Hydrogeological Investigation Report

100 Eco Park Way, Southgate, Ontario

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Executive Summary

The executive summary is a brief synopsis of the report and should not be read in lieu of reading the report in its entirety. JLP Services Inc. (JLP) was retained by Envest Corp. ("Client") to prepare a Hydrogeological Investigation Report including water balance assessment for the proposed development located at 100 Eco Park Way in the Township of Southgate, Ontario, herein referred to as the "Site" and "Project Area".

It is understood that the proposed facility will consist of a processing building with a containment area with tanks, a number of accessory buildings, a dry pond, a biofilter system, site services and pavement areas. It is understood that the tanks will extend approximately 3 m (505.4 masl) below grade (Walterfedy, March 29, 2023).

The main objectives of the hydrogeological investigation are to establish the local hydrogeological setting within and in the surrounding area of the Site and assess short-term (construction) and long-term (post-construction) dewatering flow rates and the potential impacts of construction dewatering. Additionally, the evaluation of groundwater quality and dewatering effluent discharge permit requirements are also conducted. The objectives also included the preparation of a hydrogeological investigation report to satisfy the Township of Southgate, Grand River Conservation Authority (GRCA), and the Ministry of the Environment, Conservation and Parks (MECP) requirements.

Four (4) boreholes were advanced at the Site for hydrogeological purposes. All boreholes were completed as monitoring wells (BH/MW201 to BH/MW204). Subsequent well development, single well response tests, groundwater quality sampling and groundwater elevation monitoring were carried out as required.

Groundwater quality was compared to the Provincial Water Quality Objectives (PWQOs), and the laboratory Certificate of Analysis (COA) indicated that all tested parameters conformed to the applicable criteria except for phosphorus.

It is expected that the concentration of Total Suspended Solids (TSS) and some other parameters such as total metals may exceed PWQO criteria during construction dewatering activities. Therefore, it is recommended to implement a suitable treatment method such as filtration and/or decantation or any other suitable treatment method recommended by a treatment specialist/process engineer, prior to discharge of dewatering effluent during construction.

Groundwater quality at the site is expected to be varied with time and may not be representative of long-term groundwater quality.

The estimated maximum construction dewatering rate using the highest hydraulic conductivity (K) value obtained for the overburden is 151,660 L/day (including a safety factor of 2.0). Therefore, a MECP Environmental Activity and Sector Registry (EASR) will be required to facilitate the construction dewatering program for the Site.

Long-term dewatering will not be required to manage post-construction groundwater seepage within the building footprint areas. It is expected that the subsurface segments of the proposed tanks, pump shelter and pasteurizers will be sealed tight using water proofing systems and designed to resist full hydrostatic pressure, which is anticipated to avoid long-term dewatering requirements.

It is JLP's understanding that the dewatering effluent during construction will be directed to a sewage system of the corporation of the Township of Southgate or a surface water body. It is recommended to contact the Township of Southgate and/or Grand River Conservation Authority (GRCA) prior to releasing dewatering effluent (short-term) for required approvals and more water testing, if any.

The annual infiltration volume will be increased from approximately 273 m^3/year to 603 m^3/year in the post-development phase and the resulting a pre- vs post-development infiltration surplus of 330 m^3/year. As a result, mitigation measures to increase groundwater infiltration during post-construction conditions will not be required.

The total annual infiltration to the Provincially Significant Wetland (PSW) adjacent to the Site will be increased by approximately 330 m^3/year. Therefore, proposed construction at the Site will not negatively impact the PSW adjacent to the Site. And mitigation measures to increase the groundwater infiltration during post-construction phase of the project for the purpose of increasing groundwater recharge will not be required.

1. Introduction

1.1 Project Description

JLP Services Inc. (JLP) was retained by Envest Corp. ("Client") to conduct a Hydrogeological Investigation including a water balance assessment for the proposed development located at 100 Eco Park Way in the Township of Southgate, Ontario, herein referred to as the "Site" and "Subject Property".

The site is currently vacant and cleared of trees and brush. The site is located in an industrial subdivision, on the southern side of Eco Parkway, east of Ida Street in the Township of Southgate, Ontario. It is surrounded by vacant and/or developed industrial properties on the north, east and west sides and by sewage lagoons on the south and west sides as shown in Figure 1.

We note that JLP, [formerly V.A. Wood (Guelph) Inc.] completed a geotechnical investigation on the northern portion of the subject property (area of 2.06 hectares) in July 2019 [see Ref. No. G4130-19-7]. Subsequent to the aforementioned investigation, it is understood that an additional, southern parcel having an area of 1.98 hectares has been purchased in order to expand the proposed facility.

It is understood that the proposed facility will consist of a processing building with a containment area with tanks, a number of accessory buildings, a dry pond, a biofilter system, site services and pavement areas. It is understood that the tanks will extend approximately 3 m (505.4 masl) below grade (Walterfedy, March 29, 2023).

Furthermore, JLP, [formerly V.A. Wood (Guelph) Inc.] completed a geotechnical investigation on the northern portion of the subject property (area of 2.06 hectares) in July 2019 [see Ref. No. G4130-19-7] and January 2023 on the southern portion of the subject property (area of 1.98 hectares) [see Ref. No. G4130-22-12]. Pertinent information gathered from the geotechnical investigation investigations will be utilized in this report. The total Site area is approximately 4.04 ha (40,040 m^2)

Limitations and Use of Report (Report Terms and Conditions) are provided in Appendix A.

1.2 Project Objectives and Scope of Work

The main objective of the hydrogeological investigation is to establish the local hydrogeological setting within and in the surrounding area of the Site, assess short-term (construction) and long-term (post-construction) dewatering flow rates, and the potential impacts of construction dewatering. Additionally, groundwater quality and the requirements for dewatering effluent discharge permit requirements were also evaluated. The objectives also included the preparation of a hydrogeological investigation report to satisfy the Township of Southgate, Grand River Conservation Authority (GRCA), and the Ministry of the Environment, Conservation and Parks (MECP) requirements.

To achieve the above-mentioned investigation objectives, JLP has completed the following scope of work:

Information Review

- Reviewed the available geological and hydrogeological information including published maps and reports for the Site and MECP Water Well Record (WWR) database;
- Reviewed MECP mapping on Wellhead Protection Areas (WHPA), Highly Vulnerable Areas (HVA), and Significant Groundwater Recharge Areas (SGRA) related to the Site;

- Reviewed regulation maps at the Grand River Conservation Authority and Source Water Protection Plans for the Site; and,
- Reviewed local planning authority (Township of Southgate) policies for un-serviced lands.

Field Investigation

- Advanced four (4) boreholes to approximately 6 mbgs, all of which were completed as 50 mm dia. monitoring wells with 3 m well screens;
- Developed all existing and new on-site monitoring wells;
- Conducted six (6) Single Well Response Tests (SWRT) on all existing and new monitoring wells to assess hydraulic conductivities of the saturated soils at the Site and completed three (3) initial rounds of groundwater level monitoring at all monitoring wells; and,
- Collected one (1) groundwater sample to be analyzed for the Provincial Water Quality Objectives (PWQO) criteria.

Data Evaluation

- Evaluated WWR database search results for water wells within 500 m of the Site boundary;
- Evaluated the site data collected during the field investigation program, including borehole geological information, grain size analysis, groundwater level monitoring results, groundwater quality and SWRT results;
- Estimated construction dewatering flow rates (short-term) and post-construction dewatering flow rates (long-term) and assessed potential impacts on the surrounding environment;
- Conducted pre- and post-development water balance assessment using Thornthwaite and Mather method and assessed groundwater infiltration deficit (pre- vs post-development) and recommended mitigation/contingency measures including preliminary sizing of Low Impact Development (LID) system(s);
- Completed a feature-based water balance assessment to evaluate any negative impacts on the Provincially Significant Wetland (PSW) within the drainage area; and,
- Evaluated MECP groundwater taking and the Township of Southgate sewer discharge permit requirements.

Reporting

- Prepared site plans, cross sections, geological maps and groundwater contours for the Site; and,
- Prepared a hydrogeological investigation report including water balance assessment results.

It should be noted that, due to the shallow groundwater levels (less than 1.0 mbgs) measured at the Site, onsite infiltration rate testing was not completed during the field program as part of the hydrogeological investigation.

1.3 Review of Previous Reports

The following reports were reviewed as part of this hydrogeological investigation:

- Golder Associates Ltd. (September 2011). Preliminary Hydrogeological/Hydrological Assessment, Dundalk Industrial Park Lands, Township of Southgate, Ontario.

- JLP Services Inc. (January 13, 2023). Supplemental Geotechnical Investigation, Southgate Renewables Facility, 100 Eco Parkway, Township of Southgate, Ontario.

- V.A. Wood (Guelph) Inc. (July 2019). Geotechnical Investigation, Dundalk Ecopark, 100 Eco Parkway, Township of Southgate, Ontario.

2. Regional and Local Hydrogeology

2.1 Regional Setting

2.1.1 Regional Physiography

The Site is located within the physiographic region named the Dundalk Till Plain, and physiographic landform named Till Plains (Drumlinized). North of West of Dundalk, low drumlinoidal swells appear with their long axes oriented southeastward (Chapman & Putman, 2007). The Plain is characterized by swamps/bogs and poorly drained depressions. Most of the area carries a surficial deposit of silt, possibly due to windblown material.

2.1.2 Regional Geology and Hydrogeology

The surficial geology of the subject property and surrounding area is mapped as Glaciofluvial deposits, consisting of river deposits and delta topset facies and sandy deposits (Ontario Geological Survey, 2010).

The surficial geology of the Site and surrounding areas is shown in Figure 2.

The dominant bedrock geology of the area is mapped as Lower Silurian sandstone, shale, dolostone and siltstone, belonging to the Guelph Formation as shown in Figure 3.

Local groundwater flow across the area is mapped to a south/southeast direction, towards Foley Drains. Regional groundwater flow across the site and surrounding area is mapped to south/southeast, towards the Grand River. It is expected that groundwater flow directions may vary locally from the regional flow directions due to various natural factors including local topographic and stratigraphic variations, submerged riverbeds, and engineering structures such as buildings and infrastructure.

2.2 Vulnerable Areas Mapping

The site area is located within the Grand River Source Water Protection Plan Area. Published maps and websites for the GRCA and the MECP were reviewed to identify if the Site footprint is within any of the regulated areas mapped by GRCA and MECP.

The following regulated areas were considered during the above information search:

- Wellhead Protection Areas (WHPA)
- Highly Vulnerable Aquifer Areas
- Intake protection Zones
- Significant Groundwater Recharge Areas
- Provincially Significant Wetlands
- Unevaluated Wetlands (GRCA)

As shown in Figure 4-1, the northwestern side of the Site is located in Wellhead Protection Area D, with a vulnerability score of 2. As shown in Figure 4-2, the area adjacent to the western boundary of the Site is

categorized as a floodplain area and within an unevaluated wetland area (GRCA) and the site area close to the southern boundary is categorized as a part of a provincially significant wetland (PSW) (Figure 4-4). Additionally, as per the MECP Source protection Information Atlas, the entire site area is included in an area identified as a significant groundwater recharge area (SGRA) as shown in Figure 4-3. The site is within a SGRA, however it does not have an applicable vulnerability score. Site and/or areas without vulnerability scores may be due to insufficient data and/or no previous assessments of the area.

2.3 Existing Water Wells

Water Well Records (WWRs) from the database maintained by the Ministry of Environment, Conservation and Parks (MECP) were reviewed to determine the number of water wells within a 500 m buffer from the Site boundary. The locations of the MECP WWR are shown in Figure 5. A summary of the WWR is included in Appendix B.

The MECP WWR database indicates a total of fifteen (15) wells within 500 m distance from the site boundary. Two wells were recorded on-Site. As per the details provided in the well records, both on-Site wells are identified as monitoring wells. Thirteen (13) wells were recorded off-Site, of which nine (9) are identified as monitoring wells, one (1) well is for domestic water supply, one (1) well is abandoned and two (2) wells are unspecified or uncompleted.

Based on the correspondences with the Client, the Township of Southgate has confirmed municipal water supply to the site.

2.4 Site Setting

2.4.1 Site Topography and Surface Water Features

As per elevation survey results at borehole/monitoring well locations, the surface elevation of the Site area varies from approximately 506.1 to 508.0 masl, approximately 2 m between the highest and lowest elevations at borehole locations. The topography of the site area can be considered to be fairly flat, sloping gently from northeast to southwest.

The majority of the Site is in a general industrial land use area. The southeast border of the Site (approximately 0.6 hectares) is part of PSW.

The Site area belongs to the Upper Grand River watershed. The nearest surface water features are Foley Drain and Foley Drain 1964, which are tributaries of the Grand River, which run directly adjacent to the southwest and southeast Site boundaries. The Site is located approximately 96 km northwest of Lake Ontario. Available area maps show that there are no water bodies on-Site.

2.4.2 Local Geology and Hydrogeology

A summary of subsurface soil stratigraphy at the Site is provided in the following paragraphs.

Appendix C provides detailed soil profiles, and the borehole location plan and interpreted geological cross section are presented in Figures 6 and 7, respectively.

It should be noted that the soil boundaries indicated on the borehole logs are inferred from non-continuous sampling and observations noted during the drilling program. These boundaries are intended to reflect approximate transition zones for the hydrogeological investigation and shall not be interpreted as exact stratigraphic changes.

A layer of **topsoil**, about 100 to 300mm thick, was encountered at the surface of boreholes BH1, BH2, BH3, BH4, BH6, BH7 and BH8. The topsoil consisted of sandy silt, trace to some gravel, and mixed with organics. It was black to dark brown in colour. The natural moisture content was found to range between 12 and 52%.

It should be noted that the thickness of topsoil may vary significantly between borehole locations and should not be relied upon to estimate the quantity of topsoil for removal.

The surface at borehole BH5 and topsoil at other boreholes was underlain by a deposit of brown **fill** extending to the depths of the boreholes at approximately 1.5 to 1.7 mbgs. The fill was dark brown to brown in colour and consisted of sandy silt, some gravel, trace clay. The natural moisture content was found to range from 6 to 26%.

The fill in all boreholes was underlain by a deposit of brown **sandy silt till** extending to the termination depths of the boreholes at about 6.38 to 9.59 mbgs. The sandy silt till was brown in colour and consisted of some sand, some gravel, trace to some clay, and occasional wet sand seams, sandy or clayey seams and cobbles. The natural moisture content was found to range from 3 to 15%.

Based on the test results and visual and tactile examination of the soil samples, the sandy silt till is considered to be in dense to very dense state of compactness and in moist to wet condition.

The bedrock was not encountered during the drilling investigation. The maximum investigated depth was 9.2 mbgs.

One (1) cross section was prepared to show the soil stratigraphy to a depth of approximately 10 mbgs (maximum investigated depth). The Borehole/Monitoring Well Location Map is provided in Figure 6 and Cross Section A-A' is provided in Figure 7.

3. Field Investigation Results

3.1 Monitoring Well Network Details

As part of the drilling program for the hydrogeological investigation, four (4) boreholes were advanced at the Site, and all were completed as monitoring wells (BH/MWs 201 through 204) by JLP as shown in Figure 6 and Appendix C. Two (2) previously installed monitoring wells (BH/MW 101 and 106) are also available at the Site.

All monitoring wells were completed with 50 mm dia. and 1.5 to 3 m long well screens with stick-up well casings.

Table 3.1 provides a summary of monitoring well construction details.

Table 3.1 - Summary of Monitoring Well Installation Details

Monitoring Well Number	Northing (m±)	Easting (m±)	Ground Elevation (masl)	Stick-up Length (m)	Well Depth (mbgs)	Well Bottom Elevation (masl)	Screen Interval (masl)	Soil Formation Screened
BH/MW 201	4889749.10	549397.60	508.00	0.86	6.00	502.01	498.96 to 502.01	Sandy Silt Till
BH/MW 202	4889644.74	549420.46	506.09	0.84	6.10	499.99	496.94 to 499.99	Sandy Silt Till
BH/MW 203	4889653.01	549512.55	507.23	1.07	5.91	501.31	498.26 to 501.31	Sandy Silt Till
BH/MW 204	4889594.35	549560.82	507.30	0.99	5.98	501.32	498.27 to 501.32	Sandy Silt Till
Existing Monitoring Wells								
BH/MW 101	4889620.30	549488.37	506.40	0.86	9.24	497.16	498.96 to 497.16	Sandy Silt Till
BH/MW 106	4889545.63	549531.94	506.69	0.92	6.00	500.69	499.17 to 500.69	Sandy Silt Till

Regulation 903 of the Ontario Water Resources Act requires that all monitoring wells and dewatering wells (if available) be decommissioned when no longer required. Well decommissioning should be completed by a licenced well contractor.

3.2 Groundwater Level Monitoring

As part of the current hydrogeological investigation, groundwater levels have been monitored using all wells located on-Site within the property boundary. All water levels in the wells have been measured with respect to masl.

Water level monitoring was performed at the Site in two (2) monitoring rounds on April 11 and May 8, 2023. A summary of the water level monitoring results is provided in Table 3.2.

Table 3.2 – Summary of Groundwater Level Monitoring Results

Monitoring Well ID	Ground Surface Elevation (masl)	Stick Up (m)	Monitoring Well Depth (mbgs)	Depth to Bottom of Monitoring Well (masl)	Units	11-Apr-23	8-May-23
BH/MW201	508.00	0.86	6.10	501.90	mtoc	1.26	1.145
					mbgs	0.40	0.29
					masl	507.61	507.72
BH/MW202	506.09	0.84	6.10	499.99	mtoc	1.07	1.01
					mbgs	0.23	0.17
					masl	505.86	505.92
BH/MW203	507.23	1.07	6.10	501.13	mtoc	1.35	1.37
					mbgs	0.28	0.30
					masl	506.94	506.93
BH/MW204	507.30	0.99	6.10	501.20	mtoc	1.08	1.16
					mbgs	0.09	0.17
					masl	507.21	507.13
BH/MW101	506.40	0.86	9.24	497.16	mtoc	0.53	0.59
					mbgs	-0.33	-0.27
					masl	506.73	506.67
BH/MW106	506.69	0.92	6.14	500.55	mtoc	1.01	0.91
					mbgs	0.09	-0.01
					masl	506.60	506.70

na* - Monitoring well not accessible
mtoc – meters below top of casing

Artesian groundwater conditions were reported at two (2) monitoring wells (BH/MW101 and BH/MW106). The reported groundwater levels at these two monitoring wells vary from 0.01 to 0.33 m above ground surface.

The highest groundwater elevation recorded at monitoring wells from April 11 and May 8, 2023, is provided in Table 3.3.

Table 3.3 – Recorded Highest Groundwater Elevations

Monitoring Well Number	Date Measured	Highest Groundwater Elevation (masl)	Groundwater Level (mbgs)
BH/MW201	May 8, 2023	507.72	0.29

The seasonal highest groundwater is expected to be higher than the recorded groundwater levels at the Site.

Based on the static ground water levels, the groundwater flow direction across the Site is interpreted to be vary from southwest to southeast. The groundwater contour/flow direction maps may need to be updated when subsequent monitoring data is available for review.

One (1) groundwater contour map for the water-bearing zone up to approximately 9.2 mbgs is shown in Figure 8-1.

It should be noted that groundwater levels are expected to show seasonal fluctuations and the groundwater flow directions across the Site may change. Seasonal groundwater level monitoring will be pertinent to understand seasonal groundwater level fluctuations.

It is recommended to conduct seasonal groundwater level monitoring (bi-monthly monitoring) at the Site for one year including installation of four (4) data loggers for continual water level monitoring and surface water level and flow monitoring at the tributaries which run close to the southwest and southeast boundaries of the Site.

Additionally, it is recommended to install three (3) mini-piezometer nests and three (3) surface water level gauges to evaluate surface water/groundwater interaction at the foley drain boundaries.

3.3 Hydraulic Conductivity Testing

3.3.1 Single Well Response Testing

Single well response tests (SWRT) were completed at six (6) monitoring wells (BH/MW 201 through 204 and BH/MW 101 and 106) on April 11, 2023, in order to estimate the saturated hydraulic conductivity (K) of the soil/bedrock surrounding the monitoring well screen.

All monitoring wells were developed prior to conducting SWRT testing and left for full recovery. Before starting SWRT, static water levels in each well were measured and the test was conducted by rapidly inserting a solid/water slug into each of the wells. A digital data logger pre-programed to record data at each one (1) second interval was inserted in the well prior to inserting the solid/water slug.

SWRT field data interpretation was completed using Hvorslev solution provided in the AQTESOLV Pro. V.4.5 software package.

3.3.2 Summary of Hydraulic Conductivity Test Results

Table 3.4 provides a summary of SWRT results completed on Monitoring wells BH/MW201, BH/MW202, BH/MW204 and BH/MW101 and BH/MW106. Appendix D provides SRWT test analytical results.

Table 3.4: Summary of Hydraulic Conductivity Test Results

Monitoring Well	Well Depth (mbgs)	Screen Interval (mbgs)		Screened Lithologic Unit	Test Type	Estimated Hydraulic Conductivity (m/s)
		From	To			
BH/MW201	6.10	3.10	6.10	Sandy Silt Till	SWRT – Rising Head	3.13E-07
BH/MW202	6.10	3.10	6.10	Sandy Silt Till	SWRT – Rising Head	5.15E-07
BH/MW203	6.10	3.10	6.10	Sandy Silt Till	SWRT – Rising Head	6.12E-08
BH/MW204	6.10	3.10	6.10	Sandy Silt Till	SWRT – Rising Head	3.05E-08
BH/MW101	9.14	6.14	9.14	Sandy Silt Till	SWRT – Rising Head	4.9E-08
BH/MW106	6.10	3.10	6.10	Sandy Silt Till	SWRT – Rising Head	1.26E-07
					Highest Estimated K Value	5.17E-07
					Geometric Mean of K Values	1.08E-07

The highest K value of the saturated overburden to a depth of approximately 9.2 mbgs is 5.15E-07 m/s and the geometric mean of the K values is 1.08E-07 m/s. It should be noted that, SWRT results provide the estimated saturated hydraulic conductivity (K) of the soil surrounding each monitoring well screen and therefore, may not represent the hydraulic conductivity of the total soil formation screened.

3.4 Infiltration Rate Testing Results

3.4.1 Grainsize Analysis Results

To estimate the soil infiltration rates, JLP conducted three (3) grain size analyses using soil samples collected at selected boreholes and depths (BH101, BH103 and BH106).

Soil sample depths were selected from two depth ranges (0.8 to 2.0 and 3.0 to 3.5 mbgs), suitable to estimate design infiltration rates.

The stratigraphy of the shallow subsurface comprises of a sandy silt and sandy silt till.

Based on the estimated hydraulic conductivity values using the results of the grain size analyses, design infiltration rates were calculated as per the Low Impact Development (LID) Stormwater Management Planning and Design Guide, CVC – TRCA, 2010.

Table 3.5 below shows a summary of field saturated hydraulic conductivity (K) testing and design infiltration rates. Locations of boreholes where soil samples were collected for grain size analysis are shown in Figure 6 and infiltration rate analysis is provided in Appendix E.

Table 3.5: Summary of Grain Size Results

Soil Sampling Location	Depth Range of Soil Samples (mbgs)	Soil Formation	Field Saturated Hydraulic Conductivity, K_{fs} (cm/s)	Infiltration Rates (mm/hr)
Shallow Soils				
BH 101 - SS2	0.8 to 1.3	Sandy Silt	8.9E-04	83
BH 106 - SS3	1.5 to 2.0	Sandy Silt	7.8E-05	44
		Geometric Mean	2.64E-04	60
Deep Soils				
BH 103 – SS5	3.0 to 3.5	Sandy Silt Till	6.23E-07	12
		Geometric Mean	6.23E-07	12
			Geometric Mean of Infiltration Rates – shallow soils	60
			Design Infiltration Rate*	13.3

Notes:
*Safety Factor of 4.5 was used to calculate the design infiltration rate as per Low Impact Development Stormwater Management Planning and Design Guide, CVC – TRCA, 2010.

The estimated design infiltration rate based on the results of grain size analyses for the Site is 13.3 mm/hr, which can be used to determine the area of LID system to mitigate pre- vs post-development infiltration rate deficit assuming the final grading of any area of the Site is above 1 m higher than the seasonal high groundwater level.

3.4.2 Infiltration Rate Testing

As shown in Table 3.2, the reported groundwater levels at onsite monitoring wells varied from 0.53 mbgs to 0.33 m above ground surface (-0.3 mbgs). Since the reported groundwater levels at the Site are above 1 mbgs for the 99% of the Site area, it was not possible to conduct infiltration rate testing at the Site (Figure 8-1).

3.5 Groundwater Quality

To assess the suitability for discharging pumped groundwater into a surface water body and/or the natural environment during dewatering activities, one (1) groundwater sample was collected from monitoring well BH/MW106 on April 11, 2023, using a bailer.

Prior to the collection of the above noted groundwater sample, approximately three (3) standing well volumes of groundwater were purged from the noted well. The noted sample was collected unfiltered and placed into pre-cleaned laboratory-supplied vials and/or bottles provided with analytical test group specific preservatives, as required. Dedicated nitrile gloves were used during sample handling.

The groundwater samples were submitted for analysis to ALS Environmental, a CALA certified independent laboratory in Waterloo, Ontario. Analytical results are provided in Appendix F.

A summary of the pertinent results is provided in Table 3.6:

Table 3.6: Summary of Analytical Results

Parameter	PWQO Limit mg/L	Analytical Results BH/MW 106 April 11, 2023 mg/L
Total Phosphorus	0.01	**0.0144**

Notes:
Underlined and bolded - concentration exceeds PWQO criteria.

When compared to the Provincial Water Quality Objectives (PWQOs) the laboratory certificate of analysis indicated that the concentration of Total Phosphorus was in exceedance of the PQWO criteria.

The Laboratory certificate of analysis is provided in Appendix F.

It is expected that the concentration of total suspended solids (TSS) and some other parameters such as total metals may exceed PWQO criteria during construction dewatering activities. Therefore, it is recommended to implement a suitable treatment method such as filtration and/or decantation or any other suitable treatment method recommended by the project treatment specialist/process engineer, prior to the discharge of dewatering effluent during construction.

Groundwater quality at the site is expected to be varied with time and may not be representative of long-term groundwater quality. Additional sampling and analysis are recommended prior to discharge and/or construction activities to confirm the marginal Total Phosphorus exceedance observed on April 11, 2023.

Discharge from dewatering (short-term) can be directed to a sewage system of the corporation of the Township of Southgate or to a surface water body (Foley Drain). The Township of Southgate and/or GRCA should be contacted and notified prior to releasing dewatering effluent (short-term) for required approvals and more water testing, if any. Additional water quality testing may be necessary prior to discharge of dewatering effluent to the Foley Drain, as required by the GRCA.

4. Dewatering Rate Assessment

Based on the results of the groundwater level monitoring at the Site, and the assumed excavation levels for the proposed development, it is expected that dewatering will be required during construction and post construction phases of the development. Therefore, construction (short-term) and post construction (long-term) dewatering rate assessments are included in this report.

Assessment of expected short-term and long-term dewatering rates were completed using the analytical method described below.

4.1 Dewatering Flow Rate Assessment Methodology

Proposed Buildings and Tanks

Radial flow to a well (circular source) at a distance of R_0 to a fully penetrating well can be expressed using the equation (Dupuit-Forcheimer equation) given below. This equation was used to estimate short-term (construction) and post construction (long-term) dewatering rates for the project.

$$Q = \frac{\pi K(H^2 - hw^2)}{Ln\left[\frac{R_o}{r_e}\right]}$$

Where:

Q = Dewatering Rate (m^3/s)
K = Saturated Hydraulic conductivity (m/s)
H = Initial water column in aquifer (static groundwater elevation) (m)
h_w = Final water column in aquifer (m)
R_0 = Radius of influence (m)
r_e = Equivalent radius (m)

Equivalent radius (re) can be calculated using following equations:

$$r_e = \frac{a+b}{\pi} \quad \text{or} \quad R_{o-mod} = R_0 + r_e \text{ if } R_0 < r_e$$

a = Length of the excavation area (m)
b = Width of the excavation area (m)

Dupuit-Forcheimer equation does not consider the daily volume required to be removed from the groundwater storage within the area of zone of influence, which is mainly from the excavation area.

Due to the requirement of removal of groundwater storage within the depth range of dewatering in addition to groundwater seepage, the initial dewatering rate is expected to be higher when compared to the dewatering rate during the later (steady) stages of dewatering. To compensate for the unaccounted groundwater removal from storage and higher dewatering rates due to any unforeseen conditions, a factor of safety will be applied to estimate the final rate of groundwater removal.

Servicing Installation

Linear flow to an excavation (linear source) at a distance of L_0 to a fully penetrating well can be expressed using the equation (Dupuit equation) given below. This equation was used to estimate short-term (construction) dewatering rates for the project.

$$Q_w = (x1 + x2) * K * (H^2 - h^2)/Lo$$

Where:

Qw = Rate of pumping (m^3/s)
x_1 = Length of excavation (m)
x_1 = Width of excavation (m)
K = Hydraulic conductivity (m/s)
H = Aquifer Thickness/Initial Water Column Thickness (m)
h = Final Water Column Thickness (m)
Lo = Distance of influence (m)

Rainfall Intake

An additional volume of water will need to be removed from the excavation during and after precipitation events. As a result, daily dewatering volume should include the removal of rainwater from the excavation to determine the total dewatering rate.

To estimate the volume of rainwater collected within the footprint area of the excavation, an assumed 15 mm/day precipitation was considered. It is the responsibility of the dewatering contractor to manage the volume from direct precipitation safely without exceeding the permitted daily dewatering and discharging rates during and after rainfall events greater than 15 mm (e.g., 2-year / 100-year storm event).

To estimate the direct rainfall intake during 2-year and 100-year storm event in the Site area, the recorded precipitation rates of 60.1 mm/24-hrs and 132.7 mm/24-hrs were utilized using Intensity Duration Frequency Curves, Ontario Ministry of Transportation.

4.2 Dewatering Radius of Influence

It is considered that the distance to the circular source (radial flow) of groundwater is similar to the length of the dewatering zone of influence. To estimate the dewatering radius of influence during the construction dewatering activities, Cooper-Jacob (1946) equation was used.

The estimated radius of influence due to dewatering:

$$\mathrm{R_0} = \sqrt{2.25\mathrm{KDt/S}}$$

Where:

Ro = Estimated dewatering radius of influence (m)
K = Saturated Hydraulic conductivity (m/s)
D = For unconfined aquifers, original saturated thickness (considered as similar to aquifer thickness) (m)
S = Storage coefficient
t = Duration of pumping (s)

It should be noted that the above equation was derived for confined aquifers, however, can be used for unconfined aquifers under site specific conditions.

If the estimated R_o is less than r_e, as described above $R_{0\text{-}mod}$ is used to estimate daily dewatering rates.

4.3 Dewatering Rate Estimates

Dewatering rate estimates were carried out using the methodology provided in Sections 4.1 and 4.2.

It is understood that the proposed facility will consist of a processing building with a containment area with tanks, a number of accessory buildings, a dry pond, a biofilter system, site services and pavement areas, with a total area of 4.14 ha (41,400 m^2). It is understood that the tanks will extend approximately 3 m (505.4 masl) below grade (CHFOUR BIOGAS, December 8, 2023).

Building Construction (Organics Receiving Building (Building A), and Maintenance Shop and Office (Building B)): As per the geotechnical investigation (JLP, January 2023), the proposed buildings will be constructed without underground level(s) and suitable foundation elevations vary from approximately 504.5 to 505.6 masl. The Organics Receiving Building (Building A) has a below grade area (secondary containment pit, 25 m x 6 m) for the holding tanks to match the finished floor elevation (FFE) of Digester Tanks (3.5 mbgs or 504.5 masl) (Walterfedy March 29, 2023).

Digester Tanks (Anaerobic Digester Tanks (3 tanks), Hydrolyzer Tanks (2 tanks), and Digester Storage Tank (1 tank), pump Shelter, Pasteurizers, and Spil Containment Area: The proposed bottom of the tanks (bottom of footings) will extend to an elevation of approximately 505.4 masl (CHFOUR BIOGAS, December 8, 2023). The proposed grade of the spill containment is 507.4 masl.

Site Services: The inverts of the proposed site services were available at the time of this report. However, it is expected that the sanitary sewer, storm sewer and watermain inverts will be located at depths ranging between 2 and 4 m below the finished grades. For a conservative approach, it was assumed the servicing inverts will be located approximately 4 mbgs.

Biofilter System: It is expected that the proposed biofilter system will be installed about the groundwater level at the Site. If the discharge from the disposal tank/concrete biofilter tank is disposed into the ground, the invert elevation of the discharge system (i.e. shallow buried trench, sand filters) should be at least 1 m above the seasonal high groundwater elevation at the Site.

Table 4.1.1 and Table 4.1.2 provide the values used to estimate the short-term dewatering rate for the Site.

JLP should be retained to review the assumptions outlined in this section, should the proposed design/shoring change.

Table 4.1.1: Summary of In-put Data (Building Areas and Tanks)

Input Parameter	Unit	Organics Receiving Building (Building A)*	Organics Receiving Building (Building A) Secondary Containment Pit	Maintenance Shop and Office (Building B)	Pump Shelter + Tanks + Pasteurizer + Spill Containment Area	Notes
Finished Floor Elevation	masl	508.4	505.4	508.75	505.4	Finished grade elevation as per site drawing (Walterfedy, March 29, 2023, and CHFOUR BIOGAS, December 8, 2023)
Highest Groundwater Elevation	masl	508.1	508.1	508.1	507.7	Highest groundwater level recorded of the building area Increased by 0.5 m for seasonal highest groundwater elevation
Bottom of Footings	masl	508.4	505.4	508.75	505.4	Finished grade elevation as per site drawing (Walterfedy, March 29, 2023, and CHFOUR BIOGAS, December 8, 2023)
Lowest Foundation Elevation	masl	507.4	504.4	507.75	504.4	Assumed 1 m below FFE
Dewatered Elevation Target	masl	506.4	503.4	506.75	503.4	Assumed 1 m below foundation elevation
Building Footprint Areas	m^2	2,779*	153	571	7,500**	As per building dimensions provided (Walterfedy, March 29, 2023)
Approximate Excavation Area	m^2 (m x m)	695 (30.4 x 22.9)	153 25.0 x 6.1	143 (13.6 x 10.5)	7,500** (100.0 x 75.0)	Buildings A (without secondary containment pit area): and B Assumed a total area similar to 0.25 of the building area is open for foundations at any given time under construction
Hydraulic Conductivity (K)	m/s	5.17E-07	5.17E-07	5.17E-07	5.17E-07	Highest K value estimated for overburden

Notes:
Maintenance Shop and Office (Approximately 36.3 m x 20.5 m)
Organics Receiving Building (60.0 m x 45.0 m)
Anaerobic Digester Tanks, dia. 23.5 m (3 tanks)
Hydrolyzer Tanks, dia. 15.4 m (2 tanks)
Digester Storage Tank, dia. 19.9 m (1 tank)

*Excluding secondary containment pit area
**Total area (approximate) for Pump Shelter, Tanks, Pasteurizers, and spill containment area (Approximate dimensions to match the total area 61.5 m x 45.1 m)

Table 4.1.2: Summary of In-put Data (Site Services)

Input Parameter	Unit	Site Services	Notes
Finished Grade Elevation	masl	505.4 to 508.4	Finished grade elevation as per Walterfedy drawing March 29, 2023
Highest Groundwater Elevation	mbgs	0.00	Highest groundwater level recorded at the Site Increased by 0.5 m for seasonal highest groundwater elevation
Invert Level	mbgs	4.0	Services - Assumed 4.0 m below ground surface
Dewatered Elevation Target	mbgs	5.0	Assumed 1.0 metre below invert elevation.
Excavation Footprint Area	m^2 (m x m)	30 (15 m x 2 m)	Assumed 30 m long trench for Site Services is open at any given time
Hydraulic Conductivity (K)	m/s	5.17E-07	Highest K value estimated for overburden

4.4 Results of Construction Dewatering Rate Estimate

For this assessment, it was assumed that the proposed construction plans include a temporary shoring system. Should the proposed shoring system be revised, JLP should be retained to review the dewatering estimates.

Table 4.2 presents the short term (construction) dewatering estimate (Appendix G).

Table 4.2: Short Term (Construction) Dewatering Estimate

Description	Organics Receiving Building (Bldg. A)*	Organics Receiving Building (Building A) Secondary Containment Pit	Maintenance Shop and Office (Bldg. B)	Pump Shelter + Tanks + Pasteurizer + Spill Containment	Servicing**	Total
Units	**L/day**	**L/day**	**L/day**	**L/day**	**L/day**	**L/day**
Dewatering Flow Rate without SF of 2.0 (Q)	7,740	12,550	3,650	44,150	7,740	75,830
Dewatering Flow Rate multiplied by FS of 2.0 (Q_{sf})***	15,480	25,100	7,300	88,300	15,480	151,660
Volume from 15 mm/day rainfall event (p)	10,440	2,290	2,140	112,500	450	127,820
Dewatering Flow Rate multiplied by FS of 2.0 + Precipitation of 15 mm/day (Q_{sf+p})****	25,920	27,390	9,440	200,800	15,930	279,480
Zone of Influence (m)	15.0	15.0	15.0	15.0	11.0	

Notes:
*Excluding secondary containment pit
** Assumed 15 m long servicing trench kept open at a time
***For MECP EASR
**** For Discharge Purposes / Agreement

The estimated dewatering rates provided in Table 4.2 should be considered a conservative estimate, which accounts for initial high dewatering rates, seasonal high groundwater elevation and any other unforeseen conditions including variation of hydraulic properties and the effect of underground servicing.

Pits (sump pits) are assumed to have equal excavation depth as the main excavation. Therefore, deeper pits if any, may require extra localized dewatering and revised dewatering estimates. Additionally, high dewatering rates can be expected within local areas having high conductive soils, deeper excavations for elevator pits etc. It is the dewatering contractor's responsibility to install additional dewatering systems to maintain the excavation floor dry, during the entire dewatering period.

4.5 Long-Term Dewatering Rate Assessment

JLP understands that proposed buildings A and B (excluding secondary containment pit area) will be constructed without below grade levels and the slab-on-grade will be placed above the estimated seasonal high groundwater level. As a result, long-term dewatering will not be required to manage post-construction groundwater seepage within the building footprint areas, excluding secondary containment pit area (Building A).

