



Subsurface Assessment

Valleyview Developments Inc.

Project Name:

Proposed Residential Development
10283 Ilderton Road
Coldstream, Ontario

Project Number:

LON-00017783-GE

Prepared By:

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Date Submitted:

March 23, 2020

Subsurface Assessment

Valleyview Developments Inc.

Type of Document:

Geotechnical Report

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Prepared and Reviewed By:

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1. Introduction and Background

1.1 Introduction

EXP Services Inc. (EXP) was retained by **Valleyview Developments Inc.** to carry out a hydrogeological assessment in conjunction with a proposed 13 lot residential subdivision development to be located at 10283 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

The hydrogeological assessment was carried out in general accordance with the scope of work outlined through EXP's email proposal dated February 5, 2020. Authorization to proceed with the investigation was received from Mr. Rob Sanderson through email correspondence.

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 (MECP) 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 hydrogeological analyses, or if any questions arise concerning hydrogeological 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.

Reference is made to **Appendix C** of this report, which contains further information necessary for the proper interpretation and use of this report.

1.3 Background Information

The preparation of this report has relied upon a technical report prepared by another consultant. The relevant document which has been reviewed by EXP is provided below:

- Soil Testing & Domestic Wastewater Treatment Systems for Proposed Subdivision, October 1, 2019, prepared by BOS Engineering & Environmental Services Ltd. (BOS)

2. Methodology

EXP The fieldwork was carried out on February 26th, 2020. In general, the site investigation consisted of the advancement of two (2) boreholes at the locations denoted on **Drawing 1** as BH1/MW to BH2/MW. The test pits advanced by BOS are labelled as Test Pits TP1 to TP7.

Prior to the drilling, buried service clearances were obtained for the test hole locations by EXP.

The boreholes were completed by a specialist drilling subcontractor under the full-time supervision of EXP geotechnical staff. The boreholes were advanced to depths of 5.8 m to 6.6 m utilizing a track-mounted geoprobe equipped with direct push soil sampling equipment. In each borehole, disturbed soil samples were recovered at depth intervals of 0.75 m and 1.5 m using conventional direct push sampling 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 field personnel. All samples recovered were transported to the London EXP laboratory for detailed examination and classification.

Ground surface elevations at borehole locations were inferred from elevation contours indicated on a draft plan of subdivision provided by AGM and dated November 2019.

Water level readings and samples were collected on February 27th, March 6th and 16th, 2020 at the site.

3. Site and Subsurface Conditions

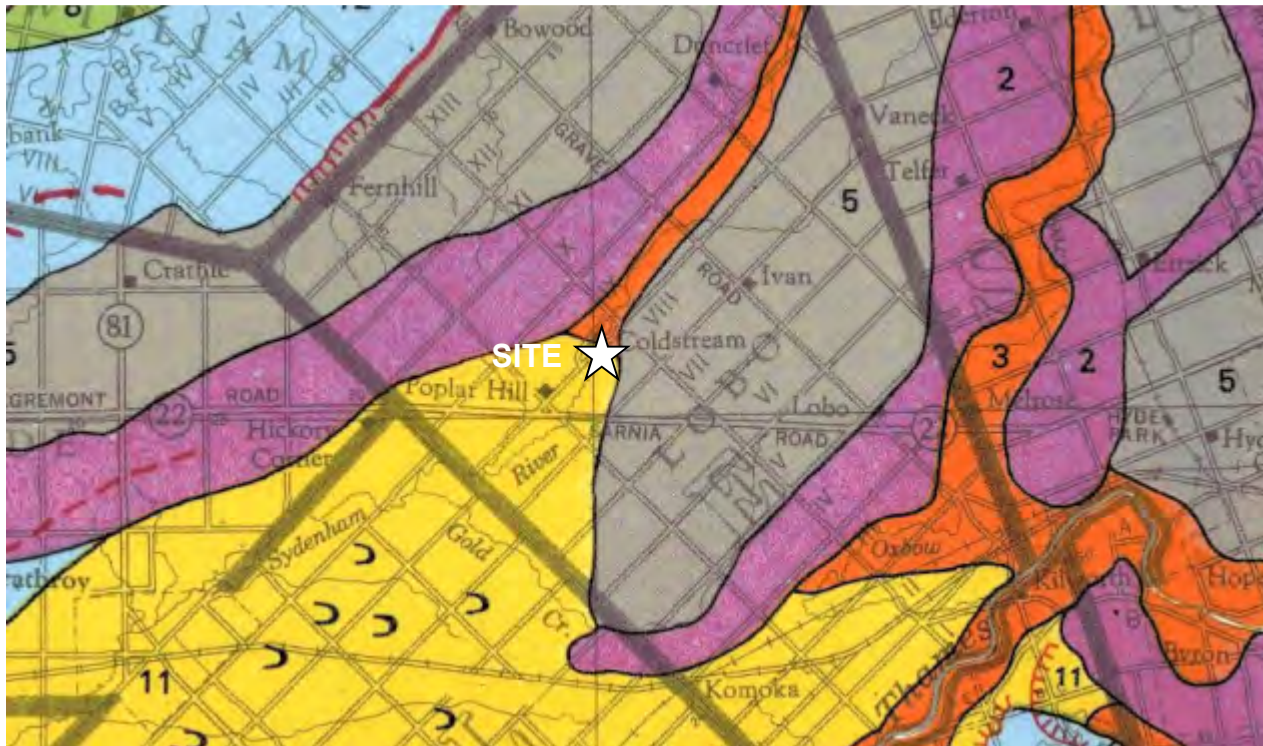
3.1 Site Description

The subject area is currently occupied by a residential building with two out-buildings and occasional trees in the northwestern portion and generally grassed elsewhere with a occasional trees. The Site is generally bounded by agricultural fields and residential buildings along Ilderton Road. The following sections provide a summary of the soil and groundwater conditions.

3.2 Site Physiography & Surficial Geology

The physiography of Southwestern Ontario was altered significantly by the glacial and interglacial periods that took place throughout the Quaternary period. The overburden deposits which are present in the study area were formed by numerous glacial events during the late Wisconsinan glacial stage approximately 10,000 to 23,000 years before present. There were two distinct glacial lobes present in Southwestern Ontario during this period. The Huron Lobe advanced from Lake Huron southwards, and the Erie Lobe advanced from the northeast, receding to the east. The physiography of the Site was influenced by the Huron Lobe.

During the advancement of the glacial ice sheets, bedrock and unconsolidated sediments were eroded. During the recession of the glaciers, the eroded materials were deposited in lakes, rivers and along spillways, contributing to the present configuration of moraines, abandoned spillways, drumlins, eskers, abandoned shorelines, and various still-water sediment deposits.





The surficial deposits were mapped and categorized into a number of physiographic regions by Chapman and Putnam (1984). The physiographic regional mapping for the area (indicates that the site is situated within the Caradoc Sand Plains and London Annex (Chapman and Putnam, 1984).

Review of physiographic landform mapping, above, indicates that the Site is located within sand plains. Quaternary geology mapping indicates the Site is located in an area characterized by Rannoch Till: generally a silt to clayey silt matrix becoming finer grained southward.

Surficial geology mapping shows the northwest two-thirds of the Site to be sandy glaciofluvial deposits and the southeast third consisting of clay to silt-textured till.

