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January 31, 2025

PH3645-LET.02

W.O. Stinson & Son Ltd.

Attention: Keith Oster

Subject: **Hydrogeological Assessment and Terrain Analysis**
5545 Albion Road South
Ottawa, Ontario

INTRODUCTION

Further to your request, Paterson has conducted a Hydrogeological Assessment and Terrain Analysis in support of a Site Plan Control Application for the proposed commercial development to be located at 5545 Albion Road South in Ottawa, Ontario.

The purpose of this work has been to determine the suitability of the water supply aquifer underlying the site and to assess the sewage system impacts on the environment in support of the Site Plan Application for a proposed commercial development. The Site Plan Application is for a proposed new commercial development. Please refer to Figure 1 – Key Plan and Hobin Architecture Drawing dated January 29, 2025 attached for the site location and proposed site layout.

An application to the Technical Standards & Safety Authority (TSSA) under the Technical Standards and Safety Act (2000) has been completed by Stinson for a permit to operate a fuel service operation. The TSSA enforces provincial regulations related to the operation, handling, monitoring and spills for liquid fuels with stringent criteria and significant fines for violations.

The subject site is bordered to the north by a vacant lot owned by W.O. Stinson & Son Ltd. followed by industrial properties, to the east by undeveloped forested areas and wetlands, to the south by Mitch Owens Road followed by commercial land / residential development, and to the west by Albion Road South followed by a gas station and residential development. The subject site is zoned RH1 and is appropriately zoned for the proposed land use. Surrounding properties are zoned RU, ME2, RC3, RC2 and RRS (Geo Ottawa).

The subject site consists of a 2.32 ha lot which is currently vacant of structures. The site has historically been used for industrial purposes or remained vacant land. The southern end of the site is asphalt covered with two small grass median-type areas. The remainder of the site consists of gravel.

A watercourse runs west/southwest towards Albion Road South along the northern property boundary. The ground surface generally slopes towards the south. The surficial mapping of the stream network (Rideau Valley Conservation Authority GIS and Shield's Creek Subwatershed Study – Figure 4.12.1 – Existing Drainage Conditions) notes that the ditch on the west extent of the site directs flows to the north along Albion Road South before following existing watercourse/ditches that are tributary to the Spratt Municipal Drain to the southwest. The shallow overburden flow is anticipated to have seasonal variations at a site-specific level; however, it is inferred to generally follow the topography on a regional level to the west. This would indicate flows would follow a westerly flow direction.

The existing site generally consists of gravel parking and asphalt surfaces that are generally considered impermeable. Historically, it was owned and used by a construction company with heavy equipment storage, vehicle maintenance and onsite refueling tanks / pumps. Environmental reporting and site works have been completed to remediate the site as noted in Paterson Report PE4169-LET.02 – Phase II Environmental Site Assessment Update.

A new sewage system to service the proposed building has been designed. A septic flow calculation was completed and resulted in a total daily water demand calculation of 9,939 L/day. A septic design has been completed for a maximum of 10,000 L/day and the design drawings completed by Paterson titled PH3645-5 – Sewage System Layout Plan and PH3645-6 – Sewage System Details and Notes are included with the Site Plan application.

A drilled potable supply well was installed on September 30, 2023, hereafter referred to as Test Well 1 (TW1) and extends to a maximum depth of 54.9 m below existing ground surface (bgs).

The suitability of the aquifer to supply the subject site and the impact of the proposed septic system was assessed using the methodology provided in the City of Ottawa Hydrogeological and Terrain Analysis Guidelines (HTAG).

Hydrogeological Pre-consultation

Several hydrogeological pre-consultations were completed with a City of Ottawa Hydrogeologist as the project evolved with the latest occurring on December 18, 2024. Additional meetings / discussions have occurred subsequently.

Proposed Development

The proposed development will consist of a single building with a public fuel bar and a card-lock fuel service with associated infrastructure. The building will be serviced by the new private water supply well and a private septic system. The building will contain a convenience store and a drive-through food service.

The general layout for the property will include multiple grassed surface areas that improve the existing potential infiltration of the site and clean roof water that is infiltrated back into infiltration galleries. The site plan provided by Hobin Architecture details the site layout.

BACKGROUND

5545 Albion Road

The subject site has historically been an industrial land use with onsite private fuel pumps and underground fuel storage tanks which were located at the southwest corner of the site. The earliest aerial photos from 1991 on GeoOttawa show the existence of the fuel pumps with photos from 1976 showing that a development existed at this location. Pinchin Ltd completed a Phase I and II assessment in July / September 2017 which noted a total of three underground storage tanks (diesel and gasoline), a fuel pump island and truck servicing within one of the site buildings.

The background information indicates that underground storage tanks and a fuel pump island were in use for approximately 26 years near to the southwest boundary of the property. The Pinchin report also included a review of the Ontario Spills database, which has record of a 700 L gasoline spill offsite at the intersection of Albion Road and Mitch Owens Road.

An environmental remediation and tank decommissioning program was completed by Paterson subsequently in November 2017 and a supplemental Phase I and II in September / October 2020.

Albion Sun Vista Residential Development

The Albion Sun Vista (ASV) residential development is serviced by private communal wells and has been in operation for an extended period of time. There are three communal wells noted in the Wellhead Protection Area Plan – Albion Sun Vista Community (WPAP) report by Trow dated June 2004. The construction of Well 1 took place in 1958, Well 2 in 1984 and the Well 3 date was not available in the report. These wells are approximately 0.5 to 0.6 km from the subject site. See attached for the well locations from Figure 2 – Well Locations (Trow, 2004).

Trow / Oliver, Mangione, McCalla & Associates completed multiple hydrogeological studies for the proposed development in 1991 and 2000. These studies concluded that

there was adequate water supply in the aquifer for the proposed park expansion without causing negative impacts to the underlying aquifer.

The WPAP report modelled the groundwater flow to estimate the horizontal capture zones within the underlying bedrock aquifer extending from 50 days, 2 years, 10 years, and 25 years. The City commentary noted current guidelines use the 5-year capture zone as the range to review potential impacts, but the 5-year zone was not analyzed under this report. See attached for WPAP capture zones (Figure 5 to 9) and ASV residential subdivision location from the WPAP report by Trow (2004).

Recommendations are provided within the WPAP report for maintaining source water protection for new construction and is discussed later in the report. There are specific recommendations related to the proposed usage; however, the proposed use (commercial fuel service) is governed under more stringent provincial guidelines (Technical Standards & Safety Act (TSSA) – 2000) that have been updated since the WPAP was completed.

FIELDWORK PROGRAM

As a means to demonstrate the adequacy of the aquifer underlying the subject lands, with respect to water quality and quantity, the drilled well (TW1) on the subject site was tested. The well was constructed in accordance with O.Reg. 903. Installation and sealing of the well casing was completed under the supervision of a qualified and licensed professional in accordance with O.Reg. 903 and the recommendations from WPAP report.

TW1 has a Water Well Record (WWR) Well ID of A361000. TW1 has a 152.4 mm diameter steel casing that extends to 17.7 m below ground surface (bgs) with a 0.67 m stick up. The well itself extends to a depth of 54.9 m bgs. Based on available geological mapping, the drift thickness at TW1 varies from 10 to 25 m. Refer to Paterson Drawing PH3645-5 – Sewage System Layout Plan, attached, for the approximate location of TW1.

As a means to evaluate the water supply aquifer intercepted by the well, the well was subjected to an 8-hour constant rate pumping test. The pumping test was conducted on October 5, 2023 under the full-time supervision of Paterson personnel. Prior to the pumping test, a datalogger was installed to monitor background groundwater levels and the well was disinfected by Air Rock Drilling Co. Ltd. (Air Rock) personnel.

A submersible pump was provided by Air Rock for the 8-hour pumping test. A licensed water well technician completed the necessary plumbing related activities. A discharge hose assembly with a gate valve was connected to the rented pump. The discharge line was placed at a sufficient distance to ensure that the discharge water was being directed away from the well as well as any septic systems in the area. Upon completion of the test, the pump was removed, and the well was disinfected by Air Rock.

The pumping test was carried out at a pumping rate of 38 L/min for a duration of 8 hours, after which the pumping rate was reduced to approximately 15 L/min for approximately an hour in an attempt to lower turbidity levels. During the pumping test, the pumping rate was periodically measured using the timed volume correlation method. The pumping rate was maintained within 5% of the selected pumping rate. The static water level was recorded manually and an electronic datalogger (VanEssen TD-Diver) was installed in the test well prior to the start of the pumping test. The selected rate of 38 L/min provides approximately 1.8 times the maximum total daily design volume for the septic system during the 8-hour pumping test. The rate was determined to be representative of a flow rate which would be in excess of what the development would require, and was completed in accordance with the City's HTAG guidelines for Site Plan applications.

The datalogger recorded water levels at 30 second intervals. In addition, manual water level readings were taken at periodic intervals during the test.

Recovery data was collected from the well following the completion of the pumping. The well was noted to have achieved 84% recovery approximately 1 hour after the completion of pumping. The well was noted to have achieved 95% recovery approximately 20 hours

after the completion of pumping. The latter portion of the pumping test noted the water level recovering while the drawdown portion of the pumping test was ongoing.

Groundwater samples were collected at 4 hours and 9 hours after the start of pumping. Prior to collection of the groundwater samples, the free chlorine residual was verified as non-detectable. The water samples were submitted for comprehensive testing of bacteriological, chemical, and physical water quality parameters consistent with the standard “Subdivision Supply” suite of parameters plus trace metals. The water samples were also submitted for comprehensive testing of Volatile Organic Compounds (VOCs), Petroleum Hydrocarbons (PHCs), and BTEX.

Elevated levels and concentrations for colour and turbidity were detected in the field testing and analytical results of TW1 during the pumping test at both the 4-hour and 9-hour marks. Elevated concentrations of iron and manganese were detected in the analytical results at both the 4-hour and 9-hour mark.

Paterson personnel went to site on October 18, 2023 to perform additional well development in an effort to reduce the colour and turbidity levels.

A submersible pump was provided by Air Rock for the additional well development. A licensed water well technician completed the necessary plumbing related activities. A discharge hose assembly with a gate valve was connected to the rented pump. The discharge line was placed at a sufficient distance to ensure that the discharge water was being directed away from the well and any septic systems in the area.

TW1 was developed for an additional 5 hours at a rate of 11 L/min. Groundwater samples were collected 5 hours after the start of pumping. Prior to collection of the groundwater samples, the free chlorine residual was verified as non-detectable and field parameters had stabilized. Upon completion of the test, the pump was removed, and the well was disinfected by Air Rock.

All samples were collected unfiltered and unchlorinated and were placed directly into clean bottles supplied by the analytical laboratory. Samples were placed immediately into a cooler with ice and were transported directly to Eurofins Environmental Testing Canada Inc. (Eurofins) laboratory in Ottawa. All samples were received by the laboratory within 24 hours of collection.

A series of field tests of the pumped water were carried out at the well head during the 8-hour pumping test and additional well development. The parameters tested at the well head included: pH, total dissolved solids, conductivity, turbidity, apparent colour, and temperature.

AQUIFER ANALYSIS

Water Quantity

Pumping test data was analyzed using AQTESOLV Pro Version 4.5 aquifer analysis software package by HydroSOLVE Inc. Drawdown data was measured using an electronic water level tape and an electronic datalogger unit.

Table 1: SUMMARY OF WATER SUPPLY AQUIFER CHARACTERISTICS OF TW1	
AQUIFER PARAMETER	**RESULT OF ANALYSIS**
Transmissivity (m^2/day)	60.95
Pumping Rate (L/min)	38
Pre-test Static Water Level (m btoc)	6.47
Total Drawdown (m)	Max – 4.3, End – 4.0
Available Drawdown (m)	49.1
% Drawdown During Pump Test (%)	9
Specific Capacity (L/min/m drawdown)	8.8

The drawdown data was analyzed using the Theis and Cooper-Jacob method of analysis. Aquifer transmissivity is estimated to be 61 m^2/day. Refer to the Theis and Cooper-Jacob method of analysis data sheets attached to this report.

The pumping test results show that TW1 has a high yield to support the water demands that may be required. The overall maximum drawdown at a constant pumping rate for a period of 8 hours was approximately 4.3 m at approximately 350 minutes into the pumping test (9% of the available drawdown). The final drawdown at the end of the 8-hour pumping test was 4.0 m (8% of the available drawdown) with well recovery occurring while the pumping phase was ongoing for the final 130 mins of the pumping duration. 84% recovery was noted one (1) hour after the end of pumping. 95% recovery was achieved approximately 20 hours after the end of pumping.

The total volume of water pumped during the 8-hour pumping test was approximately 18,240 L. This is approximately 1.8 times the maximum total daily design volume of water required to support the Site Plan Control Application. The minimum required volume is based on sewage design flows per OBC. Commercial uses do not have similar peak flows to residential uses and it is appropriate to review the maximum daily requirement over the full pumping test window. The well was noted to be recovering during the test and is indicative of an aquifer with available supply exceeding the potential demands.

The suitability of the aquifer to supply the proposed Site Plan Application for the proposed commercial development was assessed using the methodology provided in the City of Ottawa HTAG.

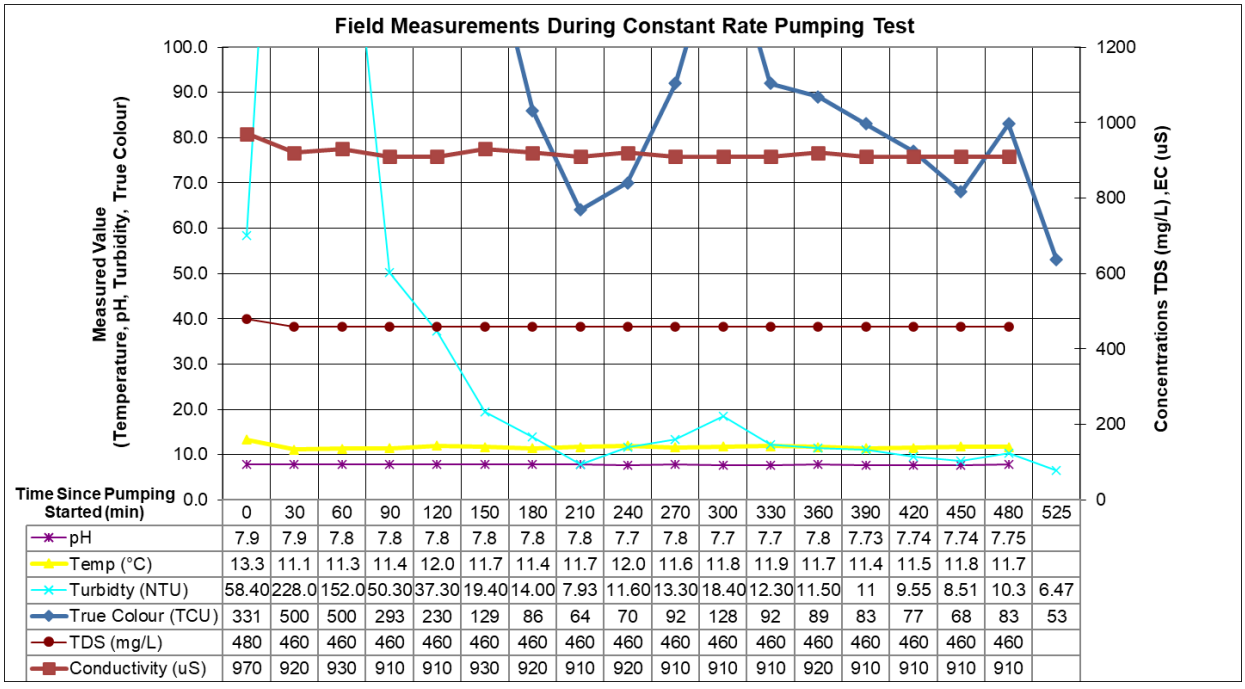
Based on the information summarized in Table 1, it is readily apparent that the water supply well has intercepted an adequately strong water supply aquifer which has sufficient quantity to service the proposed Site Plan Control Application.

Given the analyses presented and summarized above, it is our opinion that there is an adequate supply of water to support the proposed Site Plan Control Application. Available water well records (WWR) of the neighboring properties on the MECP Well Record mapping website indicated that the surrounding wells were generally screened in sandstone or limestone. Surrounding WWRs are attached to this report.

Water Quality

Field Data

Turbidity, electrical conductivity, total dissolved solids (TDS), pH, apparent colour and temperature were measured at the wellhead during the pumping test. The measurements and time intervals for each of these parameters are summarized in Figure 3 below. In addition, a HACH Pocket Colorimeter II chlorine reader was used to measure the free chlorine residual level. No chlorine residual was detected in the discharge water prior to the collection of the water samples.



Time Since Pumping Started (min)	0	30	60	90	120	150	180	210	240	270	300	330	360	390	420	450	480	525
pH	7.9	7.9	7.8	7.8	7.8	7.8	7.8	7.8	7.7	7.8	7.7	7.7	7.8	7.73	7.74	7.74	7.75	
Temp (°C)	13.3	11.1	11.3	11.4	12.0	11.7	11.4	11.7	12.0	11.6	11.8	11.9	11.7	11.4	11.5	11.8	11.7	
Turbidty (NTU)	58.40	228.0	152.0	50.30	37.30	19.40	14.00	7.93	11.60	13.30	18.40	12.30	11.50	11	9.55	8.51	10.3	6.47
True Colour (TCU)	331	500	500	293	230	129	86	64	70	92	128	92	89	83	77	68	83	53
TDS (mg/L)	480	460	460	460	460	460	460	460	460	460	460	460	460	460	460	460	460	
Conductivity (uS)	970	920	930	910	910	930	920	910	920	910	910	910	920	910	910	910	910	

Figure 3 – Field Measurements During Constant Rate Pumping Test

Laboratory Data

The Subdivision Package suite of parameters and trace metals laboratory water quality obtained from the pumping test of TW1 is provided in Table 2a and 2b below and the laboratory analyses reports can be found attached. VOC, PHC and BTEX laboratory

analytical testing was also completed. All laboratory test results can be found attached to this report.

Upon review of the laboratory water quality results obtained from the groundwater sample collected from the pumping test of TW1, several PAH and VOC parameters were detected at low levels.

At that time, we had received the same exceedances in other pumping tests on other sites across Ottawa. After consulting with the well driller, it was determined that equipment placed in TW1 during the pumping test contributed to low levels of the PAH and VOC parameters in question within the pumped water. A re-sample was taken from TW1 on October 18, 2023, for the detected parameters, without the aforementioned equipment. The subsequent lab results showed the parameters as non-detect. The lab analyses reports for the re-sample can be found attached. As this particular set of exceedances occurred on multiple sites, and resampling at the locations where this exceedance occurred was non detect, it is inferred that the exceedance was due to the equipment used during the pumping test.

TABLE 2a: GROUNDWATER MICROBIOLOGY & GENERAL GEOCHEMISTRY						
PARAMETER	UNITS	ODWS		TW1		
		LIMIT	TYPE	TW1 GW1 (4 hr) 10/5/2023	TW1 GW2 (9 hr) 10/5/2023	TW1 GW3 10/18/2023
MICROBIOLOGICAL						
Escherichia Coli (E.Coli)	ct/100mL	0	MAC	0	0	-
Total Coliforms	ct/100mL	0	MAC	0	0	-
GENERAL CHEMICAL - HEALTH RELATED						
Fluoride (F)	mg/L	1.5	MAC	0.26	0.27	-
Ammonia (N-NH_3)	mg/L	-	-	0.142	0.142	-
Nitrite (N-NO_2)	mg/L	1	MAC	<0.10	<0.10	-
Nitrate (N-NO_3)	mg/L	10	MAC	<0.10	<0.10	-
Total Kjeldahl Nitrogen	mg/L	-	-	0.215	0.640	-
Turbidity (Field)	NTU	1.0 (5.0)	MAC/AO	11.6	10.3	0.62
Turbidity (Laboratory)	NTU	1.0 (5.0)	MAC/AO	13.5	11.4	2.1
GENERAL CHEMICAL - AESTHETIC RELATED						
Alkalinity (as CaCO3)	mg/L	30-500	OG	269	270	-
Chloride (Cl)	mg/L	250	AO	91	96	-
Colour (Apparent)	TCU	5	AO	146	116	14
Colour (Field-Apparent)	TCU	5	AO	70	83	0
Conductivity	uS/cm	-	-	884	869	-
Dissolved Organic Carbon	mg/L	5	AO	1.6	1.8	-
Hardness (as CaCO3)	mg/L	100	OG	345	352	-
Ion Balance	unitless	-	-	0.96	0.96	-
pH	unitless	6.5-8.5	AO	7.81	7.86	-
Phenols	mg/L	-	-	<0.001	<0.001	-
Sulphate (SO_4)	mg/L	500	AO	<1	<1	-
Sulphide (S_2^-)	mg/L	0.05	AO	<0.05	<0.01	-
Tannin & Lignin	mg/L	-	-	<0.5	<0.5	-
Total Dissolved Solids	mg/L	500	AO	575	565	579

1. ODWS identifies the following types of parameters:
   MAC = Maximum Allowable Concentration
   AO = Aesthetic Objective
   OG = Operational Guideline
2. Shaded Concentration Indicates an Exceedance of the ODWS Objective

TABLE 2b: GROUNDWATER GEOCHEMISTRY - METALS						
PARAMETER	UNITS	ODWS		TW1		
		LIMIT	TYPE	TW1 GW1 (4 hr) 10/5/2023	TW1 GW2 (9 hr) 10/5/2023	TW1 GW3 10/18/2023
METALS						
Aluminum (Al)	mg/L	0.1	OG	0.17	0.04	-
Antimony (Sb)	mg/L	0.006	IMAC	<0.0005	<0.0005	-
Arsenic (As)	mg/L	0.01	IMAC	<0.001	<0.001	-
Barium (Ba)	mg/L	1.0	MAC	0.17	0.16	-
Beryllium (Be)	mg/L	-	-	<0.0005	<0.0005	-
Boron (B)	mg/L	5.0	IMAC	0.14	0.14	-
Cadmium (Cd)	mg/L	0.005	MAC	<0.0001	<0.0001	-
Calcium (Ca)	mg/L	-	-	74	75	-
Chromium (Cr)	mg/L	0.05	MAC	<0.001	<0.001	-
Cobalt (Co)	mg/L	-	-	<0.0002	<0.0002	-
Copper (Cu)	mg/L	1.0	AO	<0.001	<0.001	-
Iron (Fe)	mg/L	0.3	AO	0.84	1.03	0.46
Lead (Pb)	mg/L	0.01	MAC	<0.001	<0.001	-
Magnesium (Mg)	mg/L	-	-	39	40	-
Manganese (Mn)	mg/L	0.05	AO	0.06	0.06	0.07
Molybdenum (Mo)	mg/L	-	-	<0.005	<0.005	-
Nickle (Ni)	mg/L	-	-	<0.005	<0.005	-
Potassium (K)	mg/L	-	-	5	5	-
Selenium (Se)	mg/L	0.05	MAC	<0.001	<0.001	-
Silver (Ag)	mg/L	-	-	<0.0001	<0.0001	-
Sodium (Na)	mg/L	200	AO	57	56	-
Strontium (Sr)	mg/L	-	-	2.65	2.67	-
Thallium (Tl)	mg/L	-	-	<0.0001	<0.0001	-
Uranium (U)	mg/L	0.02	MAC	<0.001	<0.001	-
Vanadium (V)	mg/L	-	-	<0.001	<0.001	-
Zinc (Zn)	mg/L	5.0	AO	<0.01	<0.01	-

1. ODWS identifies the following types of parameters:
   MAC = Maximum Acceptable Concentration
   IMAC = Interim Maximum Acceptable Concentration
   AO = Aesthetic Objective
   OG = Operational Guideline
2. Shaded Concentration Indicates an Exceedance of the ODWS Objective

The bacteriological test results (Certificate of Analysis – Report No. 3002032) indicated that the test samples at the 4- and 9-hour interval were non-detect (0 ct/100 mL) for E.coli and Total Coliforms.

The water quality of the subject water supply well meets all the Ontario Drinking Water Standards maximum acceptable concentrations (MAC). Furthermore, the water meets all of the Aesthetic Objectives (AO) and Operational Guidelines (OG) with the exception of the following.

- ❑ Hardness (as $CaCO_3$)
- ❑ Colour
- ❑ Total Dissolved Solids (TDS)
- ❑ Iron (Fe)
- ❑ Manganese (Mn)

Exceedances of the above parameter are not uncommon for the water supply in the subject aquifer. Each of these groundwater parameters are discussed in detail below. Despite the minor treatment that may be used, if desired, the potential tenant is likely to exceed this based on their corporate policies.

Hardness as $CaCO_3$

Hardness, expressed as calcium carbonate, is an operational guideline and does not appear in the ODWS. Rather, it appears in the Technical Support Documents for Ontario Drinking Water Standards, Objectives and Guidelines as a parameter with an operational guideline at 100 mg/L. At the measured concentrations of 345 and 352 mg/L, the water is considered to be very hard, however, it is below the reasonable treatable limit of 500 mg/L specified in Table 3 of the MOECC guidance document Procedure D-5-5 (1996). The hardness concentration can be treated using conventional softener technologies.

Colour

Colour may occur in drinking water for several reasons. It may be due to organic substances from the decay of vegetation, or the presence of metals such as iron, manganese, and copper, which are abundant in nature. The provincial aesthetic objective for colour in drinking water is 5 True Colour Units (TCU). The federal (Health Canada) guideline aesthetic objective limit for colour is 15 TCU (Guidelines for Canadian Drinking Water Quality, Health Canada June 2019). Procedure D-5-5 gives a maximum concentration considered reasonably treatable (MCCRT) for colour as 7 TCU. As colour is a strictly aesthetic parameter, it can be reduced from the water supply, if desired, through the use of a manganese greensand treatment.

During the additional well development, a DR900 colorimeter was used in the field to measure apparent colour in the groundwater at regular intervals. The apparent colour in the groundwater was measured as 0 TCU which is below the conservative MCCRT of 7 TCU. The elevated colour levels detected in the lab samples are attributed to the precipitation of iron out of the groundwater.

Total Dissolved Solids (TDS)

Total dissolved solids (TDS) refer to the concentration of inorganic substances dissolved in water. The main constituents are typically chloride, sulphates, calcium, magnesium, and bicarbonates. Water with a TDS objective above 500 mg/L of TDS may not be palatable to some users, but taste is subjective. As a standard measure to ensure water quality for commercial usage, Tim Hortons requires specific treatment technology and will treat the water to their company standard. As such, no taste problems will occur when the system is used.

The Langelier calculation provided an LSI of -0.1. Based on the evaluation of the result, the water is considered undersaturated and tends to dissolve solid calcium carbonate (slightly corrosive but non-scale forming). Water is generally stable within a range of -0.5

to 0.5 with the current result within this range. Based on the value being within the range of stability, there are no mitigative measures needed. See Langelier Saturation Index Calculation attached for calculation details.

Iron (Fe)

Concentrations of iron above 0.3 mg/L can contribute to staining of fixtures and a metallic taste at higher concentrations. Precipitation of iron can promote the growth of iron bacteria in pipes. The concentration of iron in the groundwater in TW1 was measured to be 0.84, 1.03 and 0.46 mg/L. The concentration of iron in the groundwater in TW1 is considered to be reasonably treatable in accordance with Procedure D-5-5. It is recommended that an iron filter be used to reduce the levels of iron and reduce the potential for excessive precipitate occurring in the water supply system, if desired.

Manganese (Mn)

The manganese concentration results from the laboratory test samples for TW1 yielded a value of 0.06 and 0.07 mg/L in the onsite well, which is above the aesthetic objectives in the ODWSOG of 0.05 mg/L. Procedure D-5-5 gives a maximum concentration considered reasonably treatable for manganese as 1.0 mg/L. A conventional water softener or manganese greensand filter can be used to reduce the levels of manganese, if desired.

Sodium

Sodium (Na), an aesthetic parameter, was detected in the laboratory test samples at a concentration of 57 and 56 mg/L, which does not exceed the ODWS aesthetic objective of 200 mg/L. Although sodium is not toxic and no maximum acceptable concentration has been set, concentrations above 20 mg/L require that the Medical Officer of Health be notified of the water quality results, so that this information may be passed on to local physicians for use in treatment of those requiring a sodium-restricted diet.

TERRAIN ANALYSIS

Surficial Geology

A series of testholes were put down on the subject site to delineate the subsurface soil conditions as part of the Geotechnical Investigations (Paterson Report PG5485-1 Rev.2). Investigations occurred in September 2020, October 2023 and April 2024. A total of 15 boreholes and 4 test pits were completed on the subject property and the adjacent property (5505 Albion Road South) for the design of the proposed commercial development and its associated infrastructure. The boreholes were advanced to a maximum depth of 9.8 m below ground surface (bgs) and 1.8 m bgs for the test pits. Three (3) boreholes were completed in proximity to the proposed footprint of the commercial building and the proposed septic bed area. The locations of the boreholes on the property are delineated on the Test Hole Location Plan, drawing PG5485-1, attached.

The borehole and test pit locations were recorded and the subsurface conditions, including the soil morphology and depth to the groundwater table (if encountered), were carefully observed and recorded. The soils encountered were classified texturally in the field, and later reviewed in the laboratory.

Generally, the subsurface profile at the test hole locations were observed to consist of fill material overlying a silty sand layer followed by a silty clay to clayey silt layer over a sandy silt to silty sand followed by glacial till. The field program in 2020 did not encounter glacial till due to shallower completion of boreholes. The most recent program in 2024 noted a silty clay to clayey silt layer overlying sandy silt material. The isolating silty clay to clayey silt layer is graphically illustrated in Drawing PH3645-4 – Isopach Plan. BH 8 and borehole BH 4-24 did not encounter the isolating layer. BH 8 is located adjacent to the existing drainage swale outside of the proposed area of re-development. BH 4-24 is located east of the proposed building / fuel bar within the overall area covered by impermeable asphalt. The double-walled fuel tanks with interstitial monitoring are located downgradient (northwest) of BH 4-24.

Nine (9) grain size distribution tests were completed in conjunction with the 2024 investigation to further classify the soils. The results are summarized in the following Table 1 and appended to this report.

Table 1 – Summary of Grain Size Distribution Analysis Results						
Borehole Number	**Sample**	**Depth (m)**	**Gravel (%)**	**Sand (%)**	**Silt (%)**	**Clay (%)**
BH 1-24	SS7	4.6-5.2	0.0	10.8	58.2	31.0
BH 2-24	SS6	3.8-4.4	0.0	6.6	63.4	30.0
BH 2-24	SS7	4.6-5.2	3.0	33.3	59.4	4.3
BH 3-24	SS4	2.6-2.9	0.0	2.1	50.9	47.0
BH 3-24	SS7	4.6-4.9	0.0	39.9	56.2	4.0
BH 4-24	SS5	3.4-3.7	0.0	36.1	60.8	3.1
BH 4B-24	SS1	4.6 -5.2	28.3	35.0	29.7	7.0
BH 5-24	SS6	3.1-3.7	0.0	3.6	49.4	47.0
BH 5-24	SS8	4.6-5.2	0.0	11.2	79.3	9.5

Four PVC monitoring wells and 10 flexible piezometers were installed as part of the Geotechnical Investigations. Groundwater levels were measured and varied between 0.40 and 0.72 m bgs during the period of March to June 2024 within the onsite monitoring wells as noted in Paterson Report PG5485-1 Revision 2.

It should be noted that groundwater levels can fluctuate both seasonally and in conjunction with precipitation events. Therefore, the groundwater levels could vary at the time of construction.

Reference should be made to the borehole logs appended to this report for the details of the soil profiles encountered at each test hole location. The client should be aware that any information pertaining to soils are furnished as a matter of general information only and borehole descriptions are not to be interpreted as descriptive of conditions at locations other than those described by the boreholes themselves.

Hydrogeological Sensitivity of the Site

The subject site is currently vacant and has been historically used for industrial purposes that included underground storage tanks holding diesel and gasoline, heavy equipment storage (i.e. Trucks, hydraulic excavators, etc.) and maintenance of the equipment. The environmental reports completed by Others and Paterson have previously assessed the site for environmental impacts and completed a remediation / clean-up in the area of the tank nest, piping, and fuel pumps. These pumps are visible in an aerial photo from 1991 and were removed in November 2017. These items were in place and operational for at least 26 years. The Phase II report notes that there were historical impacts in the southwest corner of the property related to leaking pipes. The clean-up removed both

impacted soil and water to be taken to an appropriate waste receiver. Testing has indicated that all results are in compliance with Table 2 standards with the exception of Ethylbenzene in the area of the previous fuel pumps. In addition to the underlying silty clay layer at this location, ethylbenzene is less dense than water and is immiscible. It is therefore unable to negatively impact the underlying bedrock aquifer.

