	RDL	QC Batch
Inorganics						
Nitrate (N)	mg/L	0.45	0.57	1.55	0.10	5574845
RDL = Reportable Detection Limit						
QC Batch = Quality Control Batch						

Maxxam Job #: B8E1319
Report Date: 2018/06/12

exp Services Inc
Client Project #: 0753-GB
Site Location: COLDSTREAM

TEST SUMMARY

Maxxam ID: GXS960
Sample ID: BH 103
Matrix: Water

Collected: 2018/06/04
Shipped:
Received: 2018/06/11

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Nitrate (NO3) and Nitrite (NO2) in Water	LACH	5574845	N/A	2018/06/12	Chandra Nandlal

Maxxam ID: GXS961
Sample ID: BH 101
Matrix: Water

Collected: 2018/06/04
Shipped:
Received: 2018/06/11

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Nitrate (NO3) and Nitrite (NO2) in Water	LACH	5574845	N/A	2018/06/12	Chandra Nandlal

Maxxam ID: GXS962
Sample ID: BH 102
Matrix: Water

Collected: 2018/06/04
Shipped:
Received: 2018/06/11

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Nitrate (NO3) and Nitrite (NO2) in Water	LACH	5574845	N/A	2018/06/12	Chandra Nandlal

GENERAL COMMENTS

Each temperature is the average of up to three cooler temperatures taken at receipt

Package 1	4.7°C
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Results relate only to the items tested.

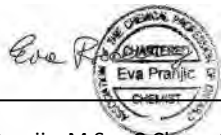
QUALITY ASSURANCE REPORT

exp Services Inc
Client Project #: 0753-GB
Site Location: COLDSTREAM

QC Batch	Parameter	Date	Matrix Spike		SPIKED BLANK		Method Blank		RPD	
			% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits
5574845	Nitrate (N)	2018/06/12	98	80 - 120	100	80 - 120	<0.10	mg/L	0.62	20
<p>Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.</p> <p>Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate sample matrix interference.</p> <p>Spiked Blank: A blank matrix sample to which a known amount of the analyte, usually from a second source, has been added. Used to evaluate method accuracy.</p> <p>Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.</p>										

VALIDATION SIGNATURE PAGE

The analytical data and all QC contained in this report were reviewed and validated by the following individual(s).



Ewa Pranjić, M.Sc., C.Chem, Scientific Specialist

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Christine Gripton

GID ENV-815

Maxxam Analytics
CAM FCD-01013/5
Page 1 of 1

When there is >1cm of visible particulate/sediment, the amount will be recorded in the field below

Bottle Types

[illegible]

Comments:

Legend:	
P	Suspended Particulate
TS	Trace Settled Sediment (just covers bottom of container or less)
S	Sediment greater than (>) Trace, but less than (<) 1 cm

Recorded By: (signature/print)

Bill & GUYLHGN 1212

Invoice Information		Report Information (if differs from invoice)		Project Information (where applicable)		Turnaround Time (TAT) Required			
Company Name: <u>EXP Services</u>		Company Name: <u>(same)</u>		Quotation #: _____		<input type="checkbox"/> Regular TAT (5-7 days) Most analyses PLEASE PROVIDE ADVANCE NOTICE FOR RUSH PROJECTS Rush TAT (Surcharges will be applied) <input checked="" type="checkbox"/> 1 Day <input type="checkbox"/> 2 Days <input type="checkbox"/> 3-4 Days			
Contact Name: <u>Botel Chiu</u>		Contact Name: <u>Vickie Coatsworth</u>		P.O. #/ A/E/R: _____					
Address: <u>15701 Robins Hill Rd</u> <u>London ON</u>		Address: _____		Project #: <u>10753-GB</u>					
Phone: <u>519-963-3000</u>		Phone: _____ Fax: _____		Site Location: <u>Caldstream</u>					
Email: <u>botel.chiu@exp.com</u>		Email: <u>botel.chiu@exp.com</u> <u>vickie.coatsworth@exp.com</u>		Site #: _____		Date Required: _____			
MOE REGULATED DRINKING WATER OR WATER INTENDED FOR HUMAN CONSUMPTION MUST BE SUBMITTED ON THE MAXXAM DRINKING WATER CHAIN OF CUSTODY									
Regulation 153 <input type="checkbox"/> Table 1 <input type="checkbox"/> Res/Park <input type="checkbox"/> Med/ Fine <input type="checkbox"/> Table 2 <input type="checkbox"/> Ind/Comm <input type="checkbox"/> Coarse <input type="checkbox"/> Table 3 <input type="checkbox"/> Agri/ Other <input type="checkbox"/> Table _____ FOR RSC (PLEASE CIRCLE) Y <input checked="" type="checkbox"/> N		Other Regulations <input type="checkbox"/> CCME <input type="checkbox"/> Sanitary Sewer Bylaw <input type="checkbox"/> MISA <input type="checkbox"/> Storm Sewer Bylaw <input type="checkbox"/> PWQO <input type="checkbox"/> Region _____ <input type="checkbox"/> Other (Specify) _____ <input type="checkbox"/> REG 558 (MIN. 3 DAY TAT REQUIRED)		Analysis Requested # OF CONTAINERS SUBMITTED: _____ FIELD FILTERED (CIRCLE) Metals / ug / CVI BTEX/ PHE/ T1 PHCS P2- P4 VOCs REG 133 METALS & INORGANICS REG 133 CPMS METALS REG 133 METALS (Pb, Cr VI, ICMS Metals, HWS - B) <u>Nitrate as N</u> HOLD- DO NOT ANALYZE				LABORATORY USE ONLY CUSTODY SEAL Y / N Present Intact Y Y <u>6.4, 4.0</u> COOLING MEDIA PRESENT: <input checked="" type="checkbox"/> Y <input type="checkbox"/> N COMMENTS	
Include Criteria on Certificate of Analysis: Y <input checked="" type="checkbox"/> N									
SAMPLES MUST BE KEPT COOL (< 10 °C) FROM TIME OF SAMPLING UNTIL DELIVERY TO MAXXAM									
SAMPLE IDENTIFICATION		DATE SAMPLED (YYYY/MM/DD)	TIME SAMPLED (HH:MM)	MATRIX					
1	<u>BH 103</u>	<u>2018/06/14</u>	<u>3:55 pm</u>	<u>1</u>					
2	<u>BH 101</u>		<u>3:20 pm</u>	<u>1</u>					
3	<u>BH 102</u>		<u>3:35 pm</u>	<u>1</u>					
4									
5									
6									
7									
8									
9									
10									

11-Jun-18 09:04
 Christine Gripton

B8E1319
 GID ENV-815
REC'D IN LONDON

RELINQUISHED BY: (Signature/Print)	DATE: (YYYY/MM/DD)	TIME: (HH:MM)	RECEIVED BY: (Signature/Print)	DATE: (YYYY/MM/DD)	TIME: (HH:MM)	MAXXAM JOB #
<u>Mona Ungeres / HCL</u>	<u>18/06/11</u>	<u>9:02</u>	<u>Christine Gripton</u>	<u>2018/06/11</u>	<u>9:04</u>	
			<u>Mona Ungeres / HCL</u>	<u>2018/06/11</u>	<u>18:10</u>	

Unless otherwise agreed to in writing, work submitted on this Chain of Custody is subject to Maxxam's standard Terms and Conditions. Signing of this Chain of Custody document is acknowledgment and acceptance of our terms which are available for viewing at www.maxxam.ca/terms. Sample container, preservation, hold time and packages information can be viewed at <http://www.maxxam.ca/wp-content/uploads/Ontario-COC.pdf>.