EXP's Site-specific drilling program and BOS's test pit program revealed the presence of predominantly clayey silt till subgrade soils resulting in surface drainage being influenced by the limited presence of near-surface sand soils. Groundwater infiltration is limited into weathered zones and pockets which have higher sand content, resulting in discontinuous pockets of shallow groundwater, perched within the predominantly silt and clay soil.

3.3 Soil Stratigraphy

The detailed stratigraphy encountered in each test hole is shown on the borehole logs found in **Appendix A** and summarized in the following paragraphs. It must be noted that the boundaries of the soil indicated on the borehole logs are inferred from non-continuous sampling and observations during drilling. These boundaries are intended to reflect transition zones for geotechnical design and should not be interpreted as exact planes of geological change.

3.3.1 Topsoil

Each borehole was surfaced with a layer of topsoil ranging between 300 mm and 400 mm in thickness. The BOS test pits encountered between 300 mm and 450 mm of topsoil.

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 Gravelly Sand

Beneath the topsoil and extending to 1.2 m below ground surface (bgs) in Test Pit 1 advanced by BOS, a gravelly sand layer was noted.

3.3.3 Clayey Silt/Silt

Beneath the topsoil and extending to 2.1 m bgs in Borehole BH1 was a layer of clayey silt. The clayey silt was brown in colour, contained trace sand and was very moist (based on tactile examination).

A silt layer extended from 0.3 m to 0.6 m bgs in Borehole BH2. The brown silt layer contained trace sand and was very moist. Silt was noted in Test Pit 7 advanced by BOS. The layer extended to 0.4 m bgs.

3.3.4 Glacial Till

Underlying the clayey silt or silt in each borehole was a stratum of clayey silt till. It was generally brown becoming grey in colour with depth, with trace sand, trace to some gravel and was generally moist (based on tactile examination). The till extended to 4.3 m bgs in Borehole BH1 and BH2 was terminated in the stratum.

The BOS test pits generally noted clay, silty clay, or hard clay below to the topsoil, silt or sand and gravel layers. The test pits were terminated in the stratum.

3.3.5 Silty Sand

A layer of silty sand was observed in Borehole BH1 and extended from 4.3 m bgs to the termination depth of the borehole. It was brown in colour, contained trace gravel, and was in a moist to wet state (based on tactile examination).

3.4 Groundwater Conditions

Two (2) monitoring wells were installed during the drilling on February 26th at the Site. The wells were installed to depths of approximately 5.8 m to 6.1 m bgs. The summary of well construction details and stabilized groundwater levels are presented in the tables below.

Table 1 – Monitoring Well Construction Details

Well ID	Ground Surface Elevation (m)	Completion Depth (m bgs)	Screen Length (m)
BH1/MW	249.00	6.10	1.52
BH2/MW	252.05	5.79	1.52

Table 2 – Stabilized Groundwater Levels

Well ID	Ground Surface Elevation (m)	Depth to Groundwater, m bgs (Groundwater Elevation, m)		
		Feb. 27, 2020	Mar. 6, 2020	Mar. 16, 2020
BH1/MW	249.00	5.13 (243.87)	5.14 (243.86)	5.21 (243.79)
BH2/MW	252.05	Dry	Dry	Dry

The EXP monitoring wells have been registered with the Ministry of the Environment, Conservation and Parks (MECP), in accordance with Ontario Regulation 903, and remain intact for the purposes of ongoing monitoring of stabilized groundwater conditions, as required.

Insufficient time was available to allow the observation of the stabilized groundwater level, particularly within the clayey soil stratum. Fluctuation of water level is possible with high level can occur in the wet seasons.

3.5 Potable Groundwater

To identify the depth of the potable groundwater aquifer for the area, a review of the local Ministry of Environment, Conservation and Parks (MECP) water well records (WWR) was carried out within close proximity (500 m or less) to the investigation area. The findings are summarized in the following table:

Table 3 – Summary of MECP Well Records

Well ID	Well Type	Depth (m)	Water Use	Water Status	Screened Lithology	Static Water Level (m)
4101053	Overburden	11.3	Public	Water Supply	Sand	4.6
4101055	Overburden	15.8	Domestic	Water Supply	Sand	6.1
4101056	Overburden	17.7	Livestock	Water Supply	Sand	5.5
4101057	Overburden	22.6	Public	Water Supply	Sand	6.7
4101058	Overburden	20.1	Public	Water Supply	Sand	2.1
4104668	Overburden	14.3	Domestic	Water Supply	Sand & Gravel	6.1
4104705	Overburden	17.7	Domestic	Water Supply	Sand	2.4
4104797	Overburden	16.5	Domestic	Water Supply	Sand	7.0
4104798	Overburden	16.0	Domestic	Water Supply	Sand & Gravel	6.7
4104965	Overburden	7.0	Domestic	Water Supply	Clay	2.7
4104991	Overburden	16.8	Domestic	Water Supply	Sand	6.1
4105024	Overburden	16.2	Domestic	Water Supply	Sand	4.0
4105602	Overburden	7.9	Public	Water Supply	Sand	0.3
4105762	Overburden	19.8	Domestic	Water Supply	Sand	4.9
4105862	Overburden	4.6	Domestic	Water Supply	Clay	1.8
4106048	Overburden	9.9	Domestic	Water Supply	Sand	6.1
4106049	Overburden	10.7	Domestic	Water Supply	Sand	6.7
4106125	Overburden	11.3	Domestic	Water Supply	Sand	4.9