The new TW1 was placed in the southwest corner of the site and was tested for PHC, VOC and BTEX. All final samples from the underlying aquifer returned non-detect results. This indicates that the un-monitored historical usage of the site has not impacted the underlying aquifer despite being within the 10-year horizontal capture zone within the Well head Protection Area (WHPA) modeling.

The adjacent service station on the west side of Albion Road has been in operation for an extended period of time. The WWR for the property does not reference a confining clayey silt / silty clay layer. Paterson is not aware of negative impacts on the ASV wells due to the existing fuel service or onsite wastewater system.

A commercial building with associated infrastructure and private servicing is proposed for the site. The servicing includes double-walled fuel tanks (Xerxes – P1000DW / P86DW) with interstitial monitoring. The WPAP report recommends that annual monitoring occur, and that leak detection be provided for underground storage tanks / piping. The TSSA requires that ongoing monitoring of the fuel storage and dispensing system occurs which shuts down the system when a leak is detected. Any spills must be reported to the Spills Action Centre and clean-up / remediation is mandated. The TSSA application was submitted by W.O. Stinson and is included in the site plan application.

The overburden at the test hole locations generally consists of fill material overlying a silty sand layer followed by a silty clay layer. The WWR from TW1 indicated that a limestone bedrock was encountered at 15.8 m bgs. According to available geological mapping, the drift thickness within the site varies from 10 to 25 m bgs.

According to the geotechnical field investigation, and corroborated by the onsite WWR and overburden mapping, the overburden thickness is noted to be greater than 2 m. As the proposed site does not have bedrock within 2 m of the ground surface, the site is not considered hydrogeologically sensitive from a private servicing perspective. Separation distances are not required to be increased between the septic components and the onsite well.

The low conductivity soil layer provides a separation to the underlying till. Additionally, the site has a stormwater management system that gathers water from asphalt surfaces, directs the stormwater through a treatment system and discharges the flow to the ditch off-site in a north / west direction per the Shield's Creek Subwatershed Study (SS). The asphalt surface provides an additional impermeable layer followed by engineered fill (Granular 'A') that provides further low conductivity separation.

Conceptual Lot Development Plan

As the septic flows for the proposed building are based on Part 8 of the Ontario Building Code (OBC), the calculation to determine the flows are discussed below.

It is proposed to construct a single-storey commercial building on the subject site consisting of a gas bar, convenience store, drive-through only donut shop, and card-lock station. The location of the proposed building can be found in the attached Hobin Architecture Drawing dated January 29, 2025. The current proposed configuration of the building septic flows per Part 8 - OBC is as follows:

- Convenience Store
- Donut Shop Drive Through (only)
- Gas Bar
- Card Lock Fuel Service

The proposed private servicing is outlined in Paterson drawing PH3645-5 – Sewage System Layout Plan, attached. It illustrates that the proposed design layout is adequate to accommodate the associated private services and meet all the regulated separation criteria. Please note that the proposed design layout is not meant to restrict the location of the proposed buildings or private services. The design will be reviewed by the Ottawa Septic System Office (OSSO) and will be constructed in accordance with the required regulations and permit approval under Part 8 of OBC. The OSSO requires inspections during construction in order to ensure compliance. An approved OSSO permit will be provided in support of the Site Plan application. The design drawings and approved OSSO permit will reference this hydrogeological report for minimum denitrification requirements.

Theoretical Sewage System Volumes

Paterson has provided theoretical uses for the proposed building space based on Part 8 – OBC values. A septic flow value was calculated for the proposed building and resulted in a total daily design sewage flow (TDDSF) of 9,939 L/day. A Design Sewage flow rate of 10,000 L/day was used for the septic impact assessment and the sewage system capacity has been designed to 10,000 L/day. The septic flow values were calculated in accordance with the OBC and discussion with the OSSO. The values are as follows:

- Convenience Store: 1,230 L/day
- Donut Shop Drive Through (only): 2,709 L/day
- Gas Bar: 5,600 L/day
- Card Lock Fuel Service: 400 L/day

Predictive Nitrate Impact Assessment

In order to demonstrate that private services would adequately support the proposed commercial development, a predictive nitrate impact assessment for the subject site was

completed. The values shown in the Predictive Nitrate Impact Assessment attached to this report are summarized below.

- ❑ Site area — 2.32 ha
- ❑ Impervious area (%) — 33 %
- ❑ Daily sewage flow — 10 m^3/d
- ❑ Concentration of nitrate in effluent — 40 mg/L
  (Value based on typical effluent concentration)
- ❑ Concentration of nitrate in effluent with treatment — 16 mg/L
  (Value based on nitrate reduction system (BNA MBBR) with 60% nitrate reduction)
- ❑ Surplus Water — 379 mm/yr
  (The surplus water value was estimated based on Environment Canada Climate Office values with a soil type comprised of a fine sandy loam (Urban lawns / Shallow Rooted Crops) and anthropogenic sources.)
- ❑ Combined infiltration factor based on: — 0.70
  - Topography infiltration factor — 0.25
  - Soil texture infiltration factor — 0.20
  - Cover infiltration factor — 0.10

The topography infiltration factor of 0.25 is calculated based upon a generally rolling land with an average slope of 2.8 to 3.8 m/km with a value of 0.2 and flat land with an average slope <0.6 m/km with a value of 0.3. The soil texture infiltration factor was based upon a medium combination of clay and loam with a value of 0.2 which is a reasonable generalization based upon the site investigations and available geological mapping. The “cover infiltration factor” was calculated at 0.10 based upon a cultivated land type cover.

The calculation for a conventional septic system, results in a predicted nitrate concentration of 21.15 mg/L nitrate for the subject site, using a value of 40 mg /L nitrate concentration within the effluent. This value was based upon a daily sewage flow of 10,000 L/day. It is expected that the actual usage should be lower.

An existing tertiary treatment system technology capable of reducing the nitrate loading in the effluent is from the Bergmann North America (BNA) brand using Moving Bed Biofilm Reactor (MBBR) technology. This system is in use for similar type sites in the area and is recommended based on the specific effluent involving potential coffee waste. Using a 100% re-circulation of the effluent, the proposed system can reach a 60% nitrate reduction value for influent Total Nitrogen. The system has the additional ability to re-circulate up to 200% of the effluent for increased reduction. Using a minimum value of 60% reduction, this would reduce the nitrate concentration in the effluent from 40 mg/L down to as low as 16 mg/L. A value of 60 % reduction results in a predicted nitrate concentration of 8.46 mg/L at the property boundary.

Based on the results of the predicted nitrate impact assessment, it is our opinion that the property can adequately support the proposed commercial building without having an adverse impact on the underlying bedrock aquifer with the use of the proposed sewage treatment system. While a number of NSF 245 certified tertiary treatment technologies would theoretically provide denitrification of the effluent, there would be a reduced lifespan of the system due to potential coffee waste. The proposed BNA MBBR system has better capabilities for treating the effluent and is recommended to provide an extended lifespan of the system. Additional documentation on the BNA system is to be provided to the City under separate cover.

Scoped Pre-Development Water Balance Review

The scoped pre-development water balance was reviewed based on the existing conditions at the site. The site generally consists of a fill layer at surface that varies between asphalt and gravel-type parking areas. Generally, the subsurface profile at the test hole locations were observed to consist of fill material overlying a silty sand layer followed by a silty clay to clayey silt layer over a sandy silt to silty sand followed by glacial till.

When falling precipitation intercepts the ground surface, three possible outcomes arise. The water can either evaporate/transpire back into the atmosphere (evapotranspiration), infiltrate into the surface soils (infiltration) or leave the area as runoff. As is required by the City in these assessments, both gravel and asphalt surfaces are considered impermeable. Given the extent of the impermeable areas, the full site calculation would be considered as providing near total run-off and evapotranspiration of any precipitation occurring on-site.

Typically, the review would assess the pre-development and post-development conditions using Thornthwaite and Mather (1957) along with Environment Canada Engineering Climate Services Unit to determine the partitioning of water through various portions of the hydrologic cycle. Inputs into the modelling program include monthly temperature, precipitation, water holding capacities and site latitude. Using the long-term averages of these variables, the annual potential and actual evapotranspiration, change in soil moisture storage and the water surplus can be calculated.

The goal of the water balance review is to maintain the balance from pre-development to post-development conditions. As this site is considered to have limited infiltration potential for pre-development conditions, the proposed layout that includes grassed areas and infiltration measures for clean roof water will provide an increase in infiltration post-development. As such, the review notes that any increase in soft landscaping and infiltration measures provides a net benefit over existing and historical site conditions.

SOURCE WATER PROTECTION ASSESSMENT

The property is appropriately zoned for the proposed usage, however, there is an unmapped private wellhead protection area with a 10-year horizontal capture zone underlying the property as noted in the WPAP report. As such, there are recommendations provided within the WPAP report. It should be noted that the WPAP was completed in 2004 and there have been significant changes to Ontario legislation (TSSA) governing liquid fuel service stations. The minimum recommendations noted in the WPAP are well below the current minimum standards required by the TSSA for new liquid fuel service stations. Further discussion of the WPAP recommendations are discussed below with additional TSSA information provided under separate cover by W.O. Stinson.

WPAP Recommendations

The report provides five recommendations with the first being paraphrased to be that the least risky land uses should be located in the WHPA. The existing MacEwen service station is noted in the report and was re-built in 2002 with increased capacity. The WWR mapped to the site does not note any clay / silty clay layer at that location and does not appear to have the modelled aquitard at that location. Recommendations were provided in the WPAP to provide monitoring of the groundwater for potential impacts on the aquifer. The site was serviced by a Class 4 sewage system. Paterson has not been made aware of any negative test results noting impacts to the underlying bedrock aquifer. Additionally, Vanson Construction was operational at the subject site for roughly 37 years and this included having buried fuel storage tanks on site. These tanks were noted to have had historical leaks that have since been remediated. Paterson completed testing on the bedrock aquifer underlying the historical tank locations and no impacts were noted.

The highest risk land use assessed in the WPAP was the private sewage systems at the ASV site.

The proposed use is required to comply with the strict provincial standards of the TSSA (2000) that requires ongoing monitoring of the fuel system from tank monitoring of fuel storage to discharge to vehicles and has updated standards that are current to December 31, 2024. The standards observed by a state-of-the-art fuel system are significantly more advanced than the recommendations noted in the WPAP points to follow below. Further information on the TSSA application completed by W.O. Stinson is available under separate cover.

The second recommendation notes there is increased risk to the underlying aquifer if the low permeability clay / silty clay layer is penetrated. This includes ensuring that constructed water wells are completed in accordance with O.Reg. 903. As previously

noted, the onsite water supply well was completed in accordance with O.Reg. 903 and water sampling has noted a good quality aquifer being accessed.

The proposed subject site infrastructure was reviewed for depth of excavation and all structures and piping are to be installed above the clay layer with the exception of the two largest double-walled fuel storage tanks with interstitial monitoring. Based on the proposed grade and tank sizing, the estimated thickness of clay to remain underlying the tank is approximately 0.45 m. The Xerxes P100DW tank detail is appended to the report and adheres to engineering requirements for soil cover and bedding. The calculation for the estimated values are below:

- Approximate Ground Surface (proposed – Arcadis GP) = 104.32
- Tank Embedment Depth = 4.14 m (based on 0.66 m cover, 3.188 m height and 0.3 m granular base pad)
- Elevation at base of tank profile = 100.152 m
- BH3-24 – Elevation Silty Clay layer (top / bottom) = 100.79 / 99.72
- Separation to Silty Clay layer from Base of Tank Profile = 100.152-99.72=0.45 m

The third and fourth WPAP recommendations note that all underground storage tanks within the 10-year time of travel capture zone noted in the WPAP should be equipped with interstitial monitoring systems and tanks/piping should have leak detection systems in place. A monitoring program should be established to provide on-going water quality information upgradient of the site.

The TSSA regulatory minimum requirements have been made much more stringent since the writing of the WPAP report. TSSA requires monitoring for leaks from all parts of the system and an automatic shutdown of the system if a leak were to be detected. Stinson has applied for the TSSA permit and it is included in the overall site plan submission. The TSSA minimum requirements exceed the recommendations provided in the WPAP. Additionally, all spills and leaks are required to be reported to the Spills Action Centre and there are significant repercussions for violations of the regulations. W.O. Stinson has prepared a document that includes training for staff, best management practices, spills prevention and spills response. All monitoring and regulatory requirements are governed by the TSSA regulations. The W.O. Stinson document is included in the Site Plan application package.

The final WPAP recommendation is specific to the existing MacEwan service station and is not addressed in this report.

WPAP Conceptual Model Comparison

The Conceptual Model (Section 4.0) of the hydrogeological system reported in the WPAP notes the majority of the Greely area consists of fossiliferous marine sand, clay and silty clay and glacial till. The observed overburden strata at the subject site is consistent with the WPAP conceptual model where a low conductivity clayey silt to silty clay layer was observed to underlie the majority of the site with the exception of the two locations noted above. BH4-24 had a confining layer with a higher percentage of silt (61%) that is consistent with Section 4.2 – Aquifer and Aquitard Parameter Characterization (WPAP) noting the aquitard layer is composed of low permeability clays and silts. The location of the double-walled fuel tanks relative to the areas encountering higher silt content are located downgradient of the aforementioned BH4-24.

The shallow groundwater flow travels in a westerly direction within the silty sand layer overlying the aquitard and is influenced by topography. This is corroborated by the Shield's Creek SS Figure 4.12.1 that notes general shallow groundwater flow directions that match with the general observations of the WPAP. The Shield's Creek SS notes that the shallow groundwater is expected to travel in a north to northwest direction from the ASV site and in a westerly direction from the subject site. The shallow overburden is expected to be the receiver for the highly treated septic effluent and will not travel in the direction of ASV. The proposed stormwater management system will collect stormwater and direct it to the roadside ditch on Albion Road. As previously noted, the water flow in the ditch travels to the north and west per the Shield's Creek SS mapping.

The pavement structure is also considered to be impermeable with the subbase engineered fill material creating a much thicker impermeable barrier.

Paterson is not aware of negative water quality observed at the ASV wells related to sewage system effluent, long term fuel station usage or road salt application.

CONCLUSIONS

Based on the information contained within the body of this report the following conclusions can be drawn:

1. The water supply aquifer intercepted by the existing well is considered to be adequate to support the water quantity demands for the proposed development.

2. The preferred water supply intercepted by TW1 contains a water supply that is potable and contains only elevated concentrations of hardness. The noted parameters can be treated with current readily available water conditioning equipment.

3. The sodium concentration was measured to be above the 20 mg/L reporting limit and, as such, the Medical Officer of Health for the City of Ottawa should be informed to assist area physicians in the treatment of local residents on sodium reduced diets.

4. Additional treatment to address TDS, iron and manganese may be desired due to the proposed tenant's usage. Water treatment methods may include reverse osmosis, iron filter, water softener and/or greensand filter, if desired.

5. The site is not considered hydrogeologically sensitive per the sewage system impact assessment and no additional separation criteria is required.

6. The predicted nitrate concentrations at the property boundary are calculated to be below the required 10 mg/L threshold when the BNA sewage treatment system is used with their denitrification technology.

7. A Sewage System Permit needs to be issued by the Ottawa Septic System Office as part of the Site Plan Application package. Both the permit and design drawings shall reference this report for denitrification requirements.

8. The results of the Hydrogeological Assessment and Terrain Analysis have provided satisfactory evidence that the subject site can support the proposed development with respect to water quality, quantity, and sewage system flow volumes.

9. The water balance review has noted there has been limited infiltration based on existing or historical conditions. The proposed re-development is adding significant soft landscaping and re-infiltrating clean roof precipitation, which will increase annual infiltration.

10. The use / storage of liquid fuel is governed under the TSSA regulations. The minimum requirements exceed recommendations listed in the WPAP. W.O.

Stinson has training practices, best management practices and spill prevention/reporting requirements under separate cover.

11. The proposed building USF, below grade storage tanks and associated onsite servicing will not intercept the underlying confining layers based on available information.

RECOMMENDATIONS

Based on the information contained within the body of this report the following recommendations can be drawn:

1. In accordance with the WPAP report and standard TSSA regulations, the proposed fuel storage tanks, piping and pumps shall have the capability to monitor for leaks which includes interstitial monitoring of the tank.

2. A sewage system maintenance program shall be entered into with the manufacturer or similar to maintain the BNA treatment plant to ensure proper operation at all times. This is a standard guideline / requirement for tertiary treatment technology and the contract will be provided to the OSSO upon each renewal.

3. The tenant is expected to require specific water treatment to maintain their desired taste of their products. A water treatment and plumbing specialist should be retained to meet the required quality standards provided by the franchise company.

4. W.O. Stinson staff should undergo appropriate training and be aware of the best management practices per the WPAP and the site specific W.O. Stinson guidance documents / training (under separate cover) created for the onsite activities. This shall include staff training for storage / handling / disposal of DNAPL / oils / grease, spills prevention plan, spills response plan and best management practices.

5. Any future work should consider the depth of excavation relative to the aquitard elevation to limit potential exposure of the underlying till aquifer. If the aquitard is penetrated during site activities, a hydrogeologist should be retained to provide recommendations to seal the hole.

6. All monitoring wells not required for long-term monitoring should be decommissioned in accordance with O.Reg.903.

We trust that the current submission satisfies your immediate requirements.

Best Regards,

Paterson Group Inc.

Michael S. Killam, P.Eng. Erik Ardley, P.Geo.

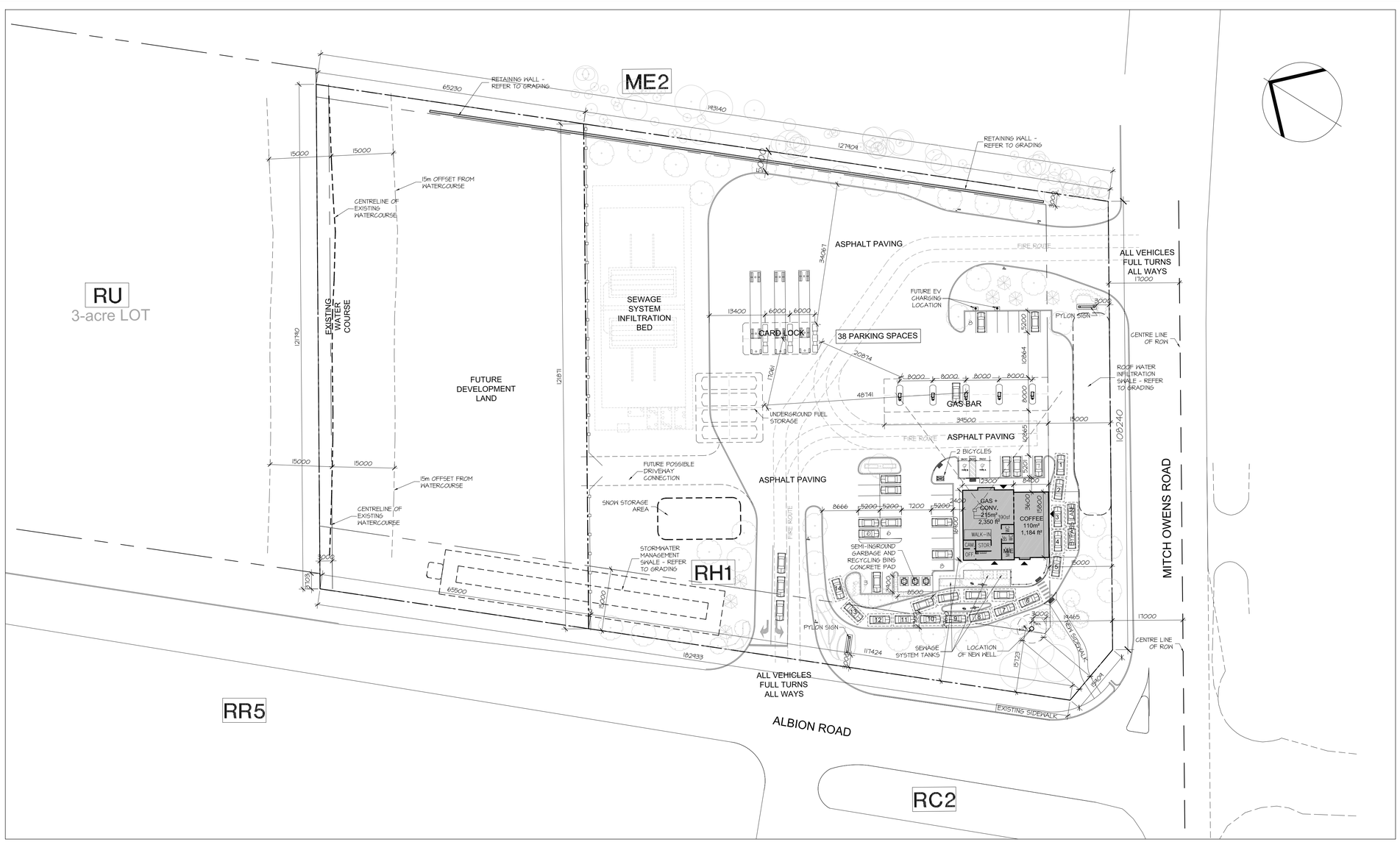
Attachments:

- ❑ Key Plan
- ❑ Hobin Architecture Site Plan Drawing
- ❑ Paterson Drawing – PH3645-5 – Sewage System Layout Plan (includes TW 1)
- ❑ Paterson Drawing – PH3645-6 – Sewage System Profile Plan
- ❑ Bergmann North America – Wastewater Treatment System Plan Layout
- ❑ MECP Water Well Record – TW1
- ❑ Eurofins Certificate of Analysis
- ❑ AQTESOLV - Pumping Test Analysis Reports
- ❑ Langelier Saturation Index Calculation
- ❑ Paterson Drawing – PG5485-1 – Rev.2 – Test Hole Location Plan
- ❑ Paterson Soil Profile and Test Data
- ❑ Grain Size Distribution
- ❑ Nitrate Impact Assessment Calculations
- ❑ Paterson Drawing – PH3645-4 – Rev.1 – Isopach Plan
- ❑ Shield's Creek Subwatershed Study – Figure 4.12.1 – Existing Drainage Conditions
- ❑ Trow Associates Inc/Jacques Whitford Environment Ltd – Wellhead Protection Area Plan – Albion Sun Vista Community – Figure 2 – Well Locations
- ❑ Trow Associates Inc/Jacques Whitford Environment Ltd – Wellhead Protection Area Plan – Albion Sun Vista Community – Capture Zones (Figure 5 to 9)
- ❑ Xerxes – P100DW – 100,000 L Double Wall UL Tank
- ❑ Xerxes – P86DW – 25,000 L Double Wall UL Tank
- ❑ Xerxes – P86DW – 20,000 L Double Wall UL Tank
- ❑ ZCL / Xerxes – Water and Wastewater – Fiberglass Storage Tanks Brochure

FIGURE 1

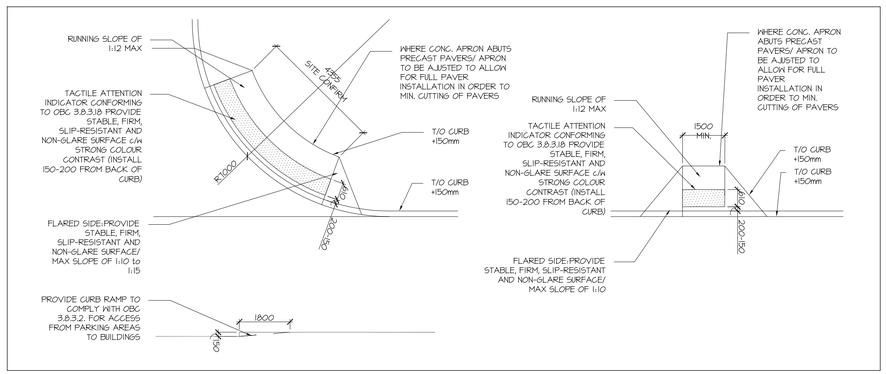
KEY PLAN

PATERSON GROUP



1 SITE PLAN
A1.00

SCALE: 1:500



2 TYPICAL TWSI DETAIL
A1.00

SCALE: 1:100

2025/01/29
1813_Site Plan_Gas Station.dwg

Owner
N. O. STINSON & SON LTD.
4728 Bank Street, Ottawa, ON K1T 3W7
Attn: Keith Oster - 613 241-1781

Architect/Agent
HOBIN ARCHITECTURE INC.
63 Pamilla Street, Ottawa, ON, K1S 3K7
Attn: Doug van den Ham - 613-238-1200 x 115

Survey
STANTEC GEOMATICS LTD.
100-600 Terry Fox Drive, Kanata, Ontario K2L 4B6
Attn: D. S. McMorran - 613-541-2580

ARCADIS
Suite 500, 333 Preston St, Ottawa, ON, K1S 5N4
Attn: Anton Ghetrar P.Eng - 613 225 1311 ext 64012

Structural
NOT YET CONTRACTED

Electrical
MASCS INC.
Attn: David MacNaughtan - 613-713-4734

Landscape
LEVSTEK AND ASSOCAITES
5811 High Cres Ottawa ON K0A 2W0
Attn: Rudy Levstek - 613-826-0518

Traffic
PARSONS ENGINEERS
1223 Michael St., Suite 100, Ottawa, ON K1J 7T2
Attn: Jake Berube - 613-854-1097

LEGAL DESCRIPTION:

PART OF LOT 30, CONCESSION 4 (RIDEAU FRONT)
GEOGRAPHIC TOWNSHIP OF GLOUCESTER
CITY OF OTTAWA

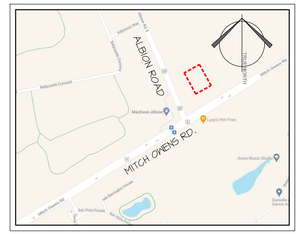
CIVIL ADDRESS:

5545 ALBION ROAD, OTTAWA

ZONING NOTES:

OFFICIAL PLAN DESIGNATION: RURAL COUNTRYSIDE
ZONING - RH1

ZONE: RH1	REQUIRED/ PERMITTED	PROVIDED
PERMITTED USE (AMONG OTHERS)	ALL LAND USES PROPOSED, INCLUDING OTHER HEAVY INDUSTRIAL TYPE USEs	GAS BAR DRIVE-THROUGH FACILITY
CONDITIONAL USES PERMITTED:	ALL LAND USED PROPOSED	CONVENIENCE STORE, RESTAURANT
MIN. LOT AREA	20,000 sq.m.	23,200sq.m.
MIN. LOT WIDTH	60m	120m
MIN. FRONT YARD SETBACK	15 m	15 m PROVIDED
MIN. INTERIOR SIDE YARD SETBACK (i) ABUTTING INDUSTRIAL ZONE (ii) OTHER	 3m 10m	 3m 10m
MIN. CORNER SIDE YARD SETBACK	15m	29m PROVIDED
MAX. PRINCIPAL BUILDING HEIGHT	15m	8m
MAX. LOT COVERAGE (%)	50%	8%
PARKING SPACES Civil	CONVENIENCE STORE 3.4 / 100m2 GFA = 6 GAS BAR = NONE RESTAURANT FAST FOOD PER 101(6)(b)(i) 20% reduction applies when operating with a drive-through 10 / 100m2 GFA = 25 = 20 TOTAL = 26	38
BICYCLE PARKING	Per 111(1): None	2 PROVIDED



LEGEND:

B.F. PARKING STALL c/w BF. SIGNAGE	3400, 5950
DEPRESSED CURB c/w TWSI	
150mm DIA., 6mm THK, GALV. STEEL BOLLARD (MIN. 1.5m HIGH & 1.5m BELOW GRADE)	BOL
HEAVY DUTY ASPHALT	
PAINTED LINE STOP BAR	
ROLLED CONCRETE CURB	RC
SITE SIGNAGE	
PAINTED LINES	
BIKE RACK	
EXTERIOR LIGHTING/ REFER TO ELEC. DWGS. FOR TYPES	
CHAIN LINK FENCE	
FIRE ROUTE SIGNAGE	FRS
EXISTING TREE* *REFER TO LANDSCAPE L101 FOR DETAILS	
NEW TREE*	
NEW PLANTING*	

no.	date	revision
5	JAN 29, 2024	ISSUED FOR SITEPLAN APPLICATION
4	DEC 3, 2024	ISSUED FOR SITEPLAN APPLICATION
3	NOV 1, 2024	ISSUED FOR PRE CONSULTATION
2	OCT 9, 2024	ISSUED FOR REVIEW
1	OCT 3, 2024	ISSUED FOR REVIEW

It is the responsibility of the appropriate contractor to check and verify all dimensions on site and report all errors and/or omissions to the architect.

All contractors must comply with all pertinent codes and by-laws.

Do not scale drawings.

This drawing may not be used for construction until signed.

ONTARIO ASSOCIATION OF ARCHITECTS
LARRY J. HOBIN
LICENCE
3049

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63 Pamilla Street
Ottawa, Ontario
Canada K1S 3K7
T: 613-238-7200
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E: mail@hobinarc.com
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HOBIN ARCHITECTURE

PROJECT/LOCATION:
W.O. Stinson & Son Ltd.
Albion Road Property
5545 Albion Road

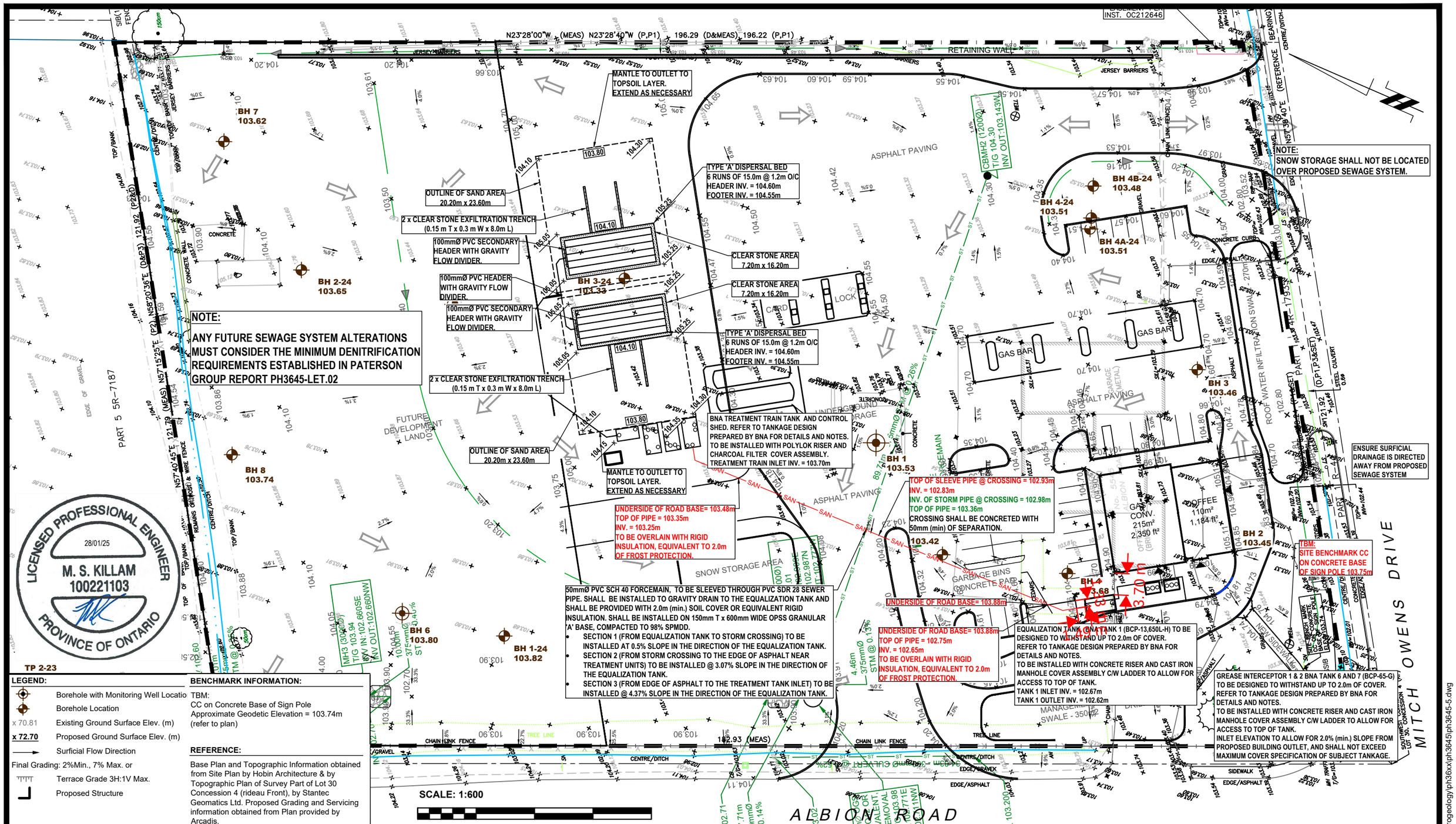
DRAWING TITLE:
GAS BAR AND CARDLOCK CONVENIENCE STORE SITE PLAN

DRAWN BY:	DATE:	SCALE:
DV / MF	SEPT. 2023	AS NOTED

PROJECT: 1813

DRAWING NO.: A1.00

REVISION NO.:



LICENSED PROFESSIONAL ENGINEER
M. S. KILLAM
100221103
28/01/25
PROVINCE OF ONTARIO

LEGEND:

- Borehole with Monitoring Well Locatio
- Borehole Location
- x 70.81 Existing Ground Surface Elev. (m)
- **x 72.70** Proposed Ground Surface Elev. (m)
- Surficial Flow Direction
- Final Grading: 2%Min., 7% Max. or
- Terrace Grade 3H:1V Max.
- Proposed Structure

BENCHMARK INFORMATION:

TBM:
CC on Concrete Base of Sign Pole
Approximate Geodetic Elevation = 103.74m
(refer to plan)

REFERENCE:

Base Plan and Topographic Information obtained from Site Plan by Hobin Architecture & by Topographic Plan of Survey Part of Lot 30 Concession 4 (rideau Front), by Stantec Geomatics Ltd. Proposed Grading and Servicing information obtained from Plan provided by Arcadis.