It is expected that the subsurface segments of the proposed Secondary Containment Pit area within Building A, Pump Shelter, Digester Tanks and spill containment area, Pasteurizer, and elevator pits are sealed tight using water proofing structures and designed to resist full hydrostatic pressure, which is anticipated to avoid long-term

dewatering requirements. It should be noted that the expected seasonal high groundwater level at this location (507.7 masl) is approximately 2.3 m higher compared to the proposed FFE (505.4 masl) of the Pump Shelter, Digester Tanks and spill containment area, and Pasteurizer.

4.6 MECP Water Taking Permit Requirements

4.6.1 Construction Dewatering

Ontario Water Resources Act states that registration with the Environmental Activity and Sector Registry (EASR) is a requirement for a rate of water taking between 50,000 and 400,000 L/day, during the construction period. If the rate of water taking exceeds 400,000 L/day, a Category 3 Permit to Take Water (PTTW) will be required from the MECP.

Based on the available hydrogeological information and assumptions, the estimated maximum construction dewatering rate using the highest K values obtained for the overburden is 151,660 L/day (including safety factor of 2.0). Therefore, an MECP EASR will be required to facilitate the construction dewatering program for the Site. It should be noted that the estimated dewatering rate is a conservative value, which may be higher than the dewatering rate during the later stage of dewatering.

The EASR, Discharge Plan, hydrogeological investigation report, water taking plan, and geotechnical assessment of settlements must also be available at the Site during the entire construction dewatering program. JLP should be notified immediately about any changes to the construction dewatering schedule or design, since the EASR will need to be updated to reflect these modifications.

Discharge rates should be monitored using calibrated flow meters and daily water taking records should be available on site. Additional regular discharge water quality monitoring should be carried out to the satisfaction of regulatory agencies.

The EASR registration allows construction dewatering discharge of up to 400,000 L/day. A Discharge Plan (dewatering sketch, sewer discharge agreement) must be developed and applied for any discharges from the Site. The Discharge Plan and monitoring for both water quantity and water quality must be carried at the Site during the entire construction dewatering phase. The daily water taking records must be maintained onsite for the entire construction dewatering phase.

The effects of dewatering on the groundwater regime surrounding the area of dewatering should be monitored using monitoring wells within and around the excavation using manual measurements and electronic data loggers.

5. Water Balance Assessment

5.1 Background Information

The site is currently vacant and cleared of trees and brush. The site is located in an industrial subdivision, on the southern side of Eco Parkway, east of Ida Street in the Township of Southgate, Ontario. It is surrounded by vacant and/or developed industrial properties on the north, east and west sides and by sewage lagoons on the south and west sides as shown in Figure 1.

The surficial geology of the subject property and surrounding area is mapped as Glaciofluvial deposits, consisting of river deposits and delta topset facies and sandy deposits (Ontario Geological Survey, 2010).

Most of the Site area is in a general industrial land use area. The topography of the site area can be considered fairly flat, sloping gently from northeast to southwest.

The northwestern side of the Site is in Wellhead Protection Area D, with a vulnerability score of 2. As shown in Figure 4-2, the area adjacent to the western boundary of the Site is categorized as a floodplain area (GRCA) and the majority of the Site is categorized as a part of a wetland (GRCA). The area close to the southwestern border of the site is identified as a MNRF PSW.

Based on the static groundwater levels, the groundwater flow direction across the Site is interpreted to be southwest to southeast across the Site (Figure 8).

5.2 Methodology

The water balance model analyzes the allocation of water among various components of the hydrologic cycle using monthly accounting procedures based on the methodology originally presented by Thornthwaite (Thornthwaite, 1948; Mather, 1978; 1979; McCabe and Wolock, 1999).

Inputs to the model include mean monthly temperature, monthly total precipitation, and latitude of the Site. Outputs include monthly potential and actual evapotranspiration, soil moisture storage, soil moisture storage change, surplus, infiltration and runoff.

The precipitation that lands on the ground surface is distributed to the natural environment through three pathways; a. some of the water infiltrates the ground (infiltration); b. some runs off the surface (runoff); and c. a major portion either evaporates or is absorbed by plants and released into the atmosphere (evapotranspiration).

The distribution of water among these pathways is referred to as the water balance. In natural settings, most of the precipitation follows the infiltration and evapotranspiration pathways, which leaves a relatively small portion that becomes runoff. In built communities, the introduction of hard surfaces and the reduction in vegetated cover allocates more water to the runoff pathway and less water to evapotranspiration and infiltration pathways. The resulting imbalance causes flooding and erosion on the land surface and lower groundwater levels that support our streams, wetlands, and groundwater resources.

For ease of calculation, a spreadsheet model was used for the computation. The Thornthwaite and Mather Model is based on the United States Geological Survey (USGS) graphical user interface (Thornthwaite Monthly Water-Balance program, 2007).

The basic water balance for a particular area can be expressed as:

$$P = RO + ET + I + \Delta S \qquad \text{(Thornthwaite and Mather, 1957)}$$

Where,
P = Total Precipitation (rain and snow)
RO = Runoff
ET = Evapotranspiration
I = Infiltration / Recharge
ΔS = Change in Storage (assumed to be zero under steady state conditions)

Infiltration is governed by the surficial soil types, topography, and land cover. If the water table is at the surface, as measured in shallow monitoring wells, then the percolation rate of precipitation into the shallow soils is considered negligible.

5.3 Meteorological Data

Meteorological data for model input including average monthly precipitation and average temperatures were obtained from the National Climate Data and Information Archive (Environment Canada) for meteorological station Proton Station, Ontario (Station ID No. 6116750). The closest Latitude to the selected meteorological Station is 44.14^0.

The closest Latitude to the Site is 44^0, which was used in the USGS model (2007). The Site location plan is shown in Figure 1.

Thirty (30) years of meteorological data from 1972 to 2001 was utilized for the assessment. A summary of input data is provided in Appendix H-1.

5.4 Pre- and Post-Development Site Characteristics for the Total Site

Most of the Site area is in a general industrial land use area and is proposed to be developed as an industrial development.

A summary of the existing and proposed (pre- and post-development) landscape features is provided in Table 5.1:

Table 5.1: Pre- and Post- Development Land Use

Description	Area (m^2)				Percentage %	
	Pre-Development (Existing)		Post-Development (Proposed)		Pre-Development (Existing)	Post-Development (Proposed)*
	Pervious	Impervious	Pervious	Impervious		
ROW (roads, sidewalks, parking) -paved surfaces, including spill containment area	-	-	-	7,660	-	18.96%
Buildings /Building Roofs	-	-	-	6,627	-	16.41%

Description	Area (m^2)				Percentage %	
	Pre-Development (Existing)		Post-Development (Proposed)		Pre-Development (Existing)	Post-Development (Proposed)*
	Pervious	Impervious	Pervious	Impervious		
Wetland Areas (PSW and dry pond area)	-	6,000	-	6,750	14.85%	16.71%
Land scaped/cultivate/gravel areas with GW level below 1 mbgs (Site Area available for infiltration contribution)	1,000	-	2,210	-	2.48%	5.47%
Land scaped/cultivated /gravel areas with GW level less than 1 mbgs (not available for infiltration contribution)	-	33,394	-	17,147	82.67%	42.45%
Total	1,000	39,394	2,210	38,184	100.0%	100.0%
Total Site Area	**40,394**		**40,394**			

*as per Walterfedy drawing March 29, 2023

As shown in Table 5.1, under post-development conditions, pervious areas available for infiltration at the Site increased from approximately 2.48% to 5.47% (Figures 8.3, 9 and 10). This excludes the land scaped/cultivated/gravel areas with GW level less than 1 mbgs (not available for infiltration contribution).

It should be noted that a part of the land area is proposed to be regraded during the post construction phase (Attachment 1). As a result, during the post-development phase, the groundwater level will be lower than 1 mbgs for a larger portion of the Site, compared to the pre-development site conditions.

It should be noted that the areas provided in Table 5.1 above were determined based on a review of available concept Site plans and these estimates are considered appropriate for estimating the water balance.

5.5 Site Water Balance Estimates

5.5.1 Climate Data Analysis

Monthly average precipitation values were obtained for 30 years (1972 to 2001) from the Past Weather and Climatic Data (Environment and Natural Resources Canada) for the Proton Station, Ontario (Station ID No. 6116750).

Soil moisture storage of 150 mm was assumed for silty sand soils and considered to be representative of pre-construction Site conditions. The closest Latitude to the Site is 44^0, which was used in the United Stated Geological Survey (USGS) graphical user interface (Thornthwaite Monthly Water-Balance program, 2007).

Table 5.2 summarizes the climatic water balance analysis. Appendix H-1 and Appendix H-2 provide model input and output, respectively.

Table 5.2: Summary of Climatic Water Balance Analysis

Description	Units	Results
Precipitation	mm/year	1,093.84
Evapotranspiration	mm/year	487.48
Surplus	mm/year	606.35

The results of the climatic water balance analysis for the Site indicate that after evapotranspiration, 606.35 mm/year of water is available for surface runoff and infiltration.

5.5.2 Pre- and Post-Development Infiltration Factors

After being subject to evapotranspiration, the site specific pre- and post-development infiltration factors were estimated using the main individual sub-factors, topography, soil type and land cover conditions. These are considered to be the main sub-factors controlling the groundwater infiltration rate at the Site (Figures 2, 9 and 10).

The magnitude of the total infiltration factor is obtained by adding the appropriate values for topography, soils and cover type. The cumulative total of these factors is applied to the available surplus water to determine the groundwater recharge for a given area (Ministry of Environment and Energy, former MECP, April 1995).

A summary of pre- and post-development sub factors were selected based on the Site conditions (Appendix H-3). The infiltration sub-factors were determined for estimating pre- and post-development infiltration rates of the entire Site. The estimated infiltration sub-factor for pre- and post-development phases of the project is 0.45, can be considered moderate.

A summary of available fraction of water (from the surplus) for groundwater infiltration and run-off based on pre- and post-development total infiltration factors is provided in Table 5.3.

Table 5.3: Fraction of Water Available for Infiltration and Run-off (from Surplus)

Development Phase	Surplus	Infiltration	Run-Off
	mm/year	mm/year	mm/year
Pre-Development	606.35	272.86	333.49
Post-Development	606.35	272.86	333.49

In areas where the water table is at or less than 1 m below surface, the infiltration rate was considered negligible for existing and proposed grades.

5.5.3 Pre- and Post-Development Water Balance Analysis for Site

Based on the available pervious areas at the Site, estimated infiltration factors and predicted surplus from modeling (Thornthwaite Monthly Water-Balance program, 2007), a pre- and post-water balance analysis was completed.

Table 5.4 provides a summary of pre- and post-development water balance analysis for the Site.

Table 5.4: Summary of Pre- and Post-Development Water Balance Analysis for Site

Description	Units	Results		Percentage of Total Precipitation	
		Pre-Development	Post-Development	Pre-Development	Post-Development
Total Site Area	m^2	40,394	40,394	-	-
Permeable Area Available for Infiltration	m^2	1,000	2,210	-	-
Precipitation for Total Site	m^3/year	44,184	44,184	100.0%	100.0%
Actual Evapotranspiration	m^3/year	19,691	12,727	44.6%	28.8%
Infiltration	m^3/year	273	603	0.6%	1.4%
Runoff	m^3/year	24,220	30,855	54.8%	69.8%

As summarized in Table 5.5, the breakdown of the pre- and post-development water balance percentages from total precipitation is as follows:

- Pre-development: evapotranspiration – 44.6%, infiltration – 0.6% and runoff – 54.8%
- Post-Development: evapotranspiration – 28.8%, infiltration – 1.4% and runoff – 69.8%

Depths of site specific pre- and post-development water balance are provided in Table 5.5:

Table 5.5: Site Specific Pre- and Post-Development Water Balance Depth

Description	Units	Pre-Development	Post-Development
Precipitation	mm/year	1,093.84	1,093.84
Actual Evapotranspiration	mm/year	487.48	315.06
Infiltration	mm/year	6.75	14.93
Runoff	mm/year	599.60	763.84

Notes: it is assumed there will be no change to groundwater storage under steady state conditions

5.6 Pre- Vs Post-Development Site Water Balance Deficit for Total Site

Table 5.6 presents a summary of the overall post-development water balance assessment and water balance deficit in the post-development phase of the project.

Table 5.6: Summary of Pre- vs Post-Development Water Balance Deficit (Unmitigated)

Development Stage	Precipitation	Actual Evapotranspiration	Groundwater Infiltration*	Run-off
	m^3/year	m^3/year	m^3/year	m^3/year
Pre-Development	44,184	19,691	273	24,220
Post-Development	44,184	12,727	603	30,855
Pre- vs Post-Development Infiltration Deficit (m^3/year)			**-330**	

*Considering groundwater infiltration is zero in areas where groundwater level is less than 1 mbgs

As shown in Table 5.6, it is estimated that the annual infiltration volume will be increased from approximately 273 m^3/year to 603 m^3/year in the post-development phase, resulting a pre- vs post-development infiltration surplus of 330 m^3/year (Appendix H-3).

Please note that, as per groundwater level monitoring results at the Site, groundwater levels at all the monitoring wells are less than 1 m from the ground level and approximately 2.5% of the Site Area is available for groundwater infiltration during pre-development phase of the project. As a result, it is considered that, during the pre-development phase of the project, the groundwater infiltration at the Site is low.

As per Walterfedy architectural drawings (May 29, 2023), JLP understands that a part of the land will be filled/graded under post-development site conditions. Therefore, areas available for groundwater infiltration increased during the post-construction phase of the project, compared to the pre-development site conditions.

5.7 Proposed Mitigation Measures

The estimated pre- vs post-development infiltration rate surplus for the Site is 330 m^3/year (Appendix H-4), therefore, mitigation measures to the groundwater infiltration during post-construction conditions will not be required.

6. Feature-Based Water Balance Assessment

As per GRCA letter dated June 23, 2023, a feature-based water balance estimate was required for the PSW adjacent to the Site. GRCA requires pre-development, post-development (unmitigated) and post-development (mitigated) conditions to be considered for the assessment.

As needed by GRCA, the feature-based water balance assessment was completed to satisfy Toronto and Region Conservation Authority requirements (Storm Water management Criteria, August 2012).

For this feature-based water balance assessment, the Thornthwaite and Mather method was used to estimate average infiltration rates. Based on the site conditions, as no recharge/infiltration to deep aquifer occurs, the component for infiltration in the Thornthwaite and Mather model was used to estimate infiltration, which corresponds to lateral movement of water in the unsaturated zone in the shallow sub-surface (first few meters) which discharges to surface water features.

Figures 11-1, 11-2 and 11-3 were prepared in support of feature-based infiltration water balance. These figures include the site location plan (Figure 11-1), the sub-drainage areas - existing conditions (Figure 11-2) and the drainage areas - post development (Figure 11-3). For ease of calculation, a spreadsheet model was used for the computation. The Thornthwaite and Mather Model was based on the United States Geological Survey (USGS) graphical user interface (Thornthwaite Monthly Water-Balance program, 2007).

Two Sub Drainage Basins (1 and 2) were identified, which feed surface and groundwater to wetlands surrounding the Site. These two Sub Drainage Areas were used to estimate monthly feature-based water balance under pre- and post-development conditions.

Appendix H-5 presents the feature-based infiltration water balance calculations.

6.1 Sub-Drainage Areas

Figures 11-2 and 11-3 present the sub-drainage areas for Foley Drain southwest) and Foley Drain 1964 (southeast) and associated PSW, for existing conditions and post-development conditions, respectively.

6.1.1 Pre- and Post-Development Sub-Drainage Basin Characteristics (Basin 1 and Basin 2)

6.1.1.1 Sub-Drainage Basin 1

The Site area is currently an undeveloped/agricultural field. A summary of the existing (pre-development) landscape features is provided for sub-drainage area 1 (Figure 11-2 and 11-3, Appendix H-5) in Table 6.1:

Table 6.1: Pre- and Post-Development Sub-Drainage Basin 1

Description	Area (m^2)				Percentage	
	Pre-Development		Post-Development		Pre-Dev.	Post-Dev.
	Pervious	Impervious	Pervious	Impervious		
ROW (Roads, Side Walks, Parking), Paved Surfaces		850		8,510	0.14%	1.44%
Buildings /Building Roofs		100		6,727	0.02%	1.14%

Description	Area (m^2)				Percentage	
	Pre-Development		Post-Development		Pre-Dev.	Post-Dev.
	Pervious	Impervious	Pervious	Impervious		
Drainage Features including Wetland Areas		98,840		99,590	16.69%	16.82%
Open spaces / Landscaped (GWL > 1 mbgs)	458,930		460,140		77.51%	77.70%
Open spaces / Landscape areas with GWL above ground/<1 mbgs		33,394		17,147	5.64%	2.90%
Sub Total	458,930	133,184	460,140	131,974	100%	100%
Total	**592,114**		**592,114**			

Notes:
Areas provided in Table 6.1 above were determined based on a review of available Site plans and GRCA mapping and these estimates are considered appropriate for estimating the water balance.

As evident from the information provided in Table 6.1, under pre-development conditions, approximately 77.51% (458,930 m^2) and under post-development conditions 77.70% (460,140 m^2) of the Sub-Drainage Basin 1 is pervious and available for groundwater infiltration.

The difference in the available area for infiltration under pre- and post-development conditions can be considered to be minimal.

6.1.1.2 Sub-Drainage Basin 2

A summary of the existing (pre-development) landscape features is provided for Sub-Drainage Basin 2 (Figures 11-2 and 11-3) in Table 6.2:

Table 6.2: Pre- and Post-Development Sub-Drainage Basin 2

Description	Area (m^2)				Percentage	
	Pre-Development		Post-Development		Pre-Dev.	Post-Dev.
	Pervious	Impervious	Pervious	Impervious		
ROW (Roads, Side Walks, Parking), Paved Surfaces		27,000		27,000	2.91%	2.91%
Buildings /Building Roofs		13,470		13,470	1.45%	1.45%
Drainage Features including Wetland Areas		439,400		439,400	47.25%	47.25%
Open spaces / Landscaped (GWL below 1 mbgs)	449,980		449,980		48.39%	48.39%
Open spaces / Landscape areas with GWL above ground/<1 mbgs		0		0	0	0

Description	Area (m^2)				Percentage	
	Pre-Development		Post-Development		Pre-Dev.	Post-Dev.
	Pervious	Impervious	Pervious	Impervious		
Sub Total	449,980	479,870	449,980	479,870	100%	100%
Total	**929,850**		**929,850**			

Notes:
Areas provided in Table 6.2 above were determined based on a review of available Site plans and GRCA mapping and these estimates are considered appropriate for estimating the water balance.

As evident from the information provided in Table 6.2, under pre- and post-development conditions, approximately 48.39% (449,980 m^2) of the Sub-Drainage Basin 2 is pervious areas and available for groundwater infiltration.

Under pre- and post-development conditions, the available areas for infiltration within Sub-Drainage Basin 2 are similar.

6.2 Climatic Data Analysis

The mean annual water surplus was calculated by using the Thornthwaite and Mather (1955) method. Monthly average precipitation values were obtained for 30 years (1972 to 2001) from the National Climate Data and Information Archive (Environment Canada) for the Proton Station, Ontario (Station ID No. 6116750).

Moisture storage of 150 mm/yr was assumed for soils and considered to be representative of pre-construction Site conditions. The closest Latitude to the Site is 44^0, which was used in the USGS model (2007).

Table 6.3 summarizes the monthly climatic water balance analysis. Appendices H-1 and H-2 provide the model input and output, respectively.

Table 6.3: Summary of Climatic Water Balance Analysis in Pre-Development Conditions

Month	Precipitation (mm/yr)	Actual ET (mm/yr)	Surplus (mm/yr)
January	109.9	7.3	26.8
February	82.6	8.6	38.4
March	81.5	16.6	119.6
April	73.3	32.8	143.9
May	83.0	62.7	31.9
June	89.5	86.8	12.8
July	78.7	97.7	6.7
August	95.6	79.3	10.3

Month	Precipitation (mm/yr)	Actual ET (mm/yr)	Surplus (mm/yr)
September	101.5	47.6	30.1
October	90.8	26.3	55.8
November	104.7	13.5	83.9
December	102.6	8.3	46.1
Total	1,093.84	487.48	606.35

Note: ET = Evapotranspiration

The results of the climatic water balance analysis for the Site suggest that a surplus of 606.35 mm/year of water is available for surface runoff and infiltration.

6.3 Results of Feature Based Water Balance

It is noted that the controlling factors provided by the Ministry of Environment in 1995 (currently the Ministry of Environment, Conservation and Parks) for estimating infiltration were used to estimate the controlling factors for infiltration. Using this method, a total infiltration factor for each feature catchment area was estimated using the individual sub-factors representative of the topography, soil type and land cover conditions.

6.3.1 Pre- vs Post-Development Water Balance Analysis (Annual)

The total sub-drainage areas 1 and 2 were used to estimate the annual precipitation volume for sub-drainage basins (Appendix H-4).

The water balance analysis is based on available information on a regional scale and is considered representative for sub drainage basins.

Table 6.4 provides a summary of the water balance analysis for the Sub-Drainage Basin 1.

Table 6.4: Summary of Annual Pre- and Post- Development Water Balance Results – Sub-Drainage Basin 1 (Unmitigated)

Development Phase	Precipitation	Actual Evapotranspiration	Infiltration	Run-Off
	m^3/Year	m^3/Year	m^3/Year	m^3/Year
Pre-Development	647,676	288,646	125,223	233,807
Post Development	647,676	272,859	125,553	230,508
Pre Vs Post Development Infiltration Deficit			**-330**	

As summarized in Table 6.4, during the post development phase of the project, the groundwater infiltration within the Sub-Drainage Basin 1 would be increased by 330 m^3/year, compared to the groundwater infiltration of 125,223 m^3/year during the pre-development phase for the Sub Drainage Basin.

Table 6.5 provides a summary of the water balance analysis for Sub-Drainage Basin 2.

Table 6.5: Summary of Annual Pre- and Post-Development Water Balance Results – Sub-Drainage Basin 2 (Unmitigated)

Development Phase	Precipitation	Actual Evapotranspiration	Infiltration	Run-Off
	m^3/Year	m^3/Year	m^3/Year	m^3/Year
Pre-Development	1,017,104	453,286	122,781	441,037
Post Development	1,017,104	433,558	122,781	460,765
Pre Vs Post Development Infiltration Deficit			**0**	

As summarized in Table 6.5, during the post development phase of the project, the groundwater infiltration within the Sub-Drainage Basin 2 would not be reduced, compared to the groundwater infiltration of 122,781 m^3/year during the pre-development phase for the Sub Drainage Basin.

6.4 Wetland Feature Impact Assessment

The overall infiltration rate in post-development for the entire Sub-Drainage Basins 1 and 2 for the PSW associated with the Site will be increased from approximately 248,004 m^3/year in pre-construction conditions to approximately 248,334 m^3/year in post-construction scenario without mitigation (Attachment H-4).

The estimated total annual infiltration to the PSW adjacent to the Site will be increased by approximately 330 m^3/year. Therefore, proposed construction at the Site will not negatively impact the PSW adjacent to the Site given that the increase of groundwater infiltration will benefit wetlands and streams. Therefore, mitigation measures to increase the groundwater infiltration during post-construction phase of the project for the purpose of increasing groundwater recharge will not be required.

6.4.1 Monitoring, Mitigation and Contingency Plan

Best management practices are to be utilized to ensure that water taking during the construction phase of the project, and the zone of influence do not adversely impact PSWs adjacent to the Site.

A monitoring, mitigation and contingency plan including monitoring frequencies, triggers for mitigation and a contingency plan will have to be implemented prior, during and after active construction dewatering on site. The Plan should include but is not limited to the quality and quantity controls for groundwater and surface water discharge, erosion control and turbidity inspection at each point of discharge.

7. Environmental Impact Assessment

7.1 Surface Water Features

The Site area belongs to the Upper Grand River watershed. The nearest surface water features are two Foley Drains (tributaries of the Grand River), which runs directly adjacent to the southwest and southeast Site boundary. Available area maps show that there are no water bodies that exist on-Site.

The estimated construction dewatering zone of influence is approximately 15 m from the excavation boundary. The nearest surface water feature, runs approximately 50 m away from the nearest excavation boundary, no impacts to surface water features including potential impacts on the decrease of baseflow are expected during construction activities.

7.2 Groundwater Water Users

As per the results of the MECP WWR Database, no active water supply wells are within 500 m of the Site boundary. As such, dewatering related impacts are not expected during dewatering activities.

The MECP WWR database indicates a total of 15 wells within 500 m distance from the site boundary including one (1) domestic water supply well located approximately 500 m away from the Site boundary.

No dewatering related impacts are expected on the domestic water supply well.

7.3 Other Potential Impact Considerations

7.3.1 Geotechnical Considerations

Due to the negligible dewatering zone of influence, potential ground settlement due to water taking (ex. settlement, soil loss, subsidence, etc.) is expected to be negligible.

However, it is advisable to have an assessment of potential dewatering related geotechnical issues completed by a qualified geotechnical engineer to satisfy MECP EASR requirements.

7.3.2 Groundwater Quality

It is JLP's understanding that the dewatering effluent during the construction will be directed to a sewage system of the corporation of the Township of Southgate and/or to the Foley Drain.

It is expected that the concentration of TSS and some other parameters such as total metals may exceed PWQO criteria, during construction dewatering activities. Therefore, it is recommended to implement a suitable treatment method such as filtration and/or decantation or any other suitable treatment method recommended by the project treatment specialist/process engineer, prior to discharge of dewatering effluent during construction.

It is recommended to contact the Township of Southgate and/or GRCA prior to releasing dewatering effluent (short-term) for required approvals and more water testing, if any.

8. Conclusions and Recommendations

The conclusions and recommendations provided below should be reviewed in conjunction with the entirety of the report. Any changes to the design concept may result in a modification to the recommendations provided in this report.

Based on the findings of the hydrogeological investigation, the following conclusions and recommendations are provided:

- The Site is located within a physiographic region named the Dundalk Till Plain. The surficial geology of the subject property and surrounding area is mapped as Glaciofluvial deposits, consisting of river deposits and delta topset facies and sandy deposits. The dominant bedrock geology of the area is mapped as Lower Silurian sandstone, shale, dolostone and siltstone, belonging to Guelph Formation

- The highest static water level recorded at the Site is 507.72 masl (0.29 mbgs) at BH/MW201, on May 8, 2023. Artesian groundwater conditions were reported at two (2) monitoring wells (BH/MW101 and BH/MW106). It is recommended to conduct a seasonal groundwater level monitoring program along with surface water (flow and level) monitoring program.

- The highest K value of the saturated overburden to a depth of approximately 9.0 mbgs is 5.17E-07 m/s and the geometric mean of the K values is 1.08E-07 m/s.

- When compared to the PWQOs the laboratory COA indicated that the concentration of total phosphorus was in exceedance. Additional sampling and analysis are recommended prior to discharge and/or construction activities to confirm the marginal Total Phosphorus exceedance observed on April 11, 2023.

- Discharge from dewatering (short-term) activities can be directed to a sewage system of the Corporation of the Township of Southgate. The Township of Southgate should be notified prior to releasing dewatering effluent (short-term) for required approvals and more water testing, if any.

- Based on the assumptions outlined in this report, the estimated maximum dewatering rate for the proposed construction will be 279,480 L/day (with SF of 2.0 and stormwater intake). This daily rate should be used for discharge purposes, as required.

- Based on the available hydrogeological information and assumptions, the estimated maximum construction dewatering rate using the highest K values obtained for the overburden is 151,660 L/day (including safety factor of 2.0). Since the estimated dewatering rate is between 50,000 and 400,000 L/day, MECP EASR will be required to facilitate construction dewatering activities.

- The EASR, Discharge Plan, hydrogeological investigation report, groundwater and surface water monitoring and mitigation plan (if required), water taking plan and geotechnical assessment of settlements must also be available at the Site during the entire period of construction dewatering. JLP should be notified immediately about any changes to the construction dewatering schedule or design, since the EASR will need to be updated to reflect these modifications.

- The EASR registration allows construction dewatering discharge of up to 400,000 L/day. A Discharge Plan (dewatering sketch, sewer discharge agreement) must be developed and applied for any discharges from the Site. The Discharge Plan and monitoring for both water quantity and water quality must be carried at the Site during the entire construction dewatering phase. The daily water taking records must

be maintained onsite for the entire construction dewatering phase.

- The construction dewatering and the long-term sub-drain discharge volumes are based on the assumptions outlined in this report. Any variations in hydrogeological conditions beyond those encountered as part of this investigation may significantly influence the discharge volumes.

- It is expected that the concentration of TSS and some other parameters such as total metals may exceed PWQO criteria, during construction dewatering activities. Therefore, it is recommended to implement a suitable treatment method such as filtration and/or decantation or any other suitable treatment method recommended by the treatment specialist/process engineer, prior to discharge of dewatering effluent during construction.

- The estimated geometric mean designed infiltration rate based on grain size analysis of selected soil samples for the Site is 13.3 mm/hr. Since the reported groundwater levels at the Site are above 1 mbgs for the entire site area, it was not possible to conduct infiltration rate testing at the Site.

- The annual infiltration volume will be increased from approximately 273 m^3/year to 603 m^3/year in the post-development phase and the resulting a pre- vs post-development infiltration surplus of 330 m^3/year.

- The estimated pre- vs post-development infiltration rate surplus for the Site is 330 m^3/year (Appendix H-4), therefore, mitigation measures to increase the groundwater infiltration during post-construction conditions will not be required.

- During the post-development phase of the project, the groundwater infiltration within the Sub-Drainage Basin 1 would be increased by 330 m^3/year, compared to the groundwater infiltration of 125,223 m^3/year during the pre-development phase for the Sub Drainage Basin.

- During the post development phase of the project, the groundwater infiltration within the Sub-Drainage Basin 2 would not change compared to the infiltration rate during the pre-development conditions.

- A monitoring, mitigation and contingency plan including monitoring frequencies, triggers for mitigation and a contingency plan will have to be implemented prior, during and after active construction dewatering on site in order to ensure that water taking, and the zone of influence do not adversely impact PSWs adjacent to the Site.

9. Closure

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

Sincerely,

JLP Services Inc.

Cindy Luu, B.Sc.
Environmental Scientist

Jay Samarakkody, M.Phil., P.Geo.
Senior Hydrogeologist

Ajay Jayalath, MBA, P.Geo., QP.
Vice President, Environmental Services

10. References

- Cashman and Preene (2013) Groundwater Lowering in Construction, 2nd Edition.
- Chapman, L.J and D.F. Putnam, 1984. The Physiography of Southern Ontario, Third Edition; Ontario Geological Survey, Special Volume 2.
- Golder Associates Ltd. (September 2011). Preliminary Hydrogeological/Hydrological Assessment, Dundalk Industrial Park Lands, Township of Southgate, Ontario.
- JLP Services Inc. (January 13, 2023). Supplemental Geotechnical Investigation, Southgate Renewables Facility, 100 Eco Parkway, Township of Southgate, Ontario
- Ministry of Northern Development and Mines (May 2012). OGS Earth. Retrieved from https://www.geologyontario.mndm.gov.on.ca/ogsearth.html
- Reynolds, W.D. (2016). A unified Per Test-Well Permeameter methodology for adsorption field investigations, Geoderma, V.264, Part A, 160-140 p.
- Toronto and Region Conservative Authority, (August 2022). Percolation Test Methodology and Data Analysis, access to the website (https://wiki.sustainabletechnologies.ca/wiki/Percolation_test).
- V.A. Wood (Guelph) Inc. (July 2019). Geotechnical Investigation, Dundalk Ecopark, 100 Eco Parkway, Township of Southgate, Ontario.

Figures

Legend:

Site Boundary

True North

JLP

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Site Location Plan
100 Eco Park Way,
Southgate, Ontario

Date: Mar. 22, 2023	Ref. No. G4130-23-3	
Prepared By: CL	Checked by: AJ	FIG. No. 1
Source: Google Maps, 2022	Scale: 50 100 200 300 metres	

Legend:

- Site & Property Boundaries
- 10 — **Fine-textured glaciomarine deposits:** silt and clay, minor sand and gravel
  10a Massive to well laminated
  10b Interbedded silt and clay and gritty, pebbly flow till and rainout deposits
- 9 — **Coarse-textured glaciolacustrine deposits:** sand, gravel, minor silt and clay
  9a Deltaic deposits
  9b Littoral deposits
  9c Foreshore and basinal deposits
- 8 — **Fine-textured glaciolacustrine deposits:** silt and clay, minor sand and gravel
  8a Massive to well laminated
  8b Interbedded silt and clay and gritty, pebbly flow till and rainout deposits
- 7 — **Glaciofluvial deposits:** river deposits and delta topset facies
  7a Sandy deposits
  7b Gravelly deposits
- 6 — **Ice-contact stratified deposits:** sand and gravel, minor silt, clay and till
  6a In moraines, eskers, kames and crevasse fills
  6b In subaquatic fans
- 5a — **Till:** Silty sand to sand-textured till on Precambrian terrain
  5a Silty sand to sand-textured till on Precambrian terrain
- 5b — 5b Stone-poor, sandy silt to silty sand-textured till on Paleozoic terrain
- 5c — 5c Stony, sandy silt to silty sand-textured till on Paleozoic terrain
- 5d — 5d Clay to silt-textured till (derived from glaciolacustrine deposits or shale)

N
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Surficial Geology
100 Eco Park Way,
Southgate, Ontario

Date: Mar. 22, 2023	Ref. No. G4130-23-3	
Prepared By: CL	Checked by: AJ	FIG. No. 2
Source: Ontario Geological Survey, 2010	Scale: 10 20 40 60 metres	

Legend:

Site & Property Boundaries

PALEOZOIC (251.0 Ma to 542.0 Ma)

MISSISSIPPIAN TO DEVONIAN[e] (318.1 Ma to 416.0 Ma)

61 **Shale:** Port Lambton Gp.

DEVONIAN (359.2 Ma to 416.0 Ma)

UPPER DEVONIAN

60 **Shale**

- 60a Kettle Point Fm.
- 60b Long Rapids Fm.

MIDDLE DEVONIAN

59 **Limestone, dolostone, shale**

- 59a Hamilton Gp.
- 59b Marcellus Fm.
- 59c Dundee Fm.
- 59d Detroit River Gp.; Onondaga Fm.
- 59e Williams Island Fm.
- 59f Murray Island Fm.
- 59g Moose River Fm.
- 59h Kwataboahegan Fm.

LOWER DEVONIAN

58 **Sandstone, dolostone, limestone**

- 58a Bois Blanc Fm.; Oriskany Fm.
- 58b Stooping River Fm.
- 58c Sextant Fm.

SILURIAN (416.0 Ma to 443.7 Ma)

UPPER SILURIAN

57 **Limestone, dolostone, shale, sandstone, gypsum, salt**

- 57a Bass Islands Fm.
- 57b Bertie Fm.
- 57c Salina Fm.
- 57d Kenogami River Fm. (Upper Silurian to Lower Devonian)

LOWER SILURIAN

56 **Sandstone, shale, dolostone, siltstone**

- 56a Guelph Fm. (also present in the Upper Silurian)
- 56b Lockport Fm.
- 56c Amabel Fm.