Well ID	Well Type	Depth (m)	Water Use	Water Status	Screened Lithology	Static Water Level (m)
4106202	Overburden	15.5	Public	Water Supply	Sand	3.0
4106222	Overburden	4.3	Domestic	Water Supply	Sand & Gravel	2.1
4106311	Overburden	9.1	Domestic	Water Supply	Sand	4.9
4106330	Overburden	15.5	Domestic	Water Supply	Sand	4.9
4106889	Overburden	10.7	Domestic	Water Supply	Sand	3.7
4107334	Overburden	16.2	Municipal	Water Supply	Sand	6.1
4107463	Overburden	7.6	Domestic	Water Supply	Clay	1.8
4107568	Overburden	14.3	Domestic	Water Supply	Sand	4.6
4107581	Overburden	11.3	Domestic	Water Supply	Sand	2.4
4107797	Overburden	5.8	Domestic	Water Supply	Clay	1.8
4107927	Overburden	17.7	Domestic	Water Supply	Sand	3.4
4108047	Overburden	6.7	Domestic	Water Supply	Clay	1.8
4108596	Overburden	20.7	Domestic	Water Supply	Sand	7.3
4109482	Overburden	16.2	Domestic	Water Supply	Sand	4.9
4110442	Overburden	5.5	Domestic	Water Supply	Gravel	3.7
4110768	Overburden	5.5	Domestic	Water Supply	Clay	1.5
4110820	Overburden	10.7	Domestic	Water Supply	Sand	6.1
4110869	Overburden	13.1	Municipal	Water Supply	Sand	4.6
4110911	Overburden	11.6	Commercial	Water Supply	Sand	5.5
4111049	Overburden	6.7	Domestic	Water Supply	Gravel	4.9
4111142	Overburden	7.3	Domestic	Water Supply	Gravel	1.8
4111191	Overburden	5.5	Domestic	Water Supply	Sand	3.7
4111322	Overburden	21.3	Abandoned-Other	---	---	---
4111324	Overburden	7.9	Domestic	Water Supply	Sand	5.5
4111325	Overburden	9.8	Domestic	Water Supply	Sand	5.5
4111421	Overburden	16.8	Domestic	Water Supply	Sand	4.6
4112039	Overburden	15.2	Domestic	Water Supply	Sand	6.7
4112544	Overburden	15.2	Domestic	Water Supply	Sand	4.9
4112651	Overburden	7.0	Domestic	Water Supply	Sand	5.0
4113014	Overburden	15.8	Domestic	Water Supply	Sand	7.3
4113531	Overburden	15.2	Domestic	Water Supply	Sand	6.7
4113778	Overburden	17.4	Domestic	Water Supply	Sand	7.3
4114641	Overburden	16.8	Domestic	Water Supply	Sand & Gravel	7.6
7107498	Overburden	17.4	Domestic	Water Supply	Sand	4.4
7108699	Overburden	13.1	Abandoned-Other	---	---	1.8
7109379	Overburden	16.2	Domestic	Water Supply	Sand	5.9
7109395	Overburden	9.1	Domestic	Water Supply	Sand & Gravel	5.8
7109677	Overburden	15.8	Domestic	Water Supply	Sand	6.9
7116282	Overburden	12.8	Domestic	Water Supply	Sand	7.3
7146762	Overburden	5.3	Monitoring	Test Hole	Sand	---
7158039	Overburden	16.5	Domestic	Water Supply	Sand	8.2
7237018	Overburden	7.6	Monitoring	Test Hole	Sand	---
7279712	Overburden	16.2	Domestic	Water Supply	Sand & Gravel	5.8

The potable wells are typically set into intermediate sand/sand and gravel aquifers. Six (6) shallow wells were set into clay. Overburden soils noted in the MECP WWR were generally described as clay with intermediate sand/sand

and gravel layers. Some unconfined sand and gravel layers were encountered, but were generally not used as a potable water source.

Groundwater flow across the Site is affected by the soil permeability, topography and drainage. The wells in the area indicate that potable water is generally found in intermediate overburden aquifers, and not drawing from unconfined shallow aquifers.

3.6 Groundwater Chemical Analysis

Groundwater samples were obtained from the monitoring wells within our studied period. The samples were taken from Monitoring Well BH1/MW on February 27th, March 6th, and March 16th, 2020 and were submitted to an accredited laboratory, Bureau Veritas in Mississauga, Ontario for analysis of Nitrate as Nitrogen. The Certificates of Analysis are provided in **Appendix B** and summarized below.

Table 4 – Nitrate as Nitrogen Results

Well ID	Nitrate as Nitrogen, mg/L		
	Feb. 27, 2020	Mar. 6, 2020	Mar. 16, 2020
BH1/MW	<0.10	<0.10	<0.10

It should be noted that no groundwater was available to sample over the sampling period from monitoring well BH2/MW. It is unlikely that the concentration of the water chemistry would vary differently due to the consistency of the soil stratigraphy.

3.7 Methane Gas

No methane gas producing materials or significant organic matter was encountered at the borehole locations, except a thin veneer of topsoil.

An RKI Gx-2003 Gas Detector was used in the upper levels of the open boreholes. The unit measures LEL combustibles, methane gas, oxygen content, carbon monoxide and hydrogen sulfide in standard confined space gases. No significant methane gas concentration was detected in the boreholes.

4. Hydrogeological Comments and Recommendations

It is understood that a 13 lot subdivision development is proposed for the subject Site, complete with private servicing and wells. Each lot will vary in size from 0.201 ha to 0.235 ha with an average lot size of 0.208 ha. The overall Site is approximately 3.577 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 4.3 m to 22.6 m in water-bearing sand/sand and gravel layers. The depth water was found at in the wells indicates the presence of shallow and intermediate aquifers. Besides MECP Well No. 4105602 and 4106222, each potable well was screened in the confined aquifers or clay.

Four (4) shallow wells (aquifer found at 3.0 m or less) are located approximately 400 m or more away from the Site. Based on the well records, the wells are typically set in intermediate sand/sand and gravel layers confined below a stratum of clayey soils. Shallow groundwater flow across the site is typically affected by the soil permeability, topography and drainage. The soils encountered in the EXP's site specific borehole program and BOS's test pit program generally encountered clayey silt till soils. Test Pit 1 advanced by BOS encountered an unconfined gravelly sand layer to 1.2 m. 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 aquifers is significantly less. The wells in the area accessing potable groundwater from the intermediate aquifer are generally found at depths ranging between about 5.5 and 22.6 m bgs. The monitoring wells installed within this Site confirmed that the stabilized groundwater level is approximately at 5.2 m below ground surface (bgs).

Based on EXP's site specific drilling program, this development is located in an area where the predominant soil type is glacial till. As a result of EXP's findings 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 aquifer depths 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. Chemical Analysis

Groundwater samples were obtained from the monitoring well BH1/MW on February 27th, March 6th, and March 16th, 2020 and were submitted to Bureau Veritas in Mississauga, Ontario for analysis of Nitrate as Nitrogen. The Certificates of Analysis are provided in **Appendix B** and summarized below.

Table 5 – Nitrate as Nitrogen Results

Well ID	Nitrate as Nitrogen, mg/L		
	Feb. 27, 2020	Mar. 6, 2020	Mar. 16, 2020
BH1/MW	<0.10	<0.10	<0.10
Overall Average	0.1		

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 can be assumed as 0.1 mg/L for mathematical modelling. As previously mentioned, no groundwater was available to sample over the sampling period from monitoring well BH2/MW.

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. Evapotranspiration 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 purposes of this analysis. The dilution water was discounted using an infiltration factor of 0.65. 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 0.1 mg/L based on our sampling and testing program.

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

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

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

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

Q_E = Yearly volume of effluent produced (L/year) for assessment purpose, assume

$365,000 \text{ L/yr} \times 13 \text{ lots} = 4,745,000 \text{ L/yr}$;

DW = Dilution Water available (L/yr) assume 14,975,220 L/yr for the total site;

N_B = Background Nitrate Concentration in diluting precipitation, assume 0.1 mg/L.

Based on the above values, the computed boundary condition will be at 9.7 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 0.1 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 Nitrogen. 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 9.7 mg/L is sufficiently less than the established boundary condition of 10 mg/L.

5.2 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.

6. 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 regards to any future hydrogeological, geotechnical and environmental 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 test hole 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.

This report was prepared for the exclusive use of **Villaview Developments Inc.** and may not be reproduced in whole or in part, without the prior written consent of EXP, or used or relied upon in whole or in part by other parties for any purposes whatsoever. Any use which a third party makes of this report, or any part thereof, or any reliance on or decisions to be made based on it, are the responsibility of such third parties. EXP Services Inc. accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this report.