Consultant
PATERSON GROUP
9 AURIGA DRIVE
OTTAWA, ON
K2E 7Z9
TEL: (613) 226-7381

DD/MM/YY	Description	Rev.
28/01/25	Issued with Revised Site Plan	0

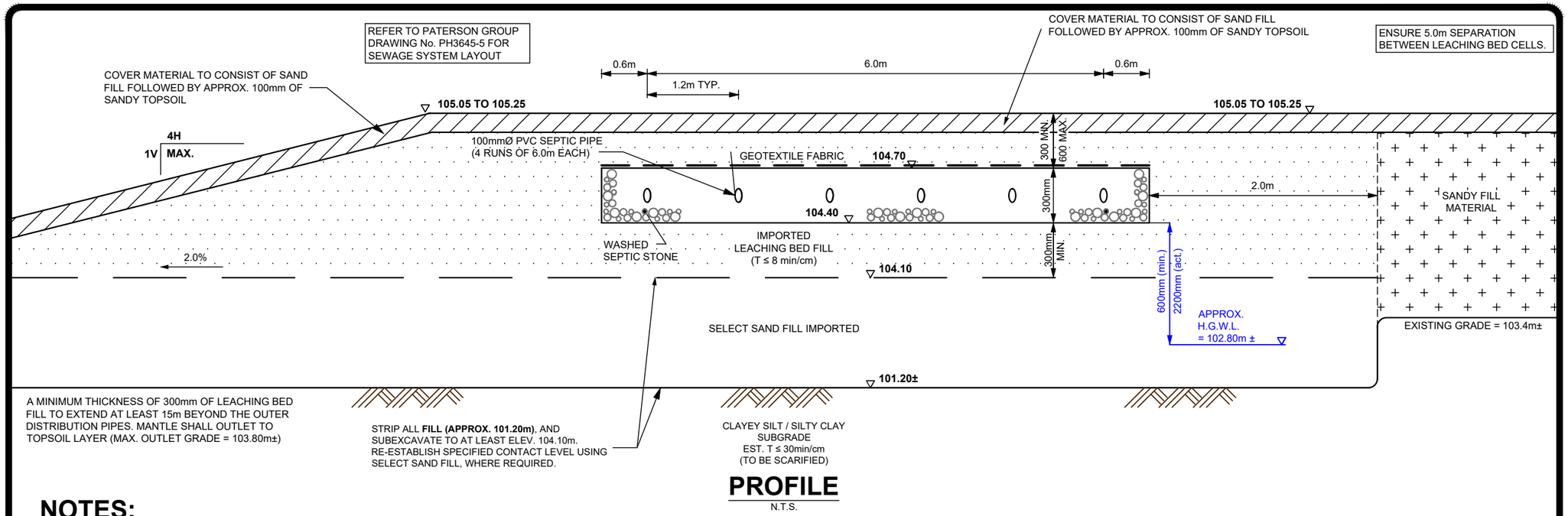
Client
W.O. STINSON & SON LTD.

Project
PROPOSED COMMERCIAL BUILDING
5545 ALBION ROAD
OTTAWA (GREELY), ONTARIO

Drawing
SEWAGE SYSTEM LAYOUT PLAN

Scale: 1:600	Drawn by: HV
Date: 01/2025	Checked by: MK
Drawing no.: PH3645-5	

p:\autocad drawings\hydrogeology\ph36xx\ph3645\ph3645-5.dwg



PROFILE

N.T.S.

NOTES:

1) ESTIMATE OF DAILY SEWAGE FLOW (Q)

TOTAL DESIGN DAILY SANITARY SEWAGE FLOW (T.D.D.S.S.F.) HAS BEEN CALCULATED IN ACCORDANCE WITH OBC TABLE 8.2.1.3.B. AND WITH TIM HORTON'S SEWAGE SYSTEM DESIGN GUIDELINES.

- GAS BAR @ 560 L/DAY PER NOZZLES: 10 NOZZLES = 5,600 L/DAY
- CARD-LOCK FUEL SERVICE: 8L/USE x 50 USES PER DAY = 400 L/DAY
- CONVENIENCE STORE @ 1230 L/DAY / WATER CLOSET: 1 WATER CLOSET = 1,230 L/DAY
- TIM HORTONS DRIVE THROUGH: 190 L / 9.25 m²: (110 m²/9.25) x 190 L/DAY = 2,259 L/DAY & 75 L/DAY PER EMPLOYEE PER 8 HOUR SHIFT: 6 x 8 HOUR SHIFTS = 450 L/DAY
- ESTIMATED SEWAGE FLOW = 9,939 L/DAY

DESIGN DAILY SEWAGE FLOW = 10,000 L/DAY

2) SOIL CONDITIONS

SOILS INFORMATION GATHERED BY PATERSON GROUP INC. ON APRIL 11, 2024, REFER TO PATERSON GROUP REPORT No. PH3645-1Rev.01.

BH 1-24, ELEV. 103.82m		BH 2-24, ELEV. 103.65m		BH 3-24, ELEV. 103.33m	
0-0.56	FILL: SISA, w STONE & GR.	0-0.15	TOPSOIL GRAVEL & COBBLES	0-2.13	FILL: SISA, w STONE & GR.
0.56-0.94	TOPSOIL, tr. ORGANICS	0.15-0.61	FILL:SISA, w STONE & GR.	2.13-4.11	SILTLY CLAY TO CLAYEY SILT
0.94-2.97	Br. SISA, Grey @ 2.3m	0.61-2.21	COMPACT Br. SILTY SAND	BH TERMINATED @ 7.52m	
BH TERMINATED @ 9.75m		BH TERMINATED @ 8.23m			
- G.W.L. @ 1.39m DEPTH (102.43m)		- G.W.L. @ 0.86m DEPTH (102.79m)		GREYING @ 2.13m DEPTH (101.20m)	

3) PRE-TREATMENT TANKAGE

- TANKAGE DESIGN HAS BEEN COMPLETED BY OTHERS (BNA)
- ANY PRETREATMENT TANKAGE THAT EXCEEDS STANDARD MAXIMUM MANUFACTURER SPECIFIED COVER SHALL BE REVIEWED BY A STRUCTURAL ENGINEER.

4) TREATMENT TANKAGE

- TANKAGE DESIGN HAS BEEN COMPLETED BY OTHERS (BNA).
- ANY TREATMENT TANKAGE THAT EXCEEDS STANDARD MAXIMUM MANUFACTURER SPECIFIED COVER SHALL BE REVIEWED BY A STRUCTURAL ENGINEER.

5) FORCEMAIN/PUMP CHAMBER

- A 50mmØ (NOMINAL) PVC SCH40 FORCEMAIN SHALL BE USED TO CARRY THE EFFLUENT FROM THE TREATMENT UNIT TO THE PRESSURIZED FLOW DIVIDER.
- FORCEMAINS TO BE PROVIDED WITH 2.0m (min.) OF SOIL COVER (OR EQUIVALENT INSULATION) AND SHALL GRAVITY DRAIN.
- FORCEMAINS SHALL BE SLEEVED THROUGH A 100mm (min.) SDR 28 PVC GASKETED PIPE UNDER ROADWAY.
- FORCEMAINS SHALL BE INSTALLED ON A 150mm THICK LAYER OF OPSS GRANULAR 'A' COMPACTED TO 98% SPMDD.

6) LEACHING BED

- THE DISPOSAL FIELD SHALL CONSIST OF 2 x TYPE 'A' DISPERSAL BED COMPRISED OF 6 RUNS OF 15.0m EACH RUN @ 1.2m O/C SPACING OF 100mmØ PVC PERFORATED SEPTIC PIPE.
- CLEAR STONE AREA REQUIRED = Q/50 = 10,000/50 = 200.0m²
- CLEAR STONE AREA PROVIDED = 2 x (7.2m x 16.20m) = 2 x 116.64 = 233.3m²
- SAND AREA REQUIRED = QT/400 = 10,000(30)/400 = 750m²
- SAND AREA PROVIDED = 2 x (20.2m x 23.63.5m) = 2 x 529.2m² = 1,058.4m²
- REMOVE ALL EXISTING **TOPSOIL**, AND FILL **(APPROX. 101.2m±)** WITHIN THE LIMITS OF THE SAND AREA AND SUBEXCAVATE TO AT LEAST ELEVATION 104.10m, WHICHEVER IS GREATER.
- THE MINIMUM SPECIFIED CONTACT ELEVATION OF 104.10m SHALL BE ESTABLISHED WITH SELECT SAND FILL.
- THE SUBGRADE SHALL BE SCARIFIED UNDER DRY CONDITIONS.
- THE SPECIFIED TOP OF THE SAND LAYER (ELEV. 104.40m), BELOW THE CLEAR STONE DISTRIBUTION AREA, SHOULD BE ESTABLISHED WITH IMPORTED SAND FILL, HAVING A PERCOLATION RATE OF NOT GREATER THAN 8 min/cm (300mm THICKNESS MINIMUM).
- LEACHING BED SAND FILL SHALL BE UNIFORM SAND WITH GRADING LIMITS SIMILAR TO 100% PASSING 13.2mm SIEVE, LESS THAN 5% PASSING 0.075mm SIEVE AND HAVING A PERCOLATION RATE OF 6 TO 8 min/cm. LEACHING BED FILL SHALL BE PRE- APPROVED BY THE CONSULTANT.
- THE SAND AREA OUTSIDE OF THE LIMITS OF THE DISTRIBUTION AREA SHALL CONSIST OF A MINIMUM THICKNESS OF 300mm OF UNIFORM SAND HAVING A PERCOLATION RATE OF NOT GREATER THAN 8 min/cm. MATCH EXISTING GRADE WITH ADDITIONAL LEACHING BED SAND FILL.
- THE DISTRIBUTION PIPES SHOULD CONSIST OF 100mmØ PERFORATED SEPTIC PIPE WHICH SHALL BE EMBEDDED IN A 300mm THICK LAYER OF WASHED SEPTIC STONE.
- THE INVERT LEVEL OF THE DISTRIBUTION PIPES SHALL BE SET AT ELEVATION 104.60m AT THE HEADER AND SET AT ELEVATION 104.55m AT THE FOOTER.
- THE ENDS OF EACH RUN SHALL BE INTERCONNECTED WITH A FOOTER PIPE.
- THE MAIN CLEAR STONE LAYER SHALL BE COVERED WITH AN APPROVED GEOTEXTILE FABRIC.
- THE SURFACE OF THE BED SHOULD BE COVERED WITH SAND FILL FOLLOWED BY APPROXIMATELY 100mm OF SANDY TOPSOIL. THE BED AREA SHOULD BE VEGETATED.
- THE TOTAL THICKNESS OF THE COVER OVER THE CLEAR STONE DISTRIBUTION LAYER SHALL RANGE BETWEEN 0.3m AND 0.6m.
- THE SIDES OF THE BED SHOULD BE SLOPED AT 4H:1V OR SHALLOWER.

7) MINIMUM CLEARANCE DISTANCE FROM CLEAR STONE

- 6.9m FROM ANY PROPERTY LINE
- 8.9m FROM ANY STRUCTURE
- 18.9m FROM ANY DRILLED WELL
- 5.0m FROM ANY TREES UNLESS OTHERWISE APPROVED
- 5.0m FROM DRIVEWAY

8) MINIMUM CLEARANCE DISTANCE FROM TANK(S)

- 1.5m FROM ANY STRUCTURE
- 15.0m FROM ANY DRILLED WELL
- 3.0m FROM ANY PROPERTY LINE

9) GENERAL

- **ANY FUTURE SEWAGE SYSTEM ALTERATIONS MUST CONSIDER THE MINIMUM DENITRIFICATION REQUIREMENTS ESTABLISHED IN PATERSON GROUP REPORT PH3645-LET.02.**
- **SNOW STORAGE SHALL NOT BE LOCATED OVER PROPOSED SEWAGE SYSTEM.**
- **THE SEWAGE SYSTEM HAS NOT BEEN DESIGNED TO SUPPORT TRAFFIC LOADING.**
- **THE BACKFILLING OF THE SEWAGE SYSTEM SHOULD MINIMIZE THE RISK OF OVER COMPACTION WITH THE USE RUBBER TRACKED EQUIPMENT AND BY AVOIDING THE CREATION OF ANY CONSTRUCTION ROUTES OR PATHWAYS OVER THE SYSTEM.**
- **ANY IRRIGATION / SPRINKLER SYSTEM TO BE LOCATED AWAY FROM PROPOSED LEACHING BED.**
- **CONTRACTOR SHALL BE QUALIFIED AND REGISTERED UNDER PART 8 OF THE ONTARIO BUILDING CODE.**
- **ALL WORK SHALL BE CARRIED OUT IN ACCORDANCE WITH THE LATEST BY-LAWS, CODES AND REGULATIONS.**
- **CONTRACTOR SHALL REVIEW DRAWINGS IN DETAIL AND SHALL INFORM THE CONSULTANT OF ANY ERRORS AND/OR OMISSIONS ON DESIGN DRAWINGS IMMEDIATELY.**
- **CONTRACTOR SHALL BE RESPONSIBLE TO LOCATE AND PROTECT ALL EXISTING UNDERGROUND SERVICES.**
- **CONTRACTOR SHALL VISIT THE SITE AND REVIEW ALL DOCUMENTATION TO BECOME FAMILIAR WITH THE SITE AND SUBSURFACE SOIL CONDITIONS TO DETERMINE SUITABLE METHODS OF CONSTRUCTION.**
- **THE FIRM OF PATERSON GROUP INC. HAS PROVIDED DESIGN SERVICES ONLY FOR THE SUBJECT SEWAGE SYSTEM. THE DESIGN HAS BEEN CARRIED OUT IN ACCORDANCE WITH THE MANUFACTURER'S GUIDELINES AND OUR INTERPRETATION OF PART 8 OF THE ONTARIO BUILDING CODE.**
- **CONSTRUCTION INSPECTIONS DURING THE INSTALLATION OF THE SEWAGE SYSTEM MAY BE REQUIRED BY THE REGULATING AUTHORITY AND ARE STRONGLY RECOMMENDED BY THIS FIRM DUE TO THE POTENTIAL VARIABILITY IN BEDROCK ELEVATION AT THE SUBJECT SITE. IF THIS FIRM IS TO COMPLETE ANY CONSTRUCTION INSPECTION(S), ADDITIONAL FEES MAY BE APPLIED. CONFIRMATION OF PAYMENT WILL BE REQUIRED PRIOR TO THE INSPECTION.**
- **THE TEST HOLE INFORMATION PROVIDED, IS INTENDED TO BE USED FOR DESIGN PURPOSES ONLY, AND SHOULD NOT BE RELIED UPON FOR CONSTRUCTION PURPOSES. IF DISCREPANCIES ARE FOUND DURING THE CONSTRUCTION PROCESS, IT IS THE CLIENT'S RESPONSIBILITY TO CONTACT THIS FIRM TO MAKE ANY NECESSARY COMMENTS OR REVISIONS. ADDITIONAL REVISIONS ARE NOT CONSIDERED PART OF THE DESIGN WORKS AND WILL BE CONSIDERED AS AN ADDITIONAL COST.**

LICENSED PROFESSIONAL ENGINEER
28/01/25
M. S. KILLAM
100221103
PROVINCE OF ONTARIO

DD/MM/YY	DESCRIPTION	REV.
28/01/25	Issued with Revised Site Plan	0

Consultant:

PATERSON GROUP
9 AURIGA DRIVE
OTTAWA, ON
K2E 7S9
TEL: (613) 226-7381

Client:

W.O. STINSON & SON LTD.

Project:

PROPOSED COMMERCIAL BUILDING

5545 ALBION ROAD
OTTAWA (GREELY), ONTARIO

Drawing:

SEWAGE SYSTEM DETAIL & NOTES

Scale:	Drawn by:
N.T.S.	HV
Date:	Checked by:
01/2025	MK

Drawing No.:

PH3645-6

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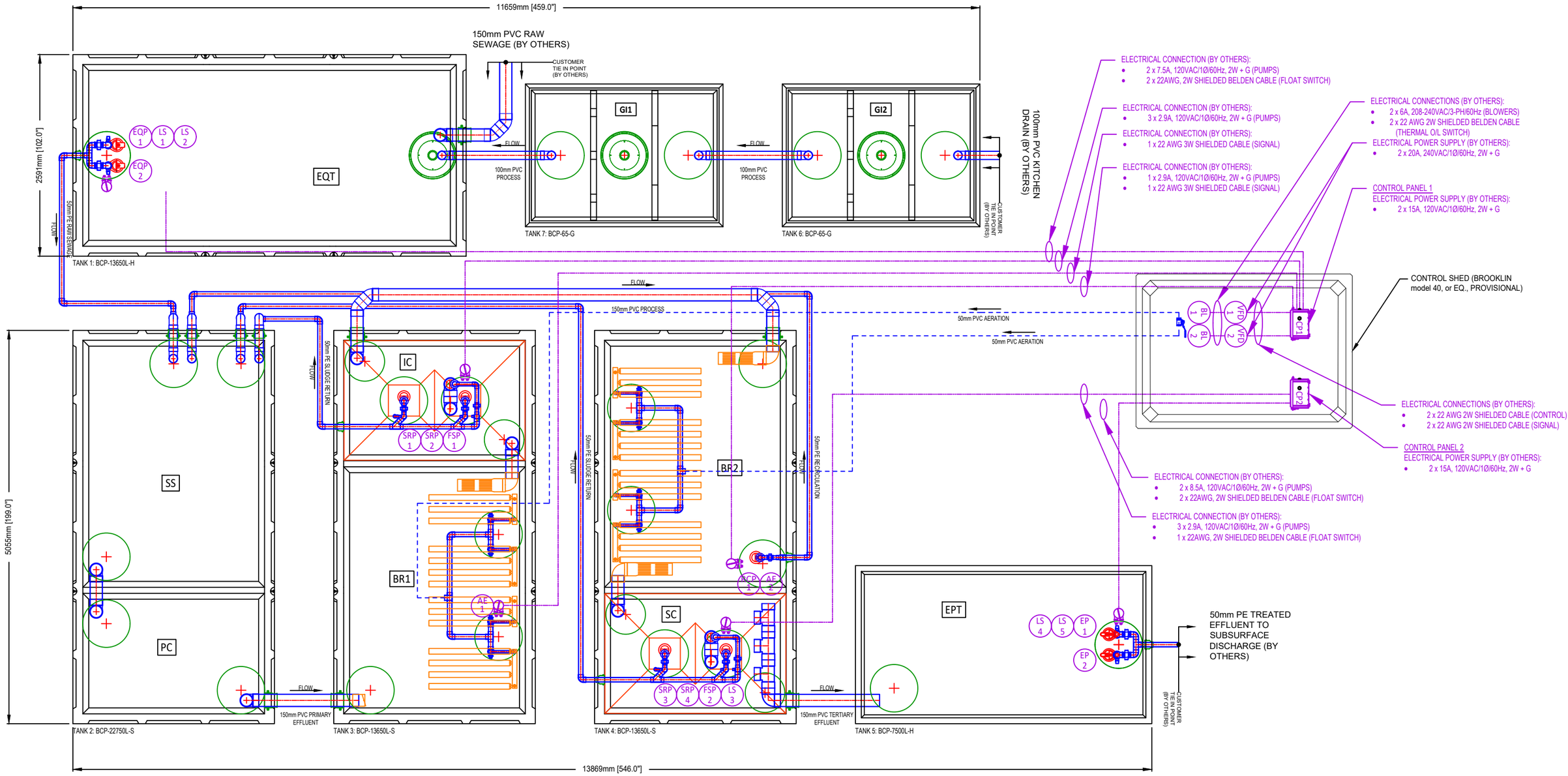


PROCESS FLOW
SLUDGE RETURN/RECIRC
AERATION
CHEMICAL DOSING
ELECTRICAL

BL	BLOWER
VFD	VARIABLE FREQUENCY DRIVE
CDP	CHEMICAL DOSING PUMP
SRP	SLUDGE RETURN PUMP
FSP	FLOATING SLUDGE (SKIMMER) PUMP
EQP	FLOW EQUALIZATION PUMP
RCP	RECIRCULATION PUMP
EP	EFFLUENT PUMP
LS	LEVEL SWITCH (FLOAT)

NOTES:

A. ALL WORK, INSTALLATION AND CONNECTIONS IN RELATION TO THE TREATMENT SYSTEM SHALL BE DONE IN ACCORDANCE WITH THE WRITTEN INSTRUCTIONS PROVIDED BY BERGMANN NORTH AMERICA INC. AND IN ACCORDANCE WITH ALL APPLICABLE LOCAL CODES AND REGULATIONS.

B. ALL ACCESS OPENINGS MUST BE INSTALLED TO GRADE AND SECURED TO PREVENT ACCIDENTAL OR UNAUTHORIZED ACCESS.

C. A MAXIMUM OF 1 METRE BURIAL DEPTH IS ALLOWABLE ON TOP OF ANY TANKS IN A NON-TRAFFIC AREA. EXTRA REINFORCEMENT IS REQUIRED FOR USE IN AREAS WITH VEHICULAR TRAFFIC AND BURIAL DEPTHS OVER 1 METRE.

TANK LIST

PROCESS NAME		TANK #	~ WORKING VOLUME (m³)
EQT	EQUALIZATION TANK	1	13.6
SS	SLUDGE STORAGE	2	14.5
PC	PRIMARY CLARIFIER	2	6.9
BR1	BIOREACTOR 1	3	9.0
C	INTERMEDIATE CLARIFIER	3	2.7
BR2	BIOREACTOR 2	4	9.0
SC	SECONDARY CLARIFIER	4	2.7
EPT	EFFLUENT PUMP TANK	5	7.5
GI1	GREASE INTERCEPTOR 1	6	3.0
GI2	GREASE INTERCEPTOR 2	7	3.0

BNA BERGMANN NORTH AMERICA INC.

iQ. MBBR

TIM HORTONS - WWTS

DRAWING: PLAN LAYOUT
PRELIMINARY
Rev.0

DRAWN BY:	APPROVED BY:	SHEET
IR	MM	1 of 1

DATE: 2024/08/13 | SCALE: 1:50

Ontario — Ministry of the Environment, Conservation and Parks

W Tag#:A361000 (Print Below)

A361000

Well Record

Regulation 903 Ontario Water Resources Act

Measurements recorded in: ☐ Metric ☒ Imperial

Page ____ of ____

Well Owner's Information

First Name	Last Name/Organization	E-mail Address	☐ Well Constructed by Well Owner
	W.O. Stinson & Sons Ltd.		

Mailing Address (Street Number/Name)	Municipality	Province	Postal Code	Telephone No. (inc. area code)
4726 Bank Street	Ottawa	ON	K1T 3W7	

Well Location

Address of Well Location (Street Number/Name)	Township	Lot	Concession
5545 Albion Road South	Gloucester	30	4 R.F.

County/District/Municipality	City/Town/Village	Province	Postal Code
Ottawa Carleton	Gloucester	Ontario	

UTM Coordinates	Zone	Easting	Northing	Municipal Plan and Sublot Number	Other
NAD 83	18	453430	5013125		

Overburden and Bedrock Materials/Abandonment Sealing Record (see instructions on the back of this form)

General Colour	Most Common Material	Other Materials	General Description	Depth (m/ft) From	Depth (m/ft) To
	Sand & Gravel	& Clay	& Boulders	0'	52'
Grey & Black	Limestone			52'	75'
Grey & White	Sandstone			75'	163'
Grey & White	Sandstone			163'	172'
Grey & White	Sandstone			172'	180'

Annular Space

Depth Set at (m/ft) From	To	Type of Sealant Used (Material and Type)	Volume Placed (m³/ft³)
58'	48'	Neat cement	12.4 ft³
48'	0'	Bentonite slurry	16.8 ft³

Method of Construction

☐ Cable Tool ☐ Diamond
☐ Rotary (Conventional) ☐ Jetting
☐ Rotary (Reverse) ☐ Driving
☐ Boring ☐ Digging
☒ Air percussion
☐ Other, specify

Well Use

☒ Public ☐ Commercial ☐ Not used
☐ Domestic ☐ Municipal ☐ Dewatering
☐ Livestock ☐ Test Hole ☐ Monitoring
☐ Irrigation ☐ Cooling & Air Conditioning
☐ Industrial
☐ Other, specify

Construction Record - Casing

Inside Diameter (cm/in)	Open Hole OR Material (Galvanized, Fibreglass, Concrete, Plastic, Steel)	Wall Thickness (cm/in)	Depth (m/ft) From	Depth (m/ft) To
6 1/4"	Steel	.188"	+2'	58'
6"	Open Hole		58'	180'

Construction Record - Screen

Outside Diameter (cm/in)	Material (Plastic, Galvanized, Steel)	Slot No.	Depth (m/ft) From	Depth (m/ft) To

Status of Well

☒ Water Supply
☐ Replacement Well
☐ Test Hole
☐ Recharge Well
☐ Dewatering Well
☐ Observation and/or Monitoring Hole
☐ Alteration (Construction)
☐ Abandoned, Insufficient Supply
☐ Abandoned, Poor Water Quality
☐ Abandoned, other, specify
☐ Other, specify

Water Details

Water found at Depth (m/ft)	Kind of Water	Hole Diameter Depth From (m/ft)	Depth To (m/ft)	Diameter (cm/in)
163 (m/ft) ☐ Gas	☐ Fresh ☐ Untested ☐ Other, specify		0' 58'	9 3/4"
172 (m/ft) ☐ Gas	☐ Fresh ☐ Untested ☐ Other, specify		58' 180'	6"
(m/ft) ☐ Gas	☐ Fresh ☐ Untested ☐ Other, specify			

Results of Well Yield Testing

After test of well yield, water was:
☐ Clear and sand free
☐ Other, specify Not tested

If pumping discontinued, give reason: X

Pump intake set at (m/ft): 170

Pumping rate (l/min/GPM): 15

Duration of pumping: 1 hrs + 0 min

Final water level end of pumping (m/ft): 84'2"

If flowing give rate (l/min/GPM): S

Recommended pump depth (m/ft): 150

Recommended pump rate (l/min/GPM): 15

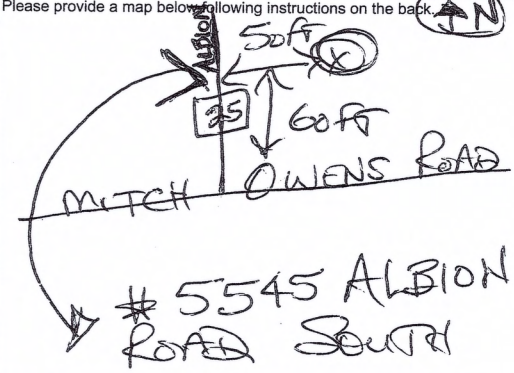
Well production (l/min/GPM): 15

Disinfected? ☒ Yes ☐ No

Draw Down Time (min)	Draw Down Water Level (m/ft)	Recovery Time (min)	Recovery Water Level (m/ft)
Static Level	23'0"		84.2'
1	34.1	1	71.7
2	38.5	2	66.3
3	42.1	3	61.5
4	45.0	4	57.8
5	47.5	5	54.3
10	56.6	10	42.6
15	59.0	15	36.0
20	66.4	20	31.9
25	71.4	25	29.3
30	75.4	30	27.5
40	79.5	40	25.7
50	82.5	50	24.2
60	84.2'	60	23.0"

Map of Well Location

Please provide a map below following instructions on the back.



Comments:
1 HP 15 GPM SET AT 150 FEET

Well Contractor and Well Technician Information

Business Name of Well Contractor	Well Contractor's Licence No.
Air Rock Drilling Co. Ltd.	7681

Business Address (Street Number/Name)	Municipality	Province	Postal Code	Business E-mail Address
6859 Frankltown Road	Richmond	ON	K0A 2Z0	air-rock@sympatico.ca

Bus. Telephone No. (inc. area code)	Name of Well Technician (Last Name, First Name)	Well Technician's Licence No.	Signature of Technician and/or Contractor	Date Submitted (Y Y Y Y M M D D)
6138382170	Hanna, Jeremy	13632		2023 09 30

Well owner's information package delivered	Date Package Delivered (Y Y Y Y M M D D)
☒ Yes ☐ No	2023 09 30

Ministry Use Only
Audit No. Z408158
Received

Certificate of Analysis

Client: Paterson Group
9 AURIGA DRIVE
Ottawa, ON
K2E 7T9
Attention: Mr. Zavian Buchanan
PO#: 58535
Invoice to: Paterson Group

Report Number: 3002032
Date Submitted: 2023-10-06
Date Reported: 2023-10-17
Project: PH3645
COC #: 910964

Dear Zavian Buchanan:

Please find attached the analytical results for your samples. If you have any questions regarding this report, please do not hesitate to call (613-727-5692).

Report Comments:

Rebecca Koshy
2023.10.17
10:26:20 -04'00'

APPROVAL: _____
Rebecca Koshy, Project Manager

All analysis is completed at Eurofins Environment Testing Canada Inc. (Ottawa, Ontario) unless otherwise indicated.

Eurofins Environment Testing Canada Inc. (Ottawa, Ontario) is accredited by CALA, Canadian Association for Laboratory Accreditation to ISO/IEC 17025 for tests which appear on the scope of accreditation. The scope is available at: https://directory.cala.ca/.

Eurofins Environment Testing Canada Inc. (Ottawa, Ontario) is licensed by the Ontario Ministry of the Environment, Conservation, and Parks (MECP) for specific tests in drinking water (license #2318). A copy of the license is available upon request.

Eurofins Environment Testing Canada Inc. (Ottawa, Ontario) is accredited by the Ontario Ministry of Agriculture, Food, and Rural Affairs for specific tests in agricultural soils.

Please note: Field data, where presented on the report, has been provided by the client and is presented for informational purposes only. Guideline values listed on this report are provided for ease of use (informational purposes) only. Eurofins recommends consulting the official provincial or federal guideline as required. Unless otherwise stated, measurement uncertainty is not taken into account when determining guideline or regulatory exceedances.

Certificate of Analysis

eurofins | Environment Testing

Client: Paterson Group
9 AURIGA DRIVE
Ottawa, ON
K2E 7T9
Attention: Mr. Zavian Buchanan
PO#: 58535
Invoice to: Paterson Group

Report Number: 3002032
Date Submitted: 2023-10-06
Date Reported: 2023-10-17
Project: PH3645
COC #: 910964

Group	Analyte	MRL	Units	Guideline	1706066 GW 2023-10-05 TW1-GW1	1706067 GW 2023-10-05 TW2-GW2
	Lab I.D.				1706066	1706067
	Sample Matrix				GW	GW
	Sample Type					
	Sampling Date				2023-10-05	2023-10-05
	Sample I.D.				TW1-GW1	TW2-GW2
Anions	Cl	1	mg/L	AO 250	91	96
	F	0.10	mg/L	MAC 1.5	0.26	0.27
	SO4	1	mg/L	AO 500	<1	<1
General Chemistry	Alkalinity as CaCO3	5	mg/L	OG 30-500	269	270
	Colour (Apparent)	2	TCU	AO 5	146*	116*
	Conductivity	5	uS/cm		884	869
	DOC	0.5	mg/L	AO 5	1.6	1.8
	pH	1.00		6.5-8.5	7.81	7.86
	Phenols	0.001	mg/L		<0.001	<0.001
	S2-	0.01	mg/L	AO 0.05		<0.01
		0.05	mg/L	AO 0.05	<0.05	
	TDS (COND - CALC)	1	mg/L	AO 500	575*	565*
	Turbidity	0.1	NTU	AO 5	13.5*	11.4*
Hardness	Hardness as CaCO3	1	mg/L	OG 80-100	345*	352*
Indices/Calc	Ion Balance	0.01			0.96	0.96
Metals	Ag	0.0001	mg/L		<0.0001	<0.0001
	Al	0.01	mg/L	OG 0.1	0.17*	0.04
	As	0.001	mg/L	IMAC 0.01	<0.001	<0.001
	B	0.01	mg/L	IMAC 5.0	0.14	0.14
	Ba	0.01	mg/L	MAC 1.0	0.17	0.16
	Be	0.0005	mg/L		<0.0005	<0.0005
	Ca	1	mg/L		74	75
	Cd	0.0001	mg/L	MAC 0.005	<0.0001	<0.0001
	Co	0.0002	mg/L		<0.0002	<0.0002
	Cr	0.001	mg/L	MAC 0.05	<0.001	<0.001

Guideline = ODWSOG *** = Guideline Exceedence**

Results relate only to the parameters tested on the samples submitted.
Methods references and/or additional QA/QC information available on request.