N

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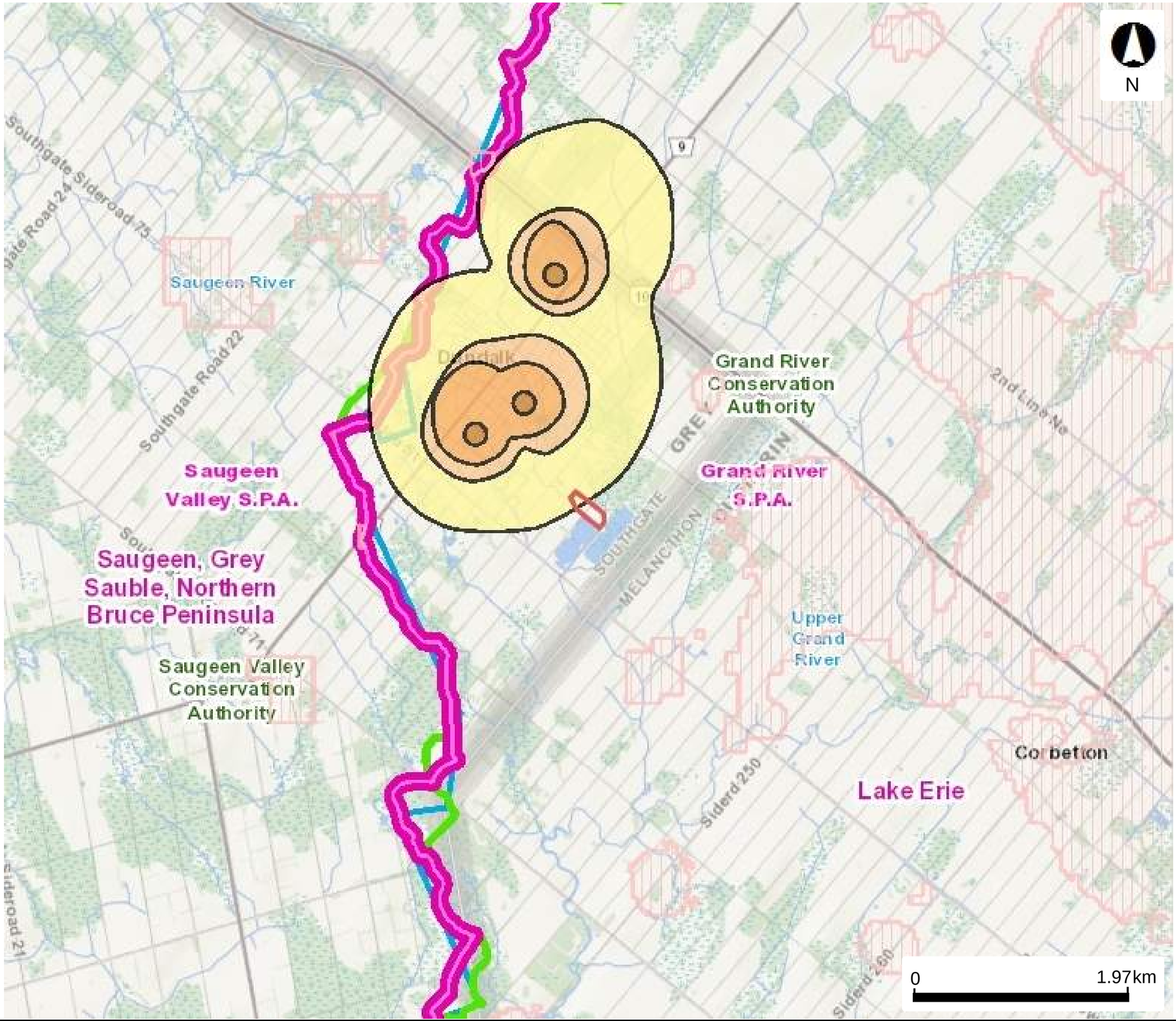
Bedrock Geology
100 Eco Park Way,
Southgate, Ontario

Date: Mar. 22, 2023	Ref. No. G4130-23-3	
Prepared By: CL	Checked by: AJ	FIG. No. 3
Source: Ontario Geological Survey, 2011	Scale: 0 5 10 20 40 metres	



Legend:

- Site Area
- Intake Protection Zone Q
- Wellhead Protection Area Q1
- Wellhead Protection Area Q2
- Issue Contributing Areas
- Highly Vulnerable Aquifers
- WHPA-E
- Wellhead Protection Area
  - A
  - B
  - C
  - C1
  - D
  - F
- Intake Protection Zone 1
- Event Based Areas
- Intake Protection Zone 2
- Source Protection Areas
- Source Protection Regions
- Conservation Authority
- Tertiary

N
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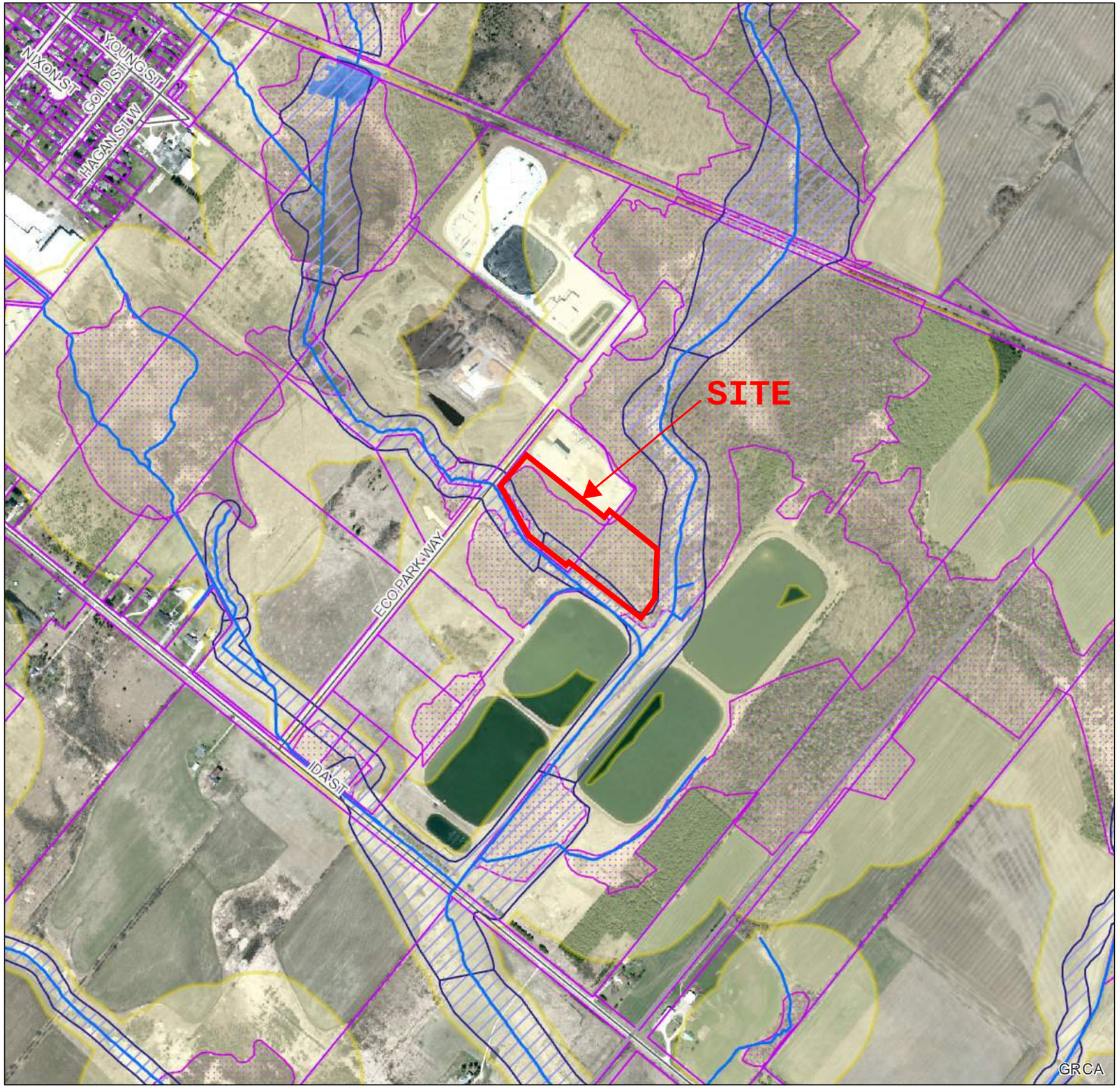
Vulnerable Areas
100 Eco Park Way,
Southgate, Ontario

Date: Mar. 22, 2023	Ref. No. G4130-23-3	
Prepared By: CL	Checked by: AJ	FIG. No. 4-1
Source: MECP, Source Protection Information Atlas, 2023		



Legend:

- Site Area
- Regulation Limit (GRCA)
- Regulated Watercourse (GRCA)
- Regulated Waterbody (GRCA)
- Wetland (GRCA)
- Floodplain (GRCA)
  - Engineered
  - Estimated
  - Approximate
  - Special Policy Area
- Slope Valley (GRCA)
  - Steep
  - Oversteep
  - Steep
- Slope Erosion (GRCA)
  - Oversteep
  - Toe
- Lake Erie Flood (GRCA)
- Lake Erie Shoreline Reach (GRCA)
- Lake Erie Dynamic Beach (GRCA)
- Lake Erie Erosion (GRCA)
- Parcel - Assessment (MPAC/MNRF)

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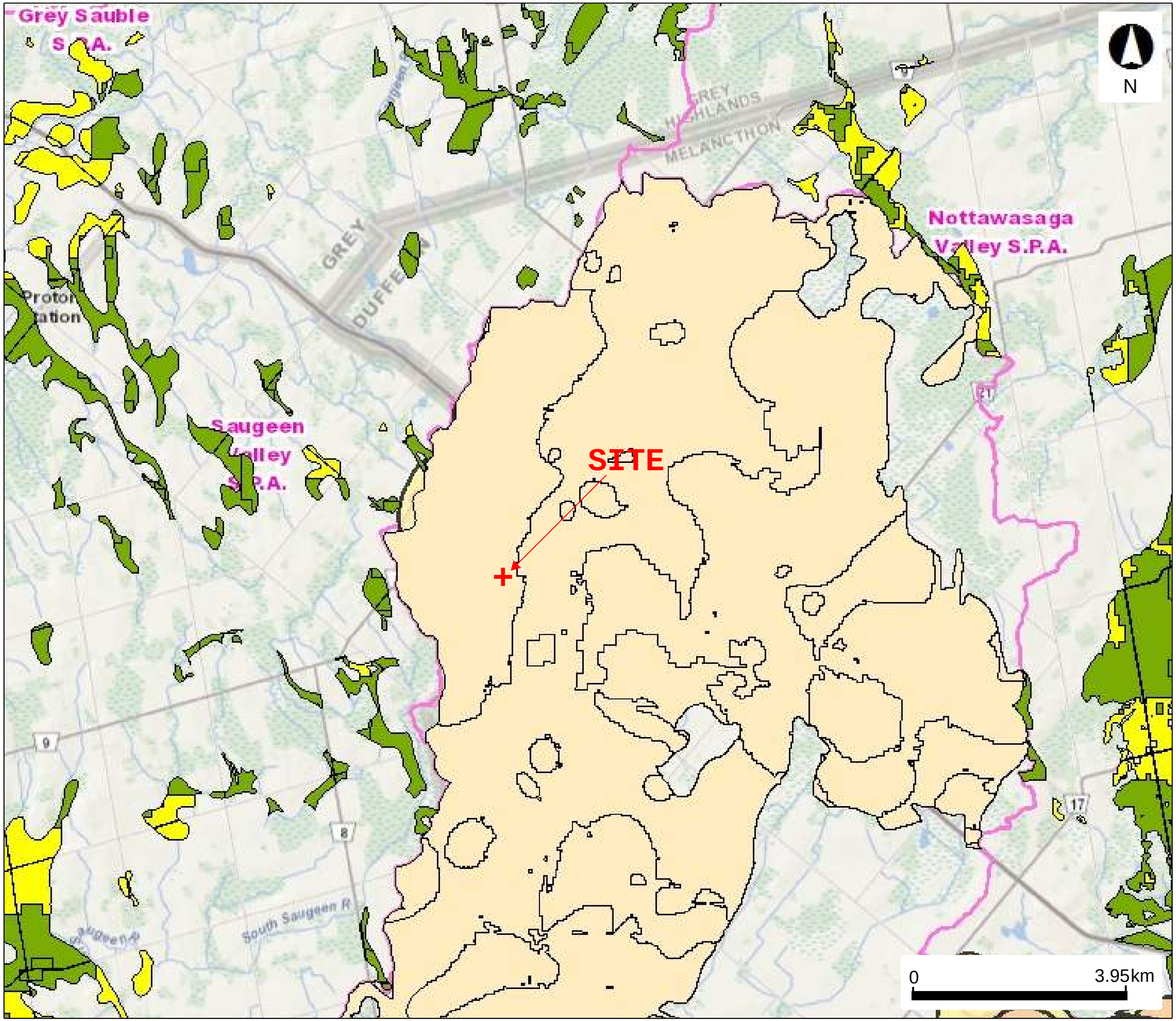
Regulated Areas
100 Eco Park Way,
Southgate, Ontario

Date: May 28, 2023	Ref. No. G4130-23-3	
Prepared By: CL	Checked By: AJ	FIG. No. 4-2
Source: GRCA, 2023		



Legend:

- Site Area
- Significant Groundwater Recharge Area
  - N/A
  - 0
  - 2
  - 4
  - 6
- Issue Contributing Areas
- WHPA-E
- Wellhead Protection Area
  - A
  - B
  - C
  - C1
  - D
  - F
- Intake Protection Zone 1
- Event Based Areas
- Intake Protection Zone 2
- Source Protection Areas
- NEP Land-Use Designations
  - Escarpment Natural Area
  - Escarpment Protection Area
  - Escarpment Recreation Area
  - Escarpment Rural Area
  - Mineral Resource Extraction Area
  - Urban Area

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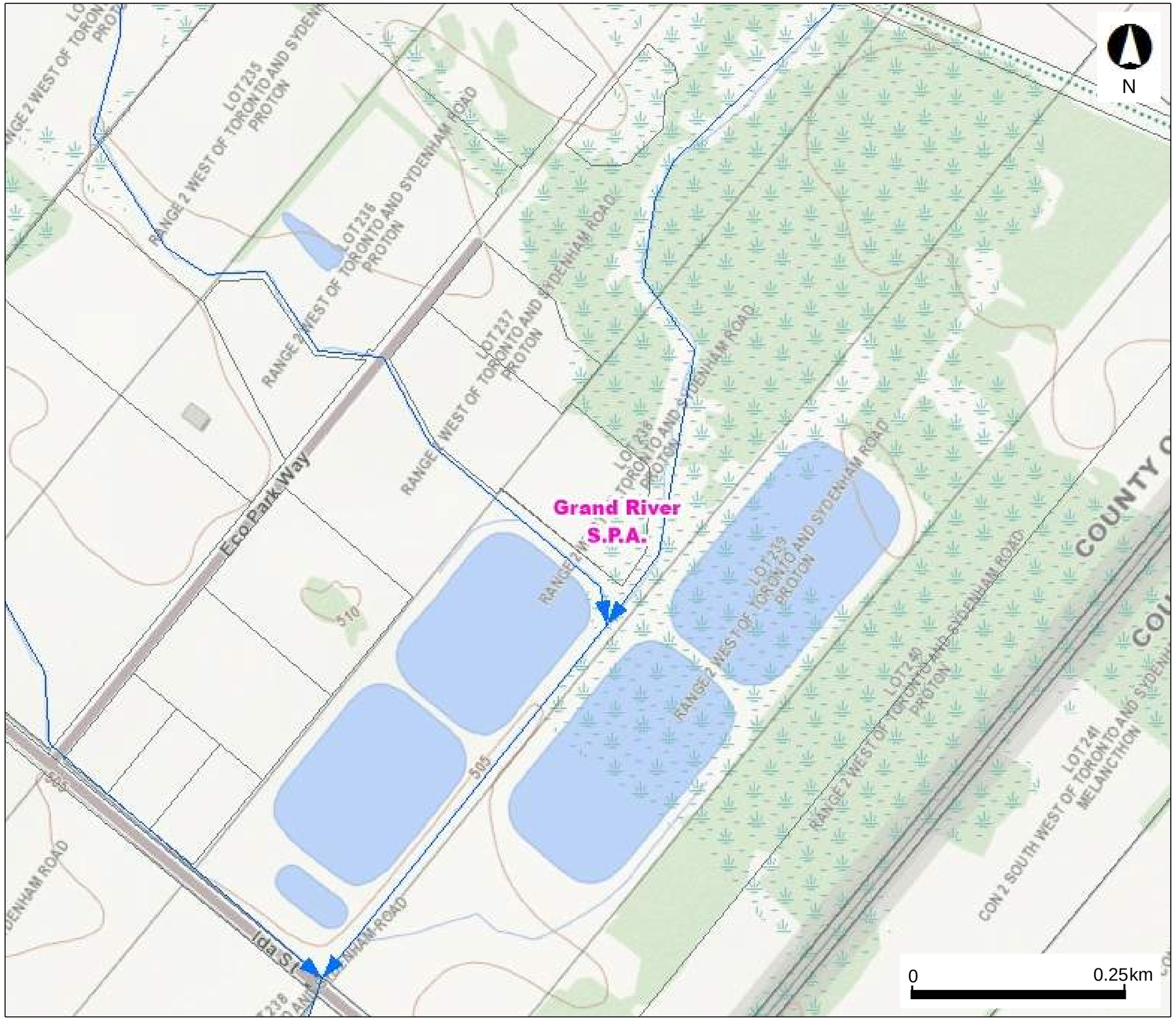
Significant Groundwater Recharge Areas
100 Eco Park Way,
Southgate, Ontario

Date: May 28, 2023	Ref. No. G4130-23-3	
Prepared By: CL	Checked By: AJ	FIG. No. 4-3
Source: King's Printer, 2023		



Legend:

- Site Area
- Issue Contributing Areas
- Watercourse Direction
- Source Protection Areas
- Assessment Parcel

N
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Provincially Significant Wetlands
100 Eco Park Way,
Southgate, Ontario

Date: May 2, 2024	Ref. No. G4130-23-3	
Prepared By: CL	Checked By: AJ	FIG. No. 4-4
Source: King's Printer, 2024		

Legend:

- Site & Property Boundaries
- 500m Radius from Site Boundary
- Monitoring/Observation Well / Test Hole
- Unclassified/Unfinished Well
- Water Supply Well
- Dewatering Well
- Abandoned Well

N
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MECP Water Well Locations
100 Eco Park Way,
Southgate, Ontario

Date: Mar. 22, 2023	Ref. No. G4130-23-3	
Prepared By: CL	Checked by: AJ	FIG. No. 5
Source: MECP Well Records, 2022	Scale: 0 20 40 80 120 metres	

Legend:

- Project Area
- Borehole with Monitor (JLP, 2023)
- Borehole (JLP, 2022)
- Borehole with Monitor (JLP, 2022)
- Borehole (V.A. Wood (Guelph), 2019)
- Borehole with Monitor (V.A. Wood (Guelph), 2019)

N

True North

- This drawing shall be read in conjunction with the associated technical report.
- EL = Elevation
- The ground surface elevations were obtained using a Sokkia GcX3 global position system referenced to the coordinate system known as NAD83 no trans, which is the North American Datum of 1983 of the Canadian Spatial Reference System, and the Universal Transverse Mercator (UTM) Zone 17.
- The soil types and boundaries are applicable only at the location of the boreholes. Between boreholes, they are assumed and may change substantially. The topsoil thicknesses quoted in the report are used for discussion purposes only and should not be used for estimating purposes.
- The soil samples will be retained for three months from the date of issue of the final report and then discarded, unless the client has requested to extend the storage period with fees.

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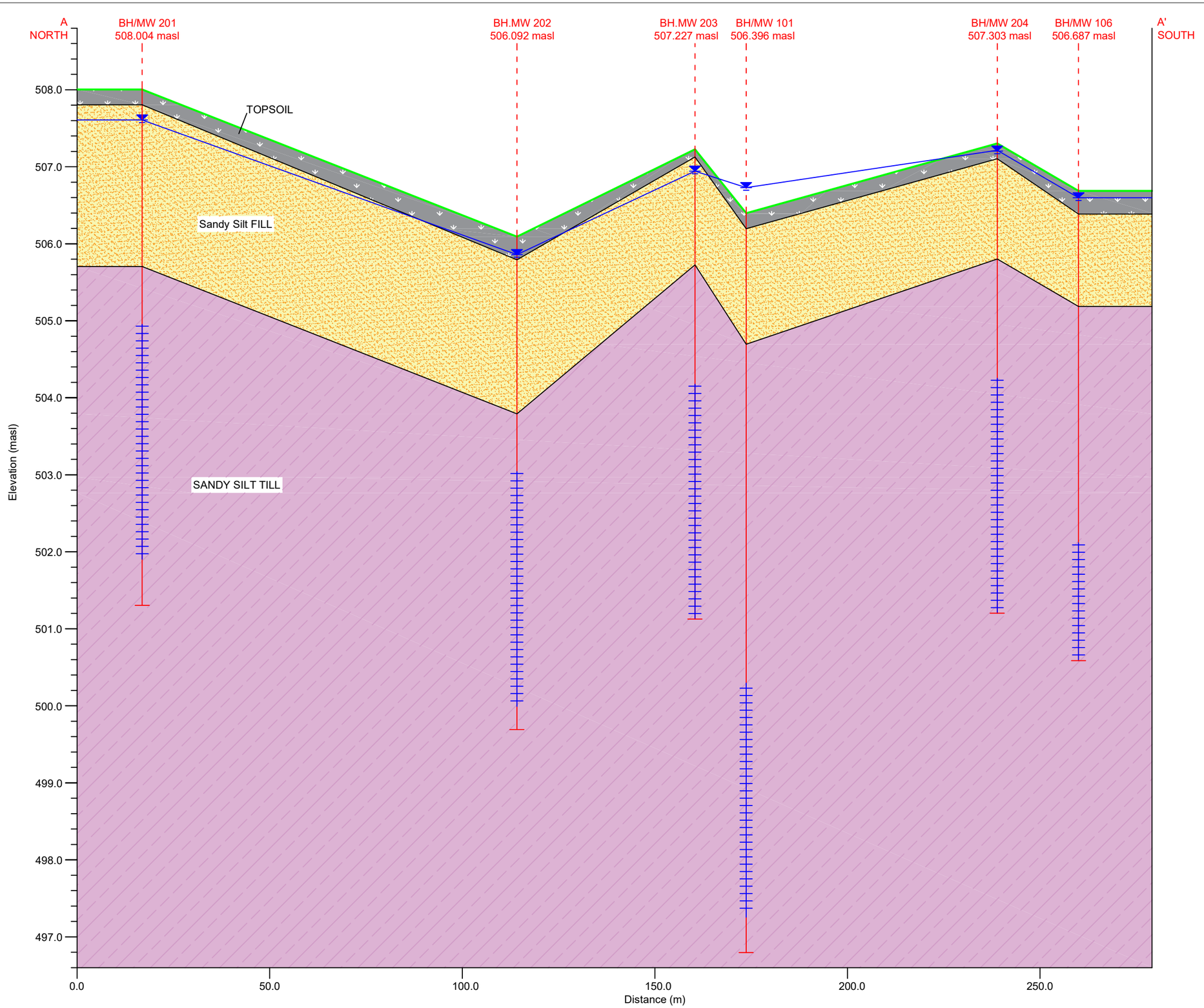
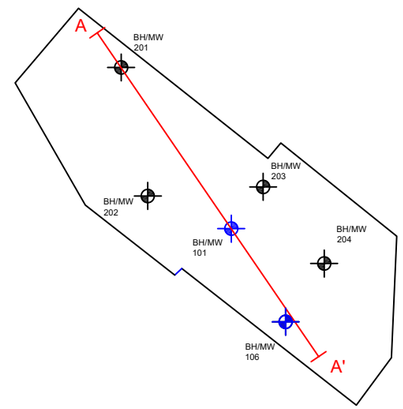
Borehole/Monitoring Well Location Plan
100 Eco Park Way,
Southgate, Ontario

Date: May 1, 2023	Ref. No. G4130-23-3	
Prepared By: CL	Checked by: AJ	FIG. No. 6
Source: Google Earth	Scale: 5 10 20 30 metres	



Site Plan



Legend

BH8 — *Borehole Location and Number*

Existing Ground Topography

SILT — *Geological Stratigraphy*

Groundwater Level (April 11, 2023)

Well Screen Location

Borehole with Monitoring Well (JLP, 2023)

Borehole with Monitoring Well (JLP, 2022)

Vertical Exaggeration - 20x

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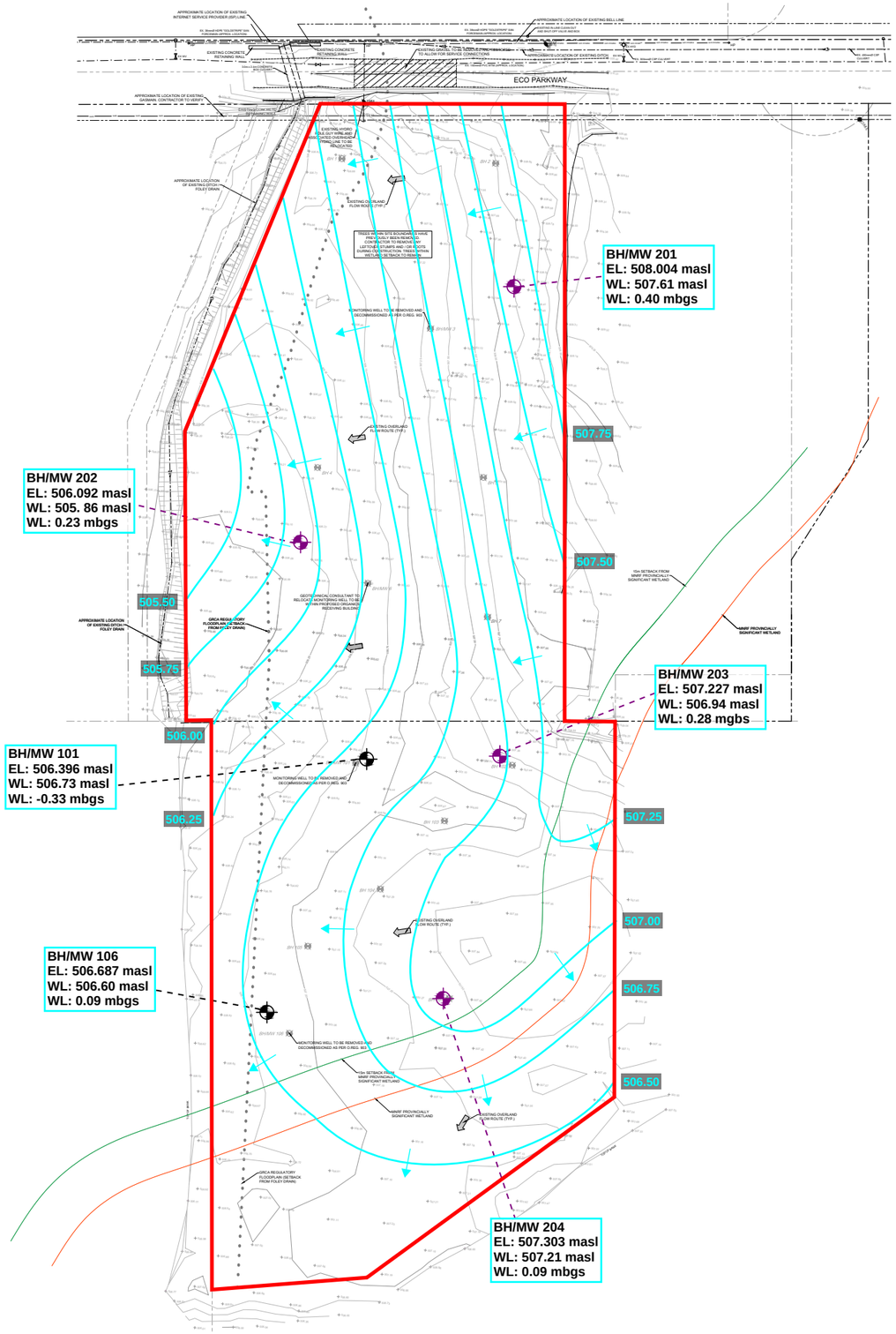
Cross Section A-A'
100 Eco Park Way,
Southgate, Ontario

Date: May 15, 2023	Ref. No. G4130-23-3	
Prepared By: CL	Checked By: AJ	DWG. No. 7
Horizontal Scale: 1:1000	Vertical Scale: 1:50	



Legend:

- Project Area
- Borehole with Monitor (JLP, 2023)
- Borehole with Monitor (JLP, 2022)
- Groundwater Contour (Water Levels taken April 11, 2023)
- Groundwater Flow

- This drawing shall be read in conjunction with the associated technical report.
- EL = Elevation
- GW = Groundwater Elevation
- The ground surface elevations were obtained using a Sokkia GcX3 global position system referenced to the coordinate system known as NAD83 no trans, which is the North American Datum of 1983 of the Canadian Spatial Reference System, and the Universal Transverse Mercator (UTM) Zone 17.

True North

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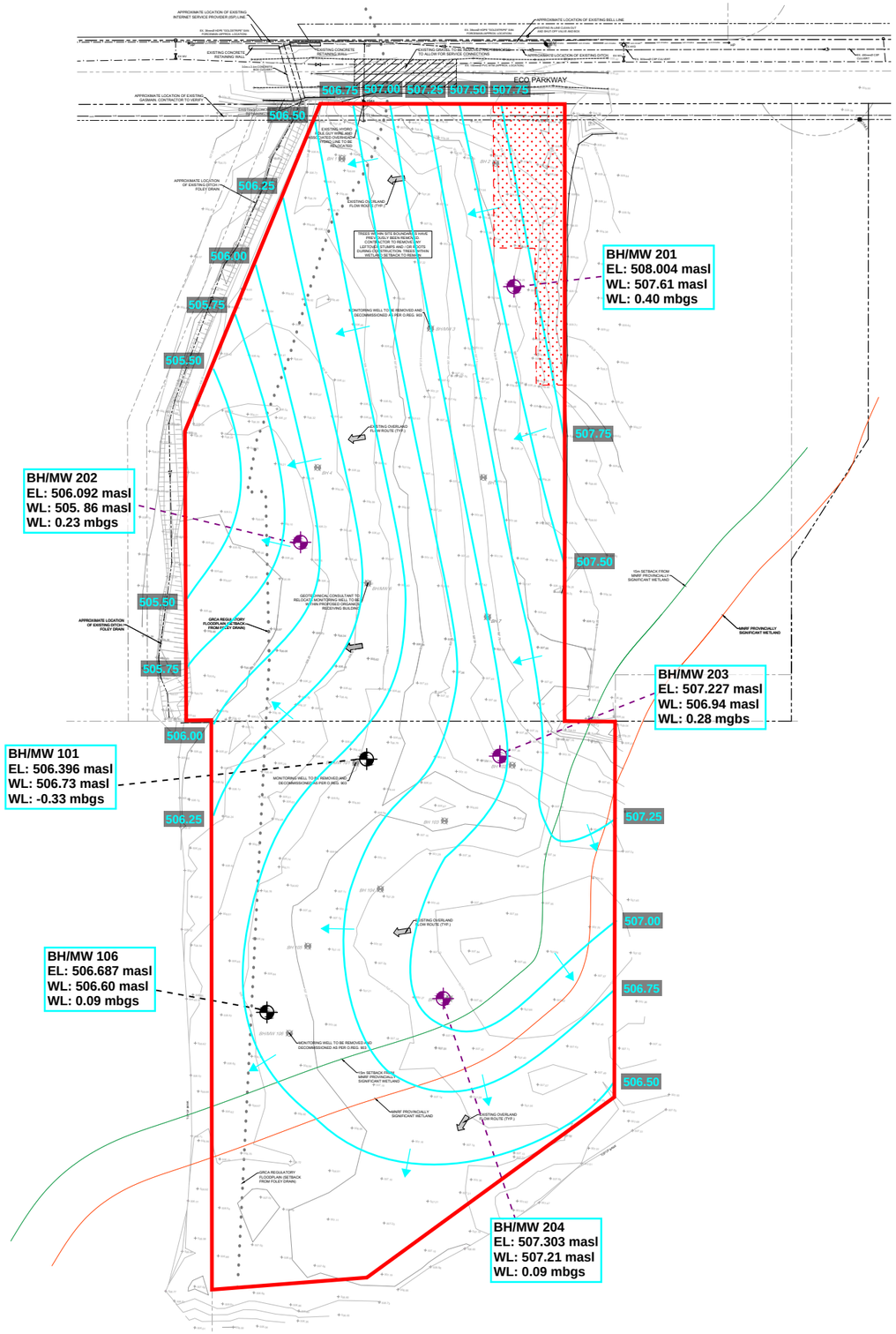
Groundwater Contour Plan
100 Eco Park Way,
Southgate, Ontario

Date: May 16, 2024		Ref. No. G4130-23-3	
Prepared By: CL		Checked by: AJ	FIG. No. 8-1
Source:	Walterfedy, C1-1, C1-2	Scale: 5 10 20 30 metres	



Legend:

- Project Area
- Borehole with Monitor (JLP, 2023)
- Borehole with Monitor (JLP, 2022)
- Groundwater Contour (Water Levels taken April 11, 2023)
- Groundwater Flow
- Groundwater Table below 1 mbgs (Approximate Area)

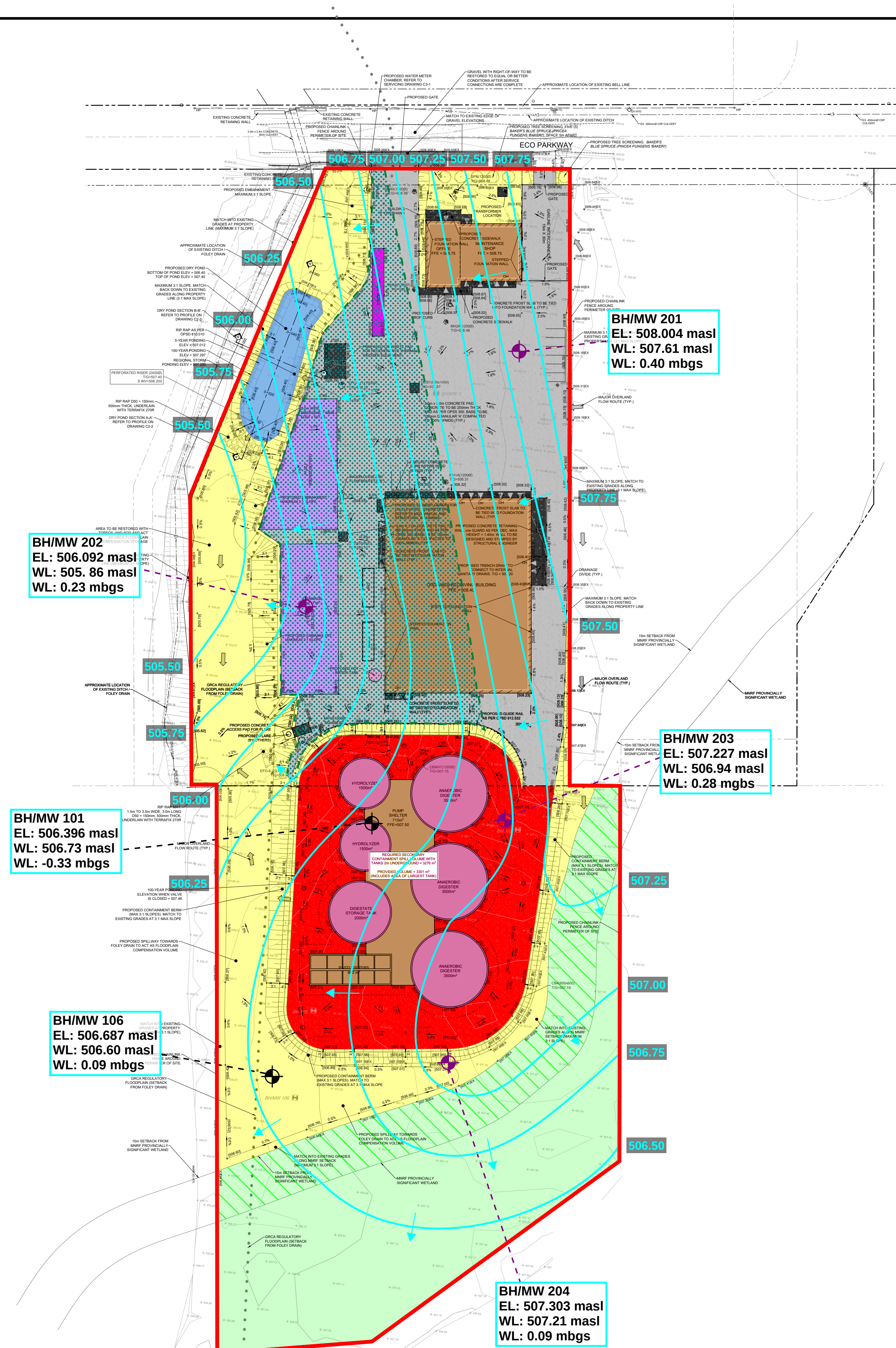
- This drawing shall be read in conjunction with the associated technical report.
- EL = Elevation
- GW = Groundwater Elevation
- The ground surface elevations were obtained using a Sokkia GcX3 global position system referenced to the coordinate system known as NAD83 no trans, which is the North American Datum of 1983 of the Canadian Spatial Reference System, and the Universal Transverse Mercator (UTM) Zone 17.

True North

JLP
Geotechnical & Environmental Consultants

Areas with Groundwater Level more than 1 mbgs
(Existing Conditions)
100 Eco Park Way,
Southgate, Ontario

Date: May 16, 2024		Ref. No. G4130-23-3	
Prepared By: CL		Checked by: AJ	FIG. No. 8-2
Source:	Walterfedy, C1-1, C1-2	Scale: 5 10 20 30 metres	



Legend:

- Project Area
- Borehole with Monitor (JLP, 2023)
- Borehole with Monitor (JLP, 2022)
- Groundwater Contour (Water Levels taken April 11, 2023)
- Groundwater Flow
- Areas with Seasonal High GW level below 1 m of Final Grades
- Concrete Surface
- Gravel Surface
- Building
- Dry Pond
- MNRF Provincially Significant Wetland
- MNRF Wetland 15m Buffer
- Graded Land or Embankment
- Tank
- Biofilter or Gas Upgrader
- Truck Scale
- Impermeable Liner

N
True North

- This drawing shall be read in conjunction with the associated technical report.
- EL = Elevation
- GW = Groundwater Elevation
- The ground surface elevations were obtained using a Sokkia GcX3 global position system referenced to the coordinate system known as NAD83 no trans, which is the North American Datum of 1983 of the Canadian Spatial Reference System, and the Universal Transverse Mercator (UTM) Zone 17.
- The soil types and boundaries are applicable only at the location of the boreholes. Between boreholes, they are assumed and may change substantially. The topsoil thicknesses quoted in the report are used for discussion purposes only and should not be used for estimating purposes.
- The soil samples will be retained for three months from the date of issue of the final report and then discarded, unless the client has requested to extend the storage period with fees.