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

Drawings



-LEGEND-


- ◆ BH1/MW Approximate Borehole Location (EXP 2020)
- TP1 Approximate Test Pit Location (BOS 2019)

-NOTES-

1. The boundaries and soil types have been established only at test hole locations. Between test holes they are assumed and may be subject to considerable error.
2. Soil samples will be retained in storage for 3 months and then destroyed unless client advises that an extended time period is required.
3. Topsoil quantities should not be established from the information provided at the test hole locations.
4. The site plan was reproduced from Google Earth Pro and should be read in conjunction with EXP Report LON-00017783-GE.

Subsurface Assessment Proposed Development

10283 Ilderton Road, Coldstream, Ontario

CLIENT Valleyview Developments Inc.	
TITLE Borehole Location Plan	
Prepared By: E.B.	Reviewed By: B.C.
<div style="display: flex; justify-content: space-between; align-items: center;"> <div>  </div> <div> EXP Services Inc. 15701 Robin's Hill Road, London, ON, N5V 0A5 </div> </div>	
DATE MARCH 2020	SCALE NTS
PROJECT NO. LON-00017783-GE	DWG. 1

Appendix A – Borehole and Test Pit 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								

- 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. Despite the use of boreholes, 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

BH1

Sheet 1 of 1

CLIENT **Valleyview Developments Inc.**PROJECT NO. **LON-00017783-GE**PROJECT **10283 Ilderton Road**DATUM **Geodetic**LOCATION **Coldstream, Ontario**DATES: Boring **February 26, 2020**Water Level **Mar 21/20**

DEPTH (m bgs)	ELEVATION (~m)	STRATA DESCRIPTION	STRATA PLOT	WELL LOG	SAMPLES			MOISTURE CONTENT (%)	SHEAR STRENGTH	
					TYPE	NUMBER	ORGANIC CONTENT (%)	N VALUE (blows)		◆ S Field Vane Test (#=Sensitivity) ▲ Penetrometer ■ Torvane
										100 200 kPa Atterberg Limits and Moisture W _p W W _L ● SPT N Value 10 20 × Dynamic Cone 30 40
0	249.0	TOPSOIL - 400 mm								
	248.6	CLAYEY SILT - brown, trace sand, very moist								
-1		- dilatant layering encountered near 1.5 m bgs			DP	S1				
					DP	S2				
-2	246.9	CLAYEY SILT TILL - brown, trace sand, trace gravel, moist - dilatant layering near 2.3 m bgs			DP	S3				
-3		- becoming grey near 2.9 m bgs			DP	S4				
-4	244.7	SILTY SAND - brown, trace gravel, moist to very moist			DP	S5				
-5		- becoming grey and wet near 5.2 m bgs			DP	S6				
-6										
-7	242.5	End of Borehole at 6.6 m bgs.								

NOTES

- Borehole Log interpretation requires assistance by EXP before use by others. Borehole Log must be read in conjunction with EXP Report LON00017783-GE.
- bgs denotes below ground surface.
- No significant methane gas concentration was detected upon completion of drilling.
- Water Level Readings:
February 27, 2020 - 5.13 m bgs, Approximate Elevation: 243.87 m
March 6, 2020 - 5.14 m bgs, Approximate Elevation: 243.86 m
March 16, 2020 - 5.21 m bgs, Approximate Elevation: 243.79 m

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

BH2

Sheet 1 of 1

CLIENT Valleyview Developments Inc. PROJECT NO. LON-00017783-GE
PROJECT 10283 Ilderton Road DATUM Geodetic
LOCATION Coldstream, Ontario DATES: Boring February 26, 2020 Water Level _____

DEPTH (m bgs)	ELEVATION (-m)	STRATA DESCRIPTION	STRATA PLOT	WELL LOG	SAMPLES			MOISTURE CONTENT (%)	SHEAR STRENGTH	
					TYPE	NUMBER	ORGANIC CONTENT (%)		Atterberg Limits and Moisture	
									100	200 kPa
									W _p W _L	
									● SPT N Value	× Dynamic Cone
									10 20 30 40	
0	252.1	TOPSOIL - 300 mm								
	251.8	SILT - brown, trace sand, very moist								
	251.5	CLAYEY SILT TILL - brown, trace sand, trace to some gravel, moist								
-1					DP	S1				
-2					DP	S2				
-3		- becoming grey near 2.9 m bgs			DP	S3				
-4					DP	S4				
-5					DP	S5				
-6	246.3	- possible cobble encountered near 5.8 m bgs								
		End of Borehole at 5.8 m bgs.								
-7										

NOTES

- Borehole Log interpretation requires assistance by EXP before use by others. Borehole Log must be read in conjunction with EXP Report LON00017783-GE.
- bgs denotes below ground surface.
- No significant methane gas concentration was detected upon completion of drilling.
- Water Level Readings:
February 27, 2020 - dry
March 6, 2020 - dry
March 16, 2020 - dry

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)

BOS Engineering & Environmental Services Inc.

LOG OF TEST PIT 1													
Proj. No. : 1909-02		Excavation Date: SEPT 11 2019											
Client: ROB SANDERSON		Datum: On site Nail in Tree - assumed (100.00)											
RE: Soil Tests		Method: Backhoe											
Depth Scale (m)	SOIL PROFILE				PERCOLATION TIME (min/cm)				WATER CONTENT (%) (if applicable)				GROUNDWATER CONDITIONS INSTALL./NOTES
	DESCRIPTION	STRAT.	ELEV. DEPTH (m)	SAMPLE No.	0	20	40	>60	10	20	30	40	
0	GROUND SURFACE		99.44										
	Topsoil		0										
			98.98										
	Gravelly Sand		0.46	1	0								
1			98.22										
	Hard Clay		1.22										
	Bottom Of Testpit		97.61										
2			1.83										Groundwater not encountered
3													
4													

BOS Engineering & Environmental Services

Prepared by: R. B.
 Reviewed by: A. B.

BOS Engineering & Environmental Services Inc.

LOG OF TEST PIT 2													
Proj. No. : 1909-02		Excavation Date: SEPT 11 2019											
Client: ROB SANDERSON		Datum: On site Nail in Tree - assumed (100.00)											
RE: Soil Tests		Method: Backhoe											
Depth Scale (m)	SOIL PROFILE				PERCOLATION TIME (min/cm)				WATER CONTENT (%) (if applicable)				GROUNDWATER CONDITIONS INSTALL./NOTES
	DESCRIPTION	STRAT.	ELEV. DEPTH (m)	SAMPLE No.	0	20	40	>60	10	20	30	40	
0	GROUND SURFACE		100.05										Groundwater not encountered
	Topsoil		99.69										
	Br. Silty Clay		99.34										
1			97.61										
	Hard Clay		97.61										
2													Groundwater not encountered
	Bottom Of Testpit		2.44										
3													
4													

BOS Engineering & Environmental Services

Prepared by: R. B.
 Reviewed by: A. B.

BOS Engineering & Environmental Services Inc.