MRL = Method Reporting Limit, AO = Aesthetic Objective, OG = Operational Guideline, MAC = Maximum Acceptable Concentration, IMAC = Interim Maximum Acceptable Concentration, STD = Standard, PWQO = Provincial Water Quality Guideline, IPWQO = Interim Provincial Water Quality Objective, TDR = Typical Desired Range

Certificate of Analysis

eurofins | Environment Testing

Client: Paterson Group
9 AURIGA DRIVE
Ottawa, ON
K2E 7T9
Attention: Mr. Zavian Buchanan
PO#: 58535
Invoice to: Paterson Group

Report Number: 3002032
Date Submitted: 2023-10-06
Date Reported: 2023-10-17
Project: PH3645
COC #: 910964

Group	Analyte	MRL	Units	Guideline	1706066 GW 2023-10-05 TW1-GW1	1706067 GW 2023-10-05 TW2-GW2
	Lab I.D.				1706066	1706067
	Sample Matrix				GW	GW
	Sample Type					
	Sampling Date				2023-10-05	2023-10-05
	Sample I.D.				TW1-GW1	TW2-GW2
Metals	Cu	0.001	mg/L	AO 1	<0.001	<0.001
	Fe	0.03	mg/L	AO 0.3	0.84*	1.03*
	Hg	0.0001	mg/L	MAC 0.001	<0.0001	<0.0001
	K	1	mg/L		5	5
	Mg	1	mg/L		39	40
	Mn	0.01	mg/L	AO 0.05	0.06*	0.06*
	Mo	0.005	mg/L		<0.005	<0.005
	Na	1	mg/L	AO 200	57	56
	Ni	0.005	mg/L		<0.005	<0.005
	Pb	0.001	mg/L	MAC 0.010	<0.001	<0.001
	Sb	0.0005	mg/L	IMAC 0.006	<0.0005	<0.0005
	Se	0.001	mg/L	MAC 0.05	<0.001	<0.001
	Sr	0.001	mg/L		2.65	2.67
	Tl	0.0001	mg/L		<0.0001	<0.0001
	U	0.001	mg/L	MAC 0.02	<0.001	<0.001
	V	0.001	mg/L		<0.001	<0.001
	Zn	0.01	mg/L	AO 5	<0.01	<0.01
Microbiology	Escherichia Coli	0	ct/100mL	MAC 0	0	0
	Total Coliforms	0	ct/100mL	MAC 0	0	0
Nutrients	N-NH3	0.020	mg/L		0.142	0.142
	Total Kjeldahl Nitrogen	0.100	mg/L		0.215	0.640
Others	N-NO2	0.10	mg/L	MAC 1.0	<0.10	<0.10
	N-NO3	0.10	mg/L	MAC 10.0	<0.10	<0.10
Subcontract-Inorg	Tannin & Lignin	0.5	mg/L		<0.5	<0.5

Guideline = ODWSOG *** = Guideline Exceedence**

Results relate only to the parameters tested on the samples submitted.
Methods references and/or additional QA/QC information available on request.

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Certificate of Analysis

Client: Paterson Group
9 AURIGA DRIVE
Ottawa, ON
K2E 7T9
Attention: Mr. Zavian Buchanan
PO#: 58535
Invoice to: Paterson Group

Report Number: 3002032
Date Submitted: 2023-10-06
Date Reported: 2023-10-17
Project: PH3645
COC #: 910964

QC Summary

Analyte	Blank	QC % Rec	QC Limits
Run No 450084 **Analysis/Extraction Date** 2023-10-07 **Analyst** L V **Method** AMBCOLM1			
Escherichia Coli			
Total Coliforms			
Run No 450103 **Analysis/Extraction Date** 2023-10-10 **Analyst** AsA **Method** C SM4500-S2-D			
S2-	<0.01 mg/L	116	80-120
Run No 450106 **Analysis/Extraction Date** 2023-10-10 **Analyst** R T **Method** C SM2130B			
Turbidity	<0.1 NTU	100	70-130
Run No 450128 **Analysis/Extraction Date** 2023-10-10 **Analyst** IP **Method** SM5530D/EPA420.2			
Phenols	<0.001 mg/L	103	50-120
Run No 450157 **Analysis/Extraction Date** 2023-10-10 **Analyst** SKH **Method** EPA 350.1			
N-NH3	<0.020 mg/L	92	80-120
Run No 450160 **Analysis/Extraction Date** 2023-10-10 **Analyst** SKH **Method** EPA 351.2			
Total Kjeldahl Nitrogen	<0.100 mg/L	105	70-130

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QC Summary

Analyte	Blank	QC % Rec	QC Limits
Run No 450172 **Analysis/Extraction Date** 2023-10-11 **Analyst** S A **Method** C SM2120C			
Colour (Apparent)	<2 TCU	96	90-110
Run No 450177 **Analysis/Extraction Date** 2023-10-11 **Analyst** Z S **Method** M SM3120B-3500C			
Calcium	<1 mg/L	100	90-110
Potassium	<1 mg/L	104	87-113
Magnesium	<1 mg/L	97	76-124
Sodium	<1 mg/L	103	82-118
Run No 450215 **Analysis/Extraction Date** 2023-10-11 **Analyst** AaN **Method** EPA 200.8			
Aluminum	<0.01 mg/L	106	80-120
Arsenic	<0.001 mg/L	97	80-120
Boron (total)	<0.01 mg/L	99	80-120
Barium	<0.01 mg/L	95	80-120
Beryllium	<0.0005 mg/L	105	80-120
Cadmium	<0.0001 mg/L	105	80-120
Cobalt	<0.0002 mg/L	99	80-120
Chromium Total	<0.001 mg/L	92	80-120

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QC Summary

Analyte	Blank	QC % Rec	QC Limits
Copper	<0.001 mg/L	85	80-120
Iron	<0.03 mg/L	116	80-120
Mercury	<0.0001 mg/L	106	80-120
Manganese	<0.01 mg/L	101	80-120
Molybdenum	<0.005 mg/L	83	80-120
Nickel	<0.005 mg/L	101	80-120
Lead	<0.001 mg/L	102	80-120
Antimony	<0.0005 mg/L	95	80-120
Selenium	<0.001 mg/L	108	80-120
Strontium	<0.001 mg/L	95	80-120
Thallium	<0.0001 mg/L	98	80-120
Uranium	<0.001 mg/L	99	80-120
Vanadium	<0.001 mg/L	82	80-120
Zinc	<0.01 mg/L	108	80-120
Run No 450237 **Analysis/Extraction Date** 2023-10-11 **Analyst** AsA **Method** SM2320,2510,4500H/F			
Alkalinity (CaCO3)	<5 mg/L	101	90-110
Conductivity	<5 uS/cm	99	90-110

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Date Submitted: 2023-10-06
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QC Summary

Analyte	Blank	QC % Rec	QC Limits
F	<0.10 mg/L	100	90-110
pH		100	90-110
Run No 450239 **Analysis/Extraction Date** 2023-10-12 **Analyst** S A **Method** SM 4110			
Chloride	<1 mg/L	100	90-110
SO4	<1 mg/L	100	90-110
Run No 450262 **Analysis/Extraction Date** 2023-10-12 **Analyst** SKH **Method** C SM4500-NO3-F			
N-NO2	<0.10 mg/L	101	80-120
N-NO3	<0.10 mg/L	104	80-120
Run No 450273 **Analysis/Extraction Date** 2023-10-11 **Analyst** AsA **Method** SM 5310B			
DOC	<0.5 mg/L	106	80-120
Run No 450322 **Analysis/Extraction Date** 2023-10-12 **Analyst** AaN **Method** EPA 200.8			
Silver	<0.0001 mg/L	108	80-120
Run No 450411 **Analysis/Extraction Date** 2023-10-13 **Analyst** AET **Method** C SM2340B			
Hardness as CaCO3			

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Date Submitted: 2023-10-06
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QC Summary

Analyte	Blank	QC % Rec	QC Limits
Ion Balance			
TDS (COND - CALC)			
Run No 450539 **Analysis/Extraction Date** 2023-10-13 **Analyst** R K **Method** SUBCONTRACT-CA-INORG			
Tannin & Lignin	<0.5 mg/L		

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Report Number: 3002032
Date Submitted: 2023-10-06
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Project: PH3645
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Sample Comment Summary

Sample ID: 1706066 TW1-GW1 S2- MRL elevated due to matrix interference (dilution was done). Turbidity analysed past holding time for all samples on the report.

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COC #: 910965

Dear Zavian Buchanan:

Please find attached the analytical results for your samples. If you have any questions regarding this report, please do not hesitate to call (613-727-5692).

Report Comments:

APPROVAL: R Zafari Raheleh Zafari 2023.10.12 13:53:58 -04'00'

Raheleh Zafari, Environmental Chemist

All analysis is completed at Eurofins Environment Testing Canada Inc. (Ottawa, Ontario) unless otherwise indicated.

Eurofins Environment Testing Canada Inc. (Ottawa, Ontario) is accredited by CALA, Canadian Association for Laboratory Accreditation to ISO/IEC 17025 for tests which appear on the scope of accreditation. The scope is available at: https://directory.cala.ca/.

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Please note: Field data, where presented on the report, has been provided by the client and is presented for informational purposes only. Guideline values listed on this report are provided for ease of use (informational purposes) only. Eurofins recommends consulting the official provincial or federal guideline as required. Unless otherwise stated, measurement uncertainty is not taken into account when determining guideline or regulatory exceedances.

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Report Number: 3002034
Date Submitted: 2023-10-06
Date Reported: 2023-10-12
Project: PH3645
COC #: 910965

				Lab I.D.	1706068
				Sample Matrix	GW
				Sample Type	
				Sampling Date	2023-10-05
				Sample I.D.	TW1-GW2
Group	**Analyte**	**MRL**	**Units**	**Guideline**	
Hydrocarbons	F1 (C6-C10)	20	ug/L		20
	F1-BTEX (C6-C10)	20	ug/L		<20
	F2 (C10-C16)	20	ug/L		<20
	F3 (C16-C34)	50	ug/L		<50
	F4 (C34-C50)	50	ug/L		<50
PHC Surrogate	Alpha-androstrane	0	%		104
VOCs Surrogates	1,2-dichloroethane-d4	0	%		124
	4-bromofluorobenzene	0	%		91
	Toluene-d8	0	%		96
Volatiles	1,1,1,2-tetrachloroethane	0.5	ug/L		<0.5
	1,1,1-trichloroethane	0.4	ug/L		<0.4
	1,1,2,2-tetrachloroethane	0.5	ug/L		<0.5
	1,1,2-trichloroethane	0.4	ug/L		<0.4
	1,1-dichloroethane	0.4	ug/L		<0.4
	1,1-dichloroethylene	0.5	ug/L	MAC 14	<0.5
	1,2-dichlorobenzene	0.4	ug/L	MAC 200	<0.4
	1,2-dichloroethane	0.5	ug/L	IMAC 5	<0.5
	1,2-dichloropropane	0.5	ug/L		<0.5
	1,3,5-trimethylbenzene	0.3	ug/L		0.6
	1,3-dichlorobenzene	0.4	ug/L		<0.4
	1,3-Dichloropropylene (cis+trans)	0.5	ug/L		<0.5
	1,4-dichlorobenzene	0.4	ug/L	MAC 5	<0.4
	Acetone	5	ug/L		<5
	Benzene	0.5	ug/L	MAC 1	<0.5
	Bromodichloromethane	0.3	ug/L		<0.3

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Report Number: 3002034
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COC #: 910965

Group	Analyte	MRL	Units	Guideline	1706068 GW 2023-10-05 TW1-GW2
	Lab I.D.				1706068
	Sample Matrix				GW
	Sample Type				
	Sampling Date				2023-10-05
	Sample I.D.				TW1-GW2
Volatiles	Bromoform	0.4	ug/L		<0.4
	Bromomethane	0.5	ug/L		<0.5
	c-1,2-Dichloroethylene	0.4	ug/L		<0.4
	c-1,3-Dichloropropylene	0.5	ug/L		<0.5
	Carbon Tetrachloride	0.2	ug/L	MAC 2	<0.2
	Chloroethane	0.5	ug/L		<0.5
	Chloroform	0.5	ug/L		<0.5
	Dibromochloromethane	0.3	ug/L		<0.3
	Dichlorodifluoromethane	0.5	ug/L		<0.5
	Dichloromethane	4.0	ug/L	MAC 50	<4.0
	Ethylbenzene	0.5	ug/L	MAC 140	<0.5
	Ethylene Dibromide	0.2	ug/L		<0.2
	Hexane	5	ug/L		<5
	m/p-xylene	0.4	ug/L		2.0
	Methyl Ethyl Ketone (MEK)	2	ug/L		<2
	Methyl Isobutyl Ketone (MIBK)	5	ug/L		<5
	Methyl Tert Butyl Ether (MTBE)	2	ug/L	AO 15	<2
	Monochlorobenzene	0.5	ug/L	MAC 80	<0.5
	o-xylene	0.4	ug/L		1.0
	Styrene	0.5	ug/L		<0.5
	t-1,2-Dichloroethylene	0.4	ug/L		<0.4
	t-1,3-Dichloropropylene	0.5	ug/L		<0.5
	Tetrachloroethylene	0.3	ug/L	MAC 10	<0.3
	Toluene	0.4	ug/L	MAC 60	2.1
	Trichloroethylene	0.3	ug/L	MAC 5	<0.3

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				Lab I.D.	1706068
				Sample Matrix	GW
				Sample Type	
				Sampling Date	2023-10-05
				Sample I.D.	TW1-GW2
Group	**Analyte**	**MRL**	**Units**	**Guideline**	
Volatiles	Trichlorofluoromethane	0.5	ug/L		<0.5
	Vinyl Chloride	0.2	ug/L	MAC 1	<0.2
	Xylene; total	0.5	ug/L	MAC 90	3.0

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QC Summary

Analyte	Blank	QC % Rec	QC Limits
Run No 450275 **Analysis/Extraction Date** 2023-10-12 **Analyst** H S **Method** CCME O.Reg 153/04			
Petroleum Hydrocarbons F2	<20 ug/L	96	60-140
Petroleum Hydrocarbons F3	<50 ug/L	96	60-140
Petroleum Hydrocarbons F4	<50 ug/L	96	60-140
Run No 450280 **Analysis/Extraction Date** 2023-10-12 **Analyst** SS **Method** EPA 8260			
Tetrachloroethane, 1,1,1,2-	<0.5 ug/L	88	60-130
Trichloroethane, 1,1,1-	<0.4 ug/L	81	60-130
Tetrachloroethane, 1,1,2,2-	<0.5 ug/L	109	60-130
Trichloroethane, 1,1,2-	<0.4 ug/L	87	60-130
Dichloroethane, 1,1-	<0.4 ug/L	102	60-130
Dichloroethylene, 1,1-	<0.5 ug/L	91	60-130
Dichlorobenzene, 1,2-	<0.4 ug/L	104	60-130
Dichloroethane, 1,2-	<0.5 ug/L	82	60-130
Dichloropropane, 1,2-	<0.5 ug/L	82	60-130
1,3,5-trimethylbenzene	<0.3 ug/L	109	60-130
Dichlorobenzene, 1,3-	<0.4 ug/L	100	60-130

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Date Reported: 2023-10-12
Project: PH3645
COC #: 910965

QC Summary

Analyte	Blank	QC % Rec	QC Limits
Dichlorobenzene, 1,4-	<0.4 ug/L	100	60-130
Acetone	<5 ug/L	80	60-130
Benzene	<0.5 ug/L	84	60-130
Bromodichloromethane	<0.3 ug/L	102	60-130
Bromoform	<0.4 ug/L	84	60-130
Bromomethane	<0.5 ug/L	101	60-130
Dichloroethylene, 1,2-cis-	<0.4 ug/L	110	60-130
Dichloropropene,1,3-cis-	<0.5 ug/L	102	60-130
Carbon Tetrachloride	<0.2 ug/L	83	60-130
Chloroethane	<0.5 ug/L	103	60-130
Chloroform	<0.5 ug/L	103	60-130
Dibromochloromethane	<0.3 ug/L	83	60-130
Dichlorodifluoromethane	<0.5 ug/L	92	60-130
Methylene Chloride	<4.0 ug/L	107	60-130
Ethylbenzene	<0.5 ug/L	80	60-130
Ethylene dibromide	<0.2 ug/L	89	60-130
Hexane (n)	<5 ug/L	100	60-130
m/p-xylene	<0.4 ug/L	102	60-130

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Report Number: 3002034
Date Submitted: 2023-10-06
Date Reported: 2023-10-12
Project: PH3645
COC #: 910965

QC Summary

Analyte	Blank	QC % Rec	QC Limits
Methyl Ethyl Ketone	<2 ug/L	120	60-130
Methyl Isobutyl Ketone	<5 ug/L	110	60-130
Methyl tert-Butyl Ether (MTBE)	<2 ug/L	100	60-130
Chlorobenzene	<0.5 ug/L	83	60-130
o-xylene	<0.4 ug/L	102	60-130
Styrene	<0.5 ug/L	99	60-130
Dichloroethylene, 1,2-trans-	<0.4 ug/L	103	60-130
Dichloropropene,1,3-trans-	<0.5 ug/L	96	60-130
Tetrachloroethylene	<0.3 ug/L	110	60-130
Toluene	<0.4 ug/L	108	60-130
Trichloroethylene	<0.3 ug/L	99	60-130
Trichlorofluoromethane	<0.5 ug/L	110	60-130
Vinyl Chloride	<0.2 ug/L	99	60-130
Run No 450287 **Analysis/Extraction Date** 2023-10-12 **Analyst** SS **Method** CCME O.Reg 153/04			
Petroleum Hydrocarbons F1	<20 ug/L	100	60-140
Run No 450290 **Analysis/Extraction Date** 2023-10-12 **Analyst** SS **Method** EPA 8260			

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Report Number: 3002034
Date Submitted: 2023-10-06
Date Reported: 2023-10-12
Project: PH3645
COC #: 910965

QC Summary

Analyte	Blank	QC % Rec	QC Limits
Xylene Mixture			
Run No 450291 **Analysis/Extraction Date** 2023-10-12 **Analyst** SS **Method** EPA 8260			
Dichloropropene,1,3-			
Run No 450292 **Analysis/Extraction Date** 2023-10-12 **Analyst** SS **Method** CCME O.Reg 153/04			
Petroleum Hydrocarbons F1-BTEX			

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Attention: Mr. Zavian Buchanan
PO#: 58619
Invoice to: Paterson Group

Report Number: 3002370
Date Submitted: 2023-10-18
Date Reported: 2023-10-26
Project: PH3645
COC #: 911124

Dear Zavian Buchanan:

Please find attached the analytical results for your samples. If you have any questions regarding this report, please do not hesitate to call (613-727-5692).

Report Comments:

R Zafari

Raheleh Zafari 2023.10.26 13:15:10 -04'00'

APPROVAL: _____

Raheleh Zafari, Environmental Chemist

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Certificate of Analysis

eurofins | Environment Testing

Client: Paterson Group
9 AURIGA DRIVE
Ottawa, ON
K2E 7T9
Attention: Mr. Zavian Buchanan
PO#: 58619
Invoice to: Paterson Group

Report Number: 3002370
Date Submitted: 2023-10-18
Date Reported: 2023-10-26
Project: PH3645
COC #: 911124

				Lab I.D.	1707501
				Sample Matrix	GW
				Sample Type	
				Sampling Date	2023-10-18
				Sample I.D.	TW1-GW3
Group	**Analyte**	**MRL**	**Units**	**Guideline**	
General Chemistry	Colour (Apparent)	2	TCU	AO 5	14*
	Conductivity	5	uS/cm		891
	TDS (COND - CALC)	1	mg/L	AO 500	579*
	Turbidity	0.1	NTU	AO 5	2.1
Metals	Fe	0.03	mg/L	AO 0.3	0.46*
	Mn	0.01	mg/L	AO 0.05	0.07*

Guideline = ODWSOG *** = Guideline Exceedence**

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MRL = Method Reporting Limit, AO = Aesthetic Objective, OG = Operational Guideline, MAC = Maximum Acceptable Concentration, IMAC = Interim Maximum Acceptable Concentration, STD = Standard, PWQO = Provincial Water Quality Guideline, IPWQO = Interim Provincial Water Quality Objective, TDR = Typical Desired Range

Certificate of Analysis

Client: Paterson Group
9 AURIGA DRIVE
Ottawa, ON
K2E 7T9
Attention: Mr. Zavian Buchanan
PO#: 58619
Invoice to: Paterson Group

Report Number: 3002370
Date Submitted: 2023-10-18
Date Reported: 2023-10-26
Project: PH3645
COC #: 911124

QC Summary

Analyte	Blank	QC % Rec	QC Limits
Run No 450747 **Analysis/Extraction Date** 2023-10-19 **Analyst** AsA **Method** C SM2130B			
Turbidity	<0.1 NTU	103	70-130
Run No 450883 **Analysis/Extraction Date** 2023-10-20 **Analyst** AsA **Method** SM2320,2510,4500H/F			
Conductivity	<5 uS/cm	99	90-110
Run No 450998 **Analysis/Extraction Date** 2023-10-24 **Analyst** AET **Method** C SM2540			
TDS (COND - CALC)			
Run No 451010 **Analysis/Extraction Date** 2023-10-24 **Analyst** S A **Method** C SM2120C			
Colour (Apparent)	<2 TCU	97	90-110
Run No 451129 **Analysis/Extraction Date** 2023-10-26 **Analyst** AaN **Method** EPA 200.8			
Iron	<0.03 mg/L	82	80-120
Manganese	<0.01 mg/L	119	80-120

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Certificate of Analysis

Client:	Paterson Group 9 AURIGA DRIVE Ottawa, ON K2E 7T9	Report Number:	3002372
		Date Submitted:	2023-10-18
		Date Reported:	2023-10-24
		Project:	PH3645
		COC #:	911126
Attention:	Mr. Zavian Buchanan		
PO#:	58619		
Invoice to:	Paterson Group		

Dear Zavian Buchanan:

Please find attached the analytical results for your samples. If you have any questions regarding this report, please do not hesitate to call (613-727-5692).

Report Comments:

APPROVAL: R Zafari Raheleh Zafari 2023.10.24 10:55:27 -04'00'

Raheleh Zafari, Environmental Chemist

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Certificate of Analysis

eurofins | Environment Testing

Client: Paterson Group
9 AURIGA DRIVE
Ottawa, ON
K2E 7T9
Attention: Mr. Zavian Buchanan
PO#: 58619
Invoice to: Paterson Group

Report Number: 3002372
Date Submitted: 2023-10-18
Date Reported: 2023-10-24
Project: PH3645
COC #: 911126

				Lab I.D.	1707503
				Sample Matrix	GW
				Sample Type	
				Sampling Date	2023-10-18
				Sample I.D.	TW1-GW3
Group	**Analyte**	**MRL**	**Units**	**Guideline**	
Hydrocarbons	F1 (C6-C10)	20	ug/L		<20

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Certificate of Analysis

eurofins | Environment Testing

Client: Paterson Group
9 AURIGA DRIVE
Ottawa, ON
K2E 7T9
Attention: Mr. Zavian Buchanan
PO#: 58619
Invoice to: Paterson Group

Report Number: 3002372
Date Submitted: 2023-10-18
Date Reported: 2023-10-24
Project: PH3645
COC #: 911126

QC Summary

Analyte	Blank	QC % Rec	QC Limits
Run No 450912 **Analysis/Extraction Date** 2023-10-23 **Analyst** SS **Method** CCME O.Reg 153/04			
Petroleum Hydrocarbons F1	<20 ug/L	100	60-140

Guideline = ODWSOG *** = Guideline Exceedence**

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Certificate of Analysis

Client: Paterson Group
9 AURIGA DRIVE
Ottawa, ON
K2E 7T9
Attention: Mr. Zavian Buchanan
PO#: 58619
Invoice to: Paterson Group

Report Number: 3002371
Date Submitted: 2023-10-18
Date Reported: 2023-10-24
Project: PH3645
COC #: 911125

Dear Zavian Buchanan:

Please find attached the analytical results for your samples. If you have any questions regarding this report, please do not hesitate to call (613-727-5692).

Report Comments:

APPROVAL: R Zafari Raheleh Zafari 2023.10.24 10:52:54 -04'00'

Raheleh Zafari, Environmental Chemist

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Certificate of Analysis

Client: Paterson Group
9 AURIGA DRIVE
Ottawa, ON
K2E 7T9
Attention: Mr. Zavian Buchanan
PO#: 58619
Invoice to: Paterson Group

Report Number: 3002371
Date Submitted: 2023-10-18
Date Reported: 2023-10-24
Project: PH3645
COC #: 911125

				Lab I.D.	1707502
				Sample Matrix	GW
				Sample Type	
				Sampling Date	2023-10-18
				Sample I.D.	TW1-GW3
Group	**Analyte**	**MRL**	**Units**	**Guideline**	
VOCs Surrogates	1,2-dichloroethane-d4	0	%		114
	4-bromofluorobenzene	0	%		81
	Toluene-d8	0	%		102
Volatiles	1,1,1,2-tetrachloroethane	0.5	ug/L		<0.5
	1,1,1-trichloroethane	0.4	ug/L		<0.4
	1,1,2,2-tetrachloroethane	0.5	ug/L		<0.5
	1,1,2-trichloroethane	0.4	ug/L		<0.4
	1,1-dichloroethane	0.4	ug/L		<0.4
	1,1-dichloroethylene	0.5	ug/L	MAC 14	<0.5
	1,2-dichlorobenzene	0.4	ug/L	MAC 200	<0.4
	1,2-dichloroethane	0.5	ug/L	IMAC 5	<0.5
	1,2-dichloropropane	0.5	ug/L		<0.5
	1,3,5-trimethylbenzene	0.3	ug/L		<0.3
	1,3-dichlorobenzene	0.4	ug/L		<0.4
	1,3-Dichloropropylene (cis+trans)	0.5	ug/L		<0.5
	1,4-dichlorobenzene	0.4	ug/L	MAC 5	<0.4
	Acetone	5	ug/L		<5
	Benzene	0.5	ug/L	MAC 1	<0.5
	Bromodichloromethane	0.3	ug/L		<0.3
	Bromoform	0.4	ug/L		<0.4
	Bromomethane	0.5	ug/L		<0.5
	c-1,2-Dichloroethylene	0.4	ug/L		<0.4
	c-1,3-Dichloropropylene	0.5	ug/L		<0.5
	Carbon Tetrachloride	0.2	ug/L	MAC 2	<0.2
	Chloroethane	0.5	ug/L		<0.5

Guideline = ODWSOG *** = Guideline Exceedence**

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Certificate of Analysis

Client: Paterson Group
9 AURIGA DRIVE
Ottawa, ON
K2E 7T9
Attention: Mr. Zavian Buchanan
PO#: 58619
Invoice to: Paterson Group

Report Number: 3002371
Date Submitted: 2023-10-18
Date Reported: 2023-10-24
Project: PH3645
COC #: 911125

Group	Analyte	MRL	Units	Guideline	Lab I.D. / Sample Matrix / Sample Type / Sampling Date / Sample I.D.
					1707502 / GW / / 2023-10-18 / TW1-GW3
Volatiles	Chloroform	0.5	ug/L		<0.5
	Dibromochloromethane	0.3	ug/L		<0.3
	Dichlorodifluoromethane	0.5	ug/L		<0.5
	Dichloromethane	4.0	ug/L	MAC 50	<4.0
	Ethylbenzene	0.5	ug/L	MAC 140	<0.5
	Ethylene Dibromide	0.2	ug/L		<0.2
	Hexane	5	ug/L		<5
	m/p-xylene	0.4	ug/L		<0.4
	Methyl Ethyl Ketone (MEK)	2	ug/L		<2
	Methyl Isobutyl Ketone (MIBK)	5	ug/L		<5
	Methyl Tert Butyl Ether (MTBE)	2	ug/L	AO 15	<2
	Monochlorobenzene	0.5	ug/L	MAC 80	<0.5
	o-xylene	0.4	ug/L		<0.4
	Styrene	0.5	ug/L		<0.5
	t-1,2-Dichloroethylene	0.4	ug/L		<0.4
	t-1,3-Dichloropropylene	0.5	ug/L		<0.5
	Tetrachloroethylene	0.3	ug/L	MAC 10	<0.3
	Toluene	0.4	ug/L	MAC 60	<0.4
	Trichloroethylene	0.3	ug/L	MAC 5	<0.3
	Trichlorofluoromethane	0.5	ug/L		<0.5
	Vinyl Chloride	0.2	ug/L	MAC 1	<0.2
	Xylene; total	0.5	ug/L	MAC 90	<0.5

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Report Number: 3002371
Date Submitted: 2023-10-18
Date Reported: 2023-10-24
Project: PH3645
COC #: 911125

QC Summary

Analyte	Blank	QC % Rec	QC Limits
Run No 450911 **Analysis/Extraction Date** 2023-10-21 **Analyst** SS **Method** EPA 8260			
Tetrachloroethane, 1,1,1,2-	<0.5 ug/L	88	60-130
Trichloroethane, 1,1,1-	<0.4 ug/L	81	60-130
Tetrachloroethane, 1,1,2,2-	<0.5 ug/L	109	60-130
Trichloroethane, 1,1,2-	<0.4 ug/L	87	60-130
Dichloroethane, 1,1-	<0.4 ug/L	102	60-130
Dichloroethylene, 1,1-	<0.5 ug/L	91	60-130
Dichlorobenzene, 1,2-	<0.4 ug/L	104	60-130
Dichloroethane, 1,2-	<0.5 ug/L	82	60-130
Dichloropropane, 1,2-	<0.5 ug/L	82	60-130
1,3,5-trimethylbenzene	<0.3 ug/L	109	60-130
Dichlorobenzene, 1,3-	<0.4 ug/L	100	60-130
Dichlorobenzene, 1,4-	<0.4 ug/L	100	60-130
Acetone	<5 ug/L	80	60-130
Benzene	<0.5 ug/L	84	60-130
Bromodichloromethane	<0.3 ug/L	102	60-130
Bromoform	<0.4 ug/L	84	60-130

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K2E 7T9
Attention: Mr. Zavian Buchanan
PO#: 58619
Invoice to: Paterson Group

Report Number: 3002371
Date Submitted: 2023-10-18
Date Reported: 2023-10-24
Project: PH3645
COC #: 911125

QC Summary

Analyte	Blank	QC % Rec	QC Limits
Bromomethane	<0.5 ug/L	101	60-130
Dichloroethylene, 1,2-cis-	<0.4 ug/L	110	60-130
Dichloropropene,1,3-cis-	<0.5 ug/L	102	60-130
Carbon Tetrachloride	<0.2 ug/L	83	60-130
Chloroethane	<0.5 ug/L	103	60-130
Chloroform	<0.5 ug/L	103	60-130
Dibromochloromethane	<0.3 ug/L	83	60-130
Dichlorodifluoromethane	<0.5 ug/L	92	60-130
Methylene Chloride	<4.0 ug/L	107	60-130
Ethylbenzene	<0.5 ug/L	80	60-130
Ethylene dibromide	<0.2 ug/L	89	60-130
Hexane (n)	<5 ug/L	100	60-130
m/p-xylene	<0.4 ug/L	102	60-130
Methyl Ethyl Ketone	<2 ug/L	120	60-130
Methyl Isobutyl Ketone	<5 ug/L	110	60-130
Methyl tert-Butyl Ether (MTBE)	<2 ug/L	100	60-130
Chlorobenzene	<0.5 ug/L	83	60-130
o-xylene	<0.4 ug/L	102	60-130

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Ottawa, ON
K2E 7T9
Attention: Mr. Zavian Buchanan
PO#: 58619
Invoice to: Paterson Group

Report Number: 3002371
Date Submitted: 2023-10-18
Date Reported: 2023-10-24
Project: PH3645
COC #: 911125

QC Summary

Analyte	Blank	QC % Rec	QC Limits
Styrene	<0.5 ug/L	99	60-130
Dichloroethylene, 1,2-trans-	<0.4 ug/L	103	60-130
Dichloropropene,1,3-trans-	<0.5 ug/L	96	60-130
Tetrachloroethylene	<0.3 ug/L	110	60-130
Toluene	<0.4 ug/L	108	60-130
Trichloroethylene	<0.3 ug/L	99	60-130
Trichlorofluoromethane	<0.5 ug/L	110	60-130
Vinyl Chloride	<0.2 ug/L	99	60-130
Run No 450913 **Analysis/Extraction Date** 2023-10-23 **Analyst** SS **Method** EPA 8260			
Xylene Mixture			
Run No 450914 **Analysis/Extraction Date** 2023-10-23 **Analyst** SS **Method** EPA 8260			
Dichloropropene,1,3-			