JLP
Geotechnical & Environmental Consultants

Areas with Groundwater Level more than 1 mbgs
(Post-development Conditions)
100 Eco Park Way,
Southgate, Ontario

Date: May 2, 2024	Ref. No. G4130-23-3	
Prepared By: CL	Checked by: AJ	FIG. No. 8-3
Source: Google Earth	Scale: 0 5 10 20 30 metres	

Legend:

- Project Area
- Undeveloped Landscape
- MNRF Provincially Protected Wetland
- MNRF Wetland 15m Buffer

N

True North

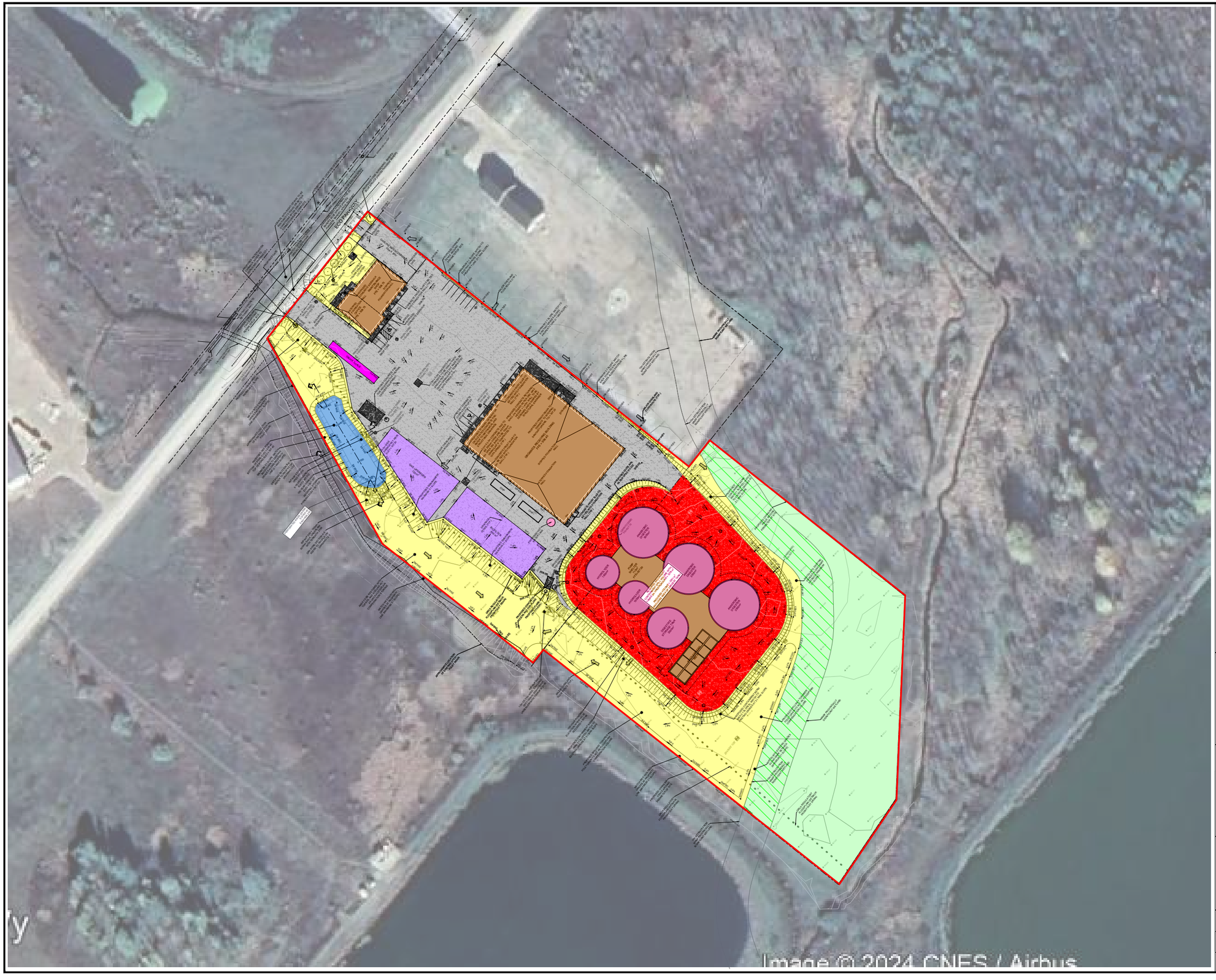
- This drawing shall be read in conjunction with the associated technical report.
- EL = Elevation
- The ground surface elevations were obtained using a Sokkia GcX3 global position system referenced to the coordinate system known as NAD83 no trans, which is the North American Datum of 1983 of the Canadian Spatial Reference System, and the Universal Transverse Mercator (UTM) Zone 17.
- The soil types and boundaries are applicable only at the location of the boreholes. Between boreholes, they are assumed and may change substantially. The topsoil thicknesses quoted in the report are used for discussion purposes only and should not be used for estimating purposes.
- The soil samples will be retained for three months from the date of issue of the final report and then discarded, unless the client has requested to extend the storage period with fees.

JLP

Geotechnical & Environmental Consultants

Pre-Construction Land Use Plan
100 Eco Park Way,
Southgate, Ontario

Date: May 16, 2023	Ref. No. G4130-23-3	
Prepared By: CL	Checked by: AJ	FIG. No. 9
Source: Google Earth	Scale: 5 10 20 30 metres	



Legend:

- Project Area
- Concrete Surface
- Gravel Surface
- Building
- Dry Pond
- MNRF Provincially Significant Wetland
- MNRF Wetland 15m Buffer
- Graded Land or Embankment
- Tank
- Biofilter or Gas Upgrader
- Truck Scale
- Impermeable Liner

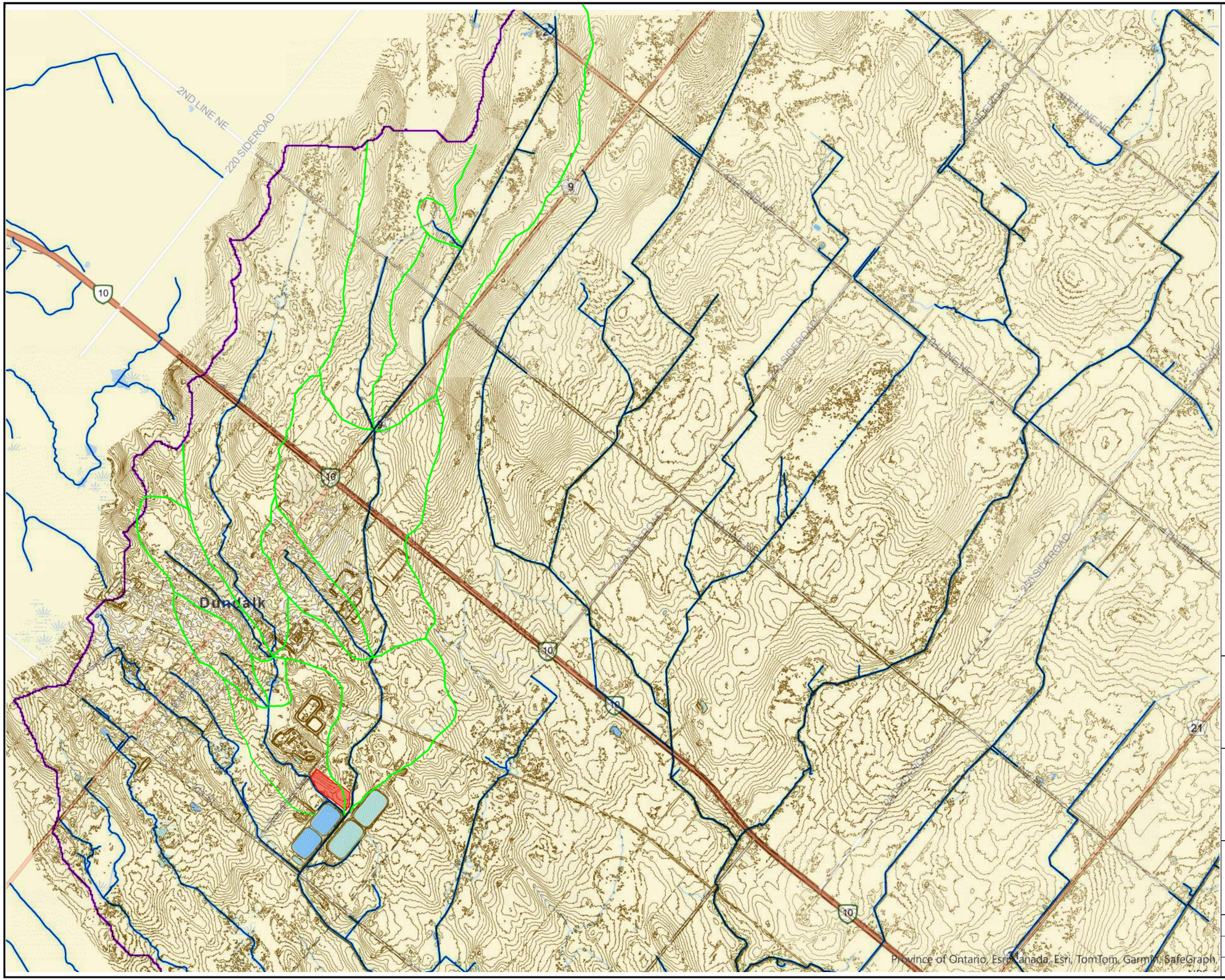
- This drawing shall be read in conjunction with the associated technical report.
- EL = Elevation
- GW = Groundwater Elevation
- The ground surface elevations were obtained using a Sokkia GcX3 global position system referenced to the coordinate system known as NAD83 no trans, which is the North American Datum of 1983 of the Canadian Spatial Reference System, and the Universal Transverse Mercator (UTM) Zone 17.

N
True North

JLP
Geotechnical & Environmental Consultants

Post-Construction Land Use Plan
100 Eco Park Way,
Southgate, Ontario

Date: May 28, 2024	Ref. No. G4130-23-3	
Prepared By: CL	Checked by: AJ	FIG. No. 10
Source: Walterfedy, C2-1, C2-2	Scale: 5 10 20 30 metres	



Legend:

- Project Area
- Grand River Watershed Boundary/Conservation Area (GRCA) boundary
- Watercourse
- Sub-Drainage Areas

- This drawing shall be read in conjunction with the associated technical report.
- GRCA = Grand River Conservation Authority

True North

JLP
Geotechnical & Environmental Consultants

Sub-Drainage Areas
100 Eco Park Way,
Southgate, Ontario

Date: May 16, 2024	Ref. No. G4130-23-3	
Prepared By: CL	Checked By: JS	FIG. No. 11-1
Source: GRCA, 2024	Scale: 100 200 400 600 metres	

Dundalk

SUB-DRAINAGE AREA 1

SUB-DRAINAGE AREA 2

Legend:

- Project Area
- Watercourse
- Sub-Drainage Areas
- Undeveloped Landscape
- MNRF Provincially Protected Wetland
- MNRF Wetland 15m Buffer
- Sub-Drainage Area 1
- Sub-Drainage Area 2

- This drawing shall be read in conjunction with the associated technical report.
- GRCA = Grand River Conservation Authority

N
True North

JLP
Geotechnical & Environmental Consultants

Sub-Drainage Areas (Existing Condition)
100 Eco Park Way,
Southgate, Ontario

Date: May 24, 2024	Ref. No. G4130-23-3	
Prepared By: CL	Checked By: JS	FIG. No. 11-2
Source: GCRA, 2024	30 60 120 180 metres	

Dundalk

SUB-DRAINAGE AREA 2

SUB-DRAINAGE AREA 1

Legend:

- Project Area
- Watercourse
- Sub-catchment Area
- Sub-Drainage Area 1
- Sub-Drainage Area 2
- Concrete Surface
- Gravel Surface
- Building
- Dry Pond
- MNRF Provincially Protected Wetland
- MNRF Wetland 15m Buffer
- Graded Land or Embankment
- Tank
- Biofilter or Gas Upgrader
- Truck Scale

- This drawing shall be read in conjunction with the associated technical report.
- GRCA = Grand River Conservation Authority

N
True North

JLP
Geotechnical & Environmental Consultants

Sub-Drainage Areas (Post-Development Condition)
100 Eco Park Way,
Southgate, Ontario

Date: May 24, 2024	Ref. No. G4130-23-3	
Prepared By: CL	Checked By: JS	FIG. No. 11-3
Source: GCRA, 2024	Scale: 30 60 120 180 meters	

Appendix A – Limitations and Use of Report

REPORT TERMS AND CONDITIONS

NOTICE: THE FOLLOWING PROVISIONS SET FORTH IMPORTANT QUALIFICATIONS AND LIMITATIONS ON THE FINDINGS AND RECOMMENDATIONS IN THE REPORT AS WELL AS THE USE OF, AND RELIANCE ON, THE REPORT.

1. **DEFINITIONS**. The following capitalized terms have the following meanings:

   (a) "**Additional Investigations**" means investigations that JLP has indicated to the Client should be undertaken to take into account any Out-of-Scope Requirements, but that are not otherwise specifically within the scope of investigations conducted for the purpose of the Report.
   (b) "**Applicable Laws**" means and includes without limitation all applicable provincial laws, regulations, guidelines, policies, standards, protocols, and objectives administered by the Ministry of the Environment and Climate Change or any other duly-constituted governmental authority, all as in force as of the date of the Report.
   (c) "**Client**" means the Client as referred to in the Report.
   (d) "**Client Information**" means the information, representations, and instructions provided by the Client, the Client's representatives, and/or others and upon which the Report is based, in whole or in part.
   (e) "**Findings**" means the evaluations and conclusions set forth in the Report.
   (f) "**JLP**" means JLP Services Inc.
   (g) "**Out-of-Scope Requirements**" means special concerns or requirements of the Client in respect of the subject matter of the Report.
   (h) "**Recommendations**" mean the findings and recommendations referred to in the Report, taking into account any Out-of-Scope Requirements that were disclosed to JLP prior to the date of the Report.
   (i) "**Report**" means the report to which these Terms and Conditions are attached and form part.
   (j) "**Report Documents**" means the underlying documents, records, data, and files, in any medium whatsoever, generated in connection with the preparation of the Report, including without limitation, the instructions and objectives communicated to JLP by the Client, communications between JLP and the Client, and other reports, proposals, or documents prepared by JLP for the Client in connection with the Site.
   (k) "**Site**" means the site in respect of which the Report was prepared.
   (l) "**Site Conditions**" means Site conditions known as a result of, or reasonably imputed by, the investigations that were undertaken as of the date of the Report.

2. **BASIS OF REPORT**. The Report is based on the Site Conditions. Any changes to the Site Conditions after the date of the Report that could or will affect the Site Conditions may or will have a corresponding effect on the Recommendations. The Report does not take into account any (a) Additional Investigations that were not undertaken, or (b) Out-of-Scope Requirements that were not communicated prior to completion of the investigations that were been undertaken as of the date of the Report. Where recommended field services are referred to, they are the minimum services necessary to determine compliance of construction with Applicable Laws, generally accepted industry-standard practices, and the Recommendations.

3. **RELIANCE & USE**. The Report has been prepared only for the Site and the related design, development, building, or building assessment objectives identified by the Client. The Findings and Recommendations are based on the Site Conditions and the Client Information. In preparing the Report, JLP has relied upon the Client Information and disclaims any responsibility for any inaccuracy, misstatement, omission, unintentional misrepresentation, or other deficiency contained in the Report as a result of such reliance. Unless specifically stated otherwise, the applicability and reliability of the Findings and the Recommendations expressed in the Report are only valid to the extent that (a) there has been no material change to or variation from any of the Client Information, (b) the Client Information contains no untrue statement of a material fact, or (c) the Client Information omits no statement of a material fact necessary in order to make the Client Information not misleading.

   The Report and the Findings and Recommendations 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 prior written consent of JLP, which may be arbitrarily withheld or conditioned.

RELIANCE UPON THE REPORT OR ANY OF THE DETERMINATIONS MADE HEREIN BY A THIRD PARTY WITHOUT JLP'S CONSENT IS PROHIBITED AND JLP MAKES NO REPRESENTATION, GUARANTEE, OR WARRANTY IN FAVOUR OF ANY THIRD PARTY WITH RESPECT TO THE REPORT WHATSOEVER. JLP FULLY DISCLAIMS, AND WILL HAVE NO LIABILITY FOR, ANY LOSS, DAMAGES, OR EXPENSES WHICH ANY THIRD-PARTY MAY INCUR OR SUFFER AS A RESULT OF THE USE OF OR RELIANCE ON THIE REPORT WHERE JLP HAS NOT EXPRESSLY AUTHORIZED SAME. ANY THIRD PARTY WHO RELIES ON THE REPORT TO ANY EXTENT DOES SO AT SUCH PARTY'S OWN RISK AND COMPLETELY WAIVES ANY AND ALL CLAIMS AGAINST JLP IN CONNECTION WITH THE REPORT, REGARDLESS OF THE THEORY OF LAW (WHETHER IN CONTRACT, TORT, OR ANY THEORY OF LAW COMING INTO EXISTENCE HEREAFTER).

4. **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. No other warranty, expressed or implied, is made or intended in the Report. It is intended that the Findings and Recommendations are meant to assist in reducing the Client's risk associated with environmental impairment at the Site. The Report should not be considered risk mitigation.

5. **ENTIRE REPORT**. The Report also includes the Report Documents. In order to properly understand the Findings and Recommendations, reference must be made to the Report in its entirety. JLP is not responsible for use by any party of a part of the Report only.

6. **GOVERNING FORMAT**. Notwithstanding that JLP may have submitted an electronic version of the Report or any document forming part of the Report, only the signed and sealed physical copy of the Report shall be deemed to be the original and in the event of any dispute or discrepancy, the physical copy shall govern. JLP makes no representation about the compatibility of its electronic or digital file format with the Client's current or future software and/or hardware systems. The documents described herein are JLP's instruments of professional service and shall not be altered without the written consent of JLP.

7. **GENERAL LIMITATIONS**.

   (a) Unless specifically stated otherwise, the Report does not contain environmental consulting advice.

   (b) The Report contains no opinion or determination as to any matters governed by laws other than the laws of the Province of Ontario and the federal laws of Canada applicable therein as of the date hereof.

   (c) During any future development of the Site, conditions not observed during JLP's investigations may become apparent. If this occurs, JLP should be contacted to assess the situation and whether there is a need for additional testing.

   (d) JLP's investigations were carried out to address the intent of Applicable Laws, which are subject to change, and such changes, when coming into legal force and effect, could alter the Findings and Recommendations in a material way.

   (e) Achieving the objectives stated in the Report has required JLP to arrive at conclusions based upon the best information presently known to JLP. Current investigative methodologies do not completely eliminate the possibility of imprecise or incomplete information. Rather, they merely reduce such possibility to acceptable levels. Professional judgment was exercised in gathering and analyzing information obtained and in the formulation of the Findings. JLP does not act as an absolute insurer of the Findings and will only be responsible for gross negligence with respect thereto.

   (f) The Report may not be reproduced in whole or in part by any party other than the Client without JLP's prior written consent. All intellectual property rights in the Report are reserved to JLP.

Appendix B – MECP WWR Summary Table

Appendix B: MECP Water Well Record Summary Table

Well ID	Zone	East 83	North 83	Location Accuracy	Date Received	Street	City	Distance From Site Centroid (m)	Final Status	1st Use	2nd Use	Depth Water Found (m)	Geology			
													Depth (m)	Material 1	Material 2	Material 3
2514227	17	549256	4889098	margin of error : 10 - 30 m	5/16/2000			582	Water Supply	Domestic		24.08	1.2	CLAY	FILL	
													22.9	CLAY	STONES	
													24.7	LIMESTONE		
7168641	17	549139	4889673	margin of error : 10 - 30 m	9/13/2011			333				#N/A	0.0	0	0	0
7175980	17	549174	4889614	margin of error : 100 m - 300 m	1/31/2012	ECO PARKWAY	DUNDALK	297	Observation Wells	Monitoring		0.00	0.3	TOPSOIL	FILL	LOOSE
													4.5	SILT	SAND	LOOSE
7175981	17	549238	4889649	margin of error : 30 m - 100 m	1/31/2012	ECO PARKWAY	DUNDALK	232	Observation Wells	Monitoring		0.00	0.3	TOPSOIL	FILL	LOOSE
													4.5	SILT	SAND	LOOSE
7175982	17	548956	4889787	margin of error : 30 m - 100 m	1/31/2012	ECO PARKWAY	DUNDALK	535	Observation Wells	Monitoring		0.00	0.3	TOPSOIL	FILL	LOOSE
													4.5	SILT	SAND	LAYERED
7175983	17	548959	4889785	margin of error : 30 m - 100 m	1/31/2012	ECO PARKWAY	DUNDALK	531	Observation Wells	Monitoring		0.00	0.3	TOPSOIL	FILL	LOOSE
													4.5	SILT	SAND	LOOSE
7175984	17	549139	4889673	margin of error : 30 m - 100 m	1/31/2012	ECO PARKWAY	DUNALK	333				0.00	0.0	0	0	0
7178933	17	549139	4889673	margin of error : 30 m - 100 m	4/5/2012	ECO PARKWAY	DUNDALK	333	Abandoned-Other			0.00	0.0	0	0	0
7190259	17	549064	4889665	margin of error : 30 m - 100 m	10/24/2012	ECO PARKWAY	DUNDALK	407	Observation Wells	Monitoring		0.00	0.6	TOPSOIL		LOOSE
													5.4	SILT	SAND	LAYERED
7190260	17	549103	4889635	margin of error : 30 m - 100 m	10/24/2012	ECO PARKWAY	DUNDALK	367	Observation Wells	Monitoring		0.00	0.6	TOPSOIL		LOOSE
													42.0	SILT	SAND	LAYERED
7190261	17	549129	4889616	margin of error : 30 m - 100 m	10/24/2012	ECO PARKWAY	DUNDALK	342	Observation Wells	Monitoring		0.00	0.6	TOPSOIL		LOOSE
													4.3	SAND	SILT	LAYERED
7190262	17	549137	4889613	margin of error : 30 m - 100 m	10/24/2012	ECO PARKWAY	DUNDALK	334	Observation Wells	Monitoring		0.00	0.6	TOPSOIL		LOOSE
													3.3	SAND	SILT	LAYERED
													7.6	SILT	SAND	CLAY
7241221	17	549472	4890169	margin of error : 30 m - 100 m	5/11/2015	191 ECO-PARKWAY	DUNDALK	530	Observation Wells	Monitoring		0.00	4.5	SAND	GRAVEL	LOOSE
7339333	17	549435	4889648	margin of error : 30 m - 100 m	8/15/2019	752051 IDA STREET	DUNDALK	36	Observation Wells	Monitoring		1.52	0.3	TOPSOIL		TOPSOIL
													1.5	CLAY	SILT	
													7.6	SILT	GRAVEL	
7339338	17	549398	4889733	margin of error : 30 m - 100 m	8/15/2019	752051 IDA STREET	DUNDALK	118	Observation Wells	Monitoring		6.10	0.3	TOPSOIL		TOPSOIL
													7.6	SILT	GRAVEL	TILL

Appendix C – Borehole Logs

BORING NUMBER BH101/MW101

JLP
Geotechnical & Environmental Consultants

CLIENT Envest Corp. **PROJECT NAME** Southgate Renewables Facility

PROJECT NUMBER G4130-22-12 **PROJECT LOCATION** 100 Eco Parkway, Southgate, Ontario

DATE STARTED 12/5/22 **COMPLETED** 12/5/22 **GROUND ELEVATION** 506.4 m **HOLE SIZE** 150mm

DRILLING CONTRACTOR London Soil Test Ltd. **GROUND WATER LEVELS:**

DRILLING METHOD Hollow Stem **AT TIME OF DRILLING** ---

LOGGED BY GB **CHECKED BY** JB **AT END OF DRILLING** ---

NOTES **AFTER DRILLING** -0.33 m / Elev 506.73 m

ELEV. (m)	DEPTH (m)	MATERIAL DESCRIPTION	DEPTH (m)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	RECOVERY %	HEADSPACE VAPOUR	ANALYSIS
506		**TOPSOIL** sandy silt, some organics; black, moist no odour, no staining.	0.2	SS 1	1-3-7-12 (10)	58	ND	
	1	**FILL** sandy silt, some gravel, scattered organic inclusions and rootlets, occasional wood pieces; brown, moist no odour, no staining.		SS 2	6-6-14-40 (20)	75	ND	
505			1.7	SS 3	17-26-33-50/0.14 50/130mm	88	ND	
	2	**SANDY SILT TILL** sandy silt, some gravel, trace clay scattered cobbles; brown, moist, very dense no odour, no staining.		SS 4	33-50/0.14 50/140mm	67	ND	
504								
	3			SS 5	50/0.08 50/80mm	0	ND	
503								
	4							
502				SS 6	33-33-44-50/0.14 50/140mm	100	ND	
	5							
501								
	6			SS 7	40-50/0.14 50/130mm	63	ND	
500								
	7							
499				SS 8	23-29-21-28 (50)	100	ND	
	8							
498								
	9							
497			9.6	SS 9	33-40-50/0.14 50/140mm	100	ND	

End of Borehole at 9.59 mbgs

BORING NUMBER BH102

JLP
Geotechnical & Environmental Consultants

CLIENT Envest Corp. **PROJECT NAME** Southgate Renewables Facility

PROJECT NUMBER G4130-22-12 **PROJECT LOCATION** 100 Eco Parkway, Southgate, Ontario

DATE STARTED 12/6/22 **COMPLETED** 12/6/22 **GROUND ELEVATION** 507.44 m **HOLE SIZE** 150mm

DRILLING CONTRACTOR London Soil Test Ltd. **GROUND WATER LEVELS:**

DRILLING METHOD Hollow Stem **AT TIME OF DRILLING** ---

LOGGED BY GB **CHECKED BY** JB **AT END OF DRILLING** ---

NOTES **AFTER DRILLING** ---

ELEV. (m)	DEPTH (m)	GRAPHIC LOG	MATERIAL DESCRIPTION	DEPTH (m)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	RECOVERY %	HEADSPACE VAPOUR	ANALYSIS	SPT N VALUE / PL MC LL / FINES CONTENT (%)	WELL CONSTRUCTION
507			**TOPSOIL** sandy silt, some organics; black, moist no odour, no staining.	0.1	SS 1	3-3-5-4 (8)	92	ND			
	1		**FILL** sand silt, some gravel, scattered organic inclusions; brown, moist to wet no odour, no staining.		SS 2	3-6-6-16 (12)	29	ND			
506				1.5	SS 3	50 50/150mm	0	ND			
	2		**SANDY SILT TILL** sandy silt, some gravel, trace clay, scattered cobbles; brown, moist, very dense no odour, no staining.		SS 4	13-37-37-46 (74)	100	ND			
505	3				SS 5	50/0.13 50/130mm	21	ND			
504	4										
503	5				SS 6	25-33-40-43 (73)	100	ND			
502	6										
501	7				SS 7	25-33-40-35 (73)	100	ND			
500	8		silty sand layer at 7.7 to 8.1m		SS 8	45-11-12-33 (23)	100	ND			
499	9										
498				9.6	SS 9	13-30-50/0.14 50/130mm	92	ND			

End of Borehole at 9.58 mbgs

BORING NUMBER BH103

JLP
Geotechnical & Environmental Consultants

CLIENT Envest Corp. **PROJECT NAME** Southgate Renewables Facility

PROJECT NUMBER G4130-22-12 **PROJECT LOCATION** 100 Eco Parkway, Southgate, Ontario

DATE STARTED 12/6/22 **COMPLETED** 12/6/22 **GROUND ELEVATION** 506.8 m **HOLE SIZE** 150mm

DRILLING CONTRACTOR London Soil Test Ltd. **GROUND WATER LEVELS:**

DRILLING METHOD Hollow Stem **AT TIME OF DRILLING** ---

LOGGED BY GB **CHECKED BY** JB **AT END OF DRILLING** ---

NOTES **AFTER DRILLING** ---

ELEV. (m)	DEPTH (m)	GRAPHIC LOG	MATERIAL DESCRIPTION	DEPTH (m)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	RECOVERY %	HEADSPACE VAPOUR	ANALYSIS	WELL CONSTRUCTION
			TOPSOIL sandy silt, some organics; black, moist no odour, no staining.	0.3	SS 1	1-1-2-4 (3)		ND		
506	1		**FILL** sand silt, some gravel, scattered organic inclusions; dark brown to brown, moist no odour, no staining.		SS 2	3-2-1-2 (3)		ND		
				1.5						
505	2		**SANDY SILT TILL** sandy silt some gravel, trace clay, scattered sand seams and cobbles; brown, dense to very dense, moist no odour, no staining.		SS 3	6-12-19-17 (31)		ND		
504	3				SS 4	17-19-23-38 (42)		ND		
					SS 5	23-43-50/0.14 50/130mm		ND		
503	4									
502	5				SS 6	28-33-45-48 (78)		ND		
501	6									
					SS 7	24-35-38-40 (73)		ND		
500	7									
499	8				SS 8	28-40-50 (90) 50/140mm		ND		
498	9									
				9.7	SS 9	21-25-35-50/0.11 50/100mm		ND		

SPT N VALUE: 20 40 60 80

PL MC LL: 20 40 60 80

FINES CONTENT (%): 20 40 60 80

End of Borehole at 9.70 mbgs

BORING NUMBER BH104

JLP
Geotechnical & Environmental Consultants

CLIENT Envest Corp. **PROJECT NAME** Southgate Renewables Facility

PROJECT NUMBER G4130-22-12 **PROJECT LOCATION** 100 Eco Parkway, Southgate, Ontario

DATE STARTED 12/5/22 **COMPLETED** 12/5/22 **GROUND ELEVATION** 507.43 m **HOLE SIZE** 150mm

DRILLING CONTRACTOR London Soil Test Ltd. **GROUND WATER LEVELS:**

DRILLING METHOD Hollow Stem **AT TIME OF DRILLING** ---

LOGGED BY GB **CHECKED BY** JB **AT END OF DRILLING** ---

NOTES **AFTER DRILLING** ---

ELEV. (m)	DEPTH (m)	GRAPHIC LOG	MATERIAL DESCRIPTION	DEPTH (m)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	RECOVERY %	HEADSPACE VAPOUR	ANALYSIS	SPT N VALUE / PL MC LL / FINES CONTENT (%)	WELL CONSTRUCTION
507			**TOPSOIL** sandy silt, some organics; black, moist	0.1	SS 1	1-3-7-4 (10)	63	ND			
	1		**FILL** sand silt, some gravel, scattered organic inclusions; brown, wet no odour, no staining.		SS 2	1-3-4-8 (7)	63	ND			
506				1.5							
	2		**SANDY SILT TILL** sandy silt, some gravel, trace clay, scattered cobbles; brown, moist, very dense no odour, no staining.		SS 3	5-7-13-20 (20)	58	ND			
505					SS 4	50/0.10 50/100mm	29	ND		>>	
	3				SS 5	27-34-50/0.11 50/100mm	100	ND		>>	
504											
	4				SS 6	50/0.13 50/130mm	25	ND		>>	
503					SS 7	22-50/0.13 50/130mm	58	ND		>>	
	5										
502											
	6				SS 8	50/0.13 50/130mm	38	ND		>>	
501											
	7										
500					SS 9	33-50/0.14 50/140mm	83	ND		>>	
	8										
499											
	9										
498				9.7	SS 10	33-40-48-50/0.06 50/50mm		ND		>>	

End of Borehole at 9.65 mbgs

BORING NUMBER BH105

JLP
Geotechnical & Environmental Consultants

CLIENT Envest Corp. **PROJECT NAME** Southgate Renewables Facility

PROJECT NUMBER G4130-22-12 **PROJECT LOCATION** 100 Eco Parkway, Southgate, Ontario

DATE STARTED 12/5/22 **COMPLETED** 12/5/22 **GROUND ELEVATION** 506.78 m **HOLE SIZE** 150mm

DRILLING CONTRACTOR London Soil Test Ltd. **GROUND WATER LEVELS:**

DRILLING METHOD Hollow Stem **AT TIME OF DRILLING** ---

LOGGED BY GB **CHECKED BY** JB **AT END OF DRILLING** ---

NOTES **AFTER DRILLING** ---

ELEV. (m)	DEPTH (m)	GRAPHIC LOG	MATERIAL DESCRIPTION	DEPTH (m)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	RECOVERY %	HEADSPACE VAPOUR	ANALYSIS	▲ SPT N VALUE ▲ 20 40 60 80 / PL MC LL 20 40 60 80 / ☐ FINES CONTENT (%) ☐ 20 40 60 80	WELL CONSTRUCTION
506	1		**FILL** sandy silt, some gravel, scattered organic inclusions and wood pieces; dark brown, moist no odour, no staining.		SS 1	2-2-4-8 (6)	25	ND			
					SS 2	7-4-3-6 (7)	79	ND			
				1.5							
505	2		**SANDY SILT TILL** sandy silt, some gravel, trace clay, scattered cobbles, occassional sand seams; brown, moist, compact to very dense no odour, no staining.		SS 3	5-14-10-15 (24)	96	ND			
504	3				SS 4	17-35-50 (85) 50/140mm	54	ND			
					SS 5	16-29-50/0.14 50/130mm	50	ND		>>	
503	4										
502	5				SS 6	30-33-50/0.14 50/130mm	83	ND		>>	
501	6										
					SS 7	40-49-50/0.14 50/130mm	96	ND		>>	
500	7										
499	8		wet at 7.6 mbgs		SS 8	33-36-50/0.11 50/100mm	71	ND		>>	
498	9										
				9.5	SS 9	43-50/0.08 50/80mm	50	ND		>>	

End of Borehole at 9.53 mbgs

BORING NUMBER BH106/MW106

JLP
Geotechnical & Environmental Consultants

CLIENT Envest Corp.
PROJECT NAME Southgate Renewables Facility
PROJECT NUMBER G4130-22-12
PROJECT LOCATION 100 Eco Parkway, Southgate, Ontario
DATE STARTED 12/5/22 **COMPLETED** 12/5/22
GROUND ELEVATION 506.7 m **HOLE SIZE** 150mm
DRILLING CONTRACTOR London Soil Test Ltd.
GROUND WATER LEVELS:
DRILLING METHOD Hollow Stem
AT TIME OF DRILLING ---
LOGGED BY GB **CHECKED BY** JB
AT END OF DRILLING ---
NOTES
AFTER DRILLING 0.09 m / Elev 506.61 m

ELEV. (m)	DEPTH (m)	GRAPHIC LOG	MATERIAL DESCRIPTION	DEPTH (m)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	RECOVERY %	HEADSPACE VAPOUR	ANALYSIS	SPT N VALUE / PL MC LL / FINES CONTENT (%)	WELL CONSTRUCTION
506	1		**TOPSOIL** sandy silt, some organics; black, moist	0.3	SS 1	1-2-10-9 (12)	67	ND			
			FILL sandy silt, some gravel, scattered organic inclusions and rootlets; dark brown to brown, moist to wet, no odour, no staining.		SS 2	4-8-10-12 (18)	33	ND			
505	2		**SANDY SILT TILL** sandy silt, some gravel, trace clay, scattered cobbles; brown, moist, dense to very dense no odour, no staining.	1.5	SS 3	4-22-23-26 (45)	92	ND			
504	3				SS 4	10-18-35-50/0.09 50/80mm	100	ND		>>	
503	4				SS 5	13-31-41-50/0.14 50/130mm	46	ND		>>	
502	5				SS 6	50/0.13 130mm	29	ND		>>	
501	6			6.1	SS 7	50/0.04 50/40mm	0	ND		>>	
			End of Borehole at 6.14 mbgs								

BORING NUMBER BH107

JLP
Geotechnical & Environmental Consultants

CLIENT Envest Corp. **PROJECT NAME** Southgate Renewables Facility

PROJECT NUMBER G4130-22-12 **PROJECT LOCATION** 100 Eco Parkway, Southgate, Ontario

DATE STARTED 12/6/22 **COMPLETED** 12/6/22 **GROUND ELEVATION** 507.52 m **HOLE SIZE** 150mm

DRILLING CONTRACTOR London Soil Test Ltd. **GROUND WATER LEVELS:**

DRILLING METHOD Hollow Stem **AT TIME OF DRILLING** ---

LOGGED BY GB **CHECKED BY** JB **AT END OF DRILLING** ---

NOTES **AFTER DRILLING** ---

ELEV. (m)	DEPTH (m)	GRAPHIC LOG	MATERIAL DESCRIPTION	DEPTH (m)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	RECOVERY %	HEADSPACE VAPOUR	ANALYSIS	SPT N VALUE / PL MC LL / FINES CONTENT (%)	WELL CONSTRUCTION
507	1		**TOPSOIL** sandy silt, some gravel, some organics; black, moist no odour, no staining.	0.2	SS 1	1-2-4-6 (6)	52	ND			
			FILL sandy silt, some gravel, scattered organic inclusions; dark brown to brown, moist, no odour, no staining.	1.5	SS 2	2-2-5-5 (7)	84	ND			
506	2		**SANDY SILT TILL** sandy silt, some gravel, trace clay, scattered cobbles; brown, moist, very dense no odour, no staining.		SS 3	9-10-19-24 (29)	68	ND			
505	3				SS 4	39-33-40-50/0.15 50/130mm	100	ND		>>	
504	4				SS 5	19-44-50/0.09 50/80mm	68	ND		>>	
503	5				SS 6	34-50/0.13 50/130mm	56	ND		>>	
502	6			6.4	SS 7	47-50/0.13 50/130mm	56	ND		>>	

End of Borehole at 6.38 mbgs

BORING NUMBER MW201

JLP
Geotechnical & Environmental Consultants

CLIENT Envest Corp. **PROJECT NAME** Southgate Renewables Facility

PROJECT NUMBER G4130-23-3 **PROJECT LOCATION** 100 Eco Parkway, Southgate, Ontario

DATE STARTED 3/1/23 **COMPLETED** 3/1/23 **GROUND ELEVATION** 508.004 m **HOLE SIZE** 150mm

DRILLING CONTRACTOR London Soil Test Ltd. **GROUND WATER LEVELS:**

DRILLING METHOD Solid Stem Auger **AT TIME OF DRILLING** ---

LOGGED BY PB **CHECKED BY** AL **AT END OF DRILLING** ---

NOTES **AFTER DRILLING** 0.40 m / Elev 507.61 m

ELEV. (m)	DEPTH (m)	GRAPHIC LOG	MATERIAL DESCRIPTION	DEPTH (m)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	RECOVERY %	HEADSPACE VAPOUR	ANALYSIS	WELL CONSTRUCTION
			TOPSOIL black	0.2	SS 1	1-1-1-1 (2)	29	ND		
			FILL Sandy Silt, some gravel, scattered organic inclusions; brown, moist to wet, no odour, no staining.							
507	1				SS 2	4-2-2-2 (4)	63	ND		
					SS 3	2-3-4-5 (7)	46	ND		
506	2			2.3						
			SANDY SILT TILL Sandy Silt, some gravel, trace clay, scattered cobbles; brown, moist, compact to very dense, no odour, no staining.		SS 4	8-10-12-10 (22)	83	ND		
505	3				SS 5	5-10-10-12 (20)	75	ND		
504	4									
					SS 6	13-17-50 (67)	58	ND		
503	5									
502	6				SS 7	50 50/130mm	17	ND		
				6.7						

End of Borehole at 6.71 mbgs

▲ SPT N VALUE ▲
20 40 60 80
PL MC LL
20 40 60 80
☐ FINES CONTENT (%) ☐
20 40 60 80

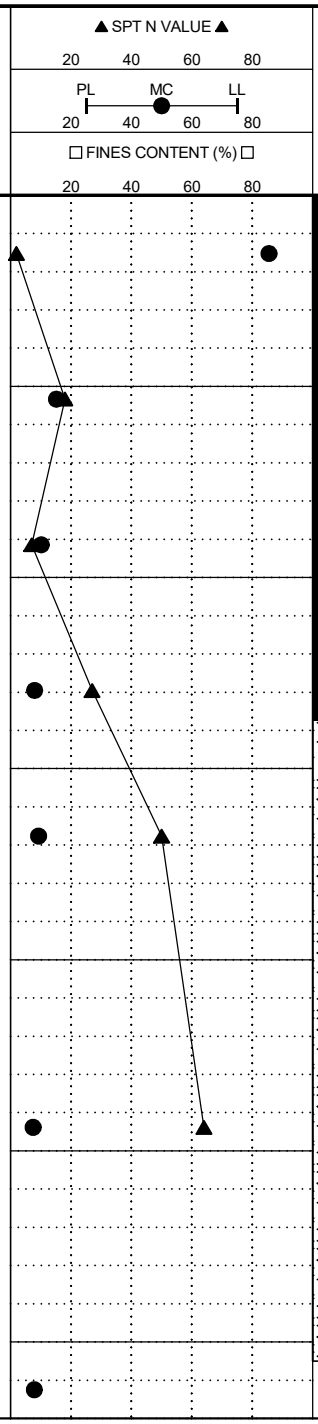
BORING NUMBER MW202

JLP
Geotechnical & Environmental Consultants

CLIENT Envest Corp.
PROJECT NAME Southgate Renewables Facility
PROJECT NUMBER G4130-23-3
PROJECT LOCATION 100 Eco Parkway, Southgate, Ontario
DATE STARTED 3/1/23 **COMPLETED** 3/1/23
GROUND ELEVATION 506.092 m **HOLE SIZE** 150mm
DRILLING CONTRACTOR London Soil Test Ltd.
GROUND WATER LEVELS:
DRILLING METHOD Solid Stem Auger
AT TIME OF DRILLING ---
LOGGED BY PB **CHECKED BY** AL
AT END OF DRILLING ---
NOTES
AFTER DRILLING 0.23 m / Elev 505.86 m