LOG OF TEST PIT 3													
Proj. No. : 1909-02		Excavation Date: SEPT 11 2019						Datum: On site Nail in Tree - assumed (100.00)					
Client: ROB SANDERSON		Method: Backhoe											
RE: Soil Tests													
Depth Scale (m)	SOIL PROFILE				PERCOLATION TIME (min/cm)				WATER CONTENT (%) (if applicable)				GROUNDWATER CONDITIONS INSTALL./NOTES
	DESCRIPTION	STRAT.	ELEV. DEPTH (m)	SAMPLE No.	0	20	40	>60	10	20	30	40	
0	GROUND SURFACE		101.31										Groundwater not encountered
	Topsoil		0										
			99.69										
			0.41										
1	Clay												
			99.34										
			1.70										
2	Br. Silty Clay												
			99.18										
	Bottom Of Testpit		2.13										
3													
4													

BOS Engineering & Environmental Services

Prepared by: R. B.
 Reviewed by: A. B.

BOS Engineering & Environmental Services Inc.

LOG OF TEST PIT 4													
Proj. No. : 1909-02		Excavation Date: SEPT 11 2019											
Client: ROB SANDERSON		Datum: On site Nail in Tree - assumed (100.00)											
RE: Soil Tests		Method: Backhoe											
Depth Scale (m)	SOIL PROFILE				PERCOLATION TIME (min/cm)				WATER CONTENT (%) (if applicable)				GROUNDWATER CONDITIONS INSTALL./NOTES
	DESCRIPTION	STRAT.	ELEV. DEPTH (m)	SAMPLE No.	0	20	40	>60	10	20	30	40	
0	GROUND SURFACE		102.70										Groundwater encountered @ 101.38
	Topsoil		0										
			102.29										
			0.41										
1	Clay												
2	Bottom Of Testpit		100.72										
			1.98										
3													
4													

BOS Engineering & Environmental Services

Prepared by: R. B.
 Reviewed by: A. B.

BOS Engineering & Environmental Services Inc.

LOG OF TEST PIT 5													
Proj. No. : 1909-02		Excavation Date: SEPT 11 2019											
Client: ROB SANDERSON		Datum: On site Nail in Tree - assumed (100.00)											
RE: Soil Tests		Method: Backhoe											
Depth Scale (m)	SOIL PROFILE				PERCOLATION TIME (min/cm)				WATER CONTENT (%) (if applicable)				GROUNDWATER CONDITIONS INSTALL./NOTES
	DESCRIPTION	STRAT.	ELEV. DEPTH (m)	SAMPLE No.	0	20	40	>60	10	20	30	40	
0	GROUND SURFACE		103.25										Groundwater not encountered
	Topsoil		0										
			102.89										
	Gr. Clay		0.36										
1			102.34										
	Clay		0.91										Groundwater not encountered
2													
	Bottom Of Testpit		100.81										
3			2.44										Groundwater not encountered
4													

BOS Engineering & Environmental Services

Prepared by: R. B.
 Reviewed by: A. B.

BOS Engineering & Environmental Services Inc.

LOG OF TEST PIT 6													
Proj. No. : 1909-02		Excavation Date: SEPT 11 2019											
Client: ROB SANDERSON		Datum: On site Nail in Tree - assumed (100.00)											
RE: Soil Tests		Method: Backhoe											
Depth Scale (m)	SOIL PROFILE				PERCOLATION TIME (min/cm)				WATER CONTENT (%) (if applicable)				GROUNDWATER CONDITIONS INSTALL./NOTES
	DESCRIPTION	STRAT.	ELEV. DEPTH (m)	SAMPLE No.	0	20	40	>60	10	20	30	40	
0	GROUND SURFACE		102.90										Groundwater not encountered
	Topsoil		0										
			102.49										
1	Clay		0.41										
2	Bottom Of Testpit		101.20										
			1.70										
3													
4													

BOS Engineering & Environmental Services

Prepared by: R. B.
 Reviewed by: A. B.

BOS Engineering & Environmental Services Inc.

LOG OF TEST PIT 7													
Proj. No. : 1909-02		Excavation Date: SEPT 11 2019											
Client: ROB SANDERSON		Datum: On site Nail in Tree - assumed (100.00)											
RE: Soil Tests		Method: Backhoe											
Depth Scale (m)	SOIL PROFILE				PERCOLATION TIME (min/cm)				WATER CONTENT (%) (if applicable)				GROUNDWATER CONDITIONS INSTALL./NOTES
	DESCRIPTION	STRAT.	ELEV. DEPTH (m)	SAMPLE No.	0	20	40	>60	10	20	30	40	
0	GROUND SURFACE		102.10										Groundwater not encountered
	Topsoil		0										
			101.80										
	Silt		0.30										
			101.69										
			0.41										
1	Clay												
2	Bottom Of Testpit		100.27										
			1.83										
3													
4													

BOS Engineering & Environmental Services

Prepared by: R. B.
 Reviewed by: A. B.

Appendix B – Chemical Test Results



Your Project #: 17783
Your C.O.C. #: 673342-05-01

Attention: Vickie Coatsworth

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

Report Date: 2020/03/09

Report #: R6103296

Version: 1 - Final

CERTIFICATE OF ANALYSIS

BV LABS JOB #: C061784

Received: 2020/03/06, 15:10

Sample Matrix: Water
Samples Received: 1

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
Nitrate (NO3) and Nitrite (NO2) in Water (1)	1	N/A	2020/03/07	CAM SOP-00440	SM 23 4500-NO3I/NO2B

Remarks:

Bureau Veritas Laboratories are accredited to ISO/IEC 17025 for specific parameters on scopes of accreditation. Unless otherwise noted, procedures used by BV Labs are based upon recognized Provincial, Federal or US method compendia such as CCME, MELCC, EPA, APHA.

All work recorded herein has been done in accordance with procedures and practices ordinarily exercised by professionals in BV Labs profession using accepted testing methodologies, quality assurance and quality control procedures (except where otherwise agreed by the client and BV Labs 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. Where applicable, unless otherwise noted, Measurement Uncertainty has not been accounted for when stating conformity to the referenced standard.

BV Labs liability is limited to the actual cost of the requested analyses, unless otherwise agreed in writing. There is no other warranty expressed or implied. BV Labs 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 BV Labs, unless otherwise agreed in writing. BV Labs is not responsible for the accuracy or any data impacts, that result from the information provided by the customer or their agent.

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. When sampling is not conducted by BV Labs, results relate to the supplied 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 #: 17783
Your C.O.C. #: 673342-05-01

Attention: Vickie Coatsworth

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

Report Date: 2020/03/09
Report #: R6103296
Version: 1 - Final

CERTIFICATE OF ANALYSIS

BV LABS JOB #: C061784

Received: 2020/03/06, 15:10

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.

Christine Gipton, Senior Project Manager

Email: Christine.Gipton@bvlabs.com

Phone# (519)652-9444

=====

This report has been generated and distributed using a secure automated process.

BV Labs has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per ISO/IEC 17025, signing the reports. For Service Group specific validation please refer to the Validation Signature Page.