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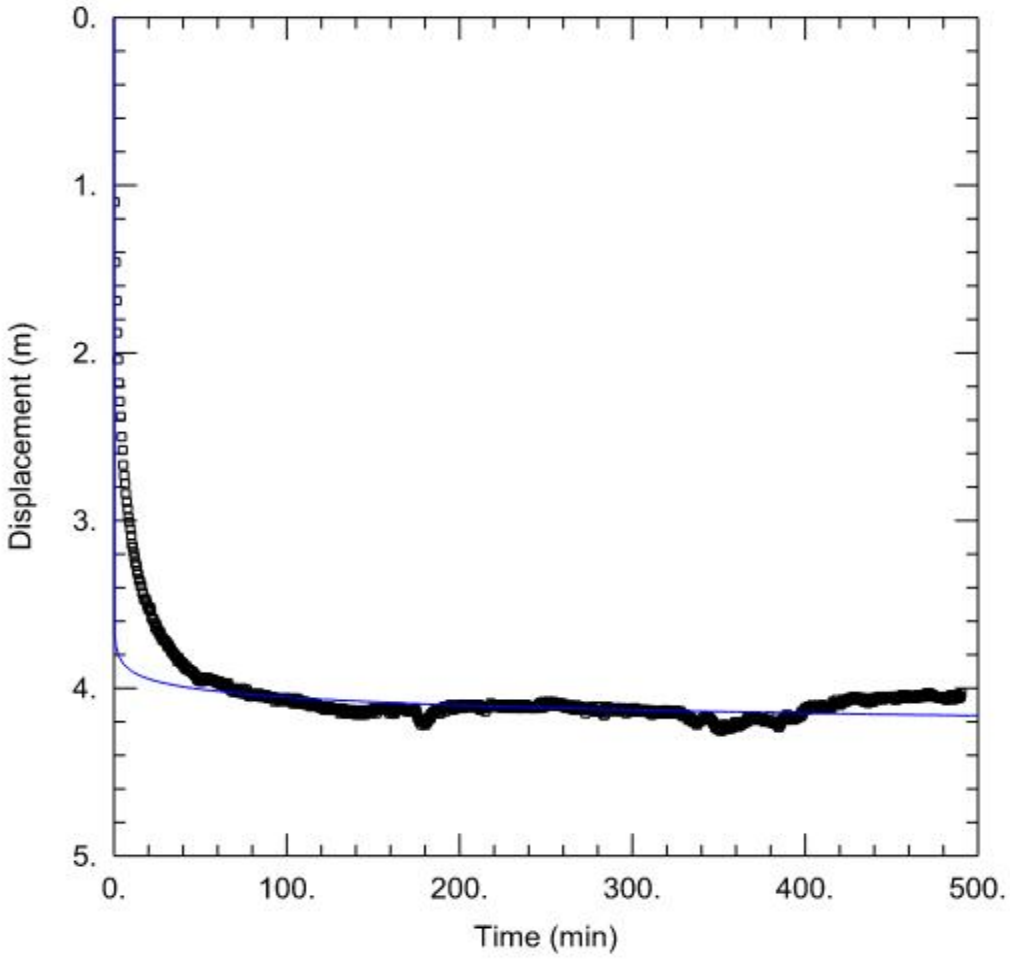
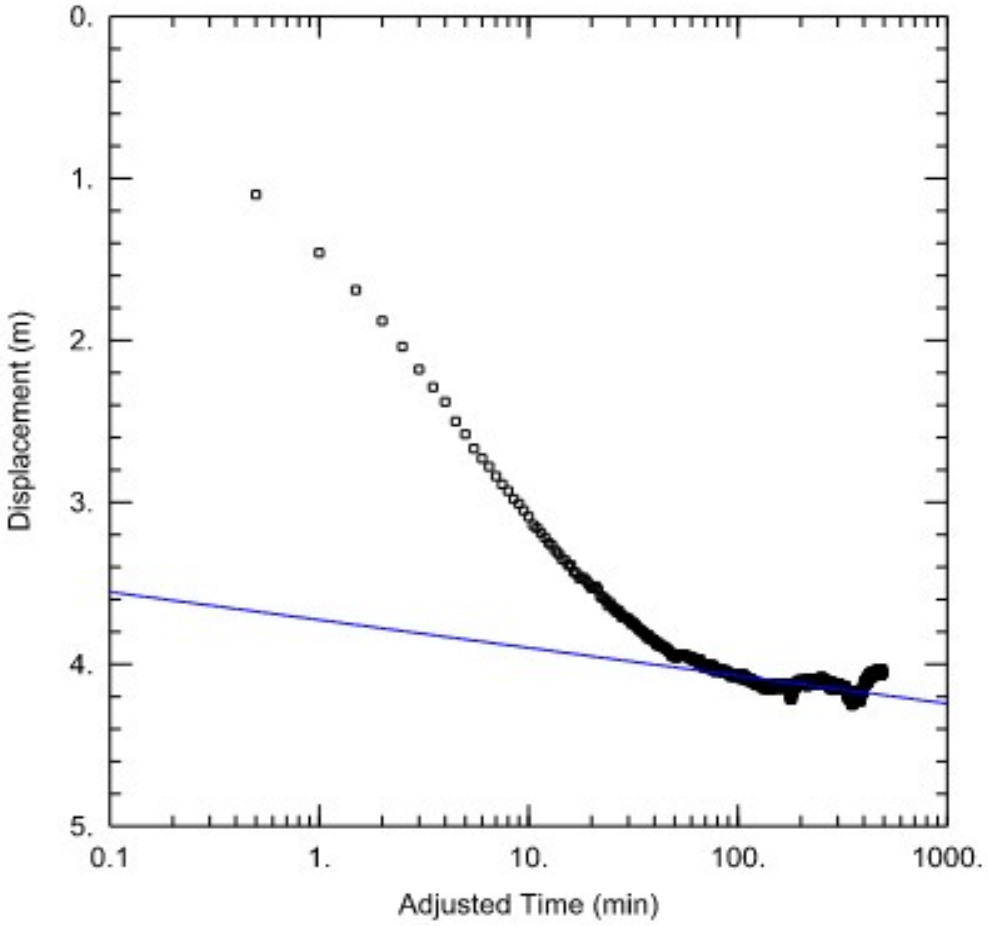
Pumping Test Analysis Report

File No.	PH3645	Well ID:	TW1
Date:	Thursday, October 5, 2023	Solution Method:	**Theis**
Client:	W.O. Stinson & Son Ltd.	Transmissitivity (m2/day):	63.67
Site Address:	5545 Albion Road South	Discharge Rate (L/min)	38
Project:	Site Plan Control Application	Analysis performed by:	ZB



Pumping Test Analysis Report

File No.	PH3645	Well ID:	TW1
Date:	Thursday, October 5, 2023	Solution Method:	**Cooper-Jacob**
Client:	W.O. Stinson & Son Ltd.	Transmissitivity (m2/day):	58.22
Site Address:	5545 Albion Road South	Discharge Rate (L/min)	38
Project:	Site Plan Control Application	Analysis performed by:	ZB



PATERSON GROUP

Pumping Test Analysis Report

File No.	PH3645
Date:	Thursday, October 5, 2023
Client:	W.O. Stinson & Son Ltd.
Site Address:	5545 Albion Road South
Project:	Site Plan Control Application

Summary Table:

Solution Method:	Well ID:	Transmissitivity (m2/day):
Theis	TW1	63.67
Cooper-Jacob	TW1	58.22
Average:		**60.95**

PATERSON GROUP

PATERSON GROUP

5545 Albion Road South
PH3645

TW1	inputs		
pH	7.86	A	0.18
TDS	565	B	2.35
Calcium	75	C	1.48
Alkalinity	270	D	2.43
Temp.	11.7		
		pHs =	7.917216248

Langelier Saturation Index (LSI) Calculation

(Langelier, 1936)

LSI = pH - pHs

pHs = (9.3 + A + B) - (C + D)

Where:

A = (Log10 [TDS] - 1) / 10

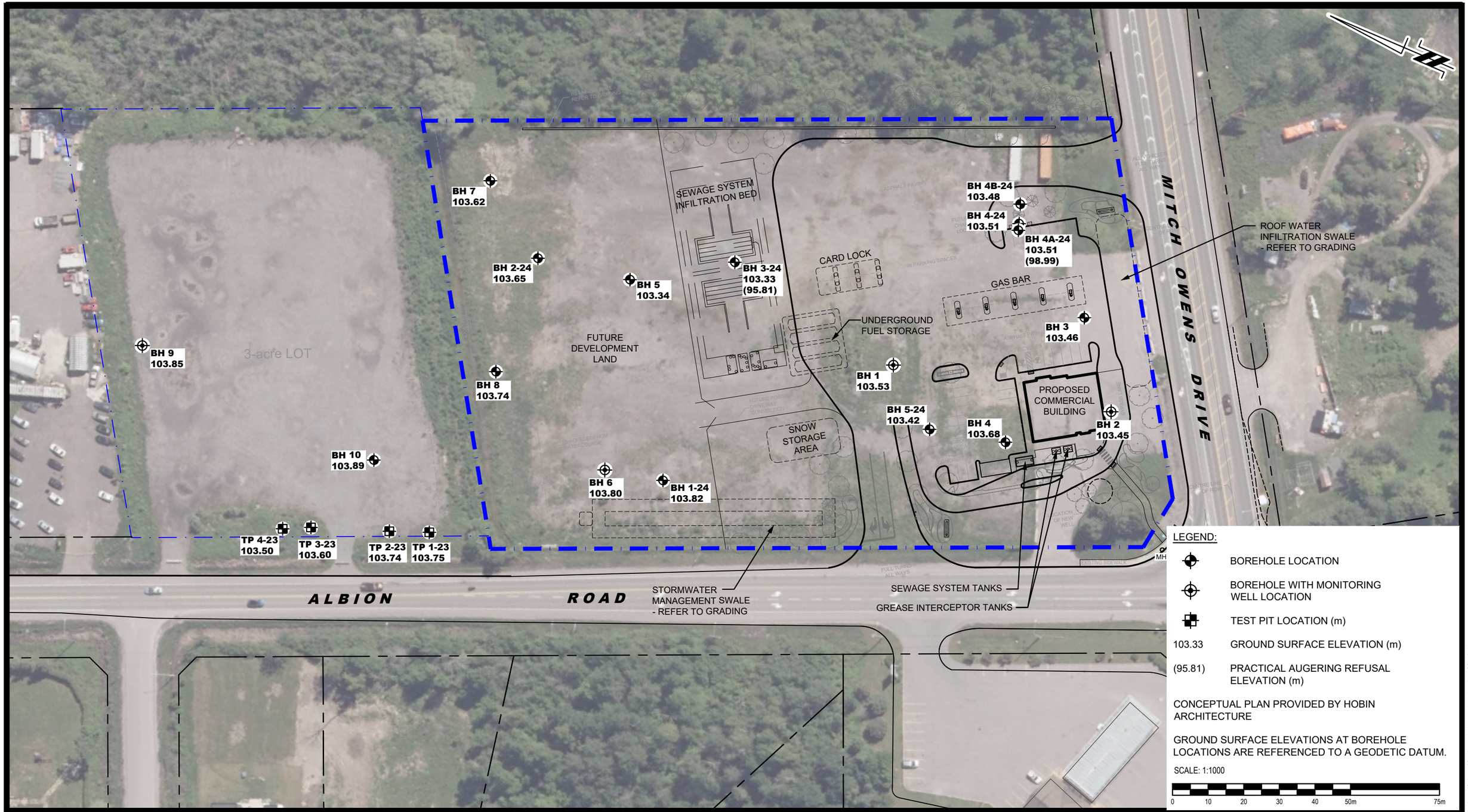
B = -13.12 x Log10 (oC + 273) + 34.55

C = Log10 [Ca2+ as CaCO3] - 0.4

D = Log10 [alkalinity as CaCO3]

LSI = -0.1

LSI	Effect
0.5 to 2	**Water is super saturated and tends to precipitate a scale layer of calcium carbonate (scale forming but non-corrosive)**
0 to 0.5	Water is super saturated and tends to precipitate a scale layer of calcium carbonate (slightly scale forming and corrosive).
0	Water is saturated (in equilibrium) with calcium carbonate. A scale layer of calcium carbonate is neither precipitated nor dissolved.
0 to -0.5	Water is under saturated and tends to dissolve solid calcium carbonate (slightly corrosivebut non-scale forming).
-0.5 to -2	Water is under saturated and tends to dissolve solid calcium carbonate (seriously corrosive).



LEGEND:

- BOREHOLE LOCATION
- BOREHOLE WITH MONITORING WELL LOCATION
- TEST PIT LOCATION (m)
- 103.33 GROUND SURFACE ELEVATION (m)
- (95.81) PRACTICAL AUGERING REFUSAL ELEVATION (m)

CONCEPTUAL PLAN PROVIDED BY HOBIN ARCHITECTURE

GROUND SURFACE ELEVATIONS AT BOREHOLE LOCATIONS ARE REFERENCED TO A GEODETIC DATUM.

SCALE: 1:1000

0 10 20 30 40 50m 75m

PATERSON GROUP
9 AURIGA DRIVE
OTTAWA, ON
K2E 7T9
TEL: (613) 226-7381

NO.	REVISIONS	DATE	INITIAL
2	UPDATED TO NEW CONCEPTUAL PLAN	27/01/2025	KP
1	UPDATED TO NEW CONCEPTUAL PLAN ADDED 2023 TEST PITS / 2024 BOREHOLES	26/07/2024	KP

W.O. STINSON AND SON LIMITED
GEOTECHNICAL INVESTIGATION
PROPOSED COMMERCIAL DEVELOPMENT
5545 ALBION ROAD
OTTAWA, ONTARIO

Title:
TEST HOLE LOCATION PLAN

Scale: 1:1000	Date: 09/2020
Drawn by: RCG	Report No.: PG5485-1
Checked by: KP	Dwg. No.: PG5485-1
Approved by: DJG	Revision No.: 2

11x17

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PATERSON GROUP

9 Auriga Drive
Ottawa, Ontario
K2E 7T9
TEL: (613) 226-7381

SOIL PROFILE AND TEST DATA

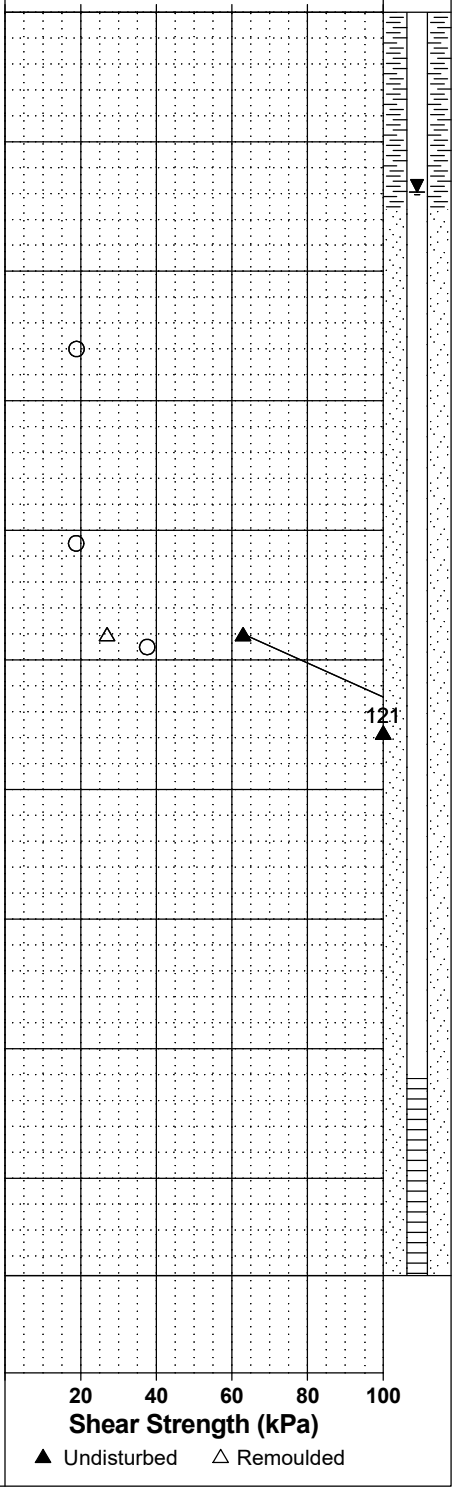
Geotechnical Investigation
5505 & 5545 Albion Road
Ottawa, Ontario

EASTING: 375872 **NORTHING:** 5014967 **ELEVATION:** 103.82
DATUM: Geodetic
REMARKS:
BORINGS BY: CME 55 Low Clearance Power Auger **DATE:** 2024 April 11

FILE NO. PG5485
HOLE NO. BH 1-24

SAMPLE DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
Ground Surface						0	103.82
FILL: Brown silty sand with crushed stone and gravel		AU	1				
0.56							
TOPSOIL , trace organics							
0.94							
Compact brown **SILTY SAND**		SS	2	79	16	1	102.82
		SS	3	83	11	2	101.82
- Grey by 2.3 m depth		SS	4	67	11		
2.97						3	100.82
Stiff grey **SILTY CLAY** to **CLAYEY SILT** , trace sand		SS	5	0	1		
		SS	6	100	2	4	99.82
		SS	7	100	P	5	98.82
5.49							
Compact to dense grey **SANDY SILT** , trace clay		SS	8	75		6	97.82
		SS	9	83	48		
7.32		SS	10	83	33	7	96.82
GLACIAL TILL: Compact to very dense, grey silty sand to sandy silt, trace clay, gravel and cobbles, occasional boulders		SS	11	42	19	8	95.82
		SS	12	46	+50		
- Gravel content increasing with depth		SS	13	75	24	9	94.82
9.75							
End of Borehole							
(GWL at 1.39 m - June 4, 2024)							

Pen. Resist. Blows/0.3m
● 50 mm Dia. Cone
○ Water Content %



PIEZOMETER CONSTRUCTION

PATERSON GROUP
9 Auriga Drive
Ottawa, Ontario
K2E 7T9
TEL: (613) 226-7381

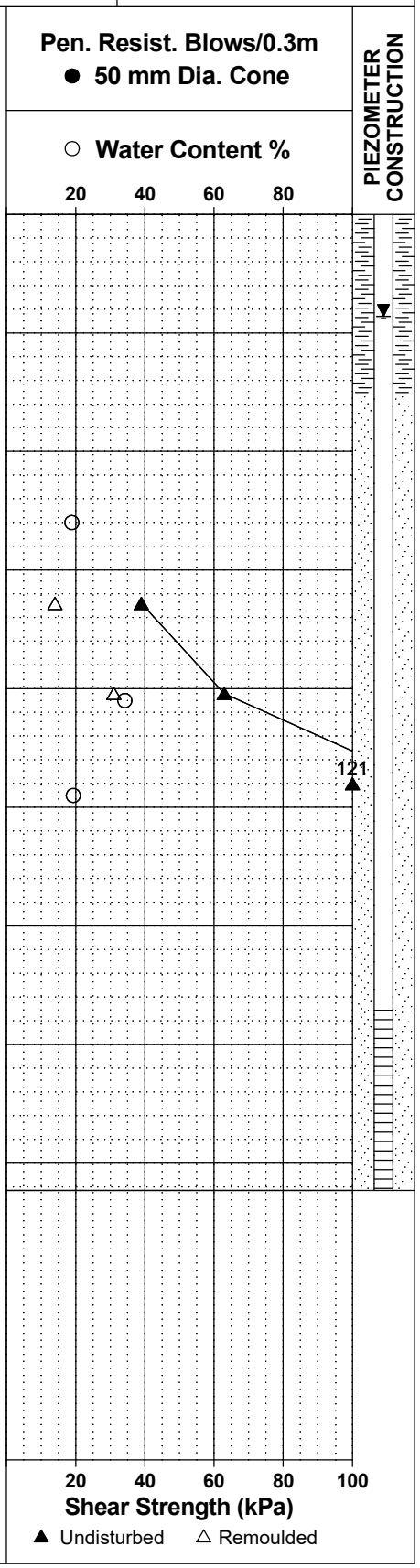
SOIL PROFILE AND TEST DATA

Geotechnical Investigation
5505 & 5545 Albion Road
Ottawa, Ontario

EASTING: 375916 **NORTHING:** 5015024 **ELEVATION:** 103.65
DATUM: Geodetic
REMARKS:
BORINGS BY: CME 55 Low Clearance Power Auger **DATE:** 2024 April 11

FILE NO. PG5485
HOLE NO. BH 2-24

SAMPLE DESCRIPTION		STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
Ground Surface							0	103.65
TOPSOIL with gravel and cobbles	0.15							
FILL: Brown silty sand with crushed stone and gravel, trace organics	0.61		AU	1				
Compact brown **SILTY SAND**			SS	2	63	13	1	102.65
- Grey by 1.8m depth			SS	3	25	13	2	101.65
Firm to stiff grey **SILTY CLAY** to **CLAYEY SILT**	2.21		SS	4	75	1		
			SS	5	0	P	3	100.65
	4.27		SS	6	67	P	4	99.65
Compact grey **SANDY SILT**								
	5.03		SS	7	75	23	5	98.65
GLACIAL TILL: Compact to very dense, grey silty sand with clay and gravel, occasional cobbles and boulders			SS	8	42	11		
			SS	9	38	9	6	97.65
- Boulder content increases with depth			SS	10	33	33	7	96.65
			SS	11	20	+50		
	8.23						8	95.65
End of Borehole								
(GWL at 0.86 m - June 4, 2024)								



PATERSON GROUP

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SOIL PROFILE AND TEST DATA

Geotechnical Investigation
5505 & 5545 Albion Road
Ottawa, Ontario

EASTING: 375937 **NORTHING:** 5014973 **ELEVATION:** 103.33
DATUM: Geodetic
REMARKS:
BORINGS BY: CME 55 Low Clearance Power Auger **DATE:** 2024 April 11

FILE NO. PG5485
HOLE NO. BH 3-24

SAMPLE DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone ○ Water Content %	PIEZOMETER CONSTRUCTION
Ground Surface						0	103.33		
FILL: Brown silty sand with crushed stone and gravel		AU	1						
- Some concrete from 0.9 to 1.1 m depth		SS	2	54	38	1	102.33		
		SS	3	38	31	2	101.33		
2.13									
Firm grey **SILTY CLAY** to **CLAYEY SILT**		SS	4	67	1	3	100.33		
		SS	5	0	P				
4.11		SS	6	67	P	4	99.33		
Loose grey **SANDY SILT**									
4.88		SS	7	63	7	5	98.33		
GLACIAL TILL: Loose to compact, grey silty sand to sandy silt, some gravel, trace to some clay		SS	8	33	13				
- Occasional cobbles and boulders by 5.5 m depth		SS	9	54	14	6	97.33		
		SS	10	58	9	7	96.33		
7.52									
End of Borehole									
Practical refusal to augering at 7.52 m depth									
Piezometer Blocked									

Pen. Resist. Blows/0.3m: 20 40 60 80
Shear Strength (kPa): 20 40 60 80 100
▲ Undisturbed △ Remoulded

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SOIL PROFILE AND TEST DATA

Geotechnical Investigation
5505 & 5545 Albion Road
Ottawa, Ontario

EASTING: 375978 **NORTHING:** 5014904 **ELEVATION:** 103.51
DATUM: Geodetic
REMARKS:
BORINGS BY: CME 55 Low Clearance Power Auger **DATE:** 2024 April 12

FILE NO. PG5485
HOLE NO. BH 4-24

SAMPLE DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	PIEZOMETER CONSTRUCTION
Ground Surface						0	103.51	
FILL: Brown silty sand with crushed stone, gravel and cobbles		AU	1					
0.91								
Compact to loose brown **SILTY SAND**		SS	2	88	11	1	102.51	
- Grey by 1.7 m depth		SS	3	75	6			
		SS	4	46	8	2	101.51	
3.20								
Compact grey **SANDY SILT**		SS	5	83	26	3	100.51	
4.11								
GLACIAL TILL: Loose, grey silty sand to sandy silt, some gravel and clay		SS	6	50	8	4	99.51	
4.42								
End of Borehole								
Hole terminated due to sand ingress into augers								
(GWL at 0.86 m - June 4, 2024)								

Pen. Resist. Blows/0.3m
● 50 mm Dia. Cone
○ Water Content %
20 40 60 80

20 40 60 80 100
Shear Strength (kPa)
▲ Undisturbed △ Remoulded

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SOIL PROFILE AND TEST DATA

Geotechnical Investigation
5505 & 5545 Albion Road
Ottawa, Ontario

EASTING: 375976 **NORTHING:** 5014903 **ELEVATION:** 103.51
DATUM: Geodetic
REMARKS:
BORINGS BY: CME 55 Low Clearance Power Auger **DATE:** 2024 April 12

FILE NO. PG5485
HOLE NO. BH 4A-24

SAMPLE DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone ○ Water Content %	PIEZOMETER CONSTRUCTION
Ground Surface						0	103.51		
FILL: Brown silty sand with crushed stone, gravel and cobbles									
0.91						1	102.51		
Compact to loose brown **SILTY SAND**									
- Grey by 1.7 m depth						2	101.51		
3.20						3	100.51		
Compact grey **SANDY SILT**									
4.11						4	99.51		
GLACIAL TILL: Loose, grey silty sand to sandy silt, some gravel and clay		SS	1		+50				
4.52									
End of Borehole									
Practical refusal to augering at 4.52 m depth									

Pen. Resist. Blows/0.3m: 20, 40, 60, 80
Shear Strength (kPa): 20, 40, 60, 80, 100
▲ Undisturbed △ Remoulded

PATERSON GROUP
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SOIL PROFILE AND TEST DATA

Geotechnical Investigation
5505 & 5545 Albion Road
Ottawa, Ontario

EASTING: 375983 **NORTHING:** 5014906 **ELEVATION:** 103.48
DATUM: Geodetic
REMARKS:
BORINGS BY: CME 55 Low Clearance Power Auger **DATE:** 2024 April 12

FILE NO. PG5485
HOLE NO. BH 4B-24

SAMPLE DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone ○ Water Content %	PIEZOMETER CONSTRUCTION
Ground Surface						0	103.48		
FILL: Brown silty sand with crushed stone, gravel and cobbles									
0.91						1	102.48		
Compact to loose brown **SILTY SAND**									
- Grey by 1.7 m depth						2	101.48		
3.20						3	100.48		
Compact grey **SANDY SILT**									
4.11						4	99.48		
GLACIAL TILL: Loose, grey silty sand to sandy silt, some gravel and clay									
4.57						5	98.48	○	
GLACIAL TILL: Compact, grey silty sand to sandy silt with gravel, trace clay, occasional cobbles and boulders		SS	1	33	11				
		SS	2	46	10	6	97.48		
		SS	3	50	22				
6.71									
End of Borehole									

Pen. Resist. Blows/0.3m: 20 40 60 80
Shear Strength (kPa): 20 40 60 80 100
▲ Undisturbed △ Remoulded

PATERSON GROUP

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SOIL PROFILE AND TEST DATA

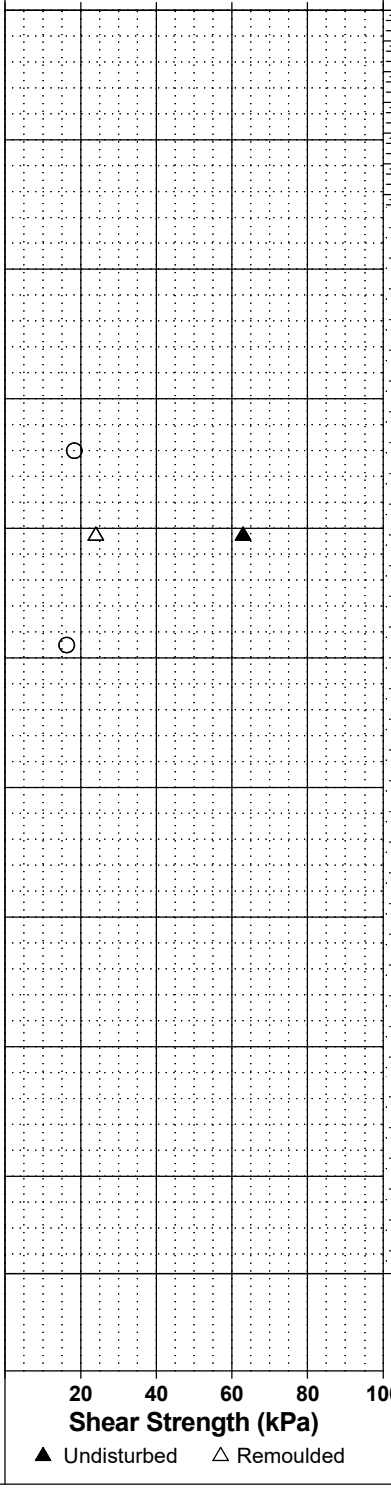
Geotechnical Investigation
5505 & 5545 Albion Road
Ottawa, Ontario

EASTING: 375915 **NORTHING:** 5014904 **ELEVATION:** 103.42
DATUM: Geodetic
REMARKS:
BORINGS BY: CME 55 Low Clearance Power Auger **DATE:** 2024 April 12

FILE NO. PG5485
HOLE NO. BH 5-24

SAMPLE DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
Ground Surface						0	103.42
TOPSOIL , some crushed stone and gravel, trace organics	0.20	AU	1				
FILL: Brown silty sand with crushed stone and gravel	0.61	AU	2				
Compact to loose brown **SILTY SAND** - Grey by 1.2 m depth		SS	3	79	10	1	102.42
		SS	4	75	7	2	101.42
		SS	5	83	3		
Stiff grey **SILTY CLAY** to **CLAYEY SILT**	2.97	SS	6	100	1	3	100.42
		SS	7	0	P	4	99.42
Dense to compact grey **SILT** , trace clay and sand	4.50	SS	8	75	34	5	98.42
		SS	9	92	22		
	6.55	SS	10	71	19	6	97.42
GLACIAL TILL: Compact to dense, grey silty sand to sandy silt with gravel, some clay, occasional cobbles and boulders		SS	11	83	13	7	96.42
		SS	12	25	19	8	95.42
		SS	13	33	12		
		SS	14	38	32	9	94.42
	9.75						
End of Borehole							
Piezometer blocked							

Pen. Resist. Blows/0.3m
● 50 mm Dia. Cone
○ Water Content %



PIEZOMETER CONSTRUCTION

patersongroup Consulting Engineers

154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Prop. Commercial Dev. - Albion Rd. at Mitch Owens Rd.
Ottawa, Ontario

DATUM Geodetic

FILE NO. PG5485

REMARKS

HOLE NO. BH 1

BORINGS BY CME-55 Low Clearance Drill **DATE** September 1, 2020

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	103.53
FILL: Brown silty sand, some crushed stone, trace organics		AU	1				
0.56							
Compact, light brown **SILTY SAND**		SS	2	46	12	1	102.53
1.37							
Loose, grey **SANDY SILT**		SS	3	42	4	2	101.53
2.13							
Loose, grey **SILTY SAND**		SS	4	96	6		
2.74						3	100.53
Firm, grey **SILTY CLAY**		SS	5	33	2		
3.81							
End of Borehole							

Pen. Resist. Blows/0.3m
● **50 mm Dia. Cone**
○ **Water Content %**

20 40 60 80

Piezometer Construction

20 40 60 80 100

Shear Strength (kPa)

▲ Undisturbed △ Remoulded

patersongroup Consulting Engineers

154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Prop. Commercial Dev. - Albion Rd. at Mitch Owens Rd.
Ottawa, Ontario

DATUM Geodetic

FILE NO. PG5485

REMARKS

HOLE NO. BH 2

BORINGS BY CME-55 Low Clearance Drill **DATE** September 1, 2020

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	103.45
FILL: Dark brown silty sand with crushed stone		AU	1				
0.60							
FILL: Brown silty sand, trace asphalt		SS	2	33	8	1	102.45
		SS	3	29	5	2	101.45
2.29							
Very loose, grey **SILTY SAND**		SS	4	54	2	3	100.45
3.05							
Stiff, grey **SILTY CLAY**		SS	5	58	2		
4.11						4	99.45
Loose, grey **SILTY SAND**		SS	6	54	P		
4.42							
End of Borehole							
(GWL @ 1.17m - Sept. 11, 2020)							

Pen. Resist. Blows/0.3m
● 50 mm Dia. Cone
○ Water Content %

20 40 60 80

Piezometer Construction

20 40 60 80 100

Shear Strength (kPa)