ELEV. (m)	DEPTH (m)	MATERIAL DESCRIPTION	DEPTH (m)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	RECOVERY %	HEADSPACE VAPOUR	ANALYSIS
506		**TOPSOIL** black	0.3	SS 1	1-1-1-1 (2)	67	ND	
	1	**FILL** Sandy Silt, some gravel, scattered organic inclusions; brown, moist to wet, no odour, no staining.		SS 2	3-10-8-4 (18)	58	ND	
505				SS 3	4-3-4-6 (7)	58	ND	
	2		2.3					
504		**SANDY SILT TILL** Sandy Silt, some gravel, trace clay, scattered cobbles; brown, moist, compact to very dense, no odour, no staining.		SS 4	4-13-14-18 (27)	75	ND	
	3			SS 5	13-22-28-33 (50)	58	ND	
503								
	4							
502				SS 6	22-27-37-50 (64)	96	ND	
	5							
501								
	6							
500			6.4	SS 7	46-50 50/210mm	54	ND	

End of Borehole at 6.40 mbgs



WELL CONSTRUCTION

BORING NUMBER MW203

JLP
Geotechnical & Environmental Consultants

CLIENT Envest Corp. **PROJECT NAME** Southgate Renewables Facility

PROJECT NUMBER G4130-23-3 **PROJECT LOCATION** 100 Eco Parkway, Southgate, Ontario

DATE STARTED 3/1/23 **COMPLETED** 3/1/23 **GROUND ELEVATION** 507.227 m **HOLE SIZE** 150mm

DRILLING CONTRACTOR London Soil Test Ltd. **GROUND WATER LEVELS:**

DRILLING METHOD Solid Stem Auger **AT TIME OF DRILLING** ---

LOGGED BY PB **CHECKED BY** AL **AT END OF DRILLING** ---

NOTES **AFTER DRILLING** 0.28 m / Elev 506.94 m

ELEV. (m)	DEPTH (m)	GRAPHIC LOG	MATERIAL DESCRIPTION	DEPTH (m)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	RECOVERY %	HEADSPACE VAPOUR	ANALYSIS	WELL CONSTRUCTION
507			**TOPSOIL** Sandy Silt, some organics; black, moist, no odour, no staining.	0.1	SS 1	3-3-5-4 (8)	92	ND		
506	1		**FILL** Sandy Silt, some gravel, scattered organic inclusions; brown, moist to wet, no odour, no staining.		SS 2	3-6-6-16 (12)	29	ND		
505	2			1.5	SS 3	50 50/150mm	0	ND		
	3		**SANDY SILT TILL** Sandy Silt, some gravel, trace clay, scattered cobbles; brown, moist, very dense, no odour, no staining.		SS 4	13-37-37-46 (74)	100	ND		
504					SS 5	50/0.13 50/130mm	21	ND		
	4									
503					SS 6	25-33-40-43 (73)	100	ND		
502	5									
	6			6.1						
501			**End of Borehole at 6.10 mbgs** **NOTE:** No soil samples taken. Soil characterization is based on BH/MW 102.		SS 7	25-33-40-35 (73)	100	ND		
	7									
500										
	8									
499										
	9									
498										

SPT N VALUE: 20 40 60 80

PL MC LL: 20 40 60 80

FINES CONTENT (%): 20 40 60 80

BORING NUMBER MW204

JLP
Geotechnical & Environmental Consultants

CLIENT Envest Corp. **PROJECT NAME** Southgate Renewables Facility

PROJECT NUMBER G4130-23-3 **PROJECT LOCATION** 100 Eco Parkway, Southgate, Ontario

DATE STARTED 3/1/23 **COMPLETED** 3/1/23 **GROUND ELEVATION** 507.303 m **HOLE SIZE** 150mm

DRILLING CONTRACTOR London Soil Test Ltd. **GROUND WATER LEVELS:**

DRILLING METHOD Hollow Stem **AT TIME OF DRILLING** ---

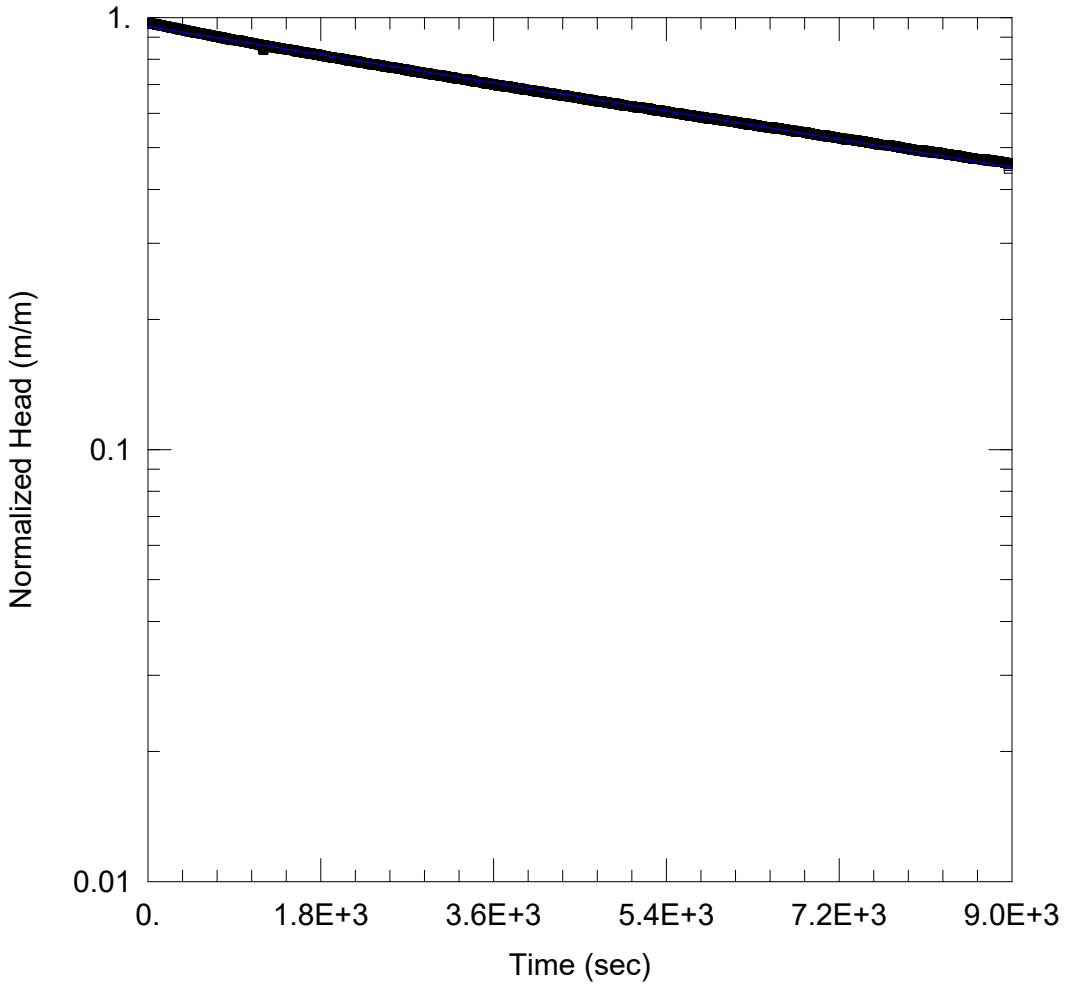
LOGGED BY PB **CHECKED BY** AL **AT END OF DRILLING** ---

NOTES **AFTER DRILLING** 0.09 m / Elev 507.21 m

ELEV. (m)	DEPTH (m)	GRAPHIC LOG	MATERIAL DESCRIPTION	DEPTH (m)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	RECOVERY %	HEADSPACE VAPOUR	ANALYSIS	SPT N VALUE / PL MC LL / FINES CONTENT (%)	WELL CONSTRUCTION
507			**TOPSOIL** Sandy Silt, some gravel, some organics; black, moist, no odour, no staining.	0.2	SS 1	1-2-4-6 (6)	52	ND			
	1		**FILL** Sandy Silt, some gravel, scattered organic inclusions; dark brown to brown, moist, no odour, no staining.		SS 2	2-2-5-5 (7)	84	ND			
506				1.5							
	2		**SANDY SILT TILL** Sandy Silt, some gravel, trace clay, scattered cobbles; brown, moist, very dense, no odour, no staining.		SS 3	9-10-19-24 (29)	68	ND			
505					SS 4	39-33-40-50/0.15 50/130mm	100	ND		>>	
	3				SS 5	19-44-50/0.09 50/80mm	68	ND		>>	
504											
	4										
503											
	5				SS 6	34-50/0.13 50/130mm	56	ND		>>	
502											
	6			6.1							
501			**End of Borehole at 6.10 mbgs**		SS 7	47-50/0.13 50/130mm	56	ND		>>	

NOTE: No soil samples taken. Soil characterization is based on BH/MW 107.

Appendix D – Single Well Response Test (SWRT)



SWRT BH/MW 101

Data Set: C:\...\BHMW 101.aqt
Date: 05/03/23 Time: 14:52:41

PROJECT INFORMATION

Company: JLP Services Inc.
Client: Envest Corp.
Project: G4130-23-3
Location: 100 Eco Park Way, Southgate ON
Test Well: BH/MW 101
Test Date: Apr 11, 2023

AQUIFER DATA

Saturated Thickness: 9.57 m Anisotropy Ratio (Kz/Kr): 1.

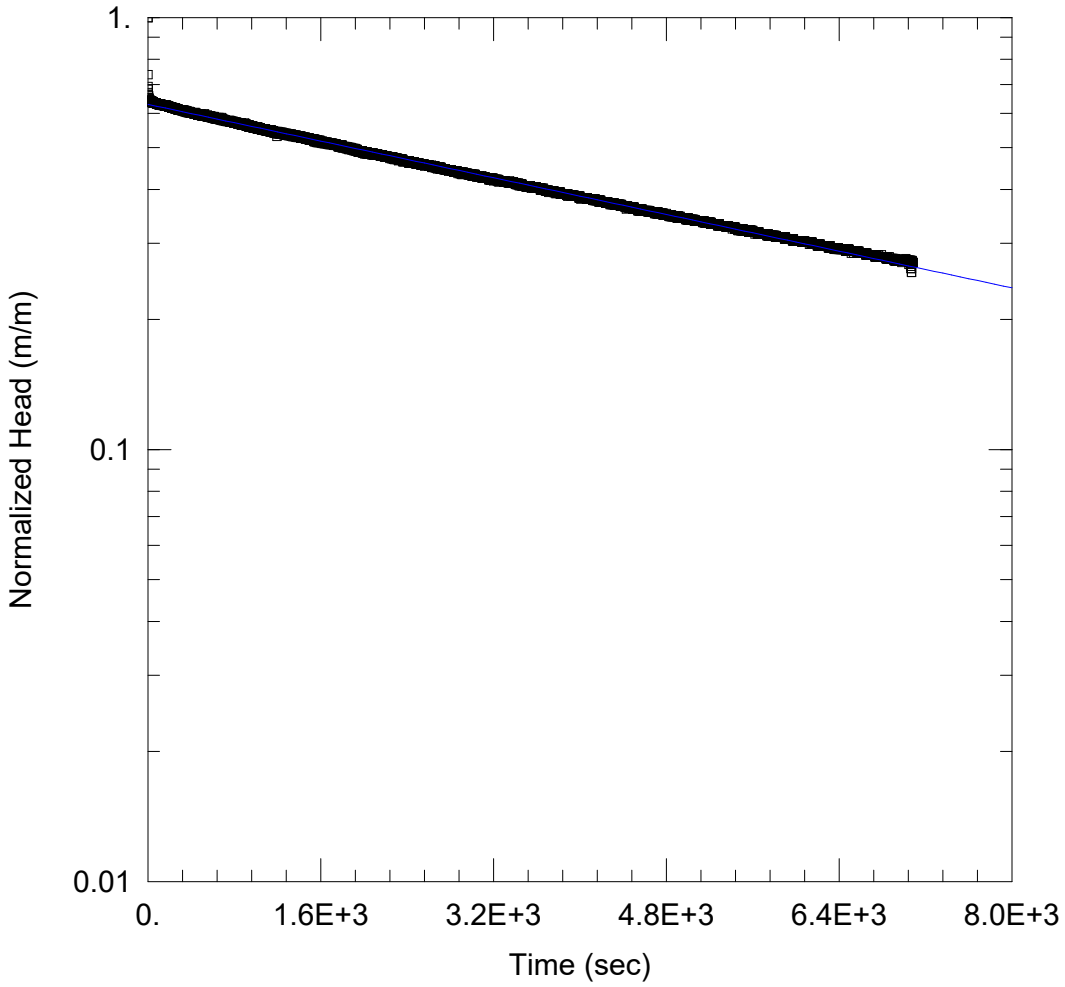
WELL DATA (BH/MW 101)

Initial Displacement: 1.305 m
Total Well Penetration Depth: 9.57 m
Casing Radius: 0.0254 m
Static Water Column Height: 9.57 m
Screen Length: 3. m
Well Radius: 0.0254 m

SOLUTION

Aquifer Model: Unconfined Solution Method: Hvorslev

K = 4.901E-8 m/sec y0 = 1.244 m



SWRT BH/MW 106

Data Set: C:\...\BHMW 106.aqt
Date: 05/03/23 Time: 15:03:02

PROJECT INFORMATION

Company: JLP Services Inc.
Client: Envest Corp.
Project: G4130-23-3
Location: 100 Eco Park Way, Southgate ON
Test Well: BH/MW 106
Test Date: Apr 11, 2023

AQUIFER DATA

Saturated Thickness: 5.91 m Anisotropy Ratio (Kz/Kr): 1.

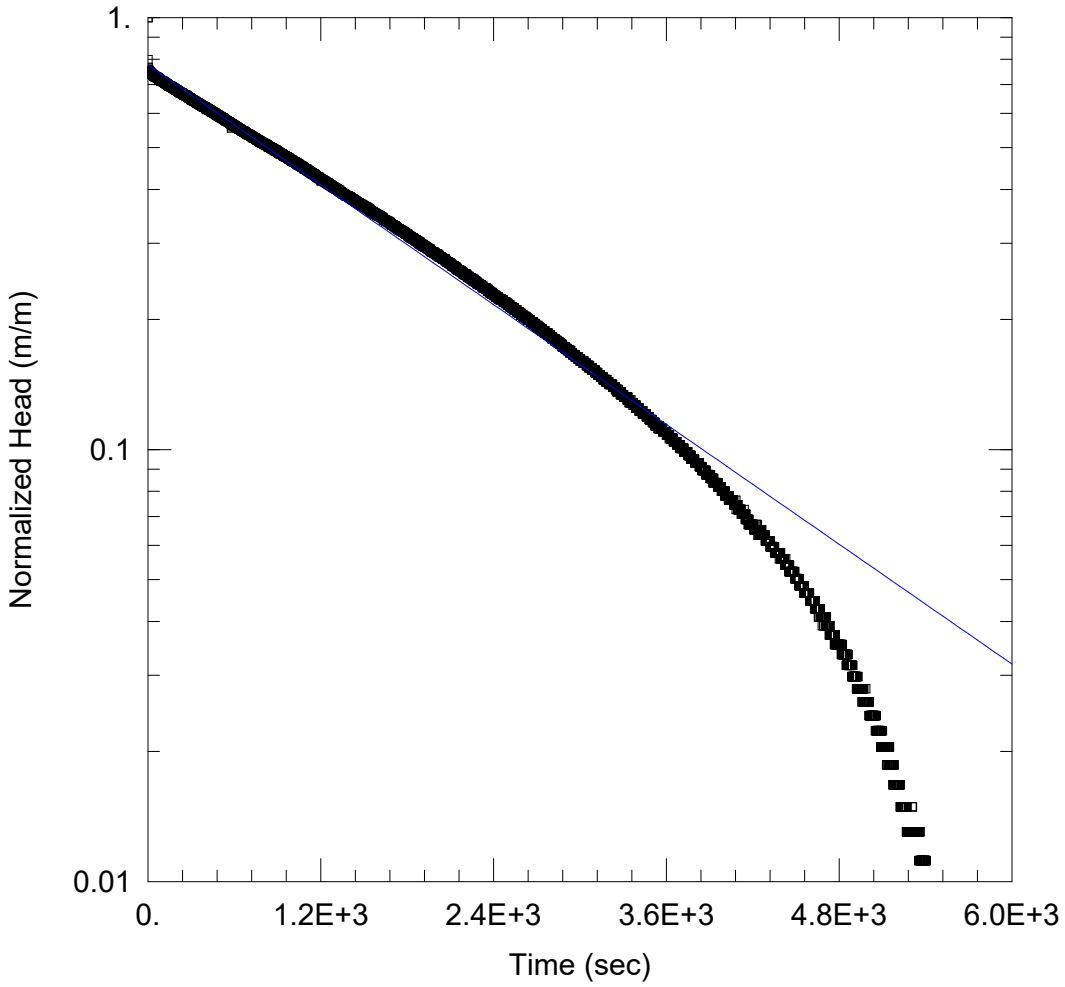
WELL DATA (BH/MW 106)

Initial Displacement: 1.074 m
Total Well Penetration Depth: 5.91 m
Casing Radius: 0.0254 m
Static Water Column Height: 5.91 m
Screen Length: 1.5 m
Well Radius: 0.0254 m

SOLUTION

Aquifer Model: Unconfined Solution Method: Hvorslev

K = 1.255E-7 m/sec y0 = 0.676 m



SWRT BH/MW 201

Data Set: C:\...\BHMW 201.aqt
Date: 05/03/23 Time: 15:04:53

PROJECT INFORMATION

Company: JLP Services Inc.
Client: Envest Corp.
Project: G4130-23-3
Location: 100 Eco Park Way, Southgate ON
Test Well: BH/MW 201
Test Date: Apr 11, 2023

AQUIFER DATA

Saturated Thickness: 5.6 m Anisotropy Ratio (Kz/Kr): 1.

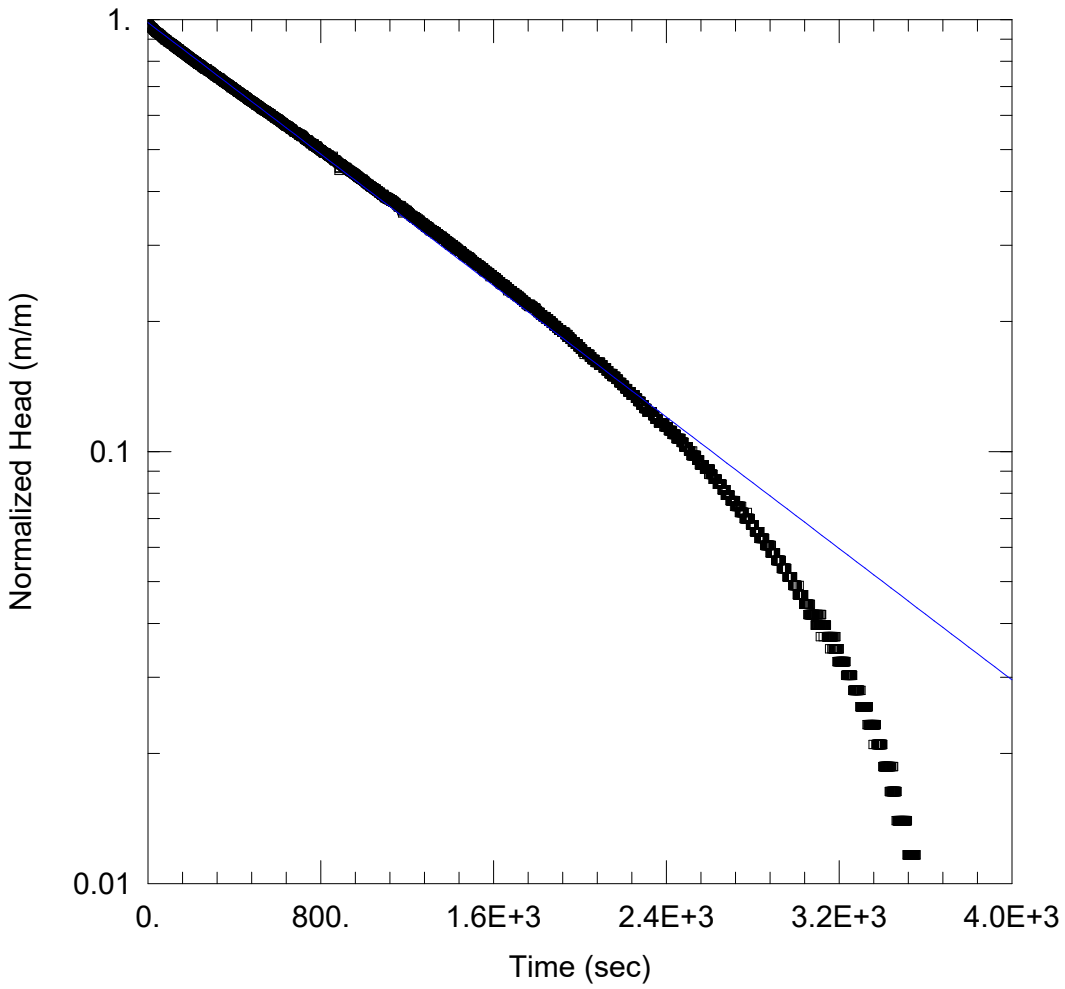
WELL DATA (BH/MW 201)

Initial Displacement: 1.611 m Static Water Column Height: 5.6 m
Total Well Penetration Depth: 5.6 m Screen Length: 3. m
Casing Radius: 0.0254 m Well Radius: 0.0254 m

SOLUTION

Aquifer Model: Unconfined Solution Method: Hvorslev

K = 3.127E-7 m/sec y0 = 1.251 m



SWRT BH/MW 202

Data Set: C:\...\BHMW 202.aqt
Date: 05/03/23 Time: 15:04:16

PROJECT INFORMATION

Company: JLP Services Inc.
Client: Envest Corp.
Project: G4130-23-3
Location: 100 Eco Park Way, Southgate ON
Test Well: BH/MW 106
Test Date: Apr 11, 2023

AQUIFER DATA

Saturated Thickness: 5.87 m Anisotropy Ratio (Kz/Kr): 1.

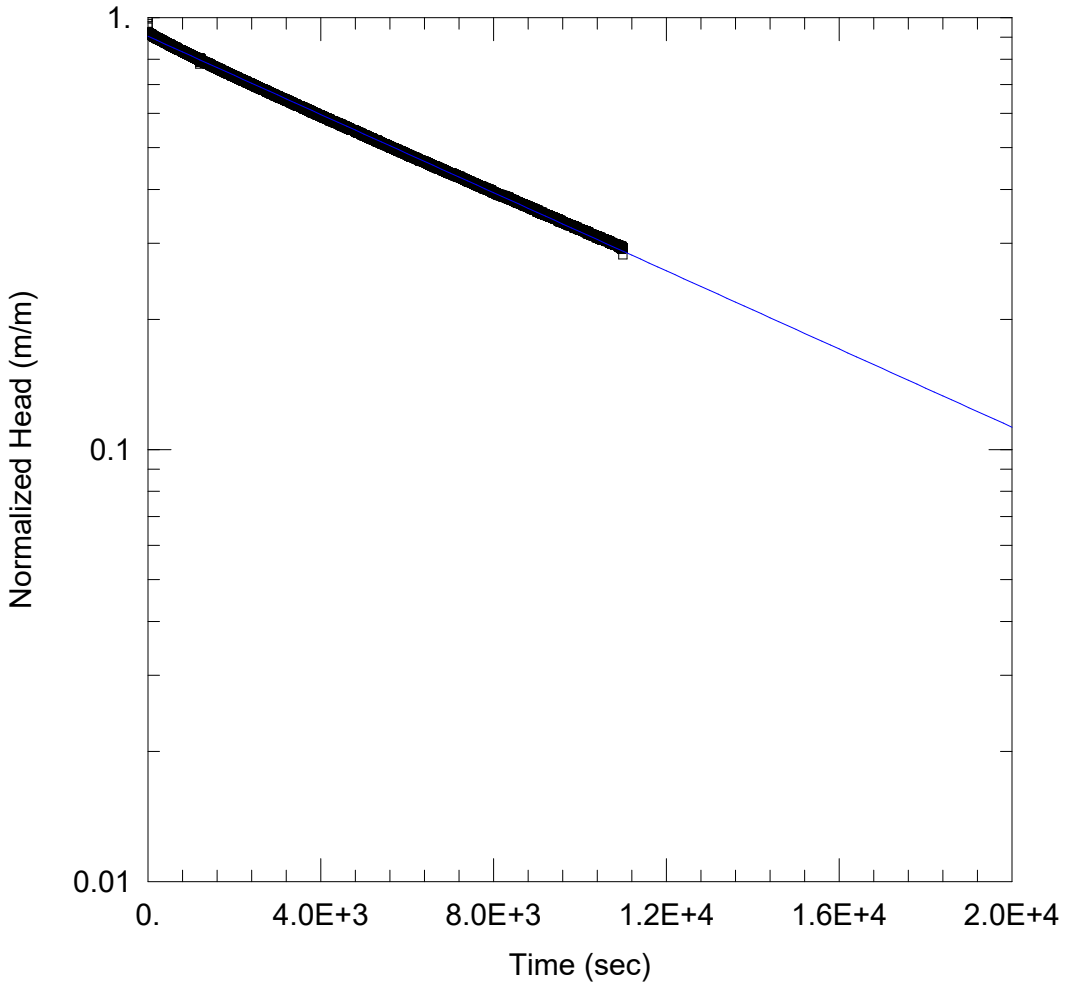
WELL DATA (BH/MW 202)

Initial Displacement: 1.287 m
Total Well Penetration Depth: 5.87 m
Casing Radius: 0.0254 m
Static Water Column Height: 5.87 m
Screen Length: 3. m
Well Radius: 0.0254 m

SOLUTION

Aquifer Model: Unconfined Solution Method: Hvorslev

K = 5.147E-7 m/sec y0 = 1.266 m



SWRT BH/MW 203

Data Set: C:\...\BH 203.aqt
Date: 05/18/23 Time: 14:40:50

PROJECT INFORMATION

Company: JLP Services Inc.
Client: Envest Corp.
Project: G4130-23-3
Location: 100 Eco Park Way, Southgate ON
Test Well: BH/MW 203
Test Date: Apr 11, 2023

AQUIFER DATA

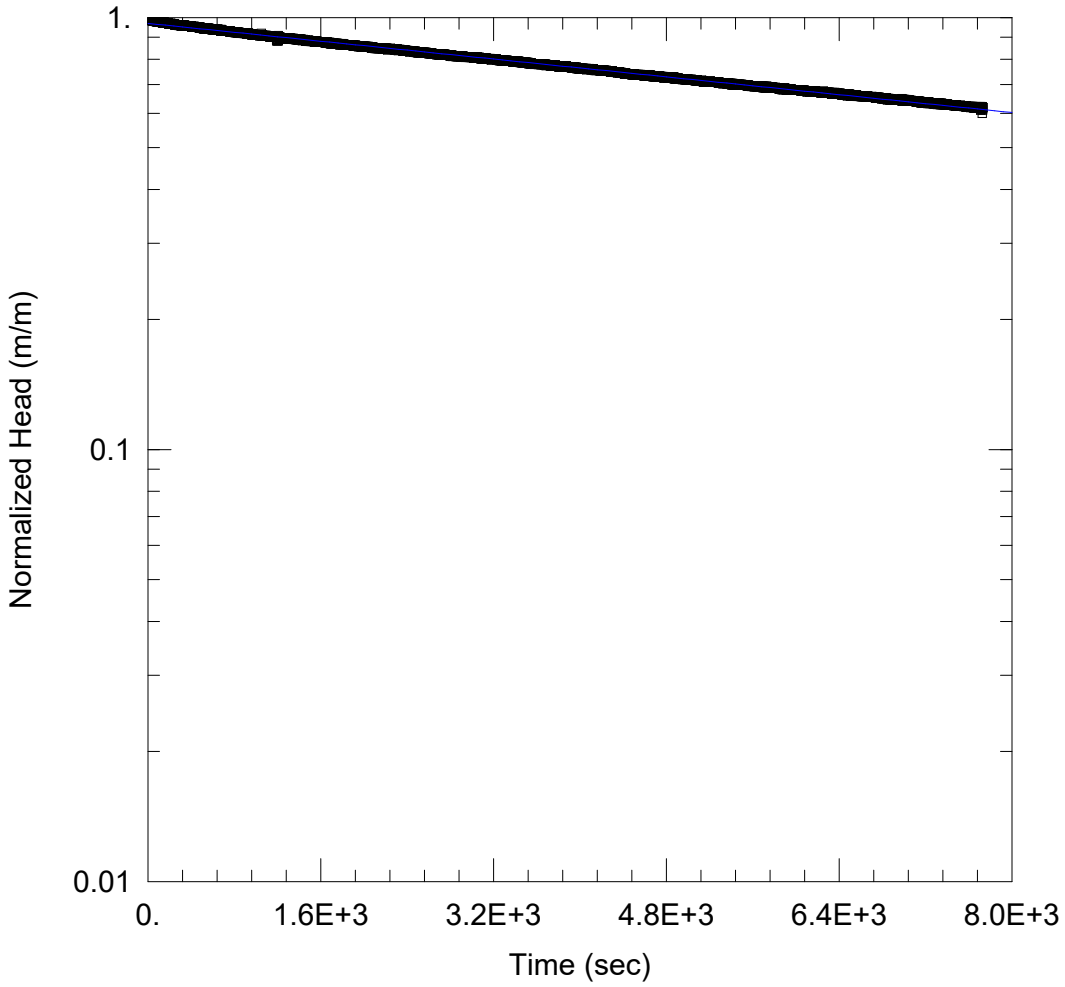
Saturated Thickness: 5.63 m Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (BH/MW 203)

Initial Displacement: 1.434 m
Total Well Penetration Depth: 5.83 m
Casing Radius: 0.0254 m
Static Water Column Height: 5.63 m
Screen Length: 3. m
Well Radius: 0.0254 m

SOLUTION

Aquifer Model: Unconfined
Solution Method: Hvorslev
K = 6.121E-8 m/sec
y0 = 1.297 m



SWRT BH/MW 204

Data Set: C:\...\BHMW 204.aqt
Date: 05/03/23 Time: 15:05:29

PROJECT INFORMATION

Company: JLP Services Inc.
Client: Envest Corp.
Project: G4130-23-3
Location: 100 Eco Park Way, Southgate ON
Test Well: BH/MW 204
Test Date: Apr 11, 2023

AQUIFER DATA

Saturated Thickness: 5.89 m Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (BH/MW 204)

Initial Displacement: 1.11 m
Total Well Penetration Depth: 5.884 m
Casing Radius: 0.0254 m
Static Water Column Height: 5.89 m
Screen Length: 3. m
Well Radius: 0.0254 m

SOLUTION

Aquifer Model: Unconfined
K = 3.047E-8 m/sec
Solution Method: Hvorslev
y0 = 1.076 m

Appendix E – Infiltration Rate – Grain Size Analysis

Appendix E-1 : Hydraulic Conductivity Calculation

(Based on Results of Grain Size Analysis)

Hazen Method

BH No.	Sample Depth (mbgs)	Soil Description	D60 mm	D10 mm	K Value m/s	CU (D60/D10)	CU Qualifier	Effective Grain Size Qualifier - D10 (mm)	Qualified Yes/No
Shallow									
BH 101 SS2	0.8 - 1.3	Sandy silt	0.3	0.032	6.43E-06	9	1 to 20	0.06 - 0.6	no
BH 106 SS3	1.5 - 2.0	Sandy silt	0.2	0.006	1.30E-07	37	1 to 20	0.06 - 0.6	no
Deep									
BH 103 SS5	3.0 - 3.5	Sandy Silt Till	0.17	0.0009	3.46E-09	189	1 to 20	0.003	no

CU - Uniformity Co-efficient

Breyer Method

BH No.	Sample Depth (mbgs)	Soil Description	D60 mm	D10 mm	K Value m/s	CU	CU Qualifier	Effective Grain Size Qualifier - D10 (mm)	Qualified Yes/No
Shallow									
BH 101 SS2	0.8 - 1.3	Sandy silt	0.3	0.032	7.96E-06	9	<5.0	0.1 - 3.0	no
BH 106 SS3	1.5 - 2.0	Sandy silt	0.2	0.006	1.53E-07	37	<5.0	0.1 - 3.0	no
Deep									
BH 103 SS5	3.0 - 3.5	Sandy Silt Till	0.17	0.0009	1.54E-09	189	<5.0	0.1 - 3.0	no

CU - Uniformity Co-efficient

Kozeny-Carman Method

BH No.	Sample Depth (mbgs)	Soil Description	D60 mm	D10 mm	K Value m/s	Effective Grain Size Qualifier - D10 (mm)	Qualified Yes/No
Shallow							
BH 101 SS2	0.8 - 1.3	Sandy silt	0.3	0.032	3.5E-06	<3.0	yes
BH 106 SS3	1.5 - 2.0	Sandy silt	0.2	0.006	5.6E-08	<3.0	yes
Deep							
BH 103 SS5	3.0 - 3.5	Sandy Silt Till	0.17	0.0009	1.5E-09	<3.0	yes

CU - Uniformity Co-efficient

Kurbish Method

BH No.	Sample Depth (mbgs)	Soil Description	Percentage of Fines (d<0.02 mm)	K Value m/s	K Value cm/s
Shallow					
BH 101 SS2	0.8 - 1.3	Sandy silt	9	2.3E-05	2.3E-03
BH 106 SS3	1.5 - 2.0	Sandy silt	12	1.1E-05	1.1E-03
Deep					
BH 103 SS5	3.0 - 3.5	Sandy Silt Till	3.1	2.6E-08	2.6E-06

Geo-Mean

BH No.	Sample Depth (mbgs)	Soil Description	Geo-Mean K m/s	Geo-Mean K cm/s
Shallow				
BH 101 SS2	0.8 - 1.3	Sandy silt	8.9E-06	8.9E-04
BH 106 SS3	1.5 - 2.0	Sandy silt	7.8E-07	7.8E-05
Deep				
BH 103 SS5	3.0 - 3.5	Sandy Silt Till	6.2E-09	6.2E-07

APP E-2: Design Infiltration Rates

100 Eco Park Way, Southgate, Ontario

Test Location	Hydraulic Conductivity (K_{fs}) (cm/s)	Infiltration Rate (IR) (mm/hr)	Discrete Design Infiltration Rate (mm/hr)	Percolation Time (min/cm)
Shallow Soils				
BH 101 SS2	8.9E-04	83	18	33
BH 106 SS3	7.8E-05	43	10	62
Deep Soils				
BH 103 SS5	6.2E-07	12	3	227

Soil Unit	Geometric Mean of K_{fs} (cm/s)	Infiltration Rate (I) (mm/hr)*	Ratio Geo-mean of Infiltration Rates	Safety Correction Factor
Shallow Soils (1.5 - 3.6 mbgs)	2.64E-04	60	5.1	4.5
Deep Soils* (4.6 - 5.2 mbgs)	6.23E-07	12		

Geo-Mean of Design Infiltration Rates (mm/hr)	Geo-mean of Percolation Times (min/cm)
13.3	**45**

Note:

* Assumed approximately 1.5 m below the bottom of LID System

$$Infiltration\ Rate\ (IR) = \left(\frac{K_{fs}}{6x10^{-11}}\right)^{\frac{1}{3.7363}}$$

$$Design\ Infiltration\ Rate\ (DIR) = \frac{IR}{SCF}$$

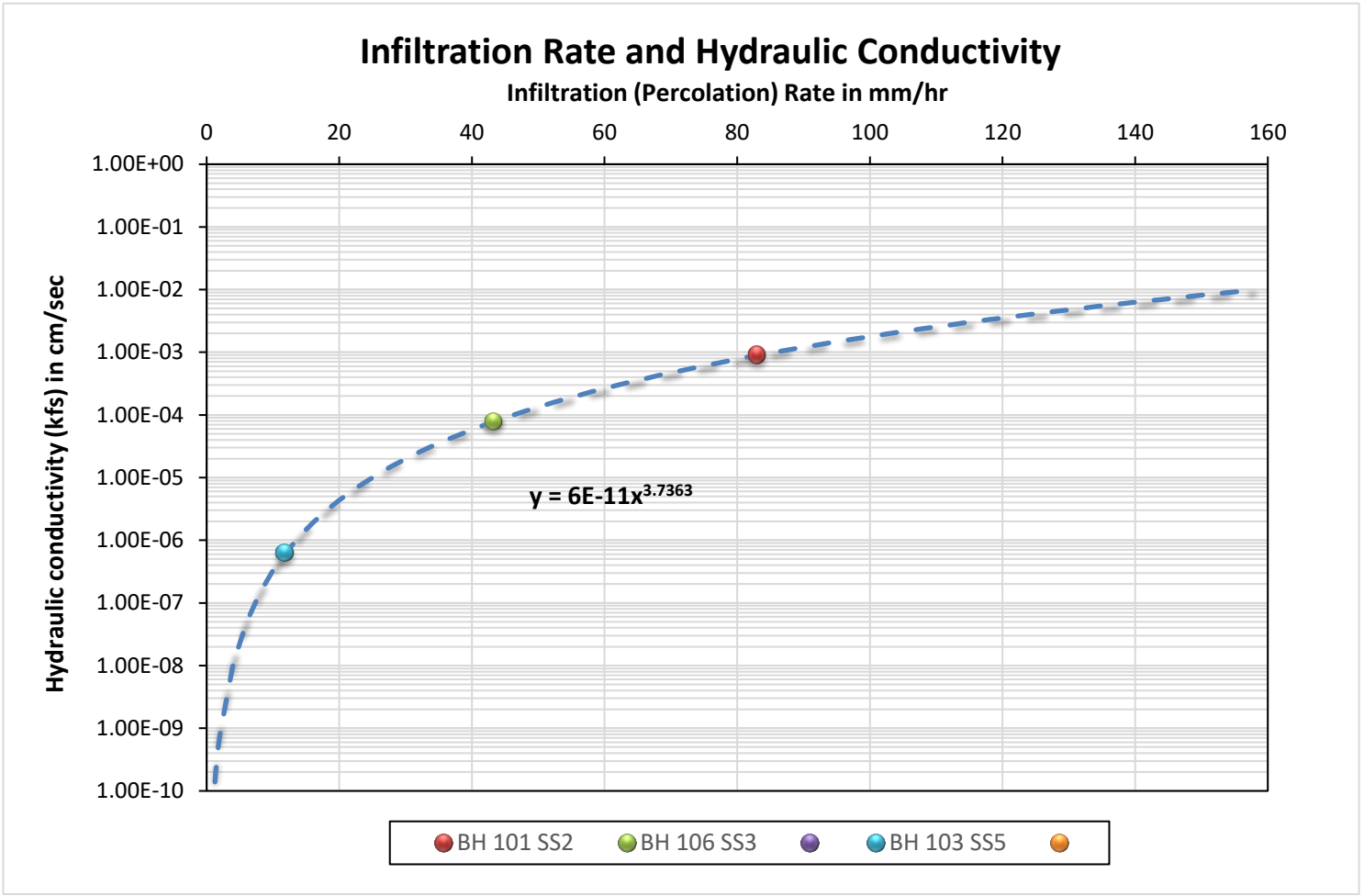
Kfs: field saturated hydraulic conductivity (cm/sec)