BV Labs Job #: C061784
Report Date: 2020/03/09

exp Services Inc
Client Project #: 17783
Sampler Initials: SA

RESULTS OF ANALYSES OF WATER

BV Labs ID		MEM842		
Sampling Date		2020/02/27		
COC Number		673342-05-01		
	UNITS	BH1	RDL	QC Batch
Inorganics				
Nitrite (N)	mg/L	<0.010	0.010	6624696
Nitrate (N)	mg/L	<0.10	0.10	6624696
Nitrate + Nitrite (N)	mg/L	<0.10	0.10	6624696
RDL = Reportable Detection Limit				
QC Batch = Quality Control Batch				



BV Labs Job #: C061784
Report Date: 2020/03/09

exp Services Inc
Client Project #: 17783
Sampler Initials: SA

TEST SUMMARY

BV Labs ID: MEM842
Sample ID: BH1
Matrix: Water

Collected: 2020/02/27
Shipped:
Received: 2020/03/06

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Nitrate (NO3) and Nitrite (NO2) in Water	LACH	6624696	N/A	2020/03/07	Amanpreet Sappal



BV Labs Job #: C061784
Report Date: 2020/03/09

exp Services Inc
Client Project #: 17783
Sampler Initials: SA

GENERAL COMMENTS

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

Package 1	6.0°C
-----------	-------

Results relate only to the items tested.



BV Labs Job #: C061784
Report Date: 2020/03/09

QUALITY ASSURANCE REPORT

exp Services Inc
Client Project #: 17783
Sampler Initials: SA

QC Batch	Parameter	Date	Matrix Spike		SPIKED BLANK		Method Blank		RPD	
			% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits
6624696	Nitrate (N)	2020/03/07	98	80 - 120	98	80 - 120	<0.10	mg/L	NC	20
6624696	Nitrite (N)	2020/03/07	105	80 - 120	101	80 - 120	<0.010	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 $\leq 2 \times \text{RDL}$).



BV Labs Job #: C061784
Report Date: 2020/03/09

exp Services Inc
Client Project #: 17783
Sampler Initials: SA

VALIDATION SIGNATURE PAGE

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

A handwritten signature in black ink, appearing to read "Anastassia Hamanov", written over a horizontal line.

Anastassia Hamanov, Scientific Specialist

BV Labs has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per ISO/IEC 17025, signing the reports. For Service Group specific validation please refer to the Validation Signature Page.



Maxxam Analytics International Corporation o/a Maxxam Analytics
109 & 110, 4023 Meadowbrook Drive, London, Ontario Canada N6L 1E7 Tel: (519) 652-9444 Toll-free 800-563-6296 Fax: (519) 652-8189 www.maxxam.ca

CHAIN OF CUSTODY RECORD

Page 1 of 1

INVOICE TO:		REPORT TO:		PROJECT INFORMATION:		Laboratory Use Only:	
Company Name: #28124 exp Services Inc		Company Name: <u>exp</u>		Quotation #: B45998		Maxxam Job #:	
Attention: Accounts Payable		Attention: <u>Ron Davis</u> <u>Victoria Cantuworth</u>		P.O. #:		Bottle Order #:	
Address: 15701 Robin's Hill Rd Unit 2		Address:		Project: <u>LON00010079</u> <u>17783</u>		673342	
London ON N5V 0A5				Project Name:		Project Manager:	
Tel: (519) 963-3000 Fax: (519) 963-1152		Tel: <u>519-963-3000</u> Fax:		Site #:		Christine Gipton	
Email: AP@exp.com, karen.Burke@exp.com		Email: <u>Ron.Davis@exp.com</u>		Sampled By:		COC #:	
						C8673342-05-01	

MOE REGULATED DRINKING WATER OR WATER INTENDED FOR HUMAN CONSUMPTION MUST BE SUBMITTED ON THE MAXXAM DRINKING WATER CHAIN OF CUSTODY					ANALYSIS REQUESTED (PLEASE BE SPECIFIC)										Turnaround Time (TAT) Required: Please provide advance notice for rush projects					
Regulation 153 (2011)			Other Regulations			Special Instructions			Field Filtered (please circle): Metals / Hg / Cr-VI										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 Dioxins/Furans are > 5 days - contact your Project Manager for details.	
<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												<input checked="" type="checkbox"/>				
<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																
<input type="checkbox"/> Table 3	<input type="checkbox"/> Agri/Other	<input type="checkbox"/> For RSC	<input type="checkbox"/> MISA	Municipality																
<input type="checkbox"/> Table			<input type="checkbox"/> PWQO																	
<input type="checkbox"/> Other																				
Include Criteria on Certificate of Analysis (Y/N)?																				
Sample Barcode Label	Sample (Location) Identification	Date Sampled	Time Sampled	Matrix																
1 <u>SKI</u>	<u>SKI, BHI-1</u>	<u>2/27/20</u>	<u>Am</u>	<u>water</u>																
2																				
3																				
4																				
5																				
6																				
7																				
8																				
9																				
10																				
* RELINQUISHED BY: (Signature/Print)					Date: (YY/MM/DD)	Time	RECEIVED BY: (Signature/Print)					Date: (YY/MM/DD)	Time	# jars used and not submitted	Laboratory Use Only					
<u>Star Arto</u>							<u>Christine Gipton</u>					<u>29/03/05</u>	<u>15:10</u>		Time Sensitive	Temperature (°C) on Receipt	Custody Seal Present	Yes	No	
							<u>DIPIKA SINGH</u>					<u>29/03/06</u>	<u>17:51</u>			<u>7.6, 5°C</u>	Intact			
* 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.															SAMPLES MUST BE KEPT COOL (< 10° C) FROM TIME OF SAMPLING UNTIL DELIVERY TO MAXXAM					
* 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.															White: Maxxa Yellow: Client					
** SAMPLE CONTAINER, PRESERVATION, HOLD TIME AND PACKAGE INFORMATION CAN BE VIEWED AT HTTP://MAXXAM.CA/WP-CONTENT/UPLOADS/ONTARIO-COC.PDF.																				

Maxxam Analytics International Corporation o/a Maxxam Analytics

LB#179209

2/2/3



Your Project #: 17783
Site Location: CDD STREAM
Your C.O.C. #: 749754-01-01

Attention: Vickie Coatsworth

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

Report Date: 2020/03/10
Report #: R6104875
Version: 1 - Final

CERTIFICATE OF ANALYSIS

BV LABS JOB #: C063204

Received: 2020/03/09, 17:35

Sample Matrix: Water
Samples Received: 1

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
Nitrate (NO3) and Nitrite (NO2) in Water (1)	1	N/A	2020/03/10	CAM SOP-00440	SM 23 4500-NO3I/NO2B

Remarks:

Bureau Veritas Laboratories are accredited to ISO/IEC 17025 for specific parameters on scopes of accreditation. Unless otherwise noted, procedures used by BV Labs are based upon recognized Provincial, Federal or US method compendia such as CCME, MELCC, EPA, APHA.

All work recorded herein has been done in accordance with procedures and practices ordinarily exercised by professionals in BV Labs profession using accepted testing methodologies, quality assurance and quality control procedures (except where otherwise agreed by the client and BV Labs 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. Where applicable, unless otherwise noted, Measurement Uncertainty has not been accounted for when stating conformity to the referenced standard.

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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. When sampling is not conducted by BV Labs, results relate to the supplied 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 #: 17783
Site Location: CDD STREAM
Your C.O.C. #: 749754-01-01

Attention: Vickie Coatsworth

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

Report Date: 2020/03/10
Report #: R6104875
Version: 1 - Final

CERTIFICATE OF ANALYSIS

BV LABS JOB #: C063204

Received: 2020/03/09, 17:35

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.