▲ Undisturbed △ Remoulded

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154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Prop. Commercial Dev. - Albion Rd. at Mitch Owens Rd.
Ottawa, Ontario

DATUM Geodetic

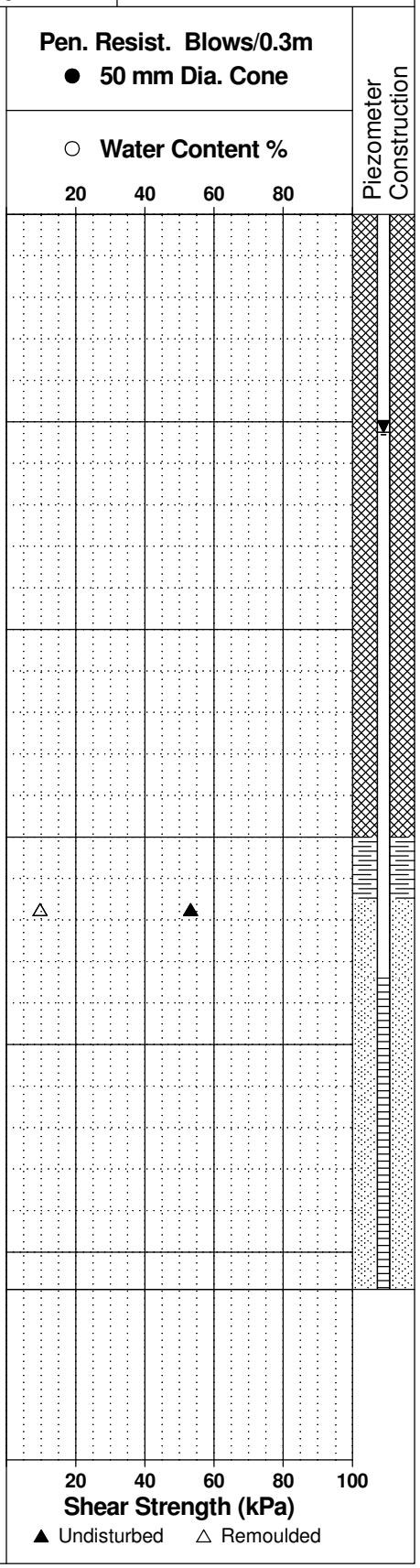
FILE NO. PG5485

REMARKS

HOLE NO. BH 3

BORINGS BY CME-55 Low Clearance Drill **DATE** September 1, 2020

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	103.46
Asphaltic concrete 0.08							
FILL: Brown silty sand with crushed stone		AU	1				
0.63							
		SS	2	58	14	1	102.46
Loose, grey **SILTY SAND**		SS	3	54	8		
		SS	4	38	5	2	101.46
3.05							
		SS	5	79	3	3	100.46
Stiff to very stiff, grey **SILTY CLAY**							
- silt content increasing with depth		SS	6	62	30	4	99.46
4.65							
Loose, grey **SANDY SILT**		SS	7	83	7	5	98.46
5.18							
End of Borehole							
(GWL @ 1.05m - Sept. 11, 2020)							



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SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Prop. Commercial Dev. - Albion Rd. at Mitch Owens Rd.
Ottawa, Ontario

DATUM Geodetic

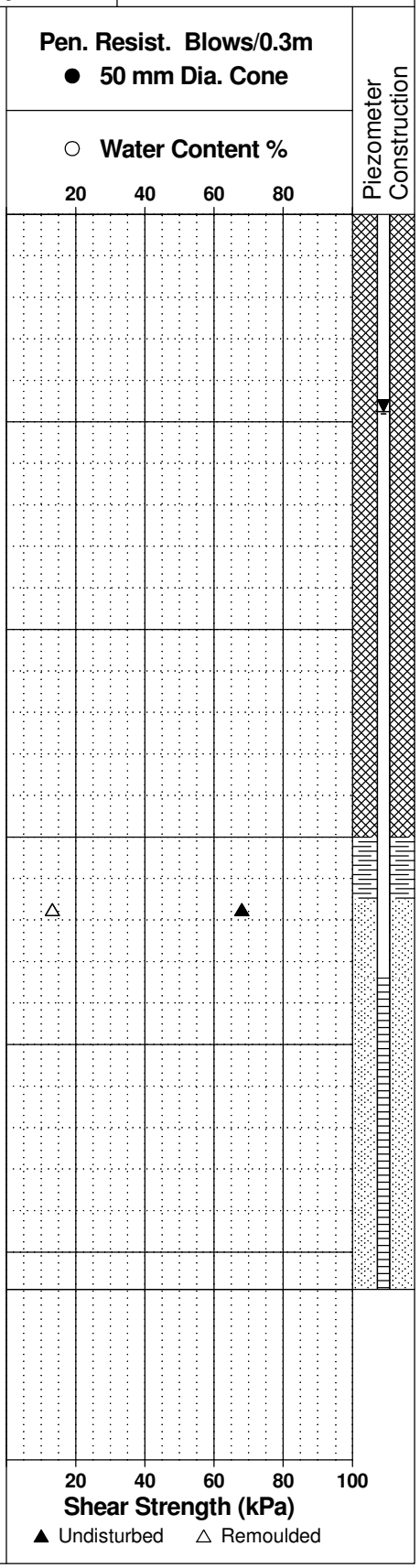
FILE NO. PG5485

REMARKS

HOLE NO. BH 4

BORINGS BY CME-55 Low Clearance Drill **DATE** September 1, 2020

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	103.68
FILL: Brown silty sand with crushed stone, trace organics		AU	1				
0.43							
		SS	2	38	9	1	102.68
Loose, brown **SILTY SAND**, trace gravel and shells		SS	3	29	10	2	101.68
2.59		SS	4	100	6		
Stiff to very stiff, grey **SILTY CLAY**		SS	5	100	P	3	100.68
		SS	6	79	3	4	99.68
4.57							
Dense, grey **SANDY SILT**		SS	7	33	31	5	98.68
5.18							
End of Borehole							
(GWL @ 0.95m - Sept. 11, 2020)							



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SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Prop. Commercial Dev. - Albion Rd. at Mitch Owens Rd.
Ottawa, Ontario

DATUM Geodetic

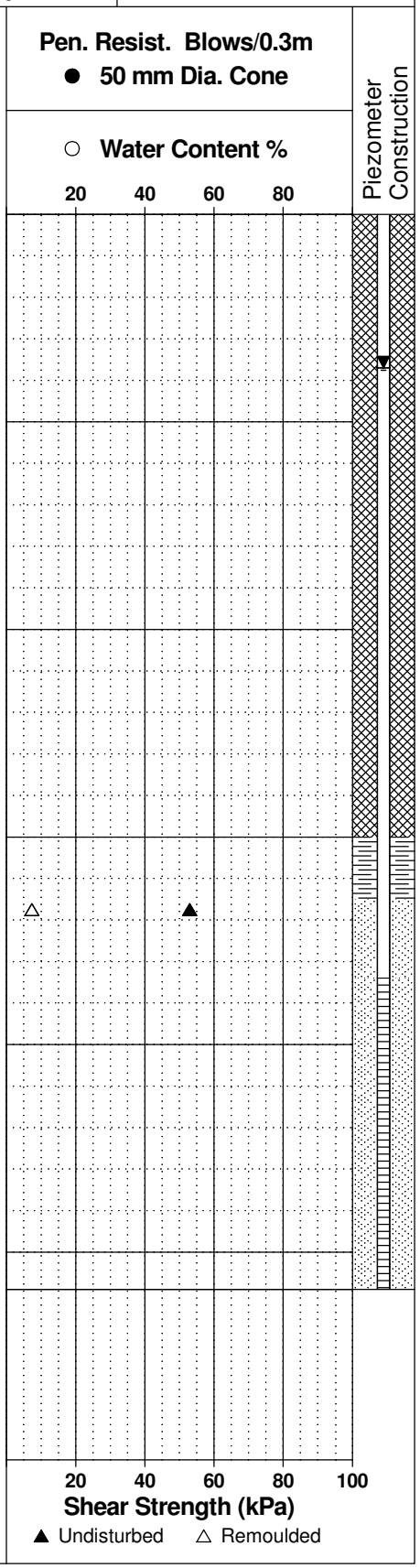
FILE NO. PG5485

REMARKS

HOLE NO. BH 5

BORINGS BY CME-55 Low Clearance Drill **DATE** September 1, 2020

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	103.34
FILL: Dark brown silty sand with gravel, some crushed stone		AU	1				
0.43							
		SS	2	54	16	1	102.34
Compact to very loose, grey **SILTY SAND,** trace shells		SS	3	21	14		
		SS	4	100	2	2	101.34
2.74							
Stiff, grey **SILTY CLAY**						3	100.34
4.11		SS	5	79	10	4	99.34
Compact, grey **SANDY SILT,** trace gravel		SS	6	38	17		
						5	98.34
5.18							
End of Borehole							
(GWL @ 0.74m - Sept. 11, 2020)							



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SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Prop. Commercial Dev. - Albion Rd. at Mitch Owens Rd.
Ottawa, Ontario

DATUM Geodetic

FILE NO. PG5485

REMARKS

HOLE NO. BH 6

BORINGS BY CME-55 Low Clearance Drill **DATE** September 1, 2020

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	103.80
FILL: Brown silty sand with crushed stone		AU	1				
0.51							
FILL: Brown/black silty sand, trace crushed stone		SS	2	62	21	1	102.80
1.52							
		SS	3	71	15	2	101.80
Compact, grey **SILTY SAND,** trace shells		SS	4	33	13	3	100.80
		SS	5	100	12	4	99.80
4.57							
Soft, grey **SILTY CLAY**		SS	6	92	2	5	98.80
5.18							
End of Borehole							
(GWL @ 1.94m - Sept. 11, 2020)							

Pen. Resist. Blows/0.3m
● **50 mm Dia. Cone**
○ **Water Content %**

20 40 60 80

Piezometer Construction

20 40 60 80 100
Shear Strength (kPa)
▲ Undisturbed △ Remoulded

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154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Prop. Commercial Dev. - Albion Rd. at Mitch Owens Rd.
Ottawa, Ontario

DATUM Geodetic

FILE NO. PG5485

REMARKS

HOLE NO. BH 7

BORINGS BY CME-55 Low Clearance Drill **DATE** September 3, 2020

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	103.62
FILL: Brown silty sand with gravel and organics		AU	1				
0.38							
Loose, brown **SILTY SAND**, with brown clay		SS	2	79	7	1	102.62
1.52							
		SS	3	29	8	2	101.62
Soft, grey **SILTY CLAY**		SS	4	96	2		
3.05						3	100.62
		SS	5	12	9		
Loose, grey **SILTY SAND** with clay		SS	6	79	W	4	99.62
		SS	7	12	9		
5.18						5	98.62
End of Borehole							
(GWL @ 0.61m - Sept. 11, 2020)							

Pen. Resist. Blows/0.3m
● **50 mm Dia. Cone**
○ **Water Content %**

20 40 60 80

Piezometer Construction

20 40 60 80 100
Shear Strength (kPa)
▲ Undisturbed △ Remoulded

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SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Prop. Commercial Dev. - Albion Rd. at Mitch Owens Rd.
Ottawa, Ontario

DATUM Geodetic

FILE NO. PG5485

REMARKS

HOLE NO. BH 8

BORINGS BY CME-55 Low Clearance Drill **DATE** September 3, 2020

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	103.74
FILL: Brown/black silty sand with crushed stone, some organics		AU	1				
0.36							
		SS	2	58	9	1	102.74
Loose, red-brown **SILTY SAND**							
- brown with clay by 1.5m depth.		SS	3	54	4	2	101.74
2.29							
		SS	4	42	7	3	100.74
		SS	5	79	6		
Loose, grey **SAND,** trace shells		SS	6	100	7	4	99.74
		SS	7	100	5	5	98.74
5.18							
End of Borehole							
(GWL @ 1.01m - Sept. 11, 2020)							

Pen. Resist. Blows/0.3m
● **50 mm Dia. Cone**
○ **Water Content %**
20 40 60 80

Piezometer Construction

20 40 60 80 100
Shear Strength (kPa)
▲ Undisturbed △ Remoulded

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SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Prop. Commercial Dev. - Albion Rd. at Mitch Owens Rd.
Ottawa, Ontario

DATUM Geodetic

FILE NO. PG5485

REMARKS

HOLE NO. BH 9

BORINGS BY CME-55 Low Clearance Drill **DATE** September 3, 2020

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	103.85
FILL: Black silty sand with crushed stone, some boulders		AU	1				
0.66							
FILL: Brown/black silty sand with grey clay, trace gravel		SS	2	46	6	1	102.85
1.52							
		SS	3	42	6	2	101.85
FILL: Grey/black silty clay with grey sand		SS	4	46	2		
3.05						3	100.85
		SS	5	83	2		
Stiff, grey **SILTY CLAY**		SS	6	100	P	4	99.85
4.57							
End of Borehole							
(GWL @ 1.52m - Sept. 11, 2020)							

Pen. Resist. Blows/0.3m
● 50 mm Dia. Cone
○ Water Content %

20 40 60 80

Piezometer Construction

20 40 60 80 100

Shear Strength (kPa)

▲ Undisturbed △ Remoulded

patersongroup Consulting Engineers

154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Prop. Commercial Dev. - Albion Rd. at Mitch Owens Rd.
Ottawa, Ontario

DATUM Geodetic

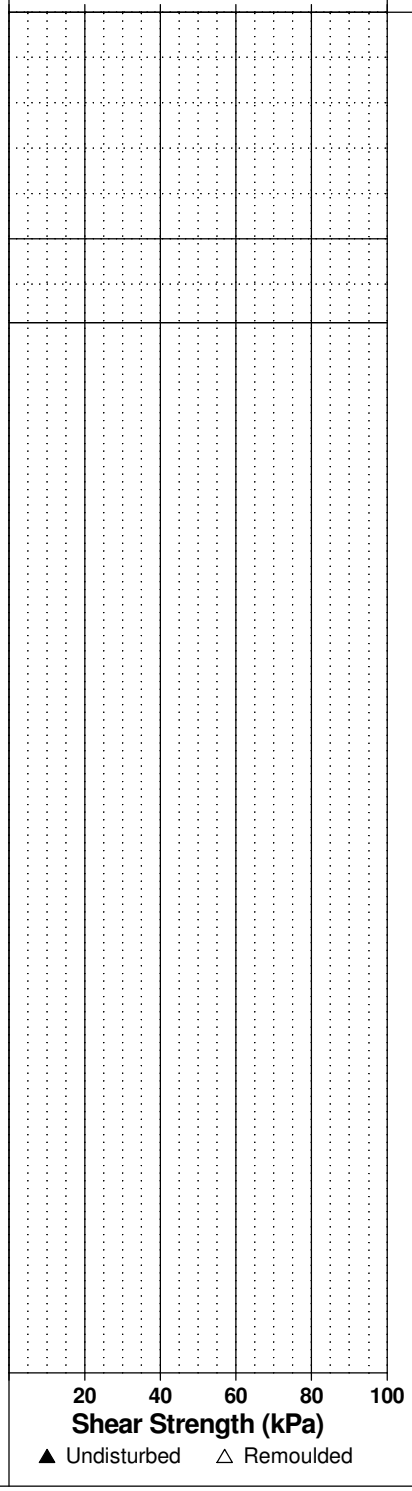
FILE NO. PG5485

REMARKS

HOLE NO. BH10

BORINGS BY CME-55 Low Clearance Drill **DATE** September 3, 2020

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone ○ Water Content %	Piezometer Construction
GROUND SURFACE									
FILL: Brown silty sand with crushed stone, gravel and cobbles, trace clay		AU	1			0	103.89		
0.10									
Compact, brown **SILTY SAND**		SS	2	38	25	1	102.89		
1.37									
End of Borehole									
(BH dry upon completion)									



SOIL PROFILE AND TEST DATA

GEOTECHNICAL INVESTIGATION

5545 Albion Road, Ottawa, Ontario

DATUM: Geodetic **EASTING:** **NORTHING:** **ELEVATION:** 103.75 m

PROJECT: Hydrogeological Assessment

BORINGS BY: Excavator

REMARKS: **DATE:** October 13, 2023

FILE NO. **PH3645**

HOLE NO. TP 1-23

SAMPLE DESCRIPTION	STRATA PLOT	Sample No.	SAMPLE % RECOVERY	N VALUE or RQD	WATER CONTENT %	DEPTH (m)	Remoulded Shear Strength (kPa) 0 50 100	Peak Shear Strength (kPa) 0 50 100	Pen. Resist. Blows/0.3m (50 mm Dia. Cone) 0 50 100	Piezometer Construction
Ground Surface EL 103.75 m						0				
FILL: Crushed stone with silty sand and gravel, occasional cobbles		G1								
0.86 m EL 102.89 m										▼
Brown SILTY SAND		G2				1				
1.29 m EL 102.46 m		G3								
Grey SILT, trace sand										
1.75 m EL 102 m						2				
End of Test Pit										
(GWL @ 0.86m depth)						3				

SOIL PROFILE AND TEST DATA

GEOTECHNICAL INVESTIGATION

5545 Albion Road, Ottawa, Ontario

DATUM: Geodetic **EASTING:** **NORTHING:** **ELEVATION:** 103.74 m

PROJECT: Hydrogeological Assessment

BORINGS BY: Excavator

REMARKS: **DATE:** October 13, 2023

FILE NO. **PH3645**

HOLE NO. TP 2-23

SAMPLE DESCRIPTION	STRATA PLOT	Sample No.	SAMPLE % RECOVERY	N VALUE or RQD	WATER CONTENT %	DEPTH (m)	Remoulded Shear Strength (kPa) 0 50 100	Peak Shear Strength (kPa) 0 50 100	Pen. Resist. Blows/0.3m (50 mm Dia. Cone) 0 50 100	Piezometer Construction
Ground Surface EL 103.74 m						0				
FILL: Crushed stone with silty sand, trace asphalt and organics		G1								
0.3 m EL 103.44 m										
FILL: Brown sand, trace silt, gravel and organics		G2								
0.95 m EL 102.79 m		G3				1				▼
Brown SANDY SILT, trace gravel										
1.75 m EL 101.99 m										
End of Test Pit						2				
(GWL @ 1.03m depth)										
						3				

SOIL PROFILE AND TEST DATA

GEOTECHNICAL INVESTIGATION

5545 Albion Road, Ottawa, Ontario

DATUM: Geodetic **EASTING:** **NORTHING:** **ELEVATION:** 103.6 m

PROJECT: Hydrogeological Assessment

BORINGS BY: Excavator

REMARKS: **DATE:** October 13, 2023

FILE NO. **PH3645**

HOLE NO. TP 3-23

SAMPLE DESCRIPTION	STRATA PLOT	Sample No.	SAMPLE % RECOVERY	N VALUE or RQD	WATER CONTENT %	DEPTH (m)	Remoulded Shear Strength (kPa) 0 50 100	Peak Shear Strength (kPa) 0 50 100	Pen. Resist. Blows/0.3m (50 mm Dia. Cone) 0 50 100	Piezometer Construction
Ground Surface EL 103.6 m						0				
FILL: Crushed stone with silty sand, trace gravel and organics		G1								▼
		G2				1				
1.27 m EL 102.33 m Grey SILT, trace sand		G3								
1.56 m EL 102.04 m End of Test Pit (GWL @ 0.64m depth)						2				
						3				

SOIL PROFILE AND TEST DATA

GEOTECHNICAL INVESTIGATION

5545 Albion Road, Ottawa, Ontario

DATUM: Geodetic **EASTING:** **NORTHING:** **ELEVATION:** 103.5 m

PROJECT: Hydrogeological Assessment

BORINGS BY: Excavator

REMARKS:

DATE: October 13, 2023

FILE NO. **PH3645**

HOLE NO. TP 4-23

SAMPLE DESCRIPTION	STRATA PLOT	Sample No.	SAMPLE % RECOVERY	N VALUE or RQD	WATER CONTENT %	DEPTH (m)	Remoulded Shear Strength (kPa) 0 50 100	Peak Shear Strength (kPa) 0 50 100	Pen. Resist. Blows/0.3m (50 mm Dia. Cone) 0 50 100	Piezometer Construction
Ground Surface EL 103.5 m						0				
FILL: Crushed stone with silty sand, trace organics		G1								▼
1.12 m EL 102.38 m						1				
Brown SILT, trace sand		G2								
1.4 m EL 102.1 m						2				
End of Test Pit (GWL @ 0.42m depth)						3				

SYMBOLS AND TERMS

SOIL DESCRIPTION

Behavioural properties, such as structure and strength, take precedence over particle gradation in describing soils. Terminology describing soil structure are as follows:

Desiccated	-	having visible signs of weathering by oxidation of clay minerals, shrinkage cracks, etc.
Fissured	-	having cracks, and hence a blocky structure.
Varved	-	composed of regular alternating layers of silt and clay.
Stratified	-	composed of alternating layers of different soil types, e.g. silt and sand or silt and clay.
Well-Graded	-	Having wide range in grain sizes and substantial amounts of all intermediate particle sizes (see Grain Size Distribution).
Uniformly-Graded	-	Predominantly of one grain size (see Grain Size Distribution).

The standard terminology to describe the strength of cohesionless soils is the relative density, usually inferred from the results of the Standard Penetration Test (SPT) 'N' value. The SPT N value is the number of blows of a 63.5 kg hammer, falling 760 mm, required to drive a 51 mm O.D. split spoon sampler 300 mm into the soil after an initial penetration of 150 mm.

Relative Density	'N' Value	Relative Density %
Very Loose	<4	<15
Loose	4-10	15-35
Compact	10-30	35-65
Dense	30-50	65-85
Very Dense	>50	>85

The standard terminology to describe the strength of cohesive soils is the consistency, which is based on the undisturbed undrained shear strength as measured by the in situ or laboratory vane tests, penetrometer tests, unconfined compression tests, or occasionally by Standard Penetration Tests.

Consistency	Undrained Shear Strength (kPa)	'N' Value
Very Soft	<12	<2
Soft	12-25	2-4
Firm	25-50	4-8
Stiff	50-100	8-15
Very Stiff	100-200	15-30
Hard	>200	>30

SYMBOLS AND TERMS (continued)

SOIL DESCRIPTION (continued)

Cohesive soils can also be classified according to their “sensitivity”. The sensitivity is the ratio between the undisturbed undrained shear strength and the remoulded undrained shear strength of the soil.

Terminology used for describing soil strata based upon texture, or the proportion of individual particle sizes present is provided on the Textural Soil Classification Chart at the end of this information package.

ROCK DESCRIPTION

The structural description of the bedrock mass is based on the Rock Quality Designation (RQD).

The RQD classification is based on a modified core recovery percentage in which all pieces of sound core over 100 mm long are counted as recovery. The smaller pieces are considered to be a result of closely-spaced discontinuities (resulting from shearing, jointing, faulting, or weathering) in the rock mass and are not counted. RQD is ideally determined from NXL size core. However, it can be used on smaller core sizes, such as BX, if the bulk of the fractures caused by drilling stresses (called “mechanical breaks”) are easily distinguishable from the normal in situ fractures.

RQD %	ROCK QUALITY
90-100	Excellent, intact, very sound
75-90	Good, massive, moderately jointed or sound
50-75	Fair, blocky and seamy, fractured
25-50	Poor, shattered and very seamy or blocky, severely fractured
0-25	Very poor, crushed, very severely fractured

SAMPLE TYPES

SS	-	Split spoon sample (obtained in conjunction with the performing of the Standard Penetration Test (SPT))
TW	-	Thin wall tube or Shelby tube
PS	-	Piston sample
AU	-	Auger sample or bulk sample
WS	-	Wash sample
RC	-	Rock core sample (Core bit size AXT, BXL, etc.). Rock core samples are obtained with the use of standard diamond drilling bits.

SYMBOLS AND TERMS (continued)

GRAIN SIZE DISTRIBUTION

MC%	-	Natural moisture content or water content of sample, %
LL	-	Liquid Limit, % (water content above which soil behaves as a liquid)
PL	-	Plastic limit, % (water content above which soil behaves plastically)
PI	-	Plasticity index, % (difference between LL and PL)
Dxx	-	Grain size which xx% of the soil, by weight, is of finer grain sizes These grain size descriptions are not used below 0.075 mm grain size
D10	-	Grain size at which 10% of the soil is finer (effective grain size)
D60	-	Grain size at which 60% of the soil is finer
Cc	-	Concavity coefficient = $(D30)^2 / (D10 \times D60)$
Cu	-	Uniformity coefficient = D60 / D10

Cc and Cu are used to assess the grading of sands and gravels:
Well-graded gravels have: $1 < Cc < 3$ and $Cu > 4$
Well-graded sands have: $1 < Cc < 3$ and $Cu > 6$
Sands and gravels not meeting the above requirements are poorly-graded or uniformly-graded.
Cc and Cu are not applicable for the description of soils with more than 10% silt and clay
(more than 10% finer than 0.075 mm or the #200 sieve)

CONSOLIDATION TEST

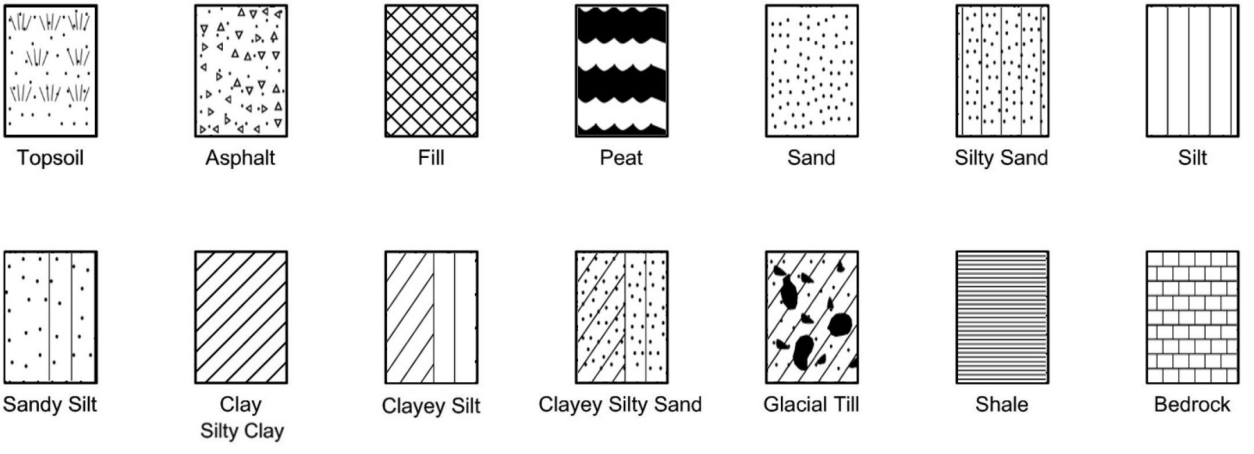
p'_o	-	Present effective overburden pressure at sample depth
p'_c	-	Preconsolidation pressure of (maximum past pressure on) sample
Ccr	-	Recompression index (in effect at pressures below p'_c)
Cc	-	Compression index (in effect at pressures above p'_c)
OC Ratio		Overconsolidaton ratio = p'_c / p'_o
Void Ratio		Initial sample void ratio = volume of voids / volume of solids
Wo	-	Initial water content (at start of consolidation test)

PERMEABILITY TEST

k	-	Coefficient of permeability or hydraulic conductivity is a measure of the ability of water to flow through the sample. The value of k is measured at a specified unit weight for (remoulded) cohesionless soil samples, because its value will vary with the unit weight or density of the sample during the test.

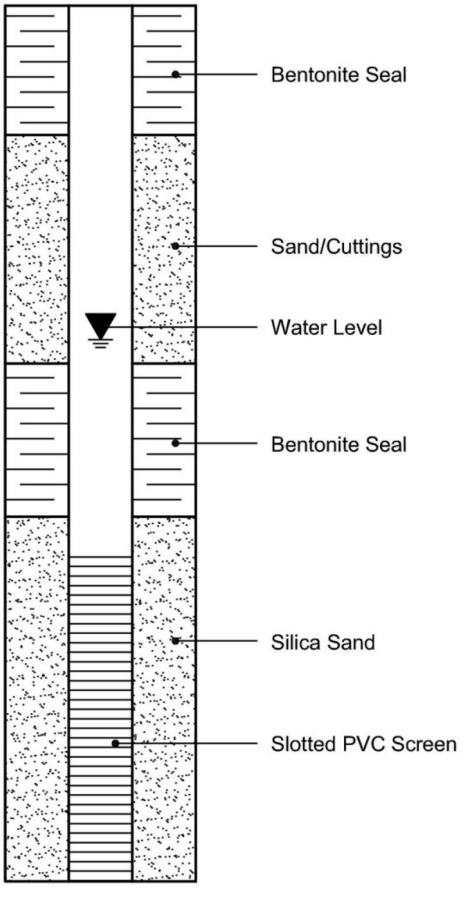
SYMBOLS AND TERMS (continued)

STRATA PLOT

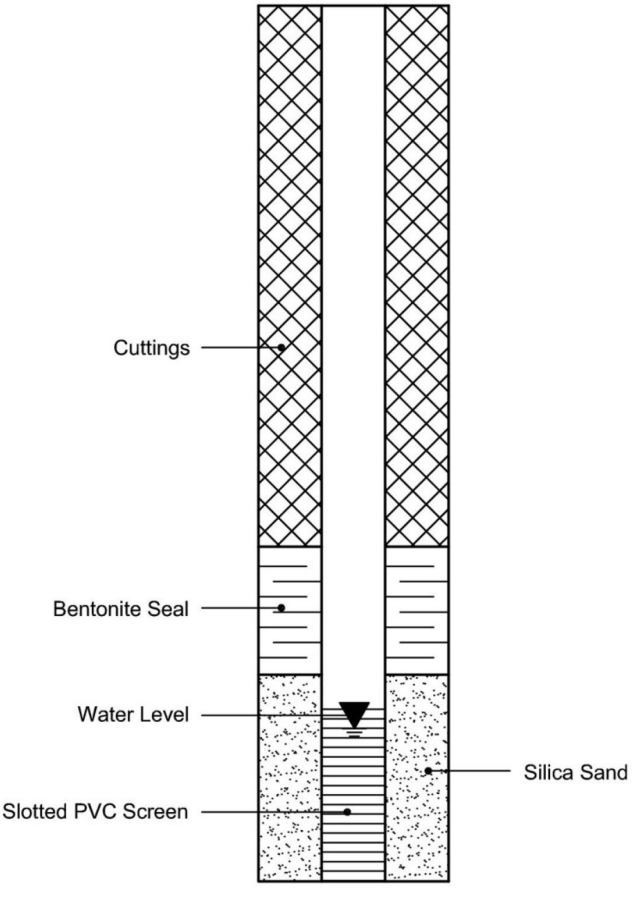


MONITORING WELL AND PIEZOMETER CONSTRUCTION

MONITORING WELL CONSTRUCTION



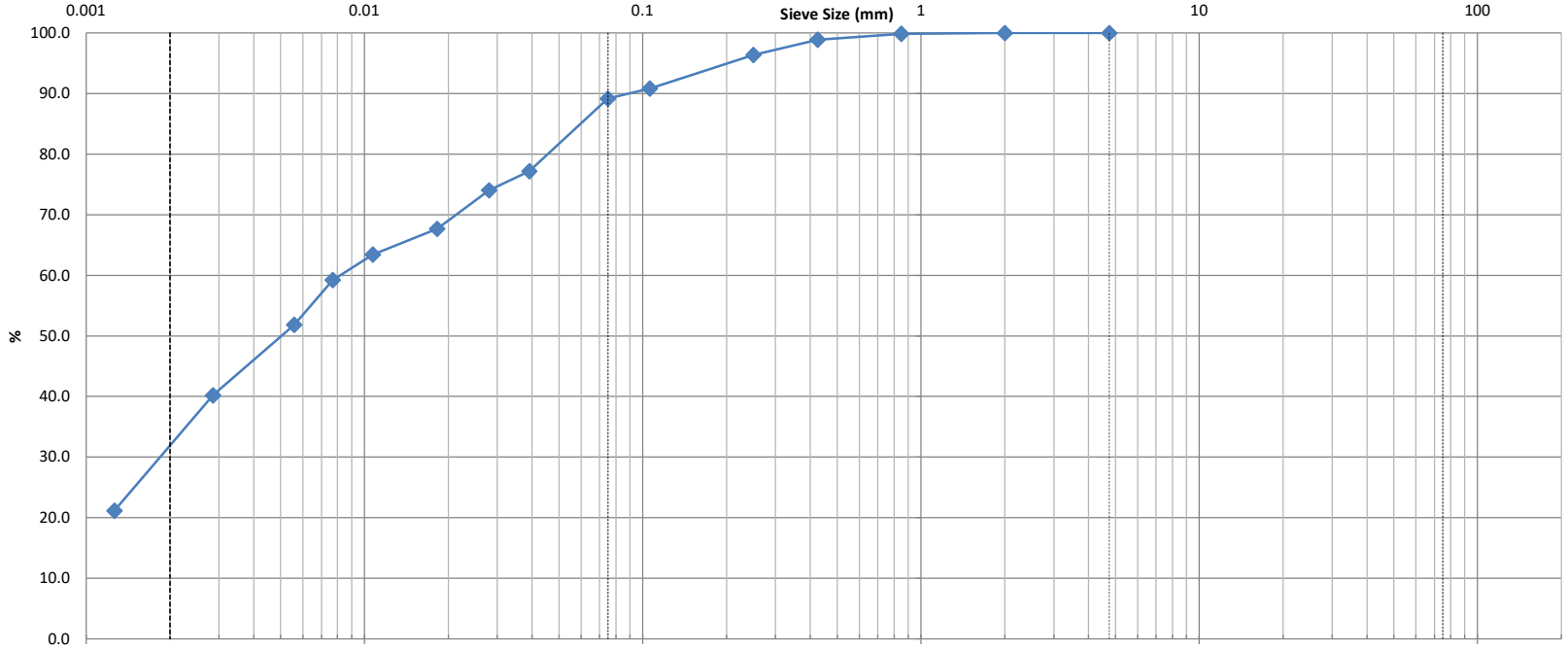
PIEZOMETER CONSTRUCTION



PATERSON GROUP

SIEVE ANALYSIS
ASTM C136

CLIENT:	W.O Stinson & Son Ltd.	DEPTH:	15' - 17'	FILE NO:	PG5485/PH3645
CONTRACT NO.:		BH OR TP No.:	BH1-24 SS7	LAB NO:	51670
PROJECT:	5505 & 5545 Albian Road			DATE RECEIVED:	25-Apr-24
				DATE TESTED:	26-Apr-24
DATE SAMPLED:	April 11-12			DATE REPORTED:	30-Apr-24
SAMPLED BY:	J.P			TESTED BY:	D.K



Clay	Silt	Sand			Gravel		Cobble
		Fine	Medium	Coarse	Fine	Coarse	

Identification	Soil Classification				MC(%)	LL	PL	PI	Cc	Cu
					37.6%					
	D100	D60	D30	D10	Gravel (%)	Sand (%)	Silt (%)		Clay (%)	
					0.0	10.8	58.2		31.0	

Comments:

REVIEWED BY:	Curtis Beadow	Joe Forsyth, P. Eng.