IR: infiltration rate (mm/hr)

DIR: design infiltration rate (mm/hr)

SCF: Safety Correction Factor (based on the chart recommended by CVC and TRCA, 2010)

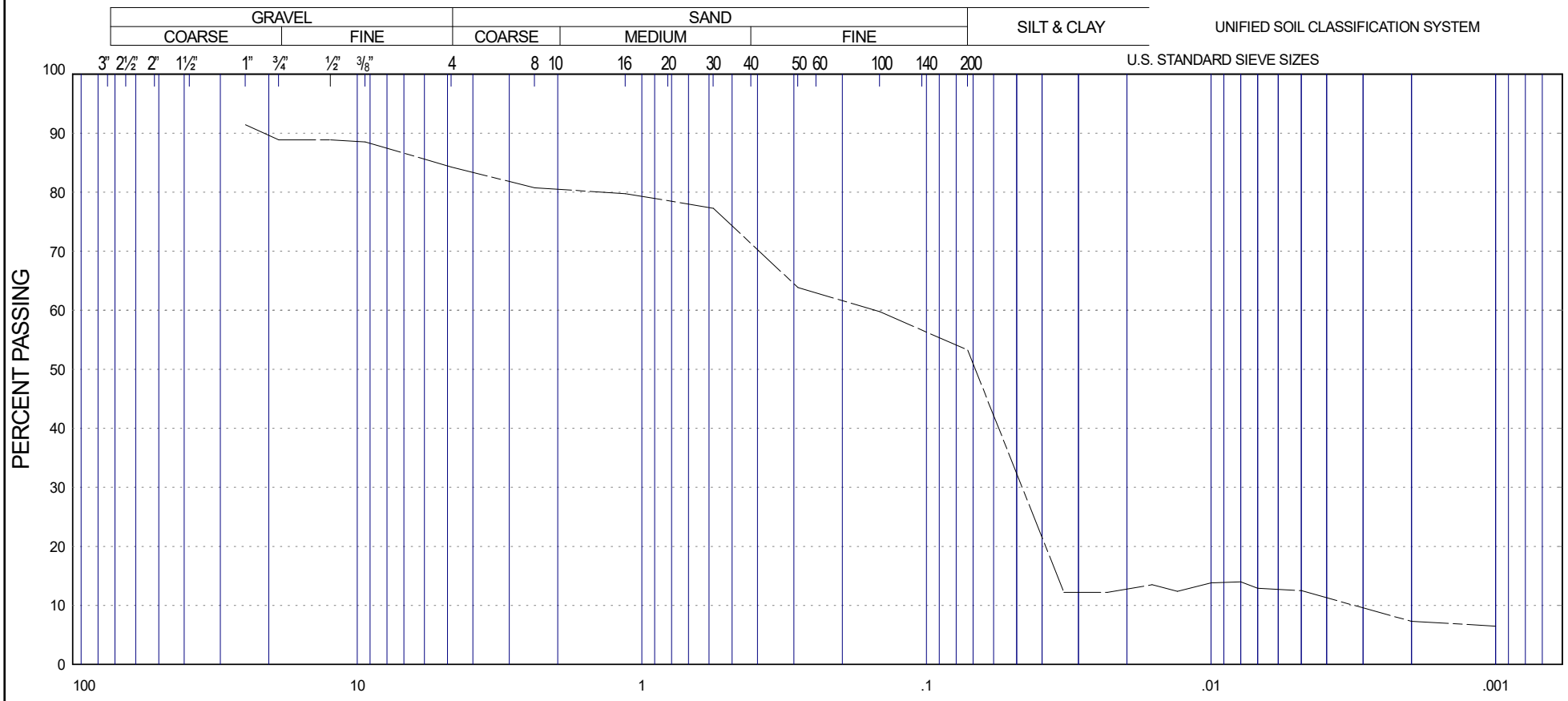
Safety Correction Factors	
Ratio of Mean Measured Infiltration Rates (Shallow/Deep)	Safety Correction Factor
</=1	2.5
1.1 to 4.0	3.5
4.1 to 8.0	4.5
8.1 to 16	6.5
16.1 or greater	8.5



Source: Ontario Ministry of Municipal Affairs and Housing. 1997. Supplementary Guidelines to the Ontario Building Code 1997. SG-6 Percolation Time and Soil Descriptions. Toronto, Ontario

GRAIN SIZE DISTRIBUTION

OUR REFERENCE N° G4130-22-12



PROJECT: Southgate Renewables Facility

LOCATION: 100 Eco Park Drive

BOREHOLE N°: 103

SAMPLE N°: 5

DEPTH: m±

ELEVATION: m±

COEFFICIENT OF UNIFORMITY:

COEFFICIENT OF CURVATURE:

Classification of Sample and Group Symbol:

SILT AND SAND, trace gravel

PLASTIC PROPERTIES

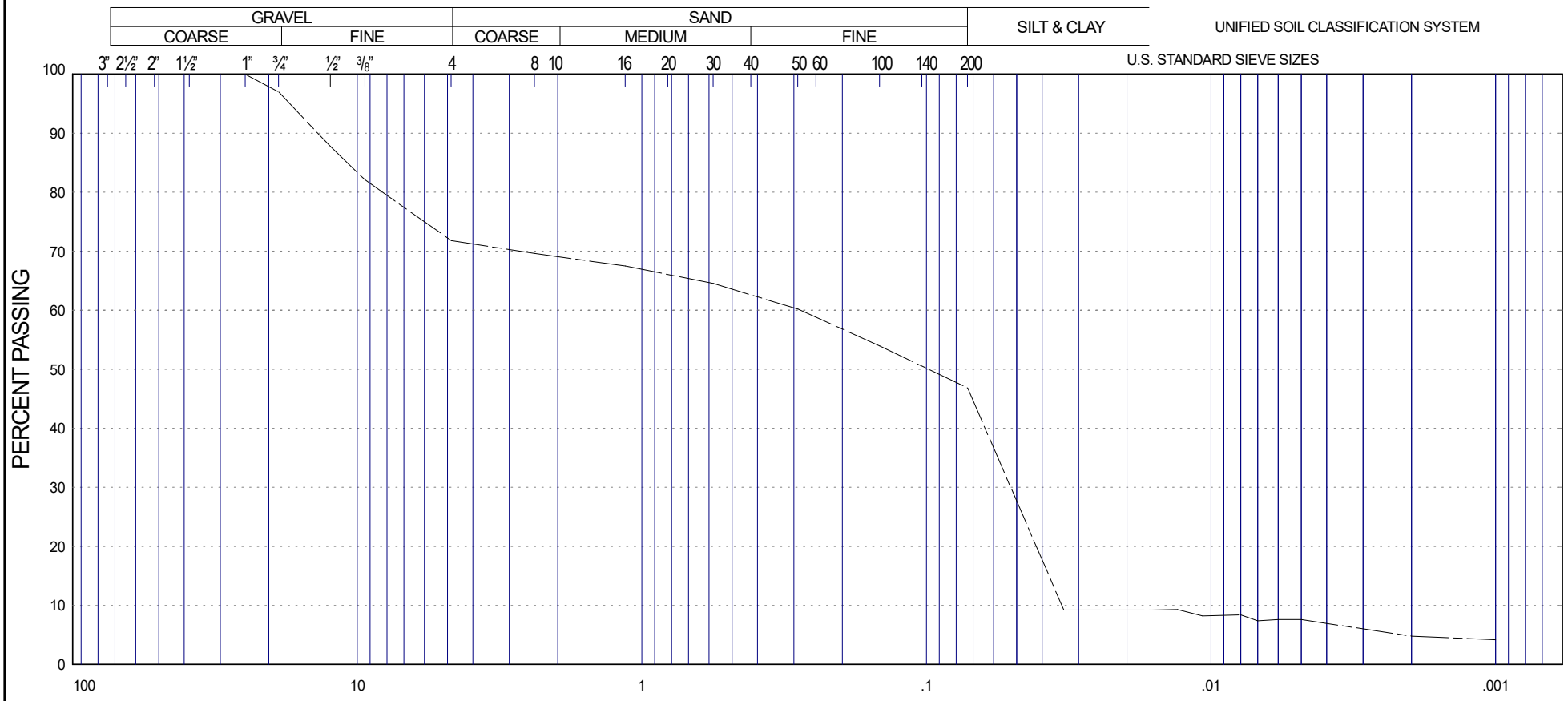
LIQUID LIMIT	% =
PLASTIC LIMIT	% =
PLASTICITY INDEX	% =
MOISTURE CONTENT	% = 9.8

ENCLOSURE N° 1

JLP SERVICES INC.

GRAIN SIZE DISTRIBUTION

OUR REFERENCE N° G4130-22-12



PROJECT: Southgate Renewables Facility

LOCATION: 100 Eco Parkway, Southgate, ON

BOREHOLE N°: 101

SAMPLE N°: 2

DEPTH: m±

ELEVATION: m±

COEFFICIENT OF UNIFORMITY:

COEFFICIENT OF CURVATURE:

Classification of Sample and Group Symbol:

Sandy SILT, some gravel, trace clay

PLASTIC PROPERTIES

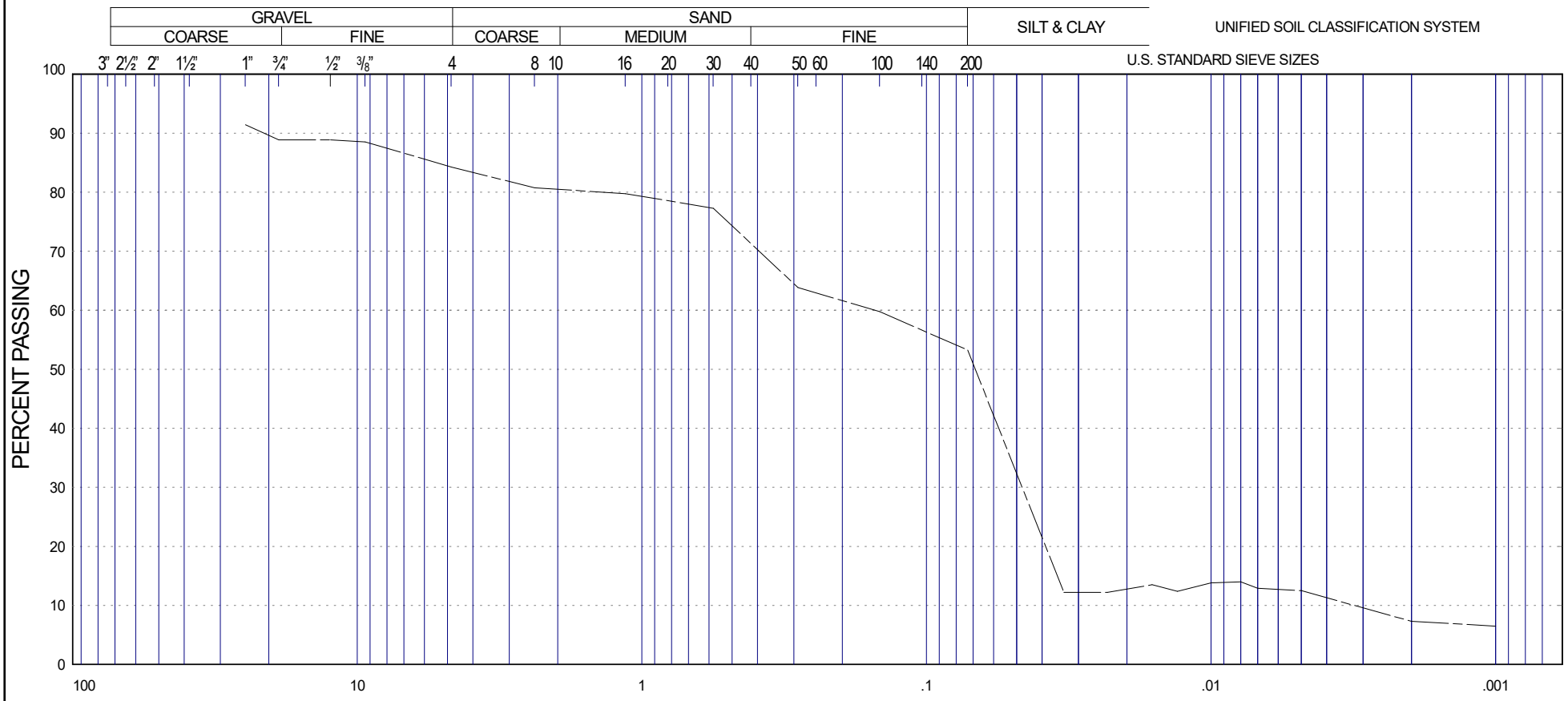
LIQUID LIMIT	% =
PLASTIC LIMIT	% =
PLASTICITY INDEX	% =
MOISTURE CONTENT	% = 8.7

ENCLOSURE N° 1

JLP SERVICES INC.

GRAIN SIZE DISTRIBUTION

OUR REFERENCE N° G4130-22-12



PROJECT: Southgate Renewables Facility

LOCATION: 100 Eco Park Drive

BOREHOLE N°: 103

SAMPLE N°: 5

DEPTH: m±

ELEVATION: m±

COEFFICIENT OF UNIFORMITY:

COEFFICIENT OF CURVATURE:

Classification of Sample and Group Symbol:

SILT AND SAND, trace gravel

PLASTIC PROPERTIES

LIQUID LIMIT	% =
PLASTIC LIMIT	% =
PLASTICITY INDEX	% =
MOISTURE CONTENT	% = 9.8

ENCLOSURE N° 1

JLP SERVICES INC.

Appendix F – Laboratory Certificates of Analysis

ALS Canada Ltd.

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CERTIFICATE OF ANALYSIS (GUIDELINE EVALUATION)

Work Order	: **WT2309312**	Page	: 1 of 5
Client	: **JLP Services Inc.**	Laboratory	: Waterloo - Environmental
Contact	: Ajay Jayalath	Account Manager	: Andrew Martin
Address	: 405 York Road Guelph ON Canada N1E 3H3	Address	: 60 Northland Road, Unit 1 Waterloo, Ontario Canada N2V 2B8
Telephone	: 519 763 3101	Telephone	: +1 519 886 6910
Project	: G4130	Date Samples Received	: 12-Apr-2023 16:20
PO	:	Date Analysis Commenced	: 13-Apr-2023
C-O-C number	: 20-1045571	Issue Date	: 20-Apr-2023 16:01
Sampler	: CLIENT		
Site	: ----		
Quote number	: Standing Offer 2022		
No. of samples received	: 1		
No. of samples analysed	: 1		

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Guideline Comparison

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QC Interpretive report to assist with Quality Review and Sample Receipt Notification (SRN).

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is conducted in accordance with US FDA 21 CFR Part 11.

Signatories	*Position*	*Laboratory Department*
Greg Pokocky	Manager - Inorganics	Inorganics, Waterloo, Ontario
Greg Pokocky	Manager - Inorganics	Metals, Waterloo, Ontario

General Comments

The analytical methods used by ALS are developed using internationally recognized reference methods (where available), such as those published by US EPA, APHA Standard Methods, ASTM, ISO, Environment Canada, BC MOE, and Ontario MOE. Refer to the ALS Quality Control Interpretive report (QCI) for applicable references and methodology summaries. Reference methods may incorporate modifications to improve performance.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.
Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QA/QC Compliance Assessment to assist with Quality Review and Sample Receipt Notification.

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Application of guidelines is provided "as is" without warranty of any kind, either expressed or implied, including, but not limited to fitness for a particular purpose, or non-infringement. ALS assumes no responsibility for errors or omissions in the information. Guidelines are not adjusted for the hardness, pH or temperature of the sample (the most conservative values are used). Measurement uncertainty is not applied to test results prior to comparison with specified criteria values.

Key : LOR: Limit of Reporting (detection limit).

Unit	*Description*
-	no units
µS/cm	microsiemens per centimetre
mg/L	milligrams per litre
NTU	nephelometric turbidity units
pH units	pH units

>: greater than.
<: less than.
Red shading is applied where the result or the LOR is greater than the Guideline Upper Limit (or lower than the Guideline Lower Limit, if applicable).
For drinking water samples, Red shading is applied where the result for E.coli, fecal or total coliforms is greater than or equal to the Guideline Upper Limit .

Qualifiers

Qualifier	*Description*
DLDS	*Detection Limit Raised: Dilution required due to high Dissolved Solids / Electrical Conductivity.*

Analytical Results

Sub-Matrix: **Water**
(Matrix: **Water**)

Analyte	Method	LOR	Unit	Client sample ID: BH/MW106 Sampling date/time: 11-Apr-2023 15:20 WT2309312-001	ONPWQO PWQOT2>100	ONPWQO PWQOT2>100				
Physical Tests										
Alkalinity, bicarbonate (as CaCO3)	E290	2.0	mg/L	245	--	--	--	--	--	--
Alkalinity, carbonate (as CO3)	E290	2.0	mg/L	8.6	--	--	--	--	--	--
Alkalinity, hydroxide (as OH)	E290	2.0	mg/L	<2.0	--	--	--	--	--	--
Alkalinity, total (as CaCO3)	E290	2.0	mg/L	259	--	--	--	--	--	--
Conductivity	E100	2.0	µS/cm	526	--	--	--	--	--	--
Hardness (as CaCO3), dissolved	EC100	0.50	mg/L	263	--	--	--	--	--	--
Langelier index (@ 20°C)	EC105A	0.010	-	0.756	--	--	--	--	--	--
Langelier index (@ 4°C)	EC105A	0.010	-	0.510	--	--	--	--	--	--
pH	E108	0.10	pH units	8.40	6.5 - 8.5 pH units	6.5 - 8.5 pH units	--	--	--	--
Solids, total dissolved [TDS]	E162	10	mg/L	248 DLDS	--	--	--	--	--	--
Turbidity	E121	0.10	NTU	3.43	--	--	--	--	--	--
pH, saturation (@ 4°C)	EC105A	0.010	pH units	7.89	--	--	--	--	--	--
pH, saturation (@ 20°C)	EC105A	0.010	pH units	7.64	--	--	--	--	--	--
Anions and Nutrients										
Ammonia, total (as N)	E298	0.0050	mg/L	0.0513	--	--	--	--	--	--
Chloride	E235.Cl	0.50	mg/L	18.0	--	--	--	--	--	--
Nitrate (as N)	E235.NO3	0.020	mg/L	<0.020	--	--	--	--	--	--
Nitrite (as N)	E235.NO2	0.010	mg/L	<0.010	--	--	--	--	--	--
Phosphate, ortho-, dissolved (as P)	E378-U	0.0010	mg/L	0.0056	--	--	--	--	--	--
Phosphorus, total	E372-U	0.0020	mg/L	0.0144	--	--	--	--	--	--
Sulfate (as SO4)	E235.SO4	0.30	mg/L	16.0	--	--	--	--	--	--
Organic / Inorganic Carbon										
Carbon, total organic [TOC]	E355-L	0.50	mg/L	2.15	--	--	--	--	--	--
Total Metals										
Aluminum, total	E420	0.0030	mg/L	0.0741	--	--	--	--	--	--
Antimony, total	E420	0.00010	mg/L	0.00033	--	--	--	--	--	--
Arsenic, total	E420	0.00010	mg/L	0.00141	0.1 mg/L	0.1 mg/L	--	--	--	--
Barium, total	E420	0.00010	mg/L	0.0329	--	--	--	--	--	--

Analyte	Method	LOR	Unit	WT2309312-001 (Continued)	ONPWQO PWQOT2>100	ONPWQO PWQOT2>100				
Total Metals - Continued										
Beryllium, total	E420	0.000020	mg/L	<0.000020	1.1 mg/L	0.011 mg/L	--	--	--	--
Boron, total	E420	0.010	mg/L	0.086	--	--	--	--	--	--
Cadmium, total	E420	0.0000050	mg/L	0.0000106	0.0002 mg/L	0.0002 mg/L	--	--	--	--
Calcium, total	E420	0.050	mg/L	22.8	--	--	--	--	--	--
Chromium, total	E420	0.00050	mg/L	<0.00050	--	--	--	--	--	--
Cobalt, total	E420	0.00010	mg/L	0.00019	--	--	--	--	--	--
Copper, total	E420	0.00050	mg/L	0.00143	0.005 mg/L	0.005 mg/L	--	--	--	--
Iron, total	E420	0.010	mg/L	0.093	0.3 mg/L	0.3 mg/L	--	--	--	--
Lead, total	E420	0.000050	mg/L	0.000220	0.005 mg/L	0.025 mg/L	--	--	--	--
Magnesium, total	E420	0.0050	mg/L	51.0	--	--	--	--	--	--
Manganese, total	E420	0.00010	mg/L	0.0243	--	--	--	--	--	--
Molybdenum, total	E420	0.000050	mg/L	0.00833	--	--	--	--	--	--
Nickel, total	E420	0.00050	mg/L	<0.00050	0.025 mg/L	0.025 mg/L	--	--	--	--
Potassium, total	E420	0.050	mg/L	6.58	--	--	--	--	--	--
Selenium, total	E420	0.000050	mg/L	0.000283	0.1 mg/L	0.1 mg/L	--	--	--	--
Silicon (as SiO2), total	EC420.SiO2	0.25	mg/L	10.7	--	--	--	--	--	--
Silicon, total	E420	0.10	mg/L	4.99	--	--	--	--	--	--
Silver, total	E420	0.000010	mg/L	<0.000010	0.0001 mg/L	0.0001 mg/L	--	--	--	--
Sodium, total	E420	0.050	mg/L	17.2	--	--	--	--	--	--
Strontium, total	E420	0.00020	mg/L	0.222	--	--	--	--	--	--
Thallium, total	E420	0.000010	mg/L	0.000011	--	--	--	--	--	--
Titanium, total	E420	0.00030	mg/L	0.00185	--	--	--	--	--	--
Tungsten, total	E420	0.00010	mg/L	0.00106	--	--	--	--	--	--
Uranium, total	E420	0.000010	mg/L	0.00128	--	--	--	--	--	--
Vanadium, total	E420	0.00050	mg/L	0.00068	--	--	--	--	--	--
Zinc, total	E420	0.0030	mg/L	0.0038	0.03 mg/L	0.03 mg/L	--	--	--	--
Zirconium, total	E420	0.00020	mg/L	<0.00020	--	--	--	--	--	--
Dissolved Metals										
Calcium, dissolved	E421	0.050	mg/L	21.6	--	--	--	--	--	--
Magnesium, dissolved	E421	0.0050	mg/L	50.7	--	--	--	--	--	--
Dissolved metals filtration location	EP421		-	Laboratory	--	--	--	--	--	--

Please refer to the General Comments section for an explanation of any qualifiers detected.

No Breaches Found

Key:

ONPWQO	Ontario PWQO (Provincial Water Quality Objectives, JULY, 1994)
PWQOT2>100	Surface Water T2 PWQOs (Hardness < 100 mg/L)

ALS Canada Ltd.

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SAMPLE RECEIPT NOTIFICATION (SRN)

Work Order	: **WT2309312**		
Client	: **JLP Services Inc.**	Laboratory	: Waterloo - Environmental
Contact	: Ajay Jayalath	Contact	: Andrew Martin
Address	: 405 York Road Guelph, ON Canada N1E 3H3	Address	: 60 Northland Road, Unit 1 Waterloo, Ontario Canada N2V 2B8
E-mail	: Ajay.Jayalath@jlpservices.ca	E-mail	: andrew.martin@alsglobal.com
Telephone	: 519 763 3101	Telephone	: +1 519 886 6910
Facsimile	: ----	Facsimile	: +1 519 886 9047
Project	: G4130	Page	: 1 of 5
Purchase order number	: ANDREW MARTIN	Quote number	: WT2022JLPS1000002 (Standing Offer 2022)
C-O-C number	: 20-1045571	QC Level	: ALS Canada Standard Quality Control
Site	: ----		
Sampler	: CLIENT		

Dates

Date Samples Received	: 12-Apr-2023 16:20	Issue Date	: 13-Apr-2023
Client Requested Due Date	: 20-Apr-2023	Scheduled Reporting Date	: 20-Apr-2023

Delivery Details

Mode of Delivery	: Undefined	Security Seal	: Not Available
No. of coolers/boxes	: ----	Temperature	: 10.0
Receipt Detail	:	No. of samples received / analyzed	: 1 / 1

General Comments

- This report contains the following information:
  - Sample Container(s)/Preservation Non-Compliances (if any)
  - Summary of Sample(s) and Requested Analysis
  - Proactive Holding Time Report
  - Requested Deliverables
- **Chain of Custody submitted incomplete, no analyses indicated. None of the bottles or CofC state that any portion of the sample was filtered for Dissolved Metals and Dissolved Organic Carbon, to be filtered and preserved in the lab.**
- *Where possible, ALS will store samples for the following durations, measured from date of sample submission: 30 days for Soil and Water samples; 6 months for Tissue/Biota samples; 14 days for air samples collected on re-usable media; and 3 days for water samples submitted for microbiological testing. Longer storage times are available upon request.*
- **Temperature is recorded in °C unless otherwise noted.**

Sample Container(s)/Preservation Non-Compliances (if any)

All comparisons are made against pretreatment/preservation practices published by CCME, BC ENV, Ontario MOE, Environment Canada, Health Canada, US EPA, APHA Standard Methods, ASTM, or ISO, and comply with provincial requirements for the laboratory location.

Method		
Client sample ID	Sample Container Received	Preferred Sample Container for Analysis
Dissolved Metals in Water by CRC ICPMS : E421		
BH/MW106	- HDPE [ON MECP]	- HDPE dissolved (nitric acid)

Summary of Sample(s) and Requested Analysis

Some items described below may be part of a laboratory process necessary for the execution of client requested tasks. Packages may contain additional analyses, such as the determination of moisture content and preparation tasks, that are included in the package.
If no sampling date is provided, the sampling date will be assumed by the laboratory and displayed in brackets without a time component.

Matrix: **Water**

Laboratory sample ID	*Client sampling date / time*	*Client sample ID*	Water - E100 Conductivity in Water (2µS/cm)	Water - E108 pH by Meter (Automated)	Water - E121 Turbidity by Nephelometry	Water - E162 TDS by Gravimetry (10mg/L)	Water - E235.Cl Chloride in Water by IC (0.5mg/L)	Water - E235.NO2 Nitrite in Water by IC (0.01mg/L)	Water - E235.NO3 Nitrate in Water by IC (0.02mg/L)	Water - E235.SO4 Sulfate in Water by IC (0.3mg/L)	Water - E290B Alkalinity Species by Titration (2 mg/L)	Water - E298 Ammonia by Fluorescence	Water - E355-L Total Organic Carbon (Non-Purgeable) by	Water - E372-U Total Phosphorus by Colourimetry (0.002 mg/L)	Water - E378-U Dissolved Orthophosphate by Colourimetry	Water - E420 Total Metals in Water by CRC ICPMS	Water - E421 Dissolved Metals in Water by CRC ICPMS	Water - EC100 Hardness	Water - EC105A Langelier Index using Laboratory pH (Ca-T)	Water - EC420.SiO2 Total Silicon as Silica (Calculation)
WT2309312-001	11-Apr-2023 15:20	BH/MW106	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

Proactive Holding Time Report

The following samples were received beyond the recommended holding times for the indicated tests.

Client Sample ID	*Test Method*	*Recommended Holding Time*
BH/MW106	E421	

Requested Deliverables

Ajay Jayalath

ALS Excel Report (ALS_MTABXL_CAN)	Email	Ajay.Jayalath@jlpservices.ca
Certificate of Analysis (Crosstab) (COA - CrossTab (CAN))	Email	Ajay.Jayalath@jlpservices.ca
Certificate of Analysis Guideline (One per Page) (COA - Guideline - One per Page (CAN))	Email	Ajay.Jayalath@jlpservices.ca
Interpretive Quality Control Report (QCI (CAN))	Email	Ajay.Jayalath@jlpservices.ca
Quality Control (QC (CAN))	Email	Ajay.Jayalath@jlpservices.ca
Sample Receipt Notification (standard format) (SRN - Short (CAN))	Email	Ajay.Jayalath@jlpservices.ca

Cindy Luu

ALS Excel Report (ALS_MTABXL_CAN)	Email	cindy.luu@jlpservices.ca
Certificate of Analysis (Crosstab) (COA - CrossTab (CAN))	Email	cindy.luu@jlpservices.ca
Certificate of Analysis Guideline (One per Page) (COA - Guideline - One per Page (CAN))	Email	cindy.luu@jlpservices.ca
Interpretive Quality Control Report (QCI (CAN))	Email	cindy.luu@jlpservices.ca
Quality Control (QC (CAN))	Email	cindy.luu@jlpservices.ca
Sample Receipt Notification (standard format) (SRN - Short (CAN))	Email	cindy.luu@jlpservices.ca

Susan Mackie

Tax Invoice (INVOICE (CAN))	Email	office@jlpservices.ca

Methods with Laboratory

Sale item

Method	Laboratory	Address	City	Province	Country
Alkalinity Species by Titration (2 mg/L)					
E290	Waterloo	60 Northland Road, Unit 1	Waterloo	Ontario	Canada
Ammonia by Fluorescence					
E298	Waterloo	60 Northland Road, Unit 1	Waterloo	Ontario	Canada
Chloride in Water by IC (0.5mg/L)					
E235.Cl	Waterloo	60 Northland Road, Unit 1	Waterloo	Ontario	Canada
Conductivity in Water (2µS/cm)					
E100	Waterloo	60 Northland Road, Unit 1	Waterloo	Ontario	Canada
Dissolved Metals in Water by CRC ICPMS					
E421	Waterloo	60 Northland Road, Unit 1	Waterloo	Ontario	Canada
Dissolved Metals Water Filtration					
EP421	Waterloo	60 Northland Road, Unit 1	Waterloo	Ontario	Canada
Dissolved Orthophosphate by Colourimetry (0.001 mg/L)					
E378-U	Waterloo	60 Northland Road, Unit 1	Waterloo	Ontario	Canada
Hardness					
EC100	Waterloo	60 Northland Road, Unit 1	Waterloo	Ontario	Canada
Langelier Index using Laboratory pH (Ca-T)					
EC105A	Waterloo	60 Northland Road, Unit 1	Waterloo	Ontario	Canada
Nitrate in Water by IC (0.02mg/L)					
E235.NO3	Waterloo	60 Northland Road, Unit 1	Waterloo	Ontario	Canada
Nitrite in Water by IC (0.01mg/L)					
E235.NO2	Waterloo	60 Northland Road, Unit 1	Waterloo	Ontario	Canada
pH by Meter (Automated)					
E108	Waterloo	60 Northland Road, Unit 1	Waterloo	Ontario	Canada
Sulfate in Water by IC (0.3mg/L)					
E235.SO4	Waterloo	60 Northland Road, Unit 1	Waterloo	Ontario	Canada
TDS by Gravimetry (10mg/L)					
E162	Waterloo	60 Northland Road, Unit 1	Waterloo	Ontario	Canada
Total Metals in Water by CRC ICPMS					
E420	Waterloo	60 Northland Road, Unit 1	Waterloo	Ontario	Canada
Total Organic Carbon (Non-Purgeable) by Combustion (0.5 mg/L) in Water					
E355-L	Waterloo	60 Northland Road, Unit 1	Waterloo	Ontario	Canada
Total Phosphorus by Colourimetry (0.002 mg/L)					

E372-U	Waterloo	60 Northland Road, Unit 1	Waterloo	Ontario	Canada
Total Silicon as Silica (Calculation)					
EC420.SiO2	Waterloo	60 Northland Road, Unit 1	Waterloo	Ontario	Canada
Turbidity by Nephelometry					
E121	Waterloo	60 Northland Road, Unit 1	Waterloo	Ontario	Canada

Chain of Custody (COC) / Analytical Request Form

www.alsglobal.com

Canada Toll Free: 1 800 668 9878

COC Number: 20 - 1045571

Page of

Report To	Contact and company name below will appear on the final report
Company:	SLR Services
Contact:	AJAY
Phone:	519-763-3101
	Company address below will appear on the final report
Street:	York Rd
City/Province:	Guelph
Postal Code:	N1E 3H3

Invoice To		
	Same as Report To	☑ YES ☐ NO
	Copy of Invoice with Report	☑ YES ☐ NO
Company:		
Contact:		

Project Information	
ALS Account # / Quote #	
Job #:	64130
PO / AFE:	Andrew Martin
LSD:	
ALS Lab Work Order # (ALS use only):	

Reports / Recipients

Select Report Format: ☑ PDF ☑ EXCEL ☐ EDD (DIGITAL)

Merge QC/QCI Reports with COA ☑ YES ☐ NO ☐ N/A

☑ Compare Results to Criteria on Report - provide details below if box checked

Select Distribution: ☑ EMAIL ☐ MAIL ☐ FAX

Email 1 or Fax: AJAY.JAYALATH@

Email 2: Cindy.Lui@

Email 3:

Invoice Recipients

Select Invoice Distribution: ☑ EMAIL ☐ MAIL ☐ FAX

Email 1 or Fax:

Email 2:

Oil and Gas Required Fields (client use)	
AFE/Cost Center:	PO#
Major/Minor Code:	Routing Code:
Requisitioner:	
Location:	

ALS Contact: Sampler:

Turnaround Time (TAT) Requested

☑ Routine [R] if received by 3pm M-F - no surcharges apply

☐ 4 day [P4] if received by 3pm M-F - 20% rush surcharge minimum

☐ 3 day [P3] if received by 3pm M-F - 25% rush surcharge minimum

☐ 2 day [P2] if received by 3pm M-F - 50% rush surcharge minimum

☐ 1 day [E] if received by 3pm M-F - 100% rush surcharge minimum

☐ Same day [E2] if received by 10am M-S - 200% rush surcharge. Additional fees may apply to rush requests on weekends, statutory holidays and non-routine tests

Date and Time Required for all E&P TATs: dd-mmm-yy hh:mm am/pm

For all tests with rush TATs requested, please contact your AM to confirm availability.

AFFIX ALS BARCODE LABEL HERE (ALS use only)

Analysis Request

Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below

ALS Sample # (ALS use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	NUMBER OF CONTAINERS	SAMPLES ON HOLD	EXTENDED STORAGE REQUIRED	SUSPECTED HAZARD (see notes)
	BH/MW106	11 April	3:20 PM	Water	5			

Environmental Division Waterloo

Work Order Reference

WT2309312

Telephone : +1 519 886 6910

Drinking Water (DW) Samples[1] (client use)

Are samples taken from a Regulated DW System?

☐ YES ☑ NO

Are samples for human consumption/ use?

☐ YES ☑ NO

Notes / Specify Limits for result evaluation by selecting from drop-down below (Excel COC only)

Screen against PWQO standards

SAMPLE RECEIPT DETAILS (ALS use only)

Cooling Method: ☐ NONE ☐ ICE ☐ ICE PACKS ☐ FROZEN ☐ COOLING INITIATED

Submission Comments Identified on Sample Receipt Notification: ☐ YES ☐ NO

Cooler Custody Seals Intact: ☐ YES ☐ N/A Sample Custody Seals Intact: ☐ YES ☐ N/A

INITIAL COOLER TEMPERATURES °C				FINAL COOLER TEMPERATURES °C			
				10.0			

SHIPMENT RELEASE (client use)		
Released by: Phillip Baradagrand	Date: 12 April 2023	Time:

INITIAL SHIPMENT RECEPTION (ALS use only)		
Received by:	Date:	Time:

FINAL SHIPMENT RECEPTION (ALS use only)		
Received by: AM	Date: 2023-04-12	Time: 4:20 PM

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

WHITE - LABORATORY COPY YELLOW - CLIENT COPY

AUG 2020 FRONT

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY. By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the back page of the white - report copy.

1. If any water samples are taken from a **Regulated Drinking Water (DW) System**, please submit using an **Authorized DW COC form**.

MM-824, N-693, GC-662

ALS Canada Ltd.

right solutions. right partner.

QUALITY CONTROL INTERPRETIVE REPORT

Work Order	: **WT2309312**	Page	: 1 of 10
Client	: **JLP Services Inc.**	Laboratory	: Waterloo - Environmental
Contact	: Ajay Jayalath	Account Manager	: Andrew Martin
Address	: 405 York Road Guelph ON Canada N1E 3H3	Address	: 60 Northland Road, Unit 1 Waterloo, Ontario Canada N2V 2B8
Telephone	: 519 763 3101	Telephone	: +1 519 886 6910
Project	: G4130	Date Samples Received	: 12-Apr-2023 16:20
PO	:	Issue Date	: 20-Apr-2023 16:01
C-O-C number	: 20-1045571		
Sampler	: CLIENT		
Site	: ----		
Quote number	: Standing Offer 2022		
No. of samples received	: 1		
No. of samples analysed	: 1		

This report is automatically generated by the ALS LIMS (Laboratory Information Management System) through evaluation of Quality Control (QC) results and other QA parameters associated with this submission, and is intended to facilitate rapid data validation by auditors or reviewers. The report highlights any exceptions and outliers to ALS Data Quality Objectives, provides holding time details and exceptions, summarizes QC sample frequencies, and lists applicable methodology references and summaries.