Christine Gipton, Senior Project Manager

Email: Christine.Gipton@bvlabs.com

Phone# (519)652-9444

=====

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BV Labs Job #: C063204
Report Date: 2020/03/10

exp Services Inc
Client Project #: 17783
Site Location: CDD STREAM
Sampler Initials: DL

RESULTS OF ANALYSES OF WATER

BV Labs ID		MEU542		
Sampling Date		2020/03/06		
COC Number		749754-01-01		
	UNITS	BH1 (SA2)	RDL	QC Batch
Inorganics				
Nitrate (N)	mg/L	<0.10	0.10	6626915
RDL = Reportable Detection Limit				
QC Batch = Quality Control Batch				



BV Labs Job #: C063204
Report Date: 2020/03/10

exp Services Inc
Client Project #: 17783
Site Location: CDD STREAM
Sampler Initials: DL

TEST SUMMARY

BV Labs ID: MEU542
Sample ID: BH1 (SA2)
Matrix: Water

Collected: 2020/03/06
Shipped:
Received: 2020/03/09

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Nitrate (NO3) and Nitrite (NO2) in Water	LACH	6626915	N/A	2020/03/10	Chandra Nandlal



BV Labs Job #: C063204
Report Date: 2020/03/10

exp Services Inc
Client Project #: 17783
Site Location: CDD STREAM
Sampler Initials: DL

GENERAL COMMENTS

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

Package 1	7.0°C
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Results relate only to the items tested.



BV Labs Job #: C063204
Report Date: 2020/03/10

QUALITY ASSURANCE REPORT

exp Services Inc
Client Project #: 17783
Site Location: CDD STREAM
Sampler Initials: DL

QC Batch	Parameter	Date	Matrix Spike		SPIKED BLANK		Method Blank		RPD	
			% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits
6626915	Nitrate (N)	2020/03/10	98	80 - 120	94	80 - 120	<0.10	mg/L	0.27	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.										





BV Labs Job #: C063204
Report Date: 2020/03/10

exp Services Inc
Client Project #: 17783
Site Location: CDD STREAM
Sampler Initials: DL

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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Your Project #: 17783
Site Location: COLD STREAM
Your C.O.C. #: 673342-02-01

Attention: Vickie Coatsworth

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

Report Date: 2020/03/18

Report #: R6115255

Version: 1 - Final

CERTIFICATE OF ANALYSIS

BV LABS JOB #: C071390

Received: 2020/03/16, 15:42

Sample Matrix: Water
Samples Received: 1

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
Nitrate (NO3) and Nitrite (NO2) in Water (1)	1	N/A	2020/03/18	CAM SOP-00440	SM 23 4500-NO3I/NO2B

Remarks:

Bureau Veritas Laboratories are accredited to ISO/IEC 17025 for specific parameters on scopes of accreditation. Unless otherwise noted, procedures used by BV Labs are based upon recognized Provincial, Federal or US method compendia such as CCME, MELCC, EPA, APHA.

All work recorded herein has been done in accordance with procedures and practices ordinarily exercised by professionals in BV Labs profession using accepted testing methodologies, quality assurance and quality control procedures (except where otherwise agreed by the client and BV Labs 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. Where applicable, unless otherwise noted, Measurement Uncertainty has not been accounted for when stating conformity to the referenced standard.

BV Labs liability is limited to the actual cost of the requested analyses, unless otherwise agreed in writing. There is no other warranty expressed or implied. BV Labs 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 BV Labs, unless otherwise agreed in writing. BV Labs is not responsible for the accuracy or any data impacts, that result from the information provided by the customer or their agent.

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. When sampling is not conducted by BV Labs, results relate to the supplied 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 #: 17783
Site Location: COLD STREAM
Your C.O.C. #: 673342-02-01

Attention: Vickie Coatsworth

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

Report Date: 2020/03/18
Report #: R6115255
Version: 1 - Final

CERTIFICATE OF ANALYSIS

BV LABS JOB #: C071390

Received: 2020/03/16, 15:42

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.

Christine Gipton, Senior Project Manager

Email: Christine.Gipton@bvlabs.com

Phone# (519)652-9444

=====

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Total Cover Pages : 2

Page 2 of 8

Bureau Veritas Laboratories 6740 Campobello Road, Mississauga, Ontario, L5N 2L8 Tel: (905) 817-5700 Toll-Free: 800-563-6266 Fax: (905) 817-5777 www.bvlabs.com

Microbiology testing is conducted at 6660 Campobello Rd. Chemistry testing is conducted at 6740 Campobello Rd.



BV Labs Job #: C071390
Report Date: 2020/03/18

exp Services Inc
Client Project #: 17783
Site Location: COLD STREAM
Sampler Initials: DL

RESULTS OF ANALYSES OF WATER

BV Labs ID		MGN844		
Sampling Date		2020/03/16		
COC Number		673342-02-01		
	UNITS	BH1, SA3	RDL	QC Batch
Inorganics				
Nitrate (N)	mg/L	<0.10	0.10	6640718
RDL = Reportable Detection Limit				
QC Batch = Quality Control Batch				



BV Labs Job #: C071390
Report Date: 2020/03/18

exp Services Inc
Client Project #: 17783
Site Location: COLD STREAM
Sampler Initials: DL

TEST SUMMARY

BV Labs ID: MGN844
Sample ID: BH1, SA3
Matrix: Water

Collected: 2020/03/16
Shipped:
Received: 2020/03/16

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Nitrate (NO3) and Nitrite (NO2) in Water	LACH	6640718	N/A	2020/03/18	Chandra Nandlal



BV Labs Job #: C071390
Report Date: 2020/03/18

exp Services Inc
Client Project #: 17783
Site Location: COLD STREAM
Sampler Initials: DL

GENERAL COMMENTS

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

Package 1	5.3°C
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Results relate only to the items tested.



BV Labs Job #: C071390
Report Date: 2020/03/18

QUALITY ASSURANCE REPORT

exp Services Inc
Client Project #: 17783
Site Location: COLD STREAM
Sampler Initials: DL

QC Batch	Parameter	Date	Matrix Spike		SPIKED BLANK		Method Blank		RPD	
			% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits
6640718	Nitrate (N)	2020/03/18	100	80 - 120	98	80 - 120	<0.10	mg/L	0.58	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.



BV Labs Job #: C071390
Report Date: 2020/03/18

exp Services Inc
Client Project #: 17783
Site Location: COLD STREAM
Sampler Initials: DL

VALIDATION SIGNATURE PAGE

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

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Maxxam Analytics International Corporation o/a Maxxam Analytics
109 & 110, 4023 Meadowbrook Drive, London, Ontario Canada N6L 1E7 Tel: (519) 652-9444 Toll-free 800-563-6266 Fax: (519) 652-8189 www.maxxam.ca

16-Mar-20 15:42

Christine Gryption



C071390

YHA ENV-658

COC #:



C#673342-02-01

Page 1 of 1

Bottle Order #:



673342

Project Manager:

Christine Gryption

INVOICE TO:
Company Name: #28124 exp Services Inc
Attention: Accounts Payable
Address: 15701 Robin's Hill Rd Unit 2
London ON N5V 0A5
Tel: (519) 963-3000 Fax: (519) 963-1152
Email: AP@exp.com, karen.Burke@exp.com

REPORT TO:
Company Name:
Attention: Ron Davis, Vickie Gault
Address:
Tel: 519-963-3000 Fax:
Email: Ron.Davis@exp.com

PROJECT INFORMATION:
Quotation #: B45998
P.O. #:
Project: LON00010079 17783
Project Name: Coldstream
Site #:
Sampled By: D. Leach

MOE REGULATED DRINKING WATER OR WATER INTENDED FOR HUMAN CONSUMPTION MUST BE SUBMITTED ON THE MAXXAM DRINKING WATER CHAIN OF CUSTODY

Regulation 153 (2011)			Other Regulations		Special Instructions
<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	
<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	
<input type="checkbox"/> Table 3	<input type="checkbox"/> Agri/Other	<input type="checkbox"/> For RSC	<input type="checkbox"/> MISA	Municipality _____	
<input type="checkbox"/> Table _____			<input type="checkbox"/> PWQO		
			<input type="checkbox"/> Other _____		

Include Criteria on Certificate of Analysis (Y/N)?