PATERSON GROUP

HYDROMETER
LS-702 ASTM-422

CLIENT:	W.O Stinson & Son Ltd.	DEPTH:	15' - 17'	FILE NO.:	PG5485/PH3645
PROJECT:	5505 & 5545 Albian Road	BH OR TP No.:	BH1-24 SS7	DATE SAMPLED:	April 11-12
LAB No. :	51670	TESTED BY:	D.K	DATE RECEIVED:	25-Apr-24
SAMPLED BY:	J.P	DATE REPT'D:	30-Apr-24	DATE TESTED:	26-Apr-24

SAMPLE INFORMATION

SAMPLE MASS	SPECIFIC GRAVITY
95.0	2.700

		HYGROSCOPIC MOISTURE		
INITIAL WEIGHT	50.00			
WEIGHT CORRECTED	46.75	TARE WEIGHT	0.00	ACTUAL WEIGHT
WT. AFTER WASH BACK SIEVE	5.48	AIR DRY	101.60	101.60
SOLUTION CONCENTRATION	40 g/L	OVEN DRY	95.00	95.00
		CORRECTED	0.935	

GRAIN SIZE ANALYSIS

SIEVE DIAMETER (mm)	WEIGHT RETAINED (g)	PERCENT RETAINED	PERCENT PASSING
26.5			
19			
13.2			
9.5			
4.75	**0.0**	0.0	**100.0**
2.0	**0.0**	0.0	**100.0**
Pan	**95.0**		
0.850	**0.07**	0.1	**99.9**
0.425	**0.55**	1.1	**98.9**
0.250	**1.81**	3.6	**96.4**
0.106	**4.57**	9.1	**90.9**
0.075	**5.41**	10.8	**89.2**
Pan	**5.48**		
SIEVE CHECK 0.0	MAX = 0.3%		

HYDROMETER DATA

ELAPSED	TIME (24 hours)	Hs	Hc	Temp. (°C)	DIAMETER	(P)	TOTAL PERCENT PASSING
1	8:49	42.5	6.0	23.0	0.0391	77.2	**77.2**
2	8:50	41.0	6.0	23.0	0.0281	74.0	**74.0**
5	8:53	38.0	6.0	23.0	0.0182	67.7	**67.7**
15	9:03	36.0	6.0	23.0	0.0107	63.4	**63.4**
30	9:18	34.0	6.0	23.0	0.0077	59.2	**59.2**
60	9:48	30.5	6.0	23.0	0.0056	51.8	**51.8**
250	12:58	25.0	6.0	23.0	0.0029	40.2	**40.2**
1440	8:48	16.0	6.0	23.0	0.0013	21.1	**21.1**

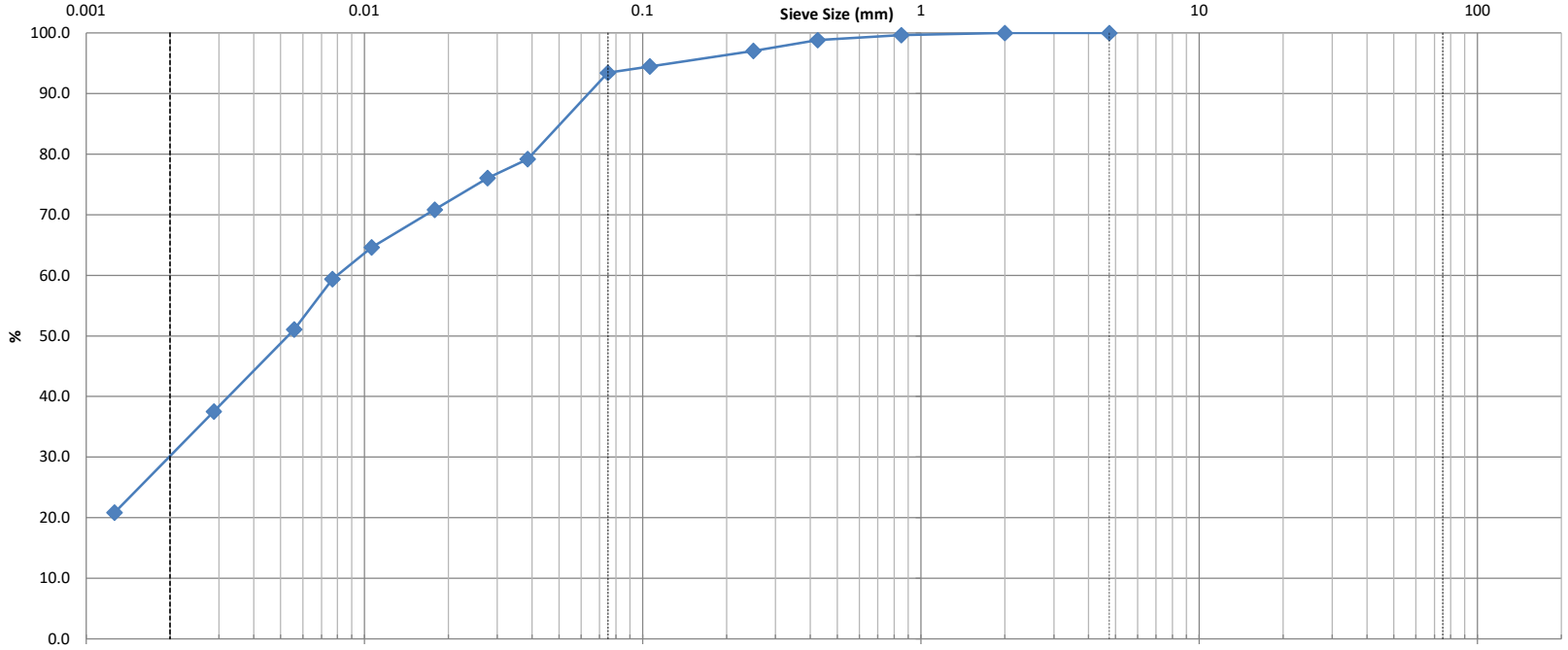
Moisture = 37.6%

REVIEWED BY:	C. Beadow	Joe Forsyth, P. Eng.

PATERSON GROUP

SIEVE ANALYSIS
ASTM C136

CLIENT:	W.O Stinson & Son Ltd.	DEPTH:	12'6" - 14'6"	FILE NO:	PG5485/PH3645
CONTRACT NO.:		BH OR TP No.:	BH2-24 SS6	LAB NO:	51672
PROJECT:	5505 & 5545 Albian Road			DATE RECEIVED:	25-Apr-24
				DATE TESTED:	26-Apr-24
DATE SAMPLED:	April 11-12			DATE REPORTED:	30-Apr-24
SAMPLED BY:	J.P			TESTED BY:	D.K



Clay	Silt	Sand			Gravel		Cobble
		Fine	Medium	Coarse	Fine	Coarse	

Identification	Soil Classification					MC(%)	LL	PL	PI	Cc	Cu
						34.2%					
	D100	D60	D30	D10	Gravel (%)	Sand (%)		Silt (%)		Clay (%)	
					0.0	6.6		63.4		30.0	

Comments:

REVIEWED BY:	Curtis Beadow	Joe Forsyth, P. Eng.

PATERSON GROUP

HYDROMETER
LS-702 ASTM-422

CLIENT:	W.O Stinson & Son Ltd.	DEPTH:	12'6" - 14'6"	FILE NO.:	PG5485/PH3645
PROJECT:	5505 & 5545 Albian Road	BH OR TP No.:	BH2-24 SS6	DATE SAMPLED:	April 11-12
LAB No. :	51672	TESTED BY:	D.K	DATE RECEIVED:	25-Apr-24
SAMPLED BY:	J.P	DATE REPT'D:	30-Apr-24	DATE TESTED:	26-Apr-24

SAMPLE INFORMATION

SAMPLE MASS	SPECIFIC GRAVITY
104.1	2.700

INITIAL WEIGHT	50.00	**HYGROSCOPIC MOISTURE**		
WEIGHT CORRECTED	47.45	TARE WEIGHT	0.00	ACTUAL WEIGHT
WT. AFTER WASH BACK SIEVE	3.36	AIR DRY	109.70	109.70
SOLUTION CONCENTRATION	40 g/L	OVEN DRY	104.10	104.10
		CORRECTED	0.949	

GRAIN SIZE ANALYSIS

SIEVE DIAMETER (mm)	WEIGHT RETAINED (g)	PERCENT RETAINED	PERCENT PASSING
26.5			
19			
13.2			
9.5			
4.75	**0.0**	0.0	**100.0**
2.0	**0.0**	0.0	**100.0**
Pan	**104.1**		
0.850	**0.17**	0.3	**99.7**
0.425	**0.58**	1.2	**98.8**
0.250	**1.47**	2.9	**97.1**
0.106	**2.75**	5.5	**94.5**
0.075	**3.29**	6.6	**93.4**
Pan	**3.36**		
SIEVE CHECK 0.0	MAX = 0.3%		

HYDROMETER DATA

ELAPSED	TIME (24 hours)	Hs	Hc	Temp. (°C)	DIAMETER	(P)	TOTAL PERCENT PASSING
1	8:54	44.0	6.0	23.0	0.0386	79.2	**79.2**
2	8:55	42.5	6.0	23.0	0.0277	76.1	**76.1**
5	8:58	40.0	6.0	23.0	0.0179	70.9	**70.9**
15	9:08	37.0	6.0	23.0	0.0106	64.6	**64.6**
30	9:23	34.5	6.0	23.0	0.0077	59.4	**59.4**
60	9:53	30.5	6.0	23.0	0.0056	51.1	**51.1**
250	13:03	24.0	6.0	23.0	0.0029	37.5	**37.5**
1440	8:53	16.0	6.0	23.0	0.0013	20.8	**20.8**

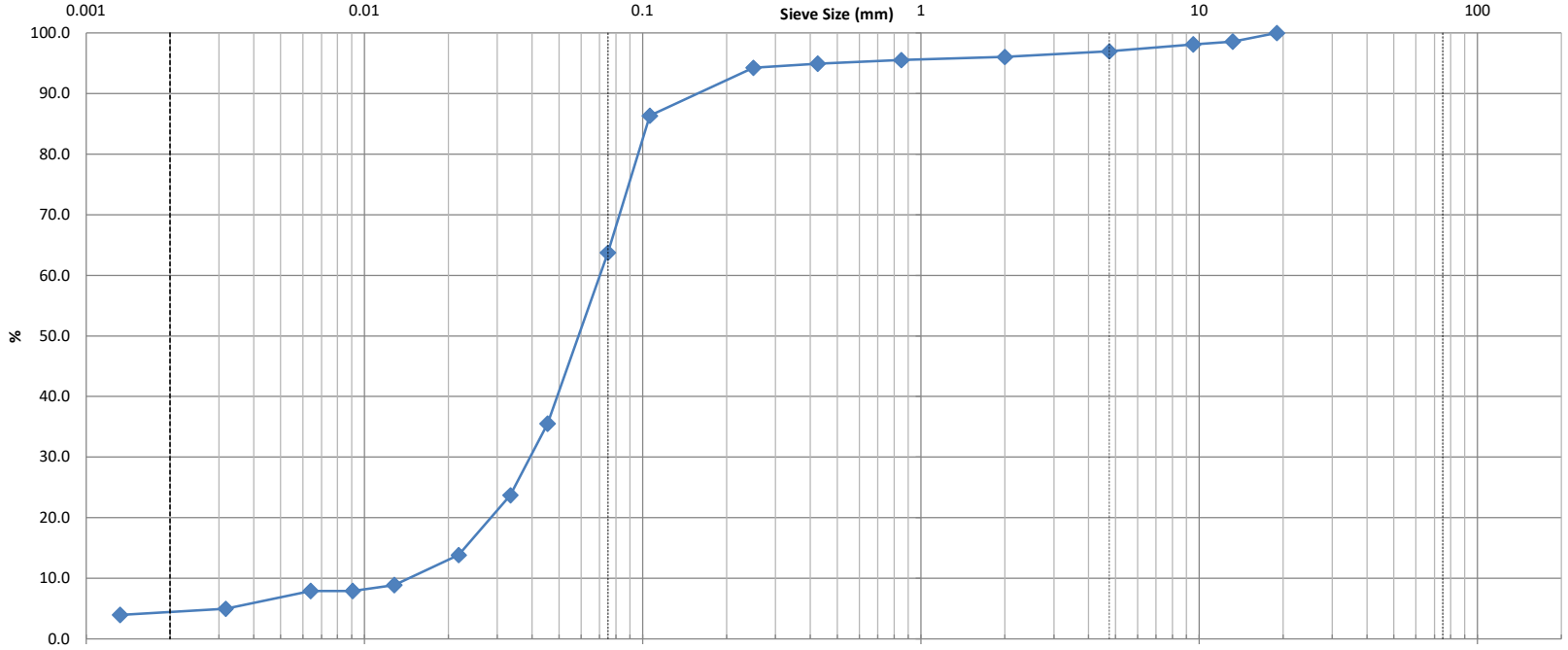
Moisture = 34.2%

REVIEWED BY:	C. Beadow	Joe Forsyth, P. Eng.

PATERSON GROUP

SIEVE ANALYSIS
ASTM C136

CLIENT:	W.O Stinson & Son Ltd.	DEPTH:	15' - 17'	FILE NO:	PG5485/PH3645
CONTRACT NO.:		BH OR TP No.:	BH2-24 SS7	LAB NO:	51678
PROJECT:	5505 & 5545 Albian Road			DATE RECEIVED:	25-Apr-24
				DATE TESTED:	26-Apr-24
DATE SAMPLED:	April 11-12			DATE REPORTED:	30-Apr-24
SAMPLED BY:	J.P			TESTED BY:	D.K



Clay	Silt	Sand			Gravel		Cobble
		Fine	Medium	Coarse	Fine	Coarse	

Identification	Soil Classification				MC(%)	LL	PL	PI	Cc	Cu
					19.3%					
	D100	D60	D30	D10	Gravel (%)	Sand (%)		Silt (%)		Clay (%)
					3.0	33.3		59.4		4.3

Comments:

REVIEWED BY:	Curtis Beadow	Joe Forsyth, P. Eng.

PATERSON GROUP

HYDROMETER
LS-702 ASTM-422

CLIENT:	W.O Stinson & Son Ltd.	DEPTH:	15' - 17'	FILE NO.:	PG5485/PH3645
PROJECT:	5505 & 5545 Albian Road	BH OR TP No.:	BH2-24 SS7	DATE SAMPLED:	April 11-12
LAB No. :	51678	TESTED BY:	D.K	DATE RECEIVED:	25-Apr-24
SAMPLED BY:	J.P	DATE REPT'D:	30-Apr-24	DATE TESTED:	26-Apr-24

SAMPLE INFORMATION

SAMPLE MASS	SPECIFIC GRAVITY
596.2	2.700

		HYGROSCOPIC MOISTURE		
INITIAL WEIGHT	50.00			
WEIGHT CORRECTED	48.14	TARE WEIGHT	0.00	ACTUAL WEIGHT
WT. AFTER WASH BACK SIEVE	22.60	AIR DRY	619.20	619.20
SOLUTION CONCENTRATION	40 g/L	OVEN DRY	596.20	596.20
		CORRECTED	0.963	

GRAIN SIZE ANALYSIS

SIEVE DIAMETER (mm)	WEIGHT RETAINED (g)	PERCENT RETAINED	PERCENT PASSING
26.5			
19	**0.0**	0.0	**100.0**
13.2	**8.4**	1.4	**98.6**
9.5	**11.1**	1.9	**98.1**
4.75	**18.0**	3.0	**97.0**
2.0	**23.5**	3.9	**96.1**
Pan	**572.7**		
0.850	**0.28**	4.5	**95.5**
0.425	**0.58**	5.1	**94.9**
0.250	**0.94**	5.7	**94.3**
0.106	**5.06**	13.7	**86.3**
0.075	**16.83**	36.3	**63.7**
Pan	**22.60**		
SIEVE CHECK 0.0	MAX = 0.3%		

HYDROMETER DATA

ELAPSED	TIME (24 hours)	Hs	Hc	Temp. (°C)	DIAMETER	(P)	TOTAL PERCENT PASSING
1	9:01	24.0	6.0	23.0	0.0454	37.0	**35.5**
2	9:02	18.0	6.0	23.0	0.0334	24.6	**23.7**
5	9:05	13.0	6.0	23.0	0.0218	14.4	**13.8**
15	9:15	10.5	6.0	23.0	0.0128	9.2	**8.9**
30	9:30	10.0	6.0	23.0	0.0091	8.2	**7.9**
60	10:00	10.0	6.0	23.0	0.0064	8.2	**7.9**
250	13:10	8.5	6.0	23.0	0.0032	5.1	**4.9**
1440	9:00	8.0	6.0	23.0	0.0013	4.1	**3.9**

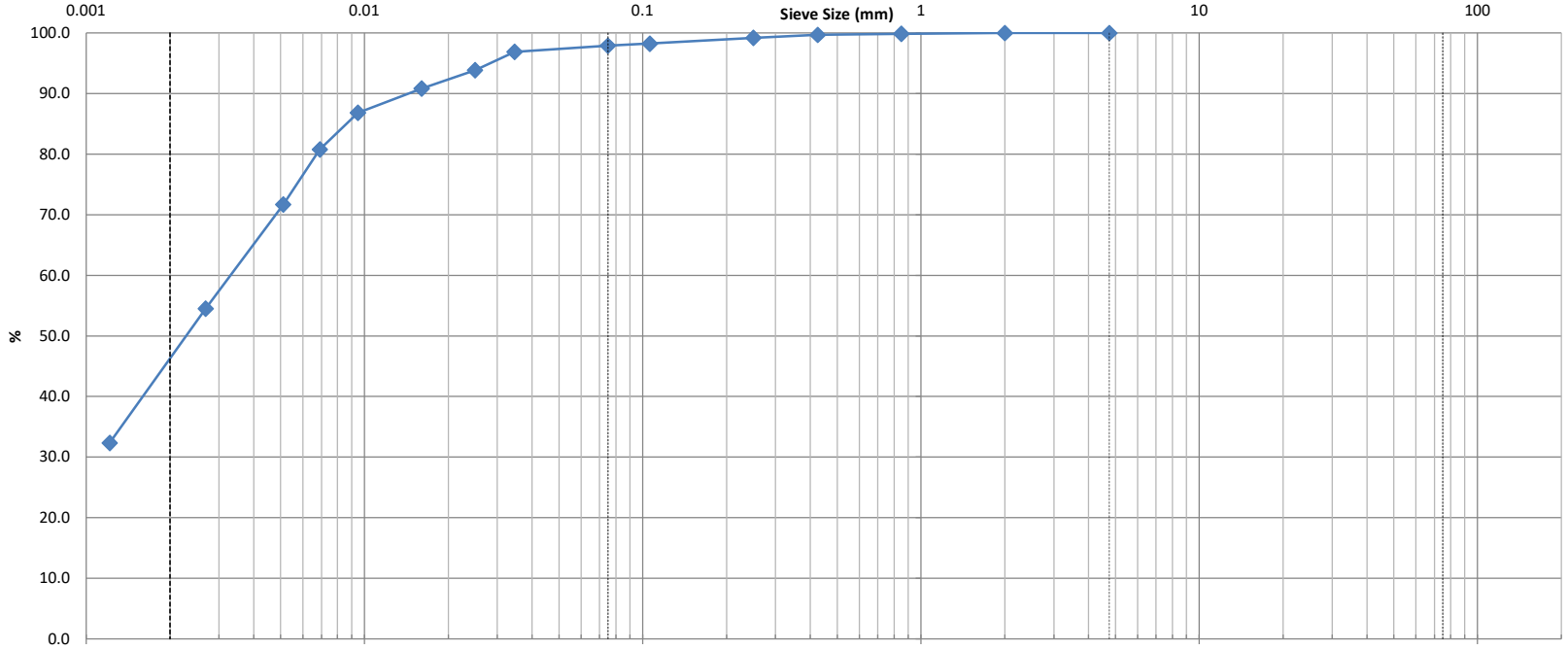
Moisture = 19.3%

REVIEWED BY:	C. Beadow	Joe Forsyth, P. Eng.

PATERSON GROUP

SIEVE ANALYSIS
ASTM C136

CLIENT:	W.O Stinson & Son Ltd.	DEPTH:	8'6" - 9'6"	FILE NO:	PG5485/PH3645
CONTRACT NO.:		BH OR TP No.:	BH3-24 SS4 BTM	LAB NO:	51673
PROJECT:	5505 & 5545 Albian Road			DATE RECEIVED:	25-Apr-24
				DATE TESTED:	26-Apr-24
DATE SAMPLED:	April 11-12			DATE REPORTED:	30-Apr-24
SAMPLED BY:	J.P			TESTED BY:	D.K



Clay	Silt	Sand			Gravel		Cobble
		Fine	Medium	Coarse	Fine	Coarse	

Identification	Soil Classification					MC(%)	LL	PL	PI	Cc	Cu
						55.7%					
	D100	D60	D30	D10	Gravel (%)	Sand (%)		Silt (%)		Clay (%)	
					0.0	2.1		50.9		47.0	

Comments:

REVIEWED BY:	Curtis Beadow	Joe Forsyth, P. Eng.

PATERSON GROUP

HYDROMETER
LS-702 ASTM-422

CLIENT:	W.O Stinson & Son Ltd.	DEPTH:	8'6" - 9'6"	FILE NO.:	PG5485/PH3645
PROJECT:	5505 & 5545 Albian Road	BH OR TP No.:	BH3-24 SS4 BTM	DATE SAMPLED:	April 11-12
LAB No. :	51673	TESTED BY:	D.K	DATE RECEIVED:	25-Apr-24
SAMPLED BY:	J.P	DATE REPT'D:	30-Apr-24	DATE TESTED:	26-Apr-24

SAMPLE INFORMATION

SAMPLE MASS	SPECIFIC GRAVITY
77.6	2.700

INITIAL WEIGHT	50.00	**HYGROSCOPIC MOISTURE**		
WEIGHT CORRECTED	42.22	TARE WEIGHT	0.00	ACTUAL WEIGHT
WT. AFTER WASH BACK SIEVE	1.08	AIR DRY	91.90	91.90
SOLUTION CONCENTRATION	40 g/L	OVEN DRY	77.60	77.60
		CORRECTED	0.844	

GRAIN SIZE ANALYSIS

SIEVE DIAMETER (mm)	WEIGHT RETAINED (g)	PERCENT RETAINED	PERCENT PASSING
26.5			
19			
13.2			
9.5			
4.75	**0.0**	0.0	**100.0**
2.0	**0.0**	0.0	**100.0**
Pan	**77.6**		
0.850	**0.07**	0.1	**99.9**
0.425	**0.16**	0.3	**99.7**
0.250	**0.40**	0.8	**99.2**
0.106	**0.87**	1.7	**98.3**
0.075	**1.04**	2.1	**97.9**
Pan	**1.08**		
SIEVE CHECK 0.0	MAX = 0.3%		

HYDROMETER DATA

ELAPSED	TIME (24 hours)	Hs	Hc	Temp. (°C)	DIAMETER	(P)	TOTAL PERCENT PASSING
1	9:20	54.0	6.0	23.0	0.0346	96.9	**96.9**
2	9:21	52.5	6.0	23.0	0.0249	93.9	**93.9**
5	9:24	51.0	6.0	23.0	0.0160	90.9	**90.9**
15	9:34	49.0	6.0	23.0	0.0095	86.8	**86.8**
30	9:49	46.0	6.0	23.0	0.0069	80.8	**80.8**
60	10:19	41.5	6.0	23.0	0.0051	71.7	**71.7**
250	13:29	33.0	6.0	23.0	0.0027	54.5	**54.5**
1440	9:19	22.0	6.0	23.0	0.0012	32.3	**32.3**

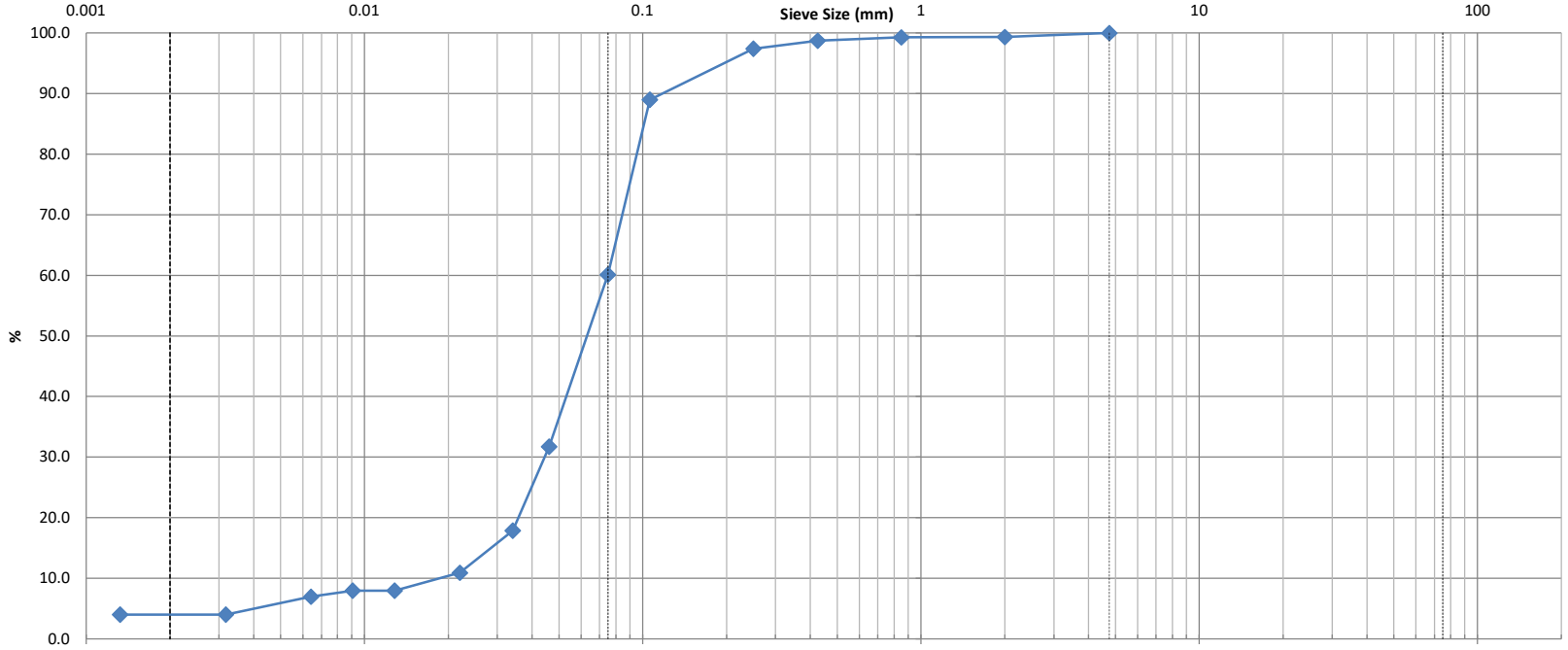
Moisture = 55.7%

REVIEWED BY:	C. Beadow	Joe Forsyth, P. Eng.

PATERSON GROUP

SIEVE ANALYSIS
ASTM C136

CLIENT:	W.O Stinson & Son Ltd.	DEPTH:	15' - 16'	FILE NO:	PG5485/PH3645
CONTRACT NO.:		BH OR TP No.:	BH3-24 SS7 TOP	LAB NO:	51668
PROJECT:	5505 & 5545 Albion Road			DATE RECEIVED:	25-Apr-24
				DATE TESTED:	26-Apr-24
DATE SAMPLED:	April 11-12			DATE REPORTED:	30-Apr-24
SAMPLED BY:	J.P			TESTED BY:	D.K



Clay	Silt	Sand			Gravel		Cobble
		Fine	Medium	Coarse	Fine	Coarse	

Identification	Soil Classification				MC(%)	LL	PL	PI	Cc	Cu
					20.9%					
	D100	D60	D30	D10	Gravel (%)	Sand (%)		Silt (%)		Clay (%)
					0.0	39.9		56.2		4.0

Comments:

REVIEWED BY:	Curtis Beadow	Joe Forsyth, P. Eng.