Key

Anonymous: Refers to samples which are not part of this work order, but which formed part of the QC process lot.
CAS Number: Chemical Abstracts Service number is a unique identifier assigned to discrete substances.
DQO: Data Quality Objective.
LOR: Limit of Reporting (detection limit).
RPD: Relative Percent Difference.

Workorder Comments

Holding times are displayed as "---" if no guidance exists from CCME, Canadian provinces, or broadly recognized international references.

Summary of Outliers

Outliers : Quality Control Samples

- No Method Blank value outliers occur.
- No Duplicate outliers occur.
- No Laboratory Control Sample (LCS) outliers occur
- No Matrix Spike outliers occur.
- No Test sample Surrogate recovery outliers exist.

Outliers: Reference Material (RM) Samples

- No Reference Material (RM) Sample outliers occur.

Outliers : Analysis Holding Time Compliance (Breaches)

- Analysis Holding Time Outliers exist - please see following pages for full details.

Outliers : Frequency of Quality Control Samples

- No Quality Control Sample Frequency Outliers occur.

Analysis Holding Time Compliance

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times, which are selected to meet known provincial and /or federal requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by organizations such as CCME, US EPA, APHA Standard Methods, ASTM, or Environment Canada (where available). Dates and holding times reported below represent the first dates of extraction or analysis. If subsequent tests or dilutions exceeded holding times, qualifiers are added (refer to COA).

If samples are identified below as having been analyzed or extracted outside of recommended holding times, measurement uncertainties may be increased, and this should be taken into consideration when interpreting results.

Where actual sampling date is not provided on the chain of custody, the date of receipt with time at 00:00 is used for calculation purposes.

Where only the sample date without time is provided on the chain of custody, the sampling date at 00:00 is used for calculation purposes.

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid) [ON MECP]										
BH/MW106	E298	11-Apr-2023	17-Apr-2023	----	----		18-Apr-2023	28 days	7 days	✓
Anions and Nutrients : Chloride in Water by IC										
HDPE [ON MECP]										
BH/MW106	E235.Cl	11-Apr-2023	14-Apr-2023	----	----		14-Apr-2023	28 days	3 days	✓
Anions and Nutrients : Dissolved Orthophosphate by Colourimetry (Ultra Trace Level 0.001										
HDPE [ON MECP]										
BH/MW106	E378-U	11-Apr-2023	15-Apr-2023	----	----		16-Apr-2023	7 days	5 days	✓
Anions and Nutrients : Nitrate in Water by IC										
HDPE [ON MECP]										
BH/MW106	E235.NO3	11-Apr-2023	14-Apr-2023	----	----		14-Apr-2023	7 days	3 days	✓
Anions and Nutrients : Nitrite in Water by IC										
HDPE [ON MECP]										
BH/MW106	E235.NO2	11-Apr-2023	14-Apr-2023	----	----		14-Apr-2023	7 days	3 days	✓
Anions and Nutrients : Sulfate in Water by IC										
HDPE [ON MECP]										
BH/MW106	E235.SO4	11-Apr-2023	14-Apr-2023	----	----		14-Apr-2023	28 days	3 days	✓

Matrix: **Water**

Evaluation: ✖ = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Anions and Nutrients : Total Phosphorus by Colourimetry (0.002 mg/L)										
Amber glass total (sulfuric acid) [ON MECP]										
BH/MW106	E372-U	11-Apr-2023	17-Apr-2023	----	----		18-Apr-2023	28 days	7 days	✓
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE [ON MECP]										
BH/MW106	E421	11-Apr-2023	14-Apr-2023	----	----		14-Apr-2023	0 hrs	9 hrs	✖ EHTR-FM
Organic / Inorganic Carbon : Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)										
Amber glass total (sulfuric acid) [ON MECP]										
BH/MW106	E355-L	11-Apr-2023	17-Apr-2023	----	----		18-Apr-2023	28 days	7 days	✓
Physical Tests : Alkalinity Species by Titration										
HDPE [ON MECP]										
BH/MW106	E290	11-Apr-2023	14-Apr-2023	----	----		14-Apr-2023	14 days	3 days	✓
Physical Tests : Conductivity in Water										
HDPE [ON MECP]										
BH/MW106	E100	11-Apr-2023	14-Apr-2023	----	----		14-Apr-2023	28 days	3 days	✓
Physical Tests : pH by Meter										
HDPE [ON MECP]										
BH/MW106	E108	11-Apr-2023	14-Apr-2023	----	----		14-Apr-2023	14 days	3 days	✓
Physical Tests : TDS by Gravimetry										
HDPE [ON MECP]										
BH/MW106	E162	11-Apr-2023	----	----	----		14-Apr-2023	7 days	3 days	✓
Physical Tests : Turbidity by Nephelometry										
HDPE [ON MECP]										
BH/MW106	E121	11-Apr-2023	----	----	----		15-Apr-2023	48 hrs	89 hrs	✖ EHT
Total Metals : Total metals in Water by CRC ICPMS										
HDPE total (nitric acid)										
BH/MW106	E420	11-Apr-2023	13-Apr-2023	----	----		14-Apr-2023	180 days	2 days	✓

Legend & Qualifier Definitions

EHTR-FM: Exceeded ALS recommended hold time prior to sample receipt. Field Measurement recommended

EHT: Exceeded ALS recommended hold time prior to analysis.

Rec. HT: ALS recommended hold time (see units).

Quality Control Parameter Frequency Compliance

The following report summarizes the frequency of laboratory QC samples analyzed within the analytical batches (QC lots) in which the submitted samples were processed. The actual frequency should be greater than or equal to the expected frequency.

Matrix: **Water**

Evaluation: × = QC frequency outside specification; ✓ = QC frequency within specification.

Quality Control Sample Type			Count		Frequency (%)		
Analytical Methods	*Method*	*QC Lot #*	*QC*	*Regular*	*Actual*	*Expected*	*Evaluation*
Laboratory Duplicates (DUP)							
Alkalinity Species by Titration	E290	897001	1	13	7.6	5.0	✓
Ammonia by Fluorescence	E298	899657	1	18	5.5	5.0	✓
Chloride in Water by IC	E235.Cl	897009	1	3	33.3	5.0	✓
Conductivity in Water	E100	897003	1	3	33.3	5.0	✓
Dissolved Metals in Water by CRC ICPMS	E421	896929	1	4	25.0	5.0	✓
Dissolved Orthophosphate by Colourimetry (Ultra Trace Level 0.001 mg/L)	E378-U	898615	1	20	5.0	5.0	✓
Nitrate in Water by IC	E235.NO3	897005	1	18	5.5	5.0	✓
Nitrite in Water by IC	E235.NO2	897004	1	9	11.1	5.0	✓
pH by Meter	E108	897002	1	12	8.3	5.0	✓
Sulfate in Water by IC	E235.SO4	897007	1	4	25.0	5.0	✓
TDS by Gravimetry	E162	897391	1	10	10.0	5.0	✓
Total metals in Water by CRC ICPMS	E420	896810	1	20	5.0	5.0	✓
Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)	E355-L	899659	1	16	6.2	5.0	✓
Total Phosphorus by Colourimetry (0.002 mg/L)	E372-U	899660	1	19	5.2	5.0	✓
Turbidity by Nephelometry	E121	898506	1	3	33.3	5.0	✓
Laboratory Control Samples (LCS)							
Alkalinity Species by Titration	E290	897001	1	13	7.6	5.0	✓
Ammonia by Fluorescence	E298	899657	1	18	5.5	5.0	✓
Chloride in Water by IC	E235.Cl	897009	1	3	33.3	5.0	✓
Conductivity in Water	E100	897003	1	3	33.3	5.0	✓
Dissolved Metals in Water by CRC ICPMS	E421	896929	1	4	25.0	5.0	✓
Dissolved Orthophosphate by Colourimetry (Ultra Trace Level 0.001 mg/L)	E378-U	898615	1	20	5.0	5.0	✓
Nitrate in Water by IC	E235.NO3	897005	1	18	5.5	5.0	✓
Nitrite in Water by IC	E235.NO2	897004	1	9	11.1	5.0	✓
pH by Meter	E108	897002	1	12	8.3	5.0	✓
Sulfate in Water by IC	E235.SO4	897007	1	4	25.0	5.0	✓
TDS by Gravimetry	E162	897391	1	10	10.0	5.0	✓
Total metals in Water by CRC ICPMS	E420	896810	1	20	5.0	5.0	✓
Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)	E355-L	899659	1	16	6.2	5.0	✓
Total Phosphorus by Colourimetry (0.002 mg/L)	E372-U	899660	1	19	5.2	5.0	✓
Turbidity by Nephelometry	E121	898506	1	3	33.3	5.0	✓
Method Blanks (MB)							
Alkalinity Species by Titration	E290	897001	1	13	7.6	5.0	✓
Ammonia by Fluorescence	E298	899657	1	18	5.5	5.0	✓
Chloride in Water by IC	E235.Cl	897009	1	3	33.3	5.0	✓

Matrix: **Water**

Evaluation: × = QC frequency outside specification; ✓ = QC frequency within specification.

Quality Control Sample Type			Count		Frequency (%)		
Analytical Methods	*Method*	*QC Lot #*	*QC*	*Regular*	*Actual*	*Expected*	*Evaluation*
Method Blanks (MB) - Continued							
Conductivity in Water	E100	897003	1	3	33.3	5.0	✓
Dissolved Metals in Water by CRC ICPMS	E421	896929	1	4	25.0	5.0	✓
Dissolved Orthophosphate by Colourimetry (Ultra Trace Level 0.001 mg/L)	E378-U	898615	1	20	5.0	5.0	✓
Nitrate in Water by IC	E235.NO3	897005	1	18	5.5	5.0	✓
Nitrite in Water by IC	E235.NO2	897004	1	9	11.1	5.0	✓
Sulfate in Water by IC	E235.SO4	897007	1	4	25.0	5.0	✓
TDS by Gravimetry	E162	897391	1	10	10.0	5.0	✓
Total metals in Water by CRC ICPMS	E420	896810	1	20	5.0	5.0	✓
Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)	E355-L	899659	1	16	6.2	5.0	✓
Total Phosphorus by Colourimetry (0.002 mg/L)	E372-U	899660	1	19	5.2	5.0	✓
Turbidity by Nephelometry	E121	898506	1	3	33.3	5.0	✓
Matrix Spikes (MS)							
Ammonia by Fluorescence	E298	899657	1	18	5.5	5.0	✓
Chloride in Water by IC	E235.Cl	897009	1	3	33.3	5.0	✓
Dissolved Metals in Water by CRC ICPMS	E421	896929	1	4	25.0	5.0	✓
Dissolved Orthophosphate by Colourimetry (Ultra Trace Level 0.001 mg/L)	E378-U	898615	1	20	5.0	5.0	✓
Nitrate in Water by IC	E235.NO3	897005	1	18	5.5	5.0	✓
Nitrite in Water by IC	E235.NO2	897004	1	9	11.1	5.0	✓
Sulfate in Water by IC	E235.SO4	897007	1	4	25.0	5.0	✓
Total metals in Water by CRC ICPMS	E420	896810	1	20	5.0	5.0	✓
Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)	E355-L	899659	1	16	6.2	5.0	✓
Total Phosphorus by Colourimetry (0.002 mg/L)	E372-U	899660	1	19	5.2	5.0	✓

Methodology References and Summaries

The analytical methods used by ALS are developed using internationally recognized reference methods (where available), such as those published by US EPA, APHA Standard Methods, ASTM, ISO, Environment Canada, BC MOE, and Ontario MOE. Reference methods may incorporate modifications to improve performance (indicated by "mod").

Analytical Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Conductivity in Water	E100 Waterloo - Environmental	Water	APHA 2510 (mod)	Conductivity, also known as Electrical Conductivity (EC) or Specific Conductance, is measured by immersion of a conductivity cell with platinum electrodes into a water sample. Conductivity measurements are temperature-compensated to 25°C.
pH by Meter	E108 Waterloo - Environmental	Water	APHA 4500-H (mod)	pH is determined by potentiometric measurement with a pH electrode, and is conducted at ambient laboratory temperature (normally 20 ± 5°C). For high accuracy test results, pH should be measured in the field within the recommended 15 minute hold time.
Turbidity by Nephelometry	E121 Waterloo - Environmental	Water	APHA 2130 B (mod)	Turbidity is measured by the nephelometric method, by measuring the intensity of light scatter under defined conditions.
TDS by Gravimetry	E162 Waterloo - Environmental	Water	APHA 2540 C (mod)	Total Dissolved Solids (TDS) are determined by filtering a sample through a glass fibre filter, with evaporation of the filtrate at 180 ± 2°C for 16 hours or to constant weight, with gravimetric measurement of the residue.
Chloride in Water by IC	E235.Cl Waterloo - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Nitrite in Water by IC	E235.NO2 Waterloo - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Nitrate in Water by IC	E235.NO3 Waterloo - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Sulfate in Water by IC	E235.SO4 Waterloo - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Alkalinity Species by Titration	E290 Waterloo - Environmental	Water	APHA 2320 B (mod)	Total alkalinity is determined by potentiometric titration to a pH 4.5 endpoint. Bicarbonate, carbonate and hydroxide alkalinity are calculated from phenolphthalein alkalinity and total alkalinity values.
Ammonia by Fluorescence	E298 Waterloo - Environmental	Water	Method Fialab 100, 2018	Ammonia in water is determined by automated continuous flow analysis with membrane diffusion and fluorescence detection, after reaction with OPA (ortho-phthalaldehyde). This method is approved under US EPA 40 CFR Part 136 (May 2021)

Analytical Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)	E355-L Waterloo - Environmental	Water	APHA 5310 B (mod)	Total Organic Carbon (Non-Purgeable), also known as NPOC (total), is a direct measurement of TOC after an acidified sample has been purged to remove inorganic carbon (IC). Analysis is by high temperature combustion with infrared detection of CO_2. NPOC does not include volatile organic species that are purged off with IC. For samples where the majority of total carbon (TC) is comprised of IC (which is common), this method is more accurate and more reliable than the TOC by subtraction method (i.e. TC minus TIC).
Total Phosphorus by Colourimetry (0.002 mg/L)	E372-U Waterloo - Environmental	Water	APHA 4500-P E (mod).	Total Phosphorus is determined colourimetrically using a discrete analyzer after heated persulfate digestion of the sample.
Dissolved Orthophosphate by Colourimetry (Ultra Trace Level 0.001 mg/L)	E378-U Waterloo - Environmental	Water	APHA 4500-P F (mod)	Dissolved Orthophosphate is determined colourimetrically on a sample that has been lab or field filtered through a 0.45 micron membrane filter. Field filtration is recommended to ensure test results represent conditions at time of sampling.
Total metals in Water by CRC ICPMS	E420 Waterloo - Environmental	Water	EPA 200.2/6020B (mod)	Water samples are digested with nitric and hydrochloric acids, and analyzed by Collision/Reaction Cell ICPMS. Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.
Dissolved Metals in Water by CRC ICPMS	E421 Waterloo - Environmental	Water	APHA 3030B/EPA 6020B (mod)	Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by Collision/Reaction Cell ICPMS. Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.
Dissolved Hardness (Calculated)	EC100 Waterloo - Environmental	Water	APHA 2340B	“Hardness (as $CaCO_3$), dissolved” is calculated from the sum of dissolved Calcium and Magnesium concentrations, expressed in $CaCO_3$ equivalents. “Total Hardness” refers to the sum of Calcium and Magnesium Hardness. Hardness is normally or preferentially calculated from dissolved Calcium and Magnesium concentrations, because it is a property of water due to dissolved divalent cations.
Saturation Index using Laboratory pH (Ca-T)	EC105A Waterloo - Environmental	Water	APHA 2330B	Langelier Index provides an indication of scale formation potential at a given pH and temperature, and is calculated as per APHA 2330B Saturation Index. Positive values indicate oversaturation with respect to $CaCO_3$. Negative values indicate undersaturation of $CaCO_3$. This calculation uses laboratory pH measurements and provides estimates of Langelier Index at temperatures of 4, 15, 20, 25, 66, and 77°C. Ryznar Stability Index is an alternative index used for scale formation and corrosion potential.
Total Silicon as Silica (Calculation)	EC420.SiO2 Waterloo - Environmental	Water	N/A	Total Silicon (as SiO_2) is a calculated parameter. Total Silicon (as SiO_2 mg/L) = 2.139 x Total Silicon (mg/L).

Preparation Methods	Method / Lab	Matrix	Method Reference	Method Descriptions

Preparation Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Preparation for Ammonia	EP298 Waterloo - Environmental	Water		Sample preparation for Preserved Nutrients Water Quality Analysis.
Preparation for Total Organic Carbon by Combustion	EP355 Waterloo - Environmental	Water		Preparation for Total Organic Carbon by Combustion
Digestion for Total Phosphorus in water	EP372 Waterloo - Environmental	Water	APHA 4500-P E (mod).	Samples are heated with a persulfate digestion reagent.
Dissolved Metals Water Filtration	EP421 Waterloo - Environmental	Water	APHA 3030B	Water samples are filtered (0.45 um), and preserved with HNO3.

QUALITY CONTROL REPORT

Work Order	: **WT2309312**	Page	: 1 of 10
Client	: JLP Services Inc.	Laboratory	: Waterloo - Environmental
Contact	: Ajay Jayalath	Account Manager	: Andrew Martin
Address	: 405 York Road Guelph ON Canada N1E 3H3	Address	: 60 Northland Road, Unit 1 Waterloo, Ontario Canada N2V 2B8
Telephone	:	Telephone	: +1 519 886 6910
Project	: G4130	Date Samples Received	: 12-Apr-2023 16:20
PO	:	Date Analysis Commenced	: 13-Apr-2023
C-O-C number	: 20-1045571	Issue Date	: 20-Apr-2023 16:05
Sampler	: CLIENT 519 763 3101		
Site	: ----		
Quote number	: Standing Offer 2022		
No. of samples received	: 1		
No. of samples analysed	: 1		

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percent Difference (RPD) and Data Quality Objectives
- Matrix Spike (MS) Report; Recovery and Data Quality Objectives
- Method Blank (MB) Report; Recovery and Data Quality Objectives
- Laboratory Control Sample (LCS) Report; Recovery and Data Quality Objectives

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is conducted in accordance with US FDA 21 CFR Part 11.

Signatories	*Position*	*Laboratory Department*
Greg Pokocky	Manager - Inorganics	Waterloo Inorganics, Waterloo, Ontario
Greg Pokocky	Manager - Inorganics	Waterloo Metals, Waterloo, Ontario

General Comments

The ALS Quality Control (QC) report is optionally provided to ALS clients upon request. ALS test methods include comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against predetermined Data Quality Objectives (DQOs) to provide confidence in the accuracy of associated test results. This report contains detailed results for all QC results applicable to this sample submission. Please refer to the ALS Quality Control Interpretation report (QCI) for applicable method references and methodology summaries.

Key :

Anonymous = Refers to samples which are not part of this work order, but which formed part of the QC process lot.
CAS Number = Chemical Abstracts Service number is a unique identifier assigned to discrete substances.
DQO = Data Quality Objective.
LOR = Limit of Reporting (detection limit).
RPD = Relative Percent Difference
# = Indicates a QC result that did not meet the ALS DQO.

Workorder Comments

Holding times are displayed as "---" if no guidance exists from CCME, Canadian provinces, or broadly recognized international references.

Laboratory Duplicate (DUP) Report

A Laboratory Duplicate (DUP) is a randomly selected intralaboratory replicate sample. Laboratory Duplicates provide information regarding method precision and sample heterogeneity. ALS DQOs for Laboratory Duplicates are expressed as test-specific limits for Relative Percent Difference (RPD), or as an absolute difference limit of 2 times the LOR for low concentration duplicates within ~ 4-10 times the LOR (cut-off is test-specific).

Sub-Matrix: **Water**

					Laboratory Duplicate (DUP) Report						
Laboratory sample ID	*Client sample ID*	*Analyte*	*CAS Number*	*Method*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD(%) or Difference*	*Duplicate Limits*	*Qualifier*
Physical Tests (QC Lot: 897001)											
WT2309304-001	Anonymous	Alkalinity, total (as CaCO3)	----	E290	2.0	mg/L	21.6	21.0	2.91%	20%	----
Physical Tests (QC Lot: 897002)											
WT2309304-001	Anonymous	pH	----	E108	0.10	pH units	6.71	6.64	1.05%	4%	----
Physical Tests (QC Lot: 897003)											
WT2309304-001	Anonymous	Conductivity	----	E100	2.0	µS/cm	150	151	0.731%	10%	----
Physical Tests (QC Lot: 897391)											
WT2309293-001	Anonymous	Solids, total dissolved [TDS]	----	E162	20	mg/L	323	326	0.771%	20%	----
Physical Tests (QC Lot: 898506)											
WT2309309-002	Anonymous	Turbidity	----	E121	0.10	NTU	222	221	0.452%	15%	----
Anions and Nutrients (QC Lot: 897004)											
WT2309304-001	Anonymous	Nitrite (as N)	14797-65-0	E235.NO2	0.010	mg/L	<0.010	<0.010	0	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 897005)											
WT2309304-001	Anonymous	Nitrate (as N)	14797-55-8	E235.NO3	0.020	mg/L	<0.020	<0.020	0	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 897007)											
WT2309304-001	Anonymous	Sulfate (as SO4)	14808-79-8	E235.SO4	0.30	mg/L	<0.30	<0.30	0	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 897009)											
WT2309304-001	Anonymous	Chloride	16887-00-6	E235.Cl	0.50	mg/L	34.6	34.6	0.0335%	20%	----
Anions and Nutrients (QC Lot: 898615)											
WT2309073-001	Anonymous	Phosphate, ortho-, dissolved (as P)	14265-44-2	E378-U	0.0010	mg/L	<0.0010	<0.0010	0	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 899657)											
BF2300011-005	Anonymous	Ammonia, total (as N)	7664-41-7	E298	0.0050	mg/L	0.0178	0.0177	0.0001	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 899660)											
BF2300011-006	Anonymous	Phosphorus, total	7723-14-0	E372-U	0.0020	mg/L	<0.0020	<0.0020	0	Diff <2x LOR	----
Organic / Inorganic Carbon (QC Lot: 899659)											
BF2300011-003	Anonymous	Carbon, total organic [TOC]	----	E355-L	0.50	mg/L	1.40	1.37	0.03	Diff <2x LOR	----
Total Metals (QC Lot: 896810)											
WT2309177-001	Anonymous	Aluminum, total	7429-90-5	E420	0.0300	mg/L	8.83	8.54	3.28%	20%	----
		Antimony, total	7440-36-0	E420	0.00100	mg/L	0.00249	0.00242	0.00007	Diff <2x LOR	----
		Arsenic, total	7440-38-2	E420	0.00100	mg/L	0.00727	0.00721	0.00005	Diff <2x LOR	----
		Barium, total	7440-39-3	E420	0.00100	mg/L	0.376	0.380	1.08%	20%	----

Sub-Matrix: **Water**

					Laboratory Duplicate (DUP) Report						
Laboratory sample ID	*Client sample ID*	*Analyte*	*CAS Number*	*Method*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD(%) or Difference*	*Duplicate Limits*	*Qualifier*
Total Metals (QC Lot: 896810) - continued											
WT2309177-001	Anonymous	Beryllium, total	7440-41-7	E420	0.000200	mg/L	0.000398	0.000388	0.000010	Diff <2x LOR	----
		Boron, total	7440-42-8	E420	0.100	mg/L	<0.100	<0.100	0	Diff <2x LOR	----
		Cadmium, total	7440-43-9	E420	0.0000500	mg/L	0.0000696	0.0000834	0.0000138	Diff <2x LOR	----
		Calcium, total	7440-70-2	E420	0.500	mg/L	148	144	2.58%	20%	----
		Chromium, total	7440-47-3	E420	0.00500	mg/L	0.0180	0.0185	0.00052	Diff <2x LOR	----
		Cobalt, total	7440-48-4	E420	0.00100	mg/L	0.00527	0.00517	0.00010	Diff <2x LOR	----
		Copper, total	7440-50-8	E420	0.00500	mg/L	0.0192	0.0185	0.00072	Diff <2x LOR	----
		Iron, total	7439-89-6	E420	0.100	mg/L	13.2	13.1	0.302%	20%	----
		Lead, total	7439-92-1	E420	0.000500	mg/L	0.00674	0.00647	4.08%	20%	----
		Magnesium, total	7439-95-4	E420	0.0500	mg/L	93.0	91.2	1.97%	20%	----
		Manganese, total	7439-96-5	E420	0.00100	mg/L	0.337	0.329	2.50%	20%	----
		Molybdenum, total	7439-98-7	E420	0.000500	mg/L	0.00370	0.00379	0.000080	Diff <2x LOR	----
		Nickel, total	7440-02-0	E420	0.00500	mg/L	0.0156	0.0151	0.00048	Diff <2x LOR	----
		Potassium, total	7440-09-7	E420	0.500	mg/L	3.92	3.76	0.158	Diff <2x LOR	----
		Selenium, total	7782-49-2	E420	0.000500	mg/L	<0.000500	<0.000500	0	Diff <2x LOR	----
		Silicon, total	7440-21-3	E420	1.00	mg/L	25.3	25.3	0.101%	20%	----
		Silver, total	7440-22-4	E420	0.000100	mg/L	<0.000100	<0.000100	0	Diff <2x LOR	----
		Sodium, total	7440-23-5	E420	0.500	mg/L	176	171	3.26%	20%	----
		Strontium, total	7440-24-6	E420	0.00200	mg/L	2.21	2.17	1.93%	20%	----
		Thallium, total	7440-28-0	E420	0.000100	mg/L	<0.000100	<0.000100	0	Diff <2x LOR	----
		Titanium, total	7440-32-6	E420	0.00300	mg/L	0.312	0.301	3.38%	20%	----
		Tungsten, total	7440-33-7	E420	0.00100	mg/L	<0.00100	<0.00100	0	Diff <2x LOR	----
		Uranium, total	7440-61-1	E420	0.000100	mg/L	0.00232	0.00222	4.28%	20%	----
		Vanadium, total	7440-62-2	E420	0.00500	mg/L	0.0221	0.0213	0.00080	Diff <2x LOR	----
		Zinc, total	7440-66-6	E420	0.0300	mg/L	0.0418	0.0417	0.00009	Diff <2x LOR	----
		Zirconium, total	7440-67-7	E420	0.00200	mg/L	<0.00200	<0.00200	0	Diff <2x LOR	----
Dissolved Metals (QC Lot: 896929)											
TY2302837-001	Anonymous	Calcium, dissolved	7440-70-2	E421	0.500	mg/L	44.7	44.8	0.0365%	20%	----
		Magnesium, dissolved	7439-95-4	E421	0.0500	mg/L	4.92	4.86	1.11%	20%	----

Method Blank (MB) Report

A Method Blank is an analyte-free matrix that undergoes sample processing identical to that carried out for test samples. Method Blank results are used to monitor and control for potential contamination from the laboratory environment and reagents. For most tests, the DQO for Method Blanks is for the result to be < LOR.

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Physical Tests (QCLot: 897001)						
Alkalinity, bicarbonate (as CaCO3)	----	E290	1	mg/L	<1.0	----
Alkalinity, total (as CaCO3)	----	E290	1	mg/L	<1.0	----
Physical Tests (QCLot: 897003)						
Conductivity	----	E100	1	µS/cm	<1.0	----
Physical Tests (QCLot: 897391)						
Solids, total dissolved [TDS]	----	E162	10	mg/L	<10	----
Physical Tests (QCLot: 898506)						
Turbidity	----	E121	0.1	NTU	<0.10	----
Anions and Nutrients (QCLot: 897004)						
Nitrite (as N)	14797-65-0	E235.NO2	0.01	mg/L	<0.010	----
Anions and Nutrients (QCLot: 897005)						
Nitrate (as N)	14797-55-8	E235.NO3	0.02	mg/L	<0.020	----
Anions and Nutrients (QCLot: 897007)						
Sulfate (as SO4)	14808-79-8	E235.SO4	0.3	mg/L	<0.30	----
Anions and Nutrients (QCLot: 897009)						
Chloride	16887-00-6	E235.Cl	0.5	mg/L	<0.50	----
Anions and Nutrients (QCLot: 898615)						
Phosphate, ortho-, dissolved (as P)	14265-44-2	E378-U	0.001	mg/L	<0.0010	----
Anions and Nutrients (QCLot: 899657)						
Ammonia, total (as N)	7664-41-7	E298	0.005	mg/L	<0.0050	----
Anions and Nutrients (QCLot: 899660)						
Phosphorus, total	7723-14-0	E372-U	0.002	mg/L	<0.0020	----
Organic / Inorganic Carbon (QCLot: 899659)						
Carbon, total organic [TOC]	----	E355-L	0.5	mg/L	<0.50	----
Total Metals (QCLot: 896810)						
Aluminum, total	7429-90-5	E420	0.003	mg/L	<0.0030	----
Antimony, total	7440-36-0	E420	0.0001	mg/L	<0.00010	----
Arsenic, total	7440-38-2	E420	0.0001	mg/L	<0.00010	----
Barium, total	7440-39-3	E420	0.0001	mg/L	<0.00010	----
Beryllium, total	7440-41-7	E420	0.00002	mg/L	<0.000020	----
Boron, total	7440-42-8	E420	0.01	mg/L	<0.010	----
Cadmium, total	7440-43-9	E420	0.000005	mg/L	<0.0000050	----

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Total Metals (QCLot: 896810) - continued						
Calcium, total	7440-70-2	E420	0.05	mg/L	<0.050	----
Chromium, total	7440-47-3	E420	0.0005	mg/L	<0.00050	----
Cobalt, total	7440-48-4	E420	0.0001	mg/L	<0.00010	----
Copper, total	7440-50-8	E420	0.0005	mg/L	<0.00050	----
Iron, total	7439-89-6	E420	0.01	mg/L	<0.010	----
Lead, total	7439-92-1	E420	0.00005	mg/L	<0.000050	----
Magnesium, total	7439-95-4	E420	0.005	mg/L	<0.0050	----
Manganese, total	7439-96-5	E420	0.0001	mg/L	<0.00010	----
Molybdenum, total	7439-98-7	E420	0.00005	mg/L	<0.000050	----
Nickel, total	7440-02-0	E420	0.0005	mg/L	<0.00050	----
Potassium, total	7440-09-7	E420	0.05	mg/L	<0.050	----
Selenium, total	7782-49-2	E420	0.00005	mg/L	<0.000050	----
Silicon, total	7440-21-3	E420	0.1	mg/L	<0.10	----
Silver, total	7440-22-4	E420	0.00001	mg/L	<0.000010	----
Sodium, total	7440-23-5	E420	0.05	mg/L	<0.050	----
Strontium, total	7440-24-6	E420	0.0002	mg/L	<0.00020	----
Thallium, total	7440-28-0	E420	0.00001	mg/L	<0.000010	----
Titanium, total	7440-32-6	E420	0.0003	mg/L	<0.00030	----
Tungsten, total	7440-33-7	E420	0.0001	mg/L	<0.00010	----
Uranium, total	7440-61-1	E420	0.00001	mg/L	<0.000010	----
Vanadium, total	7440-62-2	E420	0.0005	mg/L	<0.00050	----
Zinc, total	7440-66-6	E420	0.003	mg/L	<0.0030	----
Zirconium, total	7440-67-7	E420	0.0002	mg/L	<0.00020	----
Dissolved Metals (QCLot: 896929)						
Calcium, dissolved	7440-70-2	E421	0.05	mg/L	<0.050	----
Magnesium, dissolved	7439-95-4	E421	0.005	mg/L	<0.0050	----

Laboratory Control Sample (LCS) Report

A Laboratory Control Sample (LCS) is an analyte-free matrix that has been fortified (spiked) with test analytes at known concentration and processed in an identical manner to test samples. LCS results are expressed as percent recovery, and are used to monitor and control test method accuracy and precision, independent of test sample matrix.

Sub-Matrix: **Water**

					Laboratory Control Sample (LCS) Report				
					Spike	Recovery (%)	Recovery Limits (%)		
Analyte	CAS Number	Method	LOR	Unit	Concentration	LCS	Low	High	Qualifier
Physical Tests (QCLot: 897001)									
Alkalinity, total (as CaCO3)	----	E290	1	mg/L	150 mg/L	101	85.0	115	----
Physical Tests (QCLot: 897002)									
pH	----	E108	----	pH units	7 pH units	101	98.0	102	----
Physical Tests (QCLot: 897003)									
Conductivity	----	E100	1	µS/cm	1409 µS/cm	99.1	90.0	110	----
Physical Tests (QCLot: 897391)									
Solids, total dissolved [TDS]	----	E162	10	mg/L	1000 mg/L	97.8	85.0	115	----
Physical Tests (QCLot: 898506)									
Turbidity	----	E121	0.1	NTU	200 NTU	92.5	85.0	115	----
Anions and Nutrients (QCLot: 897004)									
Nitrite (as N)	14797-65-0	E235.NO2	0.01	mg/L	0.5 mg/L	99.7	90.0	110	----
Anions and Nutrients (QCLot: 897005)									
Nitrate (as N)	14797-55-8	E235.NO3	0.02	mg/L	2.5 mg/L	102	90.0	110	----
Anions and Nutrients (QCLot: 897007)									
Sulfate (as SO4)	14808-79-8	E235.SO4	0.3	mg/L	100 mg/L	102	90.0	110	----
Anions and Nutrients (QCLot: 897009)									
Chloride	16887-00-6	E235.Cl	0.5	mg/L	100 mg/L	101	90.0	110	----
Anions and Nutrients (QCLot: 898615)									
Phosphate, ortho-, dissolved (as P)	14265-44-2	E378-U	0.001	mg/L	0.0212 mg/L	112	80.0	120	----
Anions and Nutrients (QCLot: 899657)									
Ammonia, total (as N)	7664-41-7	E298	0.005	mg/L	0.2 mg/L	95.4	85.0	115	----
Anions and Nutrients (QCLot: 899660)									
Phosphorus, total	7723-14-0	E372-U	0.002	mg/L	0.845 mg/L	96.8	80.0	120	----
Organic / Inorganic Carbon (QCLot: 899659)									
Carbon, total organic [TOC]	----	E355-L	0.5	mg/L	8.57 mg/L	95.7	80.0	120	----
Total Metals (QCLot: 896810)									
Aluminum, total	7429-90-5	E420	0.003	mg/L	0.1 mg/L	95.4	80.0	120	----
Antimony, total	7440-36-0	E420	0.0001	mg/L	0.05 mg/L	100	80.0	120	----
Arsenic, total	7440-38-2	E420	0.0001	mg/L	0.05 mg/L	102	80.0	120	----

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Laboratory Control Sample (LCS) Report				
					Spike	Recovery (%)	Recovery Limits (%)		
					Concentration	LCS	Low	High	Qualifier
Total Metals (QCLot: 896810) - continued									
Barium, total	7440-39-3	E420	0.0001	mg/L	0.0125 mg/L	103	80.0	120	----
Beryllium, total	7440-41-7	E420	0.00002	mg/L	0.005 mg/L	99.2	80.0	120	----
Boron, total	7440-42-8	E420	0.01	mg/L	0.05 mg/L	97.0	80.0	120	----
Cadmium, total	7440-43-9	E420	0.000005	mg/L	0.005 mg/L	101	80.0	120	----
Calcium, total	7440-70-2	E420	0.05	mg/L	2.5 mg/L	99.0	80.0	120	----
Chromium, total	7440-47-3	E420	0.0005	mg/L	0.0125 mg/L	99.5	80.0	120	----
Cobalt, total	7440-48-4	E420	0.0001	mg/L	0.0125 mg/L	99.4	80.0	120	----
Copper, total	7440-50-8	E420	0.0005	mg/L	0.0125 mg/L	98.7	80.0	120	----
Iron, total	7439-89-6	E420	0.01	mg/L	0.05 mg/L	101	80.0	120	----
Lead, total	7439-92-1	E420	0.00005	mg/L	0.025 mg/L	100	80.0	120	----
Magnesium, total	7439-95-4	E420	0.005	mg/L	2.5 mg/L	97.8	80.0	120	----
Manganese, total	7439-96-5	E420	0.0001	mg/L	0.0125 mg/L	99.6	80.0	120	----
Molybdenum, total	7439-98-7	E420	0.00005	mg/L	0.0125 mg/L	101	80.0	120	----
Nickel, total	7440-02-0	E420	0.0005	mg/L	0.025 mg/L	98.0	80.0	120	----
Potassium, total	7440-09-7	E420	0.05	mg/L	2.5 mg/L	99.4	80.0	120	----
Selenium, total	7782-49-2	E420	0.00005	mg/L	0.05 mg/L	99.8	80.0	120	----
Silicon, total	7440-21-3	E420	0.1	mg/L	0.5 mg/L	100	80.0	120	----
Silver, total	7440-22-4	E420	0.00001	mg/L	0.005 mg/L	98.8	80.0	120	----
Sodium, total	7440-23-5	E420	0.05	mg/L	2.5 mg/L	102	80.0	120	----
Strontium, total	7440-24-6	E420	0.0002	mg/L	0.0125 mg/L	105	80.0	120	----
Thallium, total	7440-28-0	E420	0.00001	mg/L	0.05 mg/L	100	80.0	120	----
Titanium, total	7440-32-6	E420	0.0003	mg/L	0.0125 mg/L	98.6	80.0	120	----
Tungsten, total	7440-33-7	E420	0.0001	mg/L	0.005 mg/L	102	80.0	120	----
Uranium, total	7440-61-1	E420	0.00001	mg/L	0.00025 mg/L	103	80.0	120	----
Vanadium, total	7440-62-2	E420	0.0005	mg/L	0.025 mg/L	101	80.0	120	----
Zinc, total	7440-66-6	E420	0.003	mg/L	0.025 mg/L	97.9	80.0	120	----
Zirconium, total	7440-67-7	E420	0.0002	mg/L	0.005 mg/L	105	80.0	120	----
Dissolved Metals (QCLot: 896929)									
Calcium, dissolved	7440-70-2	E421	0.05	mg/L	2.5 mg/L	101	80.0	120	----
Magnesium, dissolved	7439-95-4	E421	0.005	mg/L	2.5 mg/L	105	80.0	120	----

Matrix Spike (MS) Report

A Matrix Spike (MS) is a randomly selected intra-laboratory replicate sample that has been fortified (spiked) with test analytes at known concentration, and processed in an identical manner to test samples. Matrix Spikes provide information regarding analyte recovery and potential matrix effects. MS DQO exceedances due to sample matrix may sometimes be unavoidable; in such cases, test results for the associated sample (or similar samples) may be subject to bias. ND – Recovery not determined, background level >= 1x spike level.