	Sample Barcode Label	Sample (Location) Identification	Date Sampled	Time Sampled	Matrix
1		BH1, SA3	3/10/20	AM	Water
2					
3					
4					
5					
6					
7					
8					
9					
10					

Field Filtered (please circle):
Metals / Hg / Cr VI

Or Reg 153 VOCs by MS & ECL (Soil)

Nitrates

ANALYSIS REQUESTED (PLEASE BE SPECIFIC)

Turnaround Time (TAT) Required:

Please provide advance notice for rush projects

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 Dioxins/Furans are > 5

days - contact your Project Manager for details.

Job Specific Rush TAT (if applies to entire submission)

Date Required: 1 day Time Required:

Rush Confirmation Number: (call lab for #)

of Bottles

Comments

RUSH!

REC'D IN LONDON

NOTICE

* RELINQUISHED BY: (Signature/Print)	Date: (YY/MM/DD)	Time	RECEIVED BY: (Signature/Print)	Date: (YY/MM/DD)	Time	# jars used and not submitted	Laboratory Use Only	Custody Seal	Yes	No	
15 D. Leach	3/10/20	15:42	Christine Gryption	2020/03/16	15:42	2	Time Sensitive	Temperature (°C) on Receipt	Present		
				2020/03/12	17:40			5/5/6C	Intact		

* 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.

* 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.

** SAMPLE CONTAINER, PRESERVATION, HOLD TIME AND PACKAGE INFORMATION CAN BE VIEWED AT HTTP://MAXXAM.CA/MP-CONTENT/UPLOADS/ONTARIO-COC.PDF.

SAMPLES MUST BE KEPT COOL (< 10° C) FROM TIME OF SAMPLING UNTIL DELIVERY TO MAXXAM

White: Maxxa Yellow: Client

Maxxam Analytics International Corporation o/a Maxxam Analytics

Appendix C – Limitations and Use of Report

LIMITATIONS AND USE OF REPORT

BASIS OF REPORT

This report (“Report”) is based on site conditions known or inferred by the hydrogeological investigation undertaken as of the date of the Report. Should changes occur which potentially impact the geotechnical condition of the site, or if construction is implemented more than one year following the date of the Report, the recommendations of EXP may require re-evaluation.

The Report is provided solely for the guidance of design engineers and on the assumption that the design will be in accordance with applicable codes and standards. Any changes in the design features which potentially impact the geotechnical analyses or issues concerning the hydrogeological aspects of applicable codes and standards will necessitate a review of the design by EXP. Additional field work and reporting may also be required.

Where applicable, recommended field services are the minimum necessary to ascertain that construction is being carried out in general conformity with building code guidelines, generally accepted practices and EXP’s recommendations. Any reduction in the level of services recommended will result in EXP providing qualified opinions regarding the adequacy of the work. EXP can assist design professionals or contractors retained by the Client to review applicable plans, drawings, and specifications as they relate to the Report or to conduct field reviews during construction.

Contractors contemplating work on the site are responsible for conducting an independent investigation and interpretation of the borehole results contained in the Report. The number of boreholes necessary to determine the localized underground conditions as they impact construction costs, techniques, sequencing, equipment and scheduling may be greater than those carried out for the purpose of the Report.

Classification and identification of soils, rocks, geological units, contaminant materials, building envelopment assessments, and engineering estimates are based on investigations performed in accordance with the standard of care set out below and require the exercise of judgment. As a result, even comprehensive sampling and testing programs implemented with the appropriate equipment by experienced personnel may fail to locate some conditions. All investigations or building envelope descriptions involve an inherent risk that some conditions will not be detected. All documents or records summarizing investigations are based on assumptions of what exists between the actual points sampled. Actual conditions may vary significantly between the points investigated. Some conditions are subject to change over time. The Report presents the conditions at the sampled points at the time of sampling. Where special concerns exist, or the Client has special considerations or requirements, these should be disclosed to EXP to allow for additional or special investigations to be undertaken not otherwise within the scope of investigation conducted for the purpose of the Report.

RELIANCE ON INFORMATION PROVIDED

The evaluation and conclusions contained in the Report are based on conditions in evidence at the time of site inspections and information provided to EXP by the Client and others. The Report has been prepared for the specific site, development, building, design or building assessment objectives and purpose as communicated by the Client. EXP has relied in good faith upon such representations, information and instructions and accepts no responsibility for any deficiency, misstatement or inaccuracy contained in the Report as a result of any misstatements, omissions, misrepresentation or fraudulent acts of persons providing information. Unless specifically stated otherwise, the applicability and reliability of the findings, recommendations, suggestions or opinions expressed in the Report are only valid to the extent that there has been no material alteration to or variation from any of the information provided to EXP.

STANDARD OF CARE

The Report has been prepared in a manner consistent with the degree of care and skill exercised by engineering consultants currently practicing under similar circumstances and locale. No other warranty, expressed or implied, is made. Unless specifically stated otherwise, the Report does not contain environmental consulting advice.

COMPLETE REPORT

All documents, records, data and files, whether electronic or otherwise, generated as part of this assignment form part of the Report. This material includes, but is not limited to, the terms of reference given to EXP by its client ("Client"), communications between EXP and the Client, other reports, proposals or documents prepared by EXP for the Client in connection with the site described in the Report. In order to properly understand the suggestions, recommendations and opinions expressed in the Report, reference must be made to the Report in its entirety. EXP is not responsible for use by any party of portions of the Report.

USE OF REPORT

The information and opinions expressed in the Report, or any document forming part of the Report, are for the sole benefit of the Client. No other party may use or rely upon the Report in whole or in part without the written consent of EXP. Any use of the Report, or any portion of the Report, by a third party are the sole responsibility of such third party. EXP is not responsible for damages suffered by any third party resulting from unauthorized use of the Report.

REPORT FORMAT

Where EXP has submitted both electronic file and a hard copy of the Report, or any document forming part of the Report, only the signed and sealed hard copy shall be the original documents for record and working purposes. In the event of a dispute or discrepancy, the hard copy shall govern. Electronic files transmitted by EXP have utilized specific software and hardware systems. EXP makes no representation about the compatibility of these files with the Client's current or future software and hardware systems. Regardless of format, the documents described herein are EXP's instruments of professional service and shall not be altered without the written consent of EXP.

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