PATERSON GROUP

HYDROMETER
LS-702 ASTM-422

CLIENT:	W.O Stinson & Son Ltd.	DEPTH:	15' - 16'	FILE NO.:	PG5485/PH3645
PROJECT:	5505 & 5545 Albion Road	BH OR TP No.:	BH3-24 SS7 TOP	DATE SAMPLED:	April 11-12
LAB No. :	51668	TESTED BY:	D.K	DATE RECEIVED:	25-Apr-24
SAMPLED BY:	J.P	DATE REPT'D:	30-Apr-24	DATE TESTED:	26-Apr-24

SAMPLE INFORMATION

SAMPLE MASS	SPECIFIC GRAVITY
135.8	2.700

		HYGROSCOPIC MOISTURE		
INITIAL WEIGHT	50.00			
WEIGHT CORRECTED	49.56	TARE WEIGHT	0.00	ACTUAL WEIGHT
WT. AFTER WASH BACK SIEVE	24.26	AIR DRY	137.00	137.00
SOLUTION CONCENTRATION	40 g/L	OVEN DRY	135.80	135.80
		CORRECTED	0.991	

GRAIN SIZE ANALYSIS

SIEVE DIAMETER (mm)	WEIGHT RETAINED (g)	PERCENT RETAINED	PERCENT PASSING
26.5			
19			
13.2			
9.5			
4.75	**0.0**	0.0	**100.0**
2.0	**0.9**	0.7	**99.3**
Pan	**134.9**		
0.850	**0.03**	0.7	**99.3**
0.425	**0.31**	1.3	**98.7**
0.250	**0.96**	2.6	**97.4**
0.106	**5.20**	11.0	**89.0**
0.075	**19.74**	39.9	**60.1**
Pan	**24.26**		
SIEVE CHECK 0.0	MAX = 0.3%		

HYDROMETER DATA

ELAPSED	TIME (24 hours)	Hs	Hc	Temp. (°C)	DIAMETER	(P)	TOTAL PERCENT PASSING
1	8:25	22.0	6.0	23.0	0.0461	31.9	**31.7**
2	8:26	15.0	6.0	23.0	0.0341	18.0	**17.8**
5	8:29	11.5	6.0	23.0	0.0220	11.0	**10.9**
15	8:39	10.0	6.0	23.0	0.0128	8.0	**7.9**
30	8:54	10.0	6.0	23.0	0.0091	8.0	**7.9**
60	9:24	9.5	6.0	23.0	0.0064	7.0	**6.9**
250	12:34	8.0	6.0	23.0	0.0032	4.0	**4.0**
1440	8:24	8.0	6.0	23.0	0.0013	4.0	**4.0**

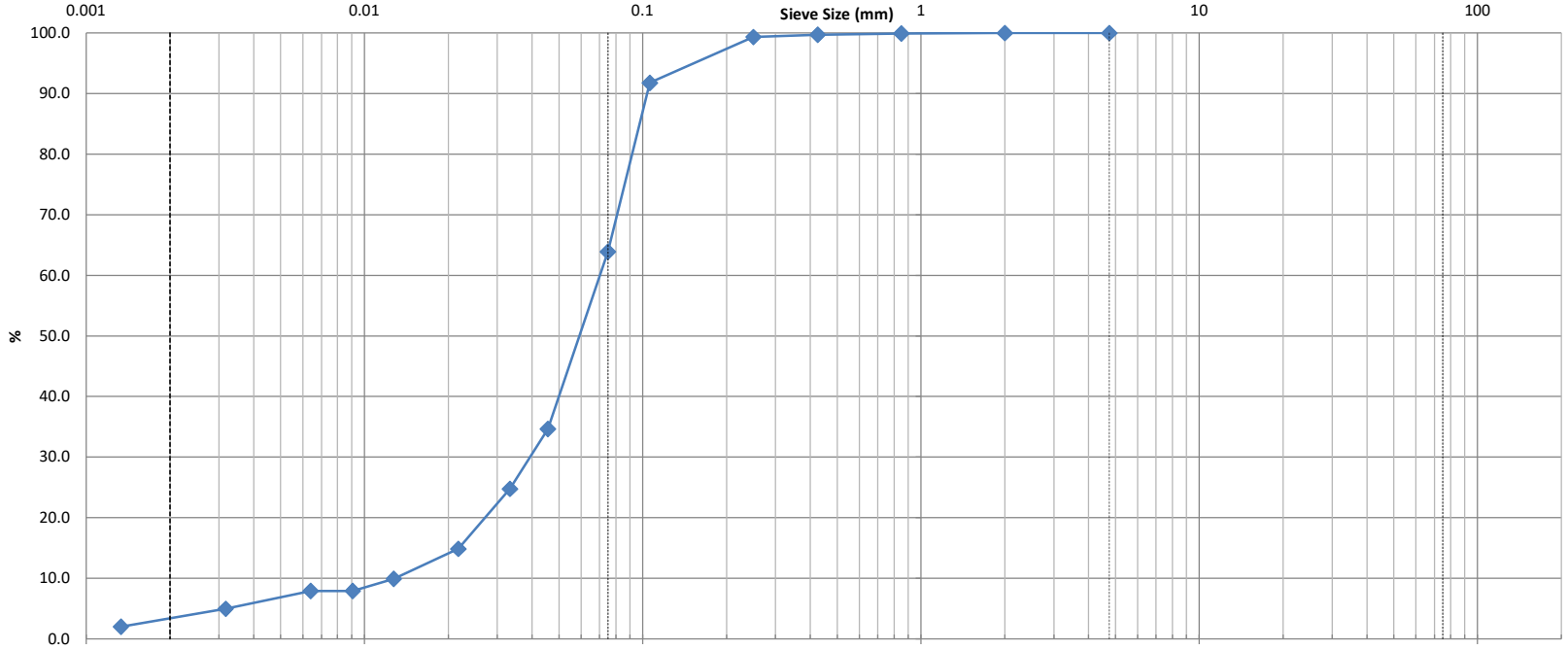
Moisture = 20.9%

REVIEWED BY:	C. Beadow	Joe Forsyth, P. Eng.

PATERSON GROUP

SIEVE ANALYSIS
ASTM C136

CLIENT:	W.O Stinson & Son Ltd.	DEPTH:	10' - 12'	FILE NO:	PG5485/PH3645
CONTRACT NO.:		BH OR TP No.:	BH4-24 SS5 BTM	LAB NO:	51674
PROJECT:	5505 & 5545 Albian Road			DATE RECEIVED:	25-Apr-24
				DATE TESTED:	26-Apr-24
DATE SAMPLED:	April 11-12			DATE REPORTED:	30-Apr-24
SAMPLED BY:	J.P			TESTED BY:	D.K



Clay	Silt	Sand			Gravel		Cobble
		Fine	Medium	Coarse	Fine	Coarse	

Identification	Soil Classification				MC(%)	LL	PL	PI	Cc	Cu
					21.1%					
	D100	D60	D30	D10	Gravel (%)	Sand (%)	Silt (%)		Clay (%)	
					0.0	36.1	60.8		3.1	

Comments:

REVIEWED BY:	Curtis Beadow	Joe Forsyth, P. Eng.

PATERSON GROUP

HYDROMETER
LS-702 ASTM-422

CLIENT:	W.O Stinson & Son Ltd.	DEPTH:	10' - 12'	FILE NO.:	PG5485/PH3645
PROJECT:	5505 & 5545 Albian Road	BH OR TP No.:	BH4-24 SS5 BTM	DATE SAMPLED:	April 11-12
LAB No. :	51674	TESTED BY:	D.K	DATE RECEIVED:	25-Apr-24
SAMPLED BY:	J.P	DATE REPT'D:	30-Apr-24	DATE TESTED:	26-Apr-24

SAMPLE INFORMATION

SAMPLE MASS	SPECIFIC GRAVITY
135.2	2.700

		HYGROSCOPIC MOISTURE		
INITIAL WEIGHT	50.00			
WEIGHT CORRECTED	49.96	TARE WEIGHT	0.00	ACTUAL WEIGHT
WT. AFTER WASH BACK SIEVE	23.18	AIR DRY	135.30	135.30
SOLUTION CONCENTRATION	40 g/L	OVEN DRY	135.20	135.20
		CORRECTED	0.999	

GRAIN SIZE ANALYSIS

SIEVE DIAMETER (mm)	WEIGHT RETAINED (g)	PERCENT RETAINED	PERCENT PASSING
26.5			
19			
13.2			
9.5			
4.75	**0.0**	0.0	**100.0**
2.0	**0.0**	0.0	**100.0**
Pan	**135.2**		
0.850	**0.04**	0.1	**99.9**
0.425	**0.13**	0.3	**99.7**
0.250	**0.33**	0.7	**99.3**
0.106	**4.10**	8.2	**91.8**
0.075	**18.05**	36.1	**63.9**
Pan	**23.18**		
SIEVE CHECK 0.0	MAX = 0.3%		

HYDROMETER DATA

ELAPSED	TIME (24 hours)	Hs	Hc	Temp. (°C)	DIAMETER	(P)	TOTAL PERCENT PASSING
1	9:24	23.5	6.0	23.0	0.0456	34.6	**34.6**
2	9:25	18.5	6.0	23.0	0.0333	24.7	**24.7**
5	9:28	13.5	6.0	23.0	0.0217	14.8	**14.8**
15	9:38	11.0	6.0	23.0	0.0127	9.9	**9.9**
30	9:53	10.0	6.0	23.0	0.0091	7.9	**7.9**
60	10:23	10.0	6.0	23.0	0.0064	7.9	**7.9**
250	13:33	8.5	6.0	23.0	0.0032	4.9	**4.9**
1440	9:23	7.0	6.0	23.0	0.0013	2.0	**2.0**

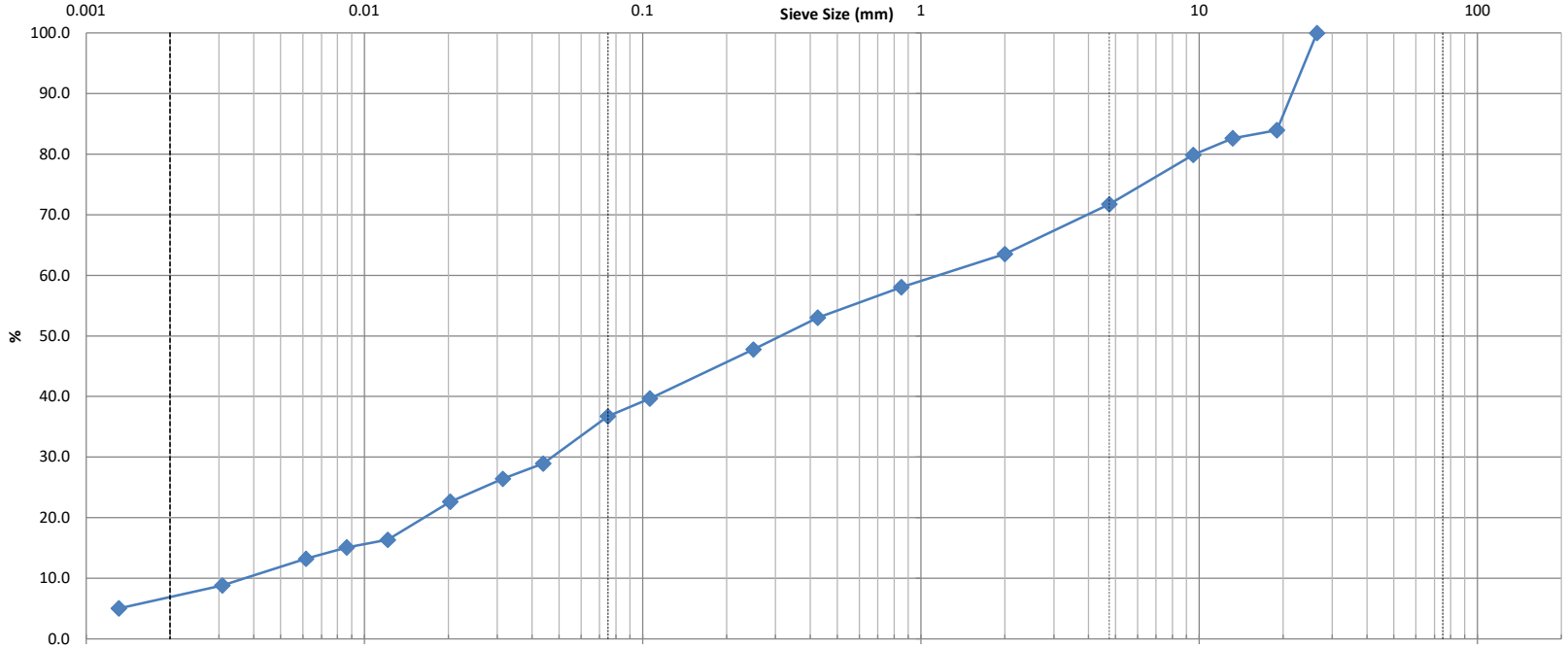
Moisture = 21.1%

REVIEWED BY:	C. Beadow	Joe Forsyth, P. Eng.

PATERSON GROUP

SIEVE ANALYSIS
ASTM C136

CLIENT:	W.O Stinson & Son Ltd.	DEPTH:	15' - 17'	FILE NO:	PG5485/PH3645
CONTRACT NO.:		BH OR TP No.:	BH4B-24 SS1	LAB NO:	51675
PROJECT:	5505 & 5545 Albian Road			DATE RECEIVED:	25-Apr-24
				DATE TESTED:	26-Apr-24
DATE SAMPLED:	April 11-12			DATE REPORTED:	30-Apr-24
SAMPLED BY:	J.P			TESTED BY:	D.K



Clay	Silt	Sand			Gravel		Cobble
		Fine	Medium	Coarse	Fine	Coarse	

Identification	Soil Classification				MC(%)	LL	PL	PI	Cc	Cu
					8.0%					
	D100	D60	D30	D10	Gravel (%)	Sand (%)		Silt (%)		Clay (%)
					28.3	35.0		29.7		7.0

Comments:

REVIEWED BY:	Curtis Beadow	Joe Forsyth, P. Eng.

PATERSON GROUP

HYDROMETER
LS-702 ASTM-422

CLIENT:	W.O Stinson & Son Ltd.	DEPTH:	15' - 17'	FILE NO.:	PG5485/PH3645
PROJECT:	5505 & 5545 Albian Road	BH OR TP No.:	BH4B-24 SS1	DATE SAMPLED:	April 11-12
LAB No. :	51675	TESTED BY:	D.K	DATE RECEIVED:	25-Apr-24
SAMPLED BY:	J.P	DATE REPT'D:	30-Apr-24	DATE TESTED:	26-Apr-24

SAMPLE INFORMATION

SAMPLE MASS	SPECIFIC GRAVITY
387.7	2.700

		HYGROSCOPIC MOISTURE		
INITIAL WEIGHT	50.00			
WEIGHT CORRECTED	49.97	TARE WEIGHT	0.00	ACTUAL WEIGHT
WT. AFTER WASH BACK SIEVE	21.50	AIR DRY	387.90	387.90
SOLUTION CONCENTRATION	40 g/L	OVEN DRY	387.70	387.70
		CORRECTED	0.999	

GRAIN SIZE ANALYSIS

SIEVE DIAMETER (mm)	WEIGHT RETAINED (g)	PERCENT RETAINED	PERCENT PASSING
26.5	**0.0**	0.0	**100.0**
19	**62.1**	16.0	**84.0**
13.2	**67.3**	17.4	**82.6**
9.5	**78.0**	20.1	**79.9**
4.75	**109.5**	28.3	**71.7**
2.0	**141.4**	36.5	**63.5**
Pan	**246.3**		
0.850	**4.31**	41.9	**58.1**
0.425	**8.27**	47.0	**53.0**
0.250	**12.42**	52.3	**47.7**
0.106	**18.76**	60.3	**39.7**
0.075	**21.10**	63.3	**36.7**
Pan	**21.50**		
SIEVE CHECK 0.0	MAX = 0.3%		

HYDROMETER DATA

ELAPSED	TIME (24 hours)	Hs	Hc	Temp. (°C)	DIAMETER	(P)	TOTAL PERCENT PASSING
1	9:11	29.0	6.0	23.0	0.0438	45.5	**28.9**
2	9:12	27.0	6.0	23.0	0.0314	41.6	**26.4**
5	9:15	24.0	6.0	23.0	0.0203	35.6	**22.6**
15	9:25	19.0	6.0	23.0	0.0121	25.7	**16.3**
30	9:40	18.0	6.0	23.0	0.0086	23.7	**15.1**
60	10:10	16.5	6.0	23.0	0.0062	20.8	**13.2**
250	13:20	13.0	6.0	23.0	0.0031	13.9	**8.8**
1440	9:10	10.0	6.0	23.0	0.0013	7.9	**5.0**

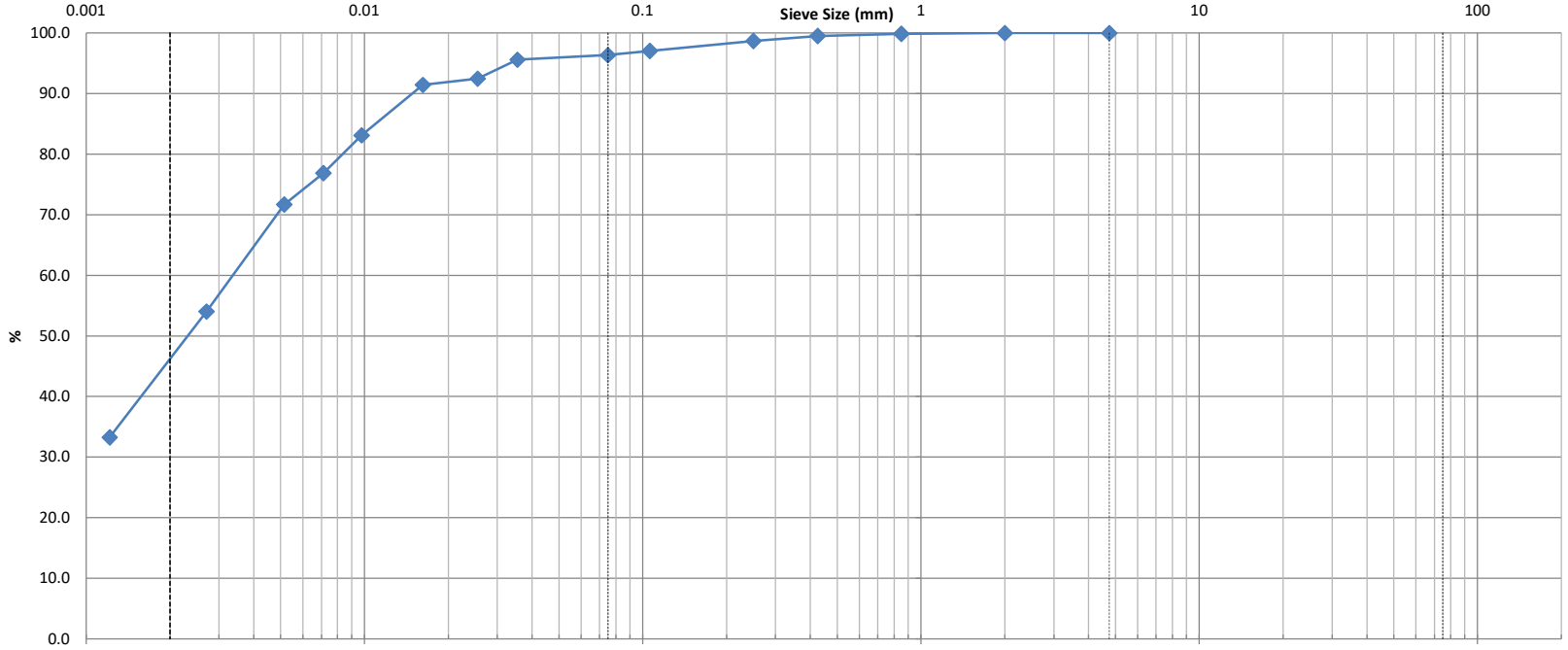
Moisture = 8.0%

REVIEWED BY:	C. Beadow	Joe Forsyth, P. Eng.

PATERSON GROUP

SIEVE ANALYSIS
ASTM C136

CLIENT:	W.O Stinson & Son Ltd.	DEPTH:	10' - 12'	FILE NO:	PG5485/PH3645
CONTRACT NO.:		BH OR TP No.:	BH5-24 SS6	LAB NO:	51676
PROJECT:	5505 & 5545 Albian Road			DATE RECEIVED:	25-Apr-24
				DATE TESTED:	26-Apr-24
DATE SAMPLED:	April 11-12			DATE REPORTED:	30-Apr-24
SAMPLED BY:	J.P			TESTED BY:	D.K



Clay	Silt	Sand			Gravel		Cobble
		Fine	Medium	Coarse	Fine	Coarse	

Identification	Soil Classification					MC(%)	LL	PL	PI	Cc	Cu
						50.3%					
	D100	D60	D30	D10	Gravel (%)	Sand (%)		Silt (%)		Clay (%)	
					0.0	3.6		49.4		47.0	

Comments:

REVIEWED BY:	Curtis Beadow	Joe Forsyth, P. Eng.

PATERSON GROUP

HYDROMETER
LS-702 ASTM-422

CLIENT:	W.O Stinson & Son Ltd.	DEPTH:	10' - 12'	FILE NO.:	PG5485/PH3645
PROJECT:	5505 & 5545 Albian Road	BH OR TP No.:	BH5-24 SS6	DATE SAMPLED:	April 11-12
LAB No. :	51676	TESTED BY:	D.K	DATE RECEIVED:	25-Apr-24
SAMPLED BY:	J.P	DATE REPT'D:	30-Apr-24	DATE TESTED:	26-Apr-24

SAMPLE INFORMATION

SAMPLE MASS	SPECIFIC GRAVITY
88.8	2.700

INITIAL WEIGHT	50.00	**HYGROSCOPIC MOISTURE**		
WEIGHT CORRECTED	41.38	TARE WEIGHT	0.00	ACTUAL WEIGHT
WT. AFTER WASH BACK SIEVE	1.85	AIR DRY	107.30	107.30
SOLUTION CONCENTRATION	40 g/L	OVEN DRY	88.80	88.80
		CORRECTED	0.828	

GRAIN SIZE ANALYSIS

SIEVE DIAMETER (mm)	WEIGHT RETAINED (g)	PERCENT RETAINED	PERCENT PASSING
26.5			
19			
13.2			
9.5			
4.75	**0.0**	0.0	**100.0**
2.0	**0.0**	0.0	**100.0**
Pan	**88.8**		
0.850	**0.07**	0.1	**99.9**
0.425	**0.24**	0.5	**99.5**
0.250	**0.66**	1.3	**98.7**
0.106	**1.47**	2.9	**97.1**
0.075	**1.82**	3.6	**96.4**
Pan	**1.85**		
SIEVE CHECK 0.0	MAX = 0.3%		

HYDROMETER DATA

ELAPSED	TIME (24 hours)	Hs	Hc	Temp. (°C)	DIAMETER	(P)	TOTAL PERCENT PASSING
1	9:43	52.0	6.0	23.0	0.0355	95.6	**95.6**
2	9:44	50.5	6.0	23.0	0.0255	92.5	**92.5**
5	9:47	50.0	6.0	23.0	0.0162	91.4	**91.4**
15	9:57	46.0	6.0	23.0	0.0098	83.1	**83.1**
30	10:12	43.0	6.0	23.0	0.0071	76.9	**76.9**
60	10:42	40.5	6.0	23.0	0.0051	71.7	**71.7**
250	13:52	32.0	6.0	23.0	0.0027	54.0	**54.0**
1440	9:42	22.0	6.0	23.0	0.0012	33.3	**33.3**

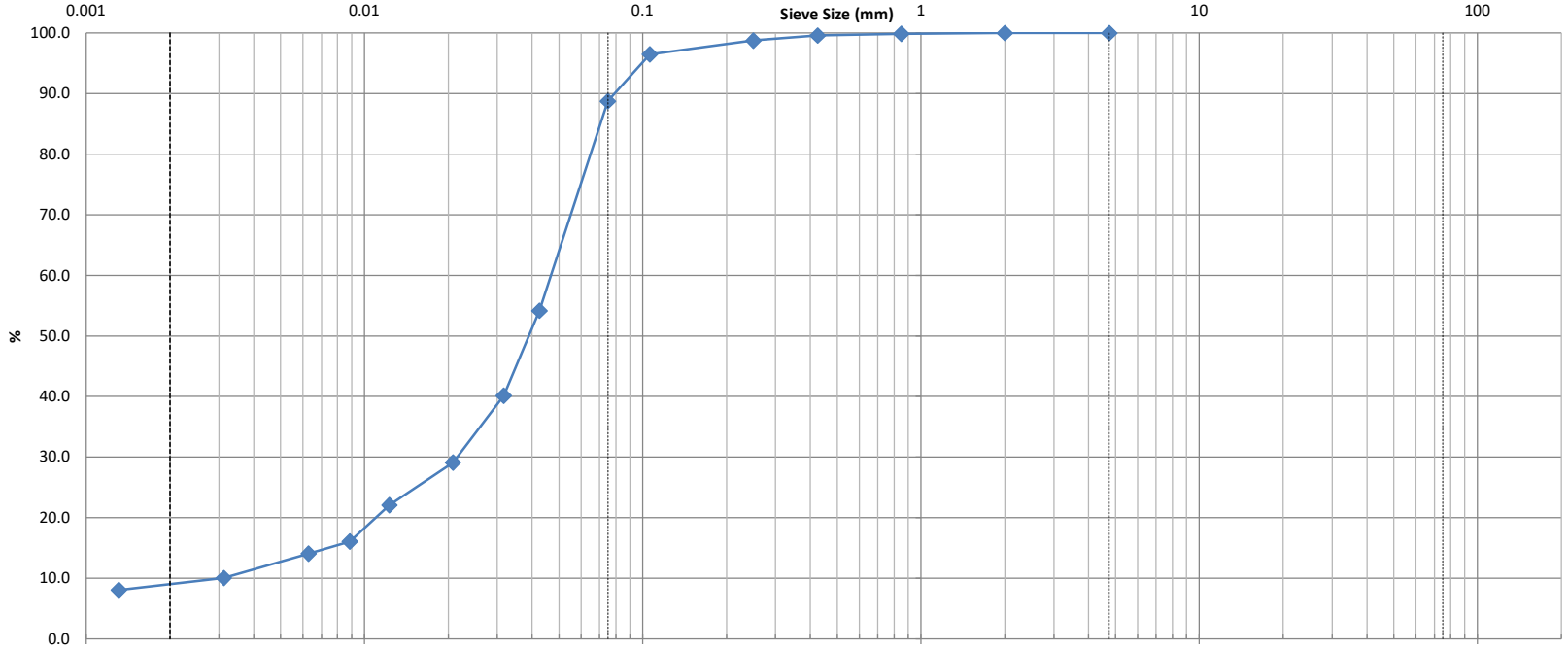
Moisture = 50.3%

REVIEWED BY:	C. Beadow	Joe Forsyth, P. Eng.

PATERSON GROUP

SIEVE ANALYSIS
ASTM C136

CLIENT:	W.O Stinson & Son Ltd.	DEPTH:	15' - 17'	FILE NO:	PG5485/PH3645
CONTRACT NO.:		BH OR TP No.:	BH5-24 SS8	LAB NO:	51677
PROJECT:	5505 & 5545 Albian Road			DATE RECEIVED:	25-Apr-24
				DATE TESTED:	26-Apr-24
DATE SAMPLED:	April 11-12			DATE REPORTED:	30-Apr-24
SAMPLED BY:	J.P			TESTED BY:	D.K



Clay	Silt	Sand			Gravel		Cobble
		Fine	Medium	Coarse	Fine	Coarse	

Identification	Soil Classification				MC(%)	LL	PL	PI	Cc	Cu
					16.3%					

D100	D60	D30	D10	Gravel (%)	Sand (%)	Silt (%)	Clay (%)
				0.0	11.2	79.3	9.5

Comments:

REVIEWED BY:	Curtis Beadow	Joe Forsyth, P. Eng.

PATERSON GROUP

HYDROMETER
LS-702 ASTM-422

CLIENT:	W.O Stinson & Son Ltd.	DEPTH:	15' - 17'	FILE NO.:	PG5485/PH3645
PROJECT:	5505 & 5545 Albian Road	BH OR TP No.:	BH5-24 SS8	DATE SAMPLED:	April 11-12
LAB No. :	51677	TESTED BY:	D.K	DATE RECEIVED:	25-Apr-24
SAMPLED BY:	J.P	DATE REPT'D:	30-Apr-24	DATE TESTED:	26-Apr-24

SAMPLE INFORMATION

SAMPLE MASS	SPECIFIC GRAVITY
180.5	2.700

		HYGROSCOPIC MOISTURE		
INITIAL WEIGHT	50.00			
WEIGHT CORRECTED	49.29	TARE WEIGHT	0.00	ACTUAL WEIGHT
WT. AFTER WASH BACK SIEVE	8.64	AIR DRY	183.10	183.10
SOLUTION CONCENTRATION	40 g/L	OVEN DRY	180.50	180.50
		CORRECTED	0.986	

GRAIN SIZE ANALYSIS

SIEVE DIAMETER (mm)	WEIGHT RETAINED (g)	PERCENT RETAINED	PERCENT PASSING
26.5			
19			
13.2			
9.5			
4.75	**0.0**	0.0	**100.0**
2.0	**0.0**	0.0	**100.0**
Pan	**180.5**		
0.850	**0.07**	0.1	**99.9**
0.425	**0.20**	0.4	**99.6**
0.250	**0.61**	1.2	**98.8**
0.106	**1.75**	3.5	**96.5**
0.075	**5.62**	11.2	**88.8**
Pan	**8.64**		
SIEVE CHECK 0.0	MAX = 0.3%		

HYDROMETER DATA

ELAPSED	TIME (24 hours)	Hs	Hc	Temp. (°C)	DIAMETER	(P)	TOTAL PERCENT PASSING
1	8:20	33.0	6.0	23.0	0.0425	54.2	**54.2**
2	8:21	26.0	6.0	23.0	0.0317	40.1	**40.1**
5	8:24	20.5	6.0	23.0	0.0208	29.1	**29.1**
15	8:34	17.0	6.0	23.0	0.0123	22.1	**22.1**
30	8:49	14.0	6.0	23.0	0.0089	16.0	**16.0**
60	9:19	13.0	6.0	23.0	0.0063	14.0	**14.0**
250	12:29	11.0	6.0	23.0	0.0031	10.0	**10.0**
1440	8:19	10.0	6.0	23.0	0.0013	8.0	**8.0**

Moisture = 16.3%

REVIEWED BY:	C. Beadow	Joe Forsyth, P. Eng.

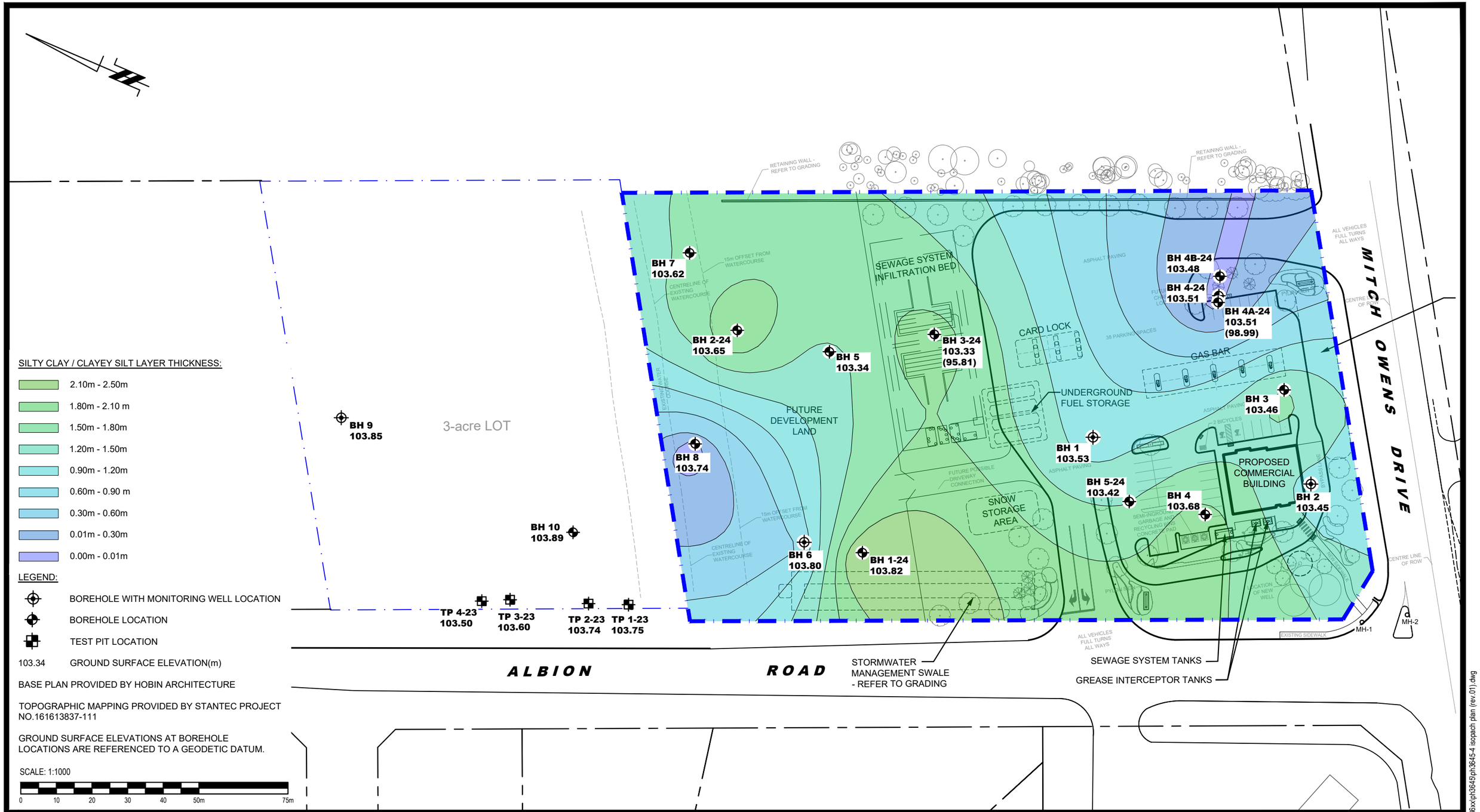
5545 Albion Road

PH3645

PREDICTIVE NITRATE IMPACT ASSESSEMENT

Infiltration Factors		
Topography	0.25	
Soil	0.20	
Cover	0.10	
Total	**0.55**	
Site Characteristics		
Area of Site :	23212	m^2
Total of roof areas:	138	m^2
Total area of paved driveway areas:	7464	m^2
Roof + paved driveway areas	7602	m^2
Impervious Area	7602	m^2
Percent Impervious Area =	33	%
Infiltration Area =	15610	m^2
Septic Effluent		
Concentration of Effluent (Cs) =	16	mg/L
Daily Sewage Flow (Qs)=	10	m^3
See Notes below.		
Infiltration Calculation		
Nitrate concentration in precipitation (C_i) =	0	mg/L
Surplus Water (Environment Canada)	379	mm/yr
Factored Water Surplus =	208	mm/yr
Infiltration % due to stormwater management measures	-	%
Infiltration rate from stormwater management measures =	0	mm/yr
Infiltration Flow