Sub-Matrix: **Water**

					Matrix Spike (MS) Report					
					Spike		Recovery (%)	Recovery Limits (%)		
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	Concentration	Target	MS	Low	High	Qualifier
Anions and Nutrients (QCLot: 897004)										
WT2309304-001	Anonymous	Nitrite (as N)	14797-65-0	E235.NO2	0.457 mg/L	0.5 mg/L	91.4	75.0	125	----
Anions and Nutrients (QCLot: 897005)										
WT2309304-001	Anonymous	Nitrate (as N)	14797-55-8	E235.NO3	2.53 mg/L	2.5 mg/L	101	75.0	125	----
Anions and Nutrients (QCLot: 897007)										
WT2309304-001	Anonymous	Sulfate (as SO4)	14808-79-8	E235.SO4	97.9 mg/L	100 mg/L	97.9	75.0	125	----
Anions and Nutrients (QCLot: 897009)										
WT2309304-001	Anonymous	Chloride	16887-00-6	E235.Cl	98.6 mg/L	100 mg/L	98.6	75.0	125	----
Anions and Nutrients (QCLot: 898615)										
WT2309073-001	Anonymous	Phosphate, ortho-, dissolved (as P)	14265-44-2	E378-U	0.0181 mg/L	0.0196 mg/L	92.6	70.0	130	----
Anions and Nutrients (QCLot: 899657)										
BF2300011-005	Anonymous	Ammonia, total (as N)	7664-41-7	E298	0.0995 mg/L	0.1 mg/L	99.5	75.0	125	----
Anions and Nutrients (QCLot: 899660)										
BF2300011-006	Anonymous	Phosphorus, total	7723-14-0	E372-U	0.0915 mg/L	0.1 mg/L	91.5	70.0	130	----
Organic / Inorganic Carbon (QCLot: 899659)										
BF2300011-003	Anonymous	Carbon, total organic [TOC]	----	E355-L	5.02 mg/L	5 mg/L	100	70.0	130	----
Total Metals (QCLot: 896810)										
WT2309182-001	Anonymous	Aluminum, total	7429-90-5	E420	0.106 mg/L	0.1 mg/L	106	70.0	130	----
		Antimony, total	7440-36-0	E420	0.0500 mg/L	0.05 mg/L	100.0	70.0	130	----
		Arsenic, total	7440-38-2	E420	0.0541 mg/L	0.05 mg/L	108	70.0	130	----
		Barium, total	7440-39-3	E420	ND mg/L	0.0125 mg/L	ND	70.0	130	----
		Beryllium, total	7440-41-7	E420	0.00545 mg/L	0.005 mg/L	109	70.0	130	----
		Boron, total	7440-42-8	E420	0.049 mg/L	0.05 mg/L	98.2	70.0	130	----
		Cadmium, total	7440-43-9	E420	0.00516 mg/L	0.005 mg/L	103	70.0	130	----
		Calcium, total	7440-70-2	E420	ND mg/L	2.5 mg/L	ND	70.0	130	----
		Chromium, total	7440-47-3	E420	0.0133 mg/L	0.0125 mg/L	106	70.0	130	----
		Cobalt, total	7440-48-4	E420	0.0129 mg/L	0.0125 mg/L	104	70.0	130	----
		Copper, total	7440-50-8	E420	0.0126 mg/L	0.0125 mg/L	101	70.0	130	----
		Iron, total	7439-89-6	E420	0.052 mg/L	0.05 mg/L	104	70.0	130	----
		Lead, total	7439-92-1	E420	0.0241 mg/L	0.025 mg/L	96.6	70.0	130	----

Sub-Matrix: **Water**

					Matrix Spike (MS) Report					
					Spike		Recovery (%)	Recovery Limits (%)		
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	Concentration	Target	MS	Low	High	Qualifier
Total Metals (QCLot: 896810) - continued										
WT2309182-001	Anonymous	Magnesium, total	7439-95-4	E420	ND mg/L	2.5 mg/L	ND	70.0	130	----
		Manganese, total	7439-96-5	E420	ND mg/L	0.0125 mg/L	ND	70.0	130	----
		Molybdenum, total	7439-98-7	E420	0.0124 mg/L	0.0125 mg/L	99.3	70.0	130	----
		Nickel, total	7440-02-0	E420	0.0246 mg/L	0.025 mg/L	98.3	70.0	130	----
		Potassium, total	7440-09-7	E420	ND mg/L	2.5 mg/L	ND	70.0	130	----
		Selenium, total	7782-49-2	E420	0.0495 mg/L	0.05 mg/L	99.0	70.0	130	----
		Silicon, total	7440-21-3	E420	ND mg/L	0.5 mg/L	ND	70.0	130	----
		Silver, total	7440-22-4	E420	0.00446 mg/L	0.005 mg/L	89.3	70.0	130	----
		Sodium, total	7440-23-5	E420	ND mg/L	2.5 mg/L	ND	70.0	130	----
		Strontium, total	7440-24-6	E420	ND mg/L	0.0125 mg/L	ND	70.0	130	----
		Thallium, total	7440-28-0	E420	0.0472 mg/L	0.05 mg/L	94.4	70.0	130	----
		Titanium, total	7440-32-6	E420	0.0136 mg/L	0.0125 mg/L	109	70.0	130	----
		Tungsten, total	7440-33-7	E420	0.00529 mg/L	0.005 mg/L	106	70.0	130	----
		Uranium, total	7440-61-1	E420	0.000255 mg/L	0.00025 mg/L	102	70.0	130	----
		Vanadium, total	7440-62-2	E420	0.0285 mg/L	0.025 mg/L	114	70.0	130	----
		Zinc, total	7440-66-6	E420	0.0238 mg/L	0.025 mg/L	95.4	70.0	130	----
		Zirconium, total	7440-67-7	E420	0.00530 mg/L	0.005 mg/L	106	70.0	130	----
Dissolved Metals (QCLot: 896929)										
TY2302837-002	Anonymous	Calcium, dissolved	7440-70-2	E421	ND mg/L	25 mg/L	ND	70.0	130	----
		Magnesium, dissolved	7439-95-4	E421	24.9 mg/L	25 mg/L	99.5	70.0	130	----

Chain of Custody (COC) / Analytical Request Form

www.alsglobal.com

Canada Toll Free: 1 800 668 9878

COC Number: 20 - 1045571

Page of

Report To	Contact and company name below will appear on the final report
Company:	SLR Services
Contact:	AJAY
Phone:	519-763-3101
	Company address below will appear on the final report
Street:	York Rd
City/Province:	Guelph
Postal Code:	N1E 3H3

Invoice To		
	Same as Report To	☑ YES ☐ NO
	Copy of Invoice with Report	☑ YES ☐ NO
Company:		
Contact:		

Project Information	
ALS Account # / Quote #	
Job #:	64130
PO / AFE:	Andrew Martin
LSD:	
ALS Lab Work Order # (ALS use only):	

Reports / Recipients

Select Report Format: ☑ PDF ☑ EXCEL ☐ EDD (DIGITAL)

Merge QC/QCI Reports with COA ☑ YES ☐ NO ☐ N/A

☑ Compare Results to Criteria on Report - provide details below if box checked

Select Distribution: ☑ EMAIL ☐ MAIL ☐ FAX

Email 1 or Fax: AJAY.JAYALATH@

Email 2: Cindy.Lui@

Email 3:

Invoice Recipients

Select Invoice Distribution: ☑ EMAIL ☐ MAIL ☐ FAX

Email 1 or Fax:

Email 2:

Oil and Gas Required Fields (client use)	
AFE/Cost Center:	PO#
Major/Minor Code:	Routing Code:
Requisitioner:	
Location:	

ALS Contact: Sampler:

Turnaround Time (TAT) Requested

☑ Routine [R] if received by 3pm M-F - no surcharges apply

☐ 4 day [P4] if received by 3pm M-F - 20% rush surcharge minimum

☐ 3 day [P3] if received by 3pm M-F - 25% rush surcharge minimum

☐ 2 day [P2] if received by 3pm M-F - 50% rush surcharge minimum

☐ 1 day [E] if received by 3pm M-F - 100% rush surcharge minimum

☐ Same day [E2] if received by 10am M-S - 200% rush surcharge. Additional fees may apply to rush requests on weekends, statutory holidays and non-routine tests

Date and Time Required for all E&P TATs: dd-mmm-yy hh:mm am/pm

For all tests with rush TATs requested, please contact your AM to confirm availability.

AFFIX ALS BARCODE LABEL HERE (ALS use only)

Analysis Request

Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below

ALS Sample # (ALS use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	NUMBER OF CONTAINERS	SAMPLES ON HOLD	EXTENDED STORAGE REQUIRED	SUSPECTED HAZARD (see notes)
	BH/MW106	11 April	3:20 PM	Water	5			

Environmental Division Waterloo

Work Order Reference

WT2309312

Telephone : +1 519 886 6910

Drinking Water (DW) Samples[1] (client use)

Are samples taken from a Regulated DW System?

☐ YES ☑ NO

Are samples for human consumption/ use?

☐ YES ☑ NO

Notes / Specify Limits for result evaluation by selecting from drop-down below (Excel COC only)

Screen against PWQO standards

SAMPLE RECEIPT DETAILS (ALS use only)

Cooling Method: ☐ NONE ☐ ICE ☐ ICE PACKS ☐ FROZEN ☐ COOLING INITIATED

Submission Comments Identified on Sample Receipt Notification: ☐ YES ☐ NO

Cooler Custody Seals Intact: ☐ YES ☐ N/A Sample Custody Seals Intact: ☐ YES ☐ N/A

INITIAL COOLER TEMPERATURES °C				FINAL COOLER TEMPERATURES °C			
				10.0			

SHIPMENT RELEASE (client use)		
Released by: Phillip Baradagrand	Date: 12 April 2023	Time:

INITIAL SHIPMENT RECEPTION (ALS use only)		
Received by:	Date:	Time:

FINAL SHIPMENT RECEPTION (ALS use only)		
Received by: AM	Date: 2023-04-12	Time: 4:20 PM

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

WHITE - LABORATORY COPY YELLOW - CLIENT COPY

AUG 2020 FRONT

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY. By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the back page of the white - report copy.

1. If any water samples are taken from a **Regulated Drinking Water (DW) System**, please submit using an **Authorized DW COC form**.

MM-824, N-693, GC-662

Appendix G – Construction Dewatering Rates

Appendix G

Dewatering Flow Rate Estimates - Short-Term

100 Eco Park Way, Southgate, Ontario

Table G-1: Short-Term Dewatering Rates for Buildings and Tanks

Parameters	Unit	Value			
		Bldg. A*	Bldn A - Secondary Containment Pit Area	Bldg. B	Pump Shelter + Tanks + Pasteurizer + Spill Contaiment Area
Finished Flow elevation	masl	508.4	505.4	508.75	505.4
Highest Groundwater Elevation	masl	508.1	508.1	508.1	507.7
Lowest Foundation Elevation	masl	507.40	504.40	507.75	504.40
Dewatering Target Elevation	masl	506.40	503.40	506.75	503.40
Base of Aquifer / Water Bearing Zone	masl	497.0	497.0	497.0	497.0
Height of Static Water Table Above the Base of the Water-Bearing Zone (H)	m	11.10	11.10	11.10	10.70
Height of Target Water Level Above the Base of Water-Bearing Zone (hw)	m	9.40	6.40	9.75	6.40
Length of Excavation	m	30.4	25.0	13.6	100.0
Width of Excavation	m	22.9	6.1	10.5	75.0
Hydraulic Conductivity (K)	m/s	5.17E-07	5.17E-07	5.17E-07	5.17E-07
Specific Yield (Sy)		0.15	0.15	0.15	0.15
Time (days)		30	30	30	30
Time (t)	s	2,592,000	2,592,000	2,592,000	2,592,000
Radius of Influence Estimates					
Equivalent Radius (re)	m	16.97	9.90	7.67	55.70
Radius of Influence (from excavation boundary) (R0)	m	14.94	14.94	14.94	14.67
Dewatering Rate Estimates					
Dewatering Flow Rate (Q)	L/day	**7,740**	**12,550**	**3,650**	**44,150**
Factor of Safety (Fs)	-	2.0	2.0	2.0	2.0
Dewatering Flow Rate Multiplied by Factor of Safety (QxFs)	L/day	**15,480**	**25,100**	**7,300**	**88,300**
Assumed Precipitation Event	mm/day	15	15	15	15
Volume from Precipitation	L/day	**10,440**	**2,290**	**2,140**	**112,500**
Total Volume - GW Discharge Discharge withh SF + Precipitation	L/day	**25,920**	**27,390**	**9,440**	**200,800**

*without containment pit area

**check notes

$$R_0 = \sqrt{2.25KDt/S}$$

(Cooper - Jacob)

$$r_e = \frac{a+b}{\pi}$$

$$R_{o-mod} = R_0 + r_e$$

if R0 <r e

$$Q_w = \frac{\pi K(H^2 - h^2)}{Ln\,[\frac{R_o}{r_e}]}$$

(Dupuit-Forcheimer)

Notes:
Tank 1 - Anaerobic Digester Tanks (3 tanks)
Tank 2 – Hydrolyzer Tanks (2 tanks),
Tank 3 - Digester Storage Tank (1 tank):

Where:

Q_w = Dewatering flow rate (L/s)

K = Hydraulic conductivity (m/s)

H = Height of static water table above base of aquifer (m)

h_w = Height of target water level above the base of aquifer (m)

R0-mod= Modified Radius of Influence (m)

R_o=Radius of influence (m)

re=Equivalent perimeter (m)

Appendix G

Dewatering Flow Rate Estimates - Short-Term

100 Eco Park Way, Southgate, Ontario

Table G-2: Short-Term Dewatering Rates for SWM Pond and Servicing

Parameters	Unit	Services
Finished grade/invert Elevation	masl	
Highest Groundwater Elevation	mbgs	0.0
SWM Bottom/Lowest Invert Elevation	mbgs	4.0
Dewatered Elevation Target	mbgs	5.0
Top of the Water-Bearing Zone	mbgs	0.0
Base of the Water-Bearing Zone	mbgs	8.0
Height of Water Table Above the Base of Water-Bearing Zone (H)	m	8.0
Height of Dewatering Target Above the Base of Water-Bearing Zone (h)	m	3.0
Hydraulic Conductivity (K)	m/s	5.17E-07
Length of Excavation (x_1)	m	15.0
Width of Excavation (x_2)	m	2.0

Radius of Influence	Unit	Value
Method to Calculate Radius of Influence	-	**Sichardt**
Radius of Influence from Sides of Excavation	m	10.8
Distance to Linear Source from Sides of excavation (L_0)	m	5.4

Dewatering Rates	Unit	Value
Dewatering Flow Rate (unconfined linear) (Q)	m^3/day	**7,740**
Factor of Safety (F_s)	-	2.00
Dewatering Flow Rate (multiplied by factor of safety) Q_{FS}	m^3/day	**15,480**
Assumed Precipitation Event	mm/day	15
Volume from Precipitation	m^3/day	**450**
Total Volume (GW Discharge Discharge withh SF + Precipitation)	m^3/day	**15,930**

Lamina Flow from an Unconfined Aquifer to a Fully-Penetrating Excavation

$$Q_w = xK(H^2 - h^2)/Lo$$ (Based on the Dupuit Equation)

$$\mathrm{R_s} = C(H - h)\sqrt{(K)}$$

Where:

Qw = Rate of Pumping (m^3/s)

x_1 = Length of Excavation (m)

x_2 = Width of Excavation (m)

K = Hydraulic Conductivity (m/s)

L_0 = Distance to Line Source, assumed R_0/2 (m)

R = Radius of Influence (R_0)

H = Aquifer Thickness / Initial Water Column Thickness (m)

h = Final Water Column Thickness (m)

C = Constant (3000)

Appendix H – Water Balance Assessment

Appendix H-1: Model Input and Output

100 Eco Park Way, Southgate, Ontario

Climatic Station: Proton Station, Ontario
Climate Station ID: 6116750

Table H-1-1 - Model Input

Year	Month	Ave. Temperature (^{0}C)	Ave Precipitation (mm)
1972-2001	January	-8.8	109.9
1972-2001	February	-8.3	82.6
1972-2001	March	-3.4	81.5
1972-2001	April	4.0	73.3
1972-2001	May	10.9	83.0
1972-2001	June	15.4	89.5
1972-2001	July	17.8	78.7
1972-2001	August	17.1	95.6
1972-2001	September	12.9	101.5
1972-2001	October	6.9	90.8
1972-2001	November	0.9	104.7
1972-2001	December	-5.4	102.6
		Annual Precipitation	1093.8

PET	Potential Evapotranspiration
P	Precipitation
AET	Actual Evapotranspiration

Table H-1-2 - Model Output

Month	PET	P	P-PET	Soil Moisture	AET	PET-AET	Snow Storage	Surplus
January	7.3	109.9	25.3	147.9	7.3	0.0	131.4	26.8
February	8.6	82.6	37.6	147.1	8.6	0.0	167.9	38.4
March	16.6	81.5	122.5	150.0	16.6	0.0	110.2	119.6
April	32.8	73.3	143.9	150.0	32.8	0.0	6.8	143.9
May	62.7	83.0	27.1	145.2	62.7	0.0	0.0	31.9
June	87.2	89.5	2.3	135.1	86.8	0.4	0.0	12.8
July	100.2	78.7	-21.4	109.4	97.7	2.4	0.0	6.7
August	81.6	95.6	14.0	115.4	79.3	2.3	0.0	10.3
September	47.9	101.5	53.6	139.2	47.6	0.3	0.0	30.1
October	26.3	90.8	64.5	147.9	26.3	0.0	0.0	55.8
November	13.5	104.7	86.0	150.0	13.5	0.0	5.2	83.9
December	8.3	102.6	45.1	149.4	8.3	0.0	54.5	45.6
Annual Rate (mm/year)	492.97	**1093.84**			**487.48**			**606.35**

	Climatic Station	Site
Longitude	-80.51	-80.39
Latitude	44.51	44.14
Elevation (masl)	480.1	506-508

Appendix H-2 - Average Infiltration Factors

100 Eco Park Way, Southgate, Ontario

Table H-2-1 - Weighted Infiltration Factor

Category	Pre-Development Permeable Areas		Post-Development Permeable Areas	
	Description	Weighted Infiltration Factor	Description	Weighted Infiltration Factor
Topography/Slope	Topography/Slope	0.15	Topography/Slope	0.15
Soil Type	60% sand and gravel 40% silt	0.20	60% sand and gravel 40% Clay and loam	0.2
Cover	Cultivated/Open Lands	0.1	Cultivated/Landscaped Lands	0.10
Total Weighted Infiltration Factor	**Pre-Development**	**0.45**	**Post-Development**	**0.45**

Attachment H-3 - Summary of Pre- Vs Post-Development Water Balance Assessment

100 Eco Park Way, Southgate, Ontario

Table H-3-1: Pre- and Post Development Climate Data

Description	Pre-Development	Post-Development
	mm/year	mm/year
Precipitation	1093.84	1093.84
Evapotranspiration	487.48	487.48
Water Surplus	606.35	606.35
Infiltration	272.86	272.86
Runoff	333.49	333.49

Table H-3-2: Pre- and Post Development Area Statistics

Description	Pre-Development	Post-Development		
	m^2	m^2		
ROW (Roads, Side Walks, Parking), Paved Surfaces,tanks	0	7,660	0.00%	18.96%
Buildings /Building Roofs	0	6,627	0.00%	16.41%
Drainage Features including dry pond Area	6,000	6,750	14.85%	16.71%
Open spaces / Landscaped (GWL below 1 mbgs)	1,000	2,210	2.48%	5.47%
Open spaces / Landscape areas with GWL above ground/<1 mbgs	33,394	17,147	82.67%	42.45%
TOTAL	40,394	40,394	100.0%	100.0%

Table H-3-3: Pre-Development Water Balance

Land Use	Area	Precipitation	Actual Evapotranspiration	Infiltration	Run-off
	m^2	m^3/year	m^3/year	m^3/year	m^3/year
ROW (Roads, Side Walks, Parking), Paved Surfaces	0	0	0	0	0
Buildings /Building Roofs	0	0	0	0	0
Drainage features including Wetland Area	6,000	6,563	2,925	0	3,638
Open spaces/Landscaped (GWL below 1 mbgs)	1,000	1,094	487	273	333
Open spaces / Landscape areas with GWL above ground/<1 mbgs	33,394	36,528	16,279	0	20,249
Total	40,394	44,184	19,691	273	24,220
	Percentage	100.0%	44.6%	0.62%	54.8%

Table H-3-4: Post-Development Water Balance

Land Use	Area	Precipitation	Actual Evapotranspiration	Infiltration Rate	Run-off
	m^2	m^3	m^3/year	m^3/year	m^3/year
ROW (Roads, Side Walks, Parking), Paved Surfaces	7,660	8,379	0	0	8,379
Buildings /Building Roofs	6,627	7,249	0	0	7,249
Drainage features including Wetland Area	6,750	7,383	3,291	0	4,093
Open spaces/Landscaped (GWL below 1 mbgs)	2,210	2,417	1,077	603	737
Open spaces / Landscape areas with GWL above ground/<1 mbgs	17,147	18,756	8,359	0	10,397
TOTAL	40,394	44,184	12,727	603	30,855
Percentage (%)		100.0%	28.8%	1.36%	69.8%

Table H-3-5: Site Specific Pre- and Post Development Rates

Development Stage	Precipitation	Actual Evapotranspiration	Infiltration Rate	Run-off
	mm/year	mm/year	mm/year	mm/year
Pre-development Infiltration Rate	1093.84	487.48	6.75	599.60
Post-development Infiltration Rate	1093.83	315.06	14.93	763.84

Table H-3-6: Pre- Vs Post-Development Water Balance Deficit

Development Stage	Precipitation	Actual Evapotranspiration	Infiltration (including Areas with WL<1 mbgs)	Run-off
	m^3/year	m^3/year	m^3/year	m^3/year
Pre-Development	44,184	19,691	273	24,220
Post Development	44,184	12,727	603	30,855
Infiltration Deficit			**-330**	

Attachment H-4: Feature Based Water Balance Results

100 Eco Park Way, Southgate, Ontario

H-4-1: Climate Data

Description	Pre-Development mm/year	Post-Development Un-Mitigated mm/year
Precipitation	1093.84	1093.84
Evapotranspiration	487.48	487.48
Water Surplus	606.35	606.35
Infiltration Rate	272.86	272.86
Runoff	333.49	333.49

H-4-2: Pre- and Post-Development Area Statistics - Total Site

Description	Pre-Development	Post-Development
	m^2	m^2
ROW (Roads, Side Walks, Parking), Paved Surfaces,tanks	0	7,660
Buildings /Building Roofs	0	6,627
Drainage Features including Wetland Area	6,000	6,750
Open spaces / Landscaped (GWL below 1 mbgs)	1,000	2,210
Open spaces / Landscape areas with GWL above ground/<1 mbgs	33,394	17,147
TOTAL	40,394	40,394

H-4-3: Annual Pre-Development Water Balance

H-4-3-1: Annual Pre-Development Water Balance (Total Site Area)

Land Use	Area	Precipitation	Actual Evapotranspiration	Infiltration Rate *	Run-off
	m^2	m^3/year	m^3/year	m^3/year	m^3/year
ROW (Roads, Side Walks, Parking), Paved Surfaces,tanks	0	0	**0**	**0**	0
Buildings /Building Roofs	0	0	0	0	0
Drainage Features including Wetland Area	6,000	6,563	2,925	0	3,638
Open spaces / Landscaped (GWL below 1 mbgs)	1,000	1,094	487	273	333
Open spaces / Landscape areas with GWL above ground/<1 mbgs*	33,394	36,528	16,279	0	20,249
TOTAL	40,394	44,184	19,691	273	24,220
PERCENTAGE		100%	44.6%	0.6%	54.8%
		Pre-development Infiltration Rate (total site)		**6.75**	**mm/year**

*Notes: * for areas with groundwater at ground surface/<1 mbgs considered having zero infiltration.*

H-4-3-2: Annual Pre-Development Water Balance - Sub-Drainage Basin 1

Land Use	Area	Precipitation	Actual Evapotranspiration	Infiltration Rate *	Run-off
	m^2	m^3/year	m^3/year	m^3/year	m^3/year
ROW (Roads, Side Walks, Parking), Paved Surfaces,tanks	850	930	414	0	515
Buildings /Building Roofs	100	109	49	0	61
Drainage Features including Wetland Areas	98,840	108,115	48,183	0	59,932
Open spaces / Landscaped (GWL below 1 mbgs)	458,930	501,994	223,721	125,223	153,051
Open spaces / Landscape areas with GWL above ground/<1 mbgs*	33,394	36,528	16,279	0	20,249
TOTAL	592,114	647,676	288,646	125,223	233,807
PERCENTAGE		100%	45%	19%	36%
		Pre-development Infiltration Rate		**211.48**	**mm/year**

*Notes: * for areas with groundwater at ground surface/<1 mbgs considered having zero infiltration.*
Soil conditions assumed similer to the site soil conditions

H-4-3-3: Annual Pre-Development Water Balance - Sub-Drainage Basin 2

Land Use	Area	Precipitation	Actual Evapotranspiration	Infiltration	Run-off
	m^2	m^3	m^3	m3	m3
ROW (Roads, Side Walks, Parking), Paved Surfaces,tanks	27,000	29,534	13,162	0	16,372
Buildings /Building Roofs	13,470	14,734	6,566	0	8,168
Drainage Features including Wetland Area	439,400	480,632	214,200	0	266,432
Open spaces / Landscaped (GWL below 1 mbgs)	449,980	492,205	219,358	122,781	150,066
Open spaces / Landscape areas with GWL above ground/<1 mbgs*	0	0	0	0	0
TOTAL	929,850	1,017,104	453,286	122,781	441,037
PERCENTAGE		100%	44.6%	12.1%	43.4%

*Notes: * for areas with groundwater at ground surface/<1 mbgs considered having zero infiltration.*

H-4-4: Annual Post-Development Water Balance Un-Mitigated

H-4-4-1: Annual Post-Development Water Balance (Total Site Area)

Land Use	Area	Precipitation	Actual Evapotranspiration	Infiltration Rate *	Run-off
	m^2	m^3	m^3	m^3	m^3
ROW (Roads, Side Walks, Parking), Paved Surfaces,tanks	7,660	8,379	**0**	**0**	8,379
Buildings /Building Roofs	6,627	7,249	0	0	7,249
Drainage Features including Wetland Area	6,750	7,383	3,291	0	4,093
Open spaces / Landscaped (GWL below 1 mbgs)	2,210	2,417	1,077	603	737
Open spaces / Landscape areas with GWL above ground/<1 mbgs*	17,147	18,756	8,359	0	10,397
TOTAL	40,394	44,184	12,727	603	30,855
	PERCENTAGE	100.0%	28.8%	1.4%	69.8%
		Post-development Infiltration Rate	**Un-Mitigated (total site)**	**14.9**	**mm/a**

*Notes: * for areas with groundwater at ground surface with zero infiltration.*

H-4-4-2: Annual Post-Development Water Balance - Sub-Drainage Basin 1

Land Use	Area	Precipitation	Actual Evapotranspiration	Infiltration Rate *	Run-off
	m^2	m^3	m^3	m^3	m^3
ROW (Roads, Side Walks, Parking), Paved Surfaces,tanks	8,510	9,309	0	**0**	9,309
Buildings /Building Roofs	6,727	7,358	0	0	7,358
Drainage Features including Wetland Area	99,590	108,935	48,548	0	60,387
Open spaces / Landscaped (GWL below 1 mbgs)	460,140	503,318	224,311	125,553	153,454
Open spaces / Landscape areas with GWL above ground/<1 mbgs*	17,147	18,756	8,359	0	10,397
TOTAL	592,114	647,676	272,859	125,553	230,508
	PERCENTAGE	100%	42%	19%	36%
		Post-development Infiltration Rate	**Un-Mitigated**	**212.0**	**mm/a**

*Notes: * for areas with groundwater at ground surface with zero infiltration.*
Soil conditions assumed similer to the site soil conditions

H-4-4-3: Annual Post-Development Water Balance - Sub-Drainage Basin 2

Land Use	Area	Precipitation	Actual Evapotranspiration	Infiltration	Run-off
	(m^2)	(m^3)	(m^3)	(m^3)	(m^3)
ROW (Roads, Side Walks, Parking), Paved Surfaces,tanks	27,000	29,534	0	0	29,534
Buildings /Building Roofs	13,470	14,734	0	0	14,734
Drainage Features including Wetland Area	439,400	480,632	214,200	0	266,432
Open spaces / Landscaped (GWL below 1 mbgs)	449,980	492,205	219,358	122,781	150,066
Open spaces / Landscape areas with GWL above ground/<1 mbgs*	0	0	0	0	0
TOTAL	**929,850**	**1,017,104**	**433,558**	**122,781**	**460,765**
	PERCENTAGE	100.0	42.6	12.1	45.3

H-4-5: Comparison of Pre- and Post-Development

H-4-5-1: Pre- Vs Post-Development (for Total Site Area)

Development Stage	Precipitation	Actual Evapotranspiration	Infiltration	Run-off
	m^3	m^3	m^3	m^3
Pre-Development	44,184	19,691	273	24,220
Post Development	44,184	12,727	603	30,855
Deficit Post Development Un-Mitigated			**-330**	

H-4-5-2: Pre- Vs Post-Development - Sub-Drainage Basin 1

Development Phase	Precipitation	Actual Evapotranspiration	Infiltration	Run-Off
	m^3	m^3	m^3	m^3
Pre-Development	647,676	288,646	125,223	233,807
Post Development	647,676	272,859	125,553	230,508
Deficit Post Development Un-Mitigated			**-330**	
Deficit compared to pre-development infiltration rate			-0.26%	

H-4-5-3: Annual Pre- Vs Post-Development Water Balance - Sub-Drainage Basin 2

Development Phase	Precipitation	Actual Evapotranspiration	Infiltration	Run-Off
	m^3	m^3	m^3	m^3
Pre-Development	1,017,104	453,286	122,781	441,037
Post Development	1,017,104	433,558	122,781	460,765
Deficit Post Development Un-Mitigated			**0**	
Deficit compared to pre-development infiltration rate			0.0%	

H-4-5-4: Annual Pre- Vs Post-Development Water Balance - Sub-Drainage Basins 1 and 2

Development Phase	Precipitation	Actual Evapotranspiration	Infiltration	Run-Off
	m^3	m^3	m^3	m^3
Pre-Development	1,664,780	741,932	248,004	674,844
Post Development	1,664,780	706,417	248,334	691,273
Deficit Post Development Un-Mitigated			**-330**	
Deficit compared to pre-development infiltration rate			-0.1%	

Appendix I – Qualifications of Assessors

Cindy Luu, B.Sc.

Cindy has a Bachelor of Science in Biomedical Sciences from the University of Waterloo. She then completed a graduate certificate program in Environmental Engineering Applications from Conestoga College.

Cindy is responsible for environmental reporting, including Phase I and II Environmental Site Assessments, due diligence reports, excess soil management, environmental monitoring and investigations, regulatory compliance and regulations.

Ajay Jayalath, MBA, P.Geo., QP

Mr. Jayalath graduated from University of Toronto with a Bachelor of Science in Environmental Geoscience, specializing in Urban Geoscience and Hydrogeology. He then obtained a Master's of Science degree from the University of Toronto in Environmental Science and a MBA from the DeGroote School of Business, McMaster University.

Mr. Jayalath has over fifteen years of environmental investigations experience in the geo-environmental field. Mr. Jayalath has worked on numerous remediation projects including the design and application of in-situ and ex-situ remediation projects. In addition, he has been involved in over fifty Phase l and ll Environmental Site Assessments, from conducting field work to the reporting and project management phases.

His current responsibilities include the management of the environmental groups, including the site assessment, hydrogeological, air quality, hazardous materials, and risk assessment teams. As part of his responsibilities, Mr. Jayalath's role is to ensure the environmental operations are completed in a timely manner to client satisfaction. Mr. Jayalath oversees various contracts for nationwide clients and routinely coordinates with the regional offices to ensure project and contract performance.

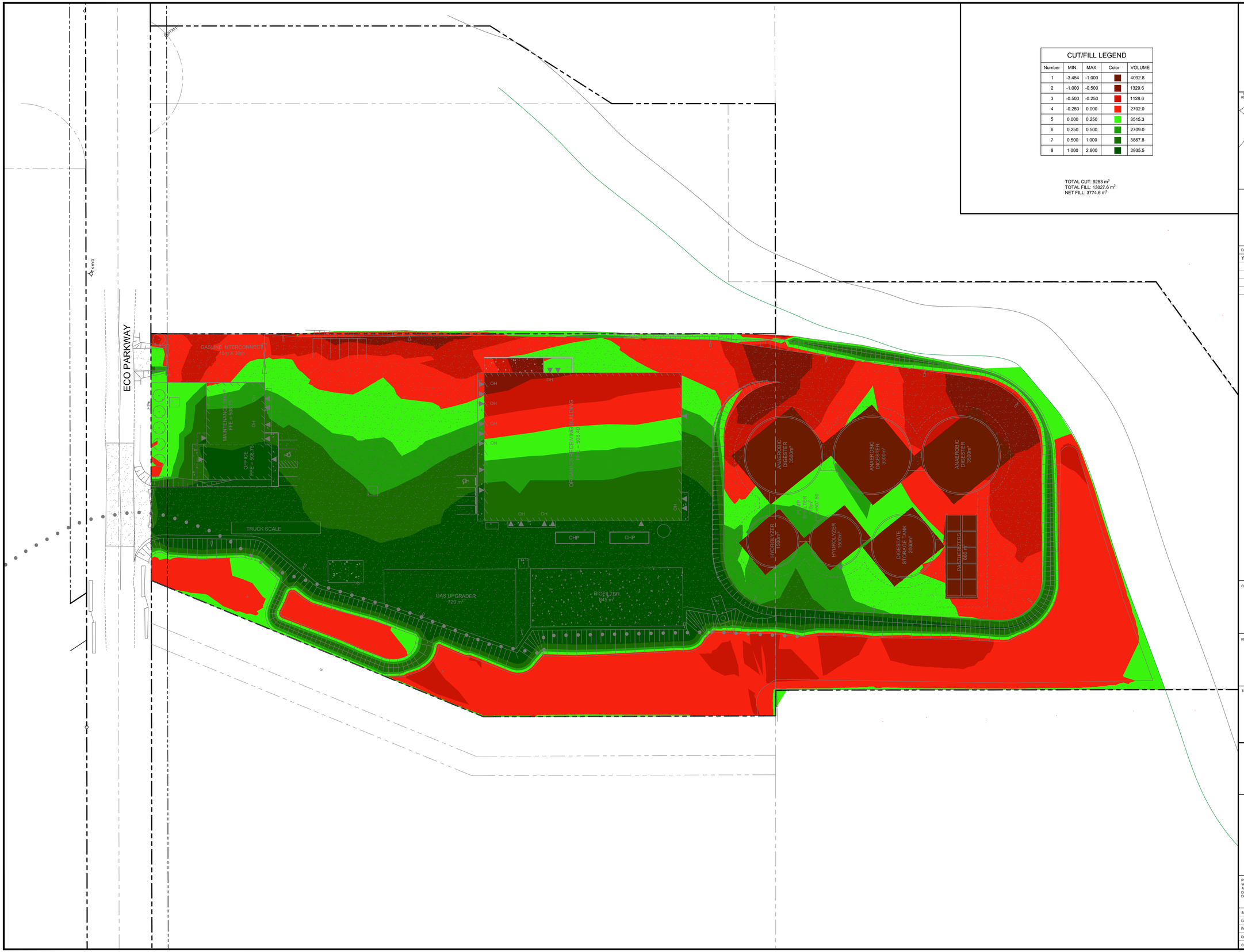
Jay Samarakkody, B.Sc., M.Phil., P. Geo.

Mr. Samarakkody is a Senior Hydrogeologist graduated from the University of Peradeniya, Sri Lanka with a Bachelor of Science in Geology, and a Master of Philosophy in Hydrogeology. He completed a Post Graduate diploma in Environmental Engineering Applications at Conestoga College in Kitchener, Ontario.

Mr. Samarakkody has over forty years of overall experience including over twenty years in Canada, completing numerous hydrogeology related projects for public and private sector clients, mainly in the province of Ontario.

His core expertise includes overall management of variety of hydrogeology related projects, well developed hydrogeological technical expertise, water balance studies, numerical groundwater modelling, client engagement and management, project team management, staff development in technical fields, report writing and peer reviewing. He has a thorough knowledge of applicable federal, provincial and municipal Acts and Regulations.

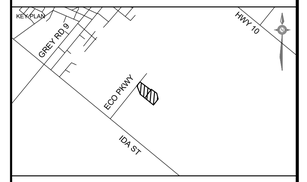
Attachment 1 – Overall Site Cut and Fill Analysis



CUT/FILL LEGEND

Number	MIN.	MAX	Color	VOLUME
1	-3.454	-1.000		4092.8
2	-1.000	-0.500		1329.6
3	-0.500	-0.250		1128.6
4	-0.250	0.000		2702.0
5	0.000	0.250		3515.3
6	0.250	0.500		2709.0
7	0.500	1.000		3867.8
8	1.000	2.600		2935.5

TOTAL CUT: 9253 m³
TOTAL FILL: 13027.6 m³
NET FILL: 3774.6 m³



PROJECT NORTH

TRUE NORTH

DATE	ISSUANCE	NO.
YYYY.MM.DD	ISSUED FOR...	

CLIENT

ENVEST CORP.
77 KING ST WEST, SUITE 3000
TORONTO, ON M5K 1G8

PROJECT

SOUTHGATE RENEWABLES RECYCLING PROJECT
100 ECO PARKWAY, DUNDALK, ON

TITLE

OVERALL SITE CUT FILL ANALYSIS

WALTERFEDY
KITCHENER | HAMILTON | TORONTO
800.685.1378 walterfedy.com

SCALE:	1:500
DATE:	2024-05-15
PROJECT NO.:	2021-0713-10
DRAWN BY:	TK
CHECKED BY:	MH

SHEET NO.: C7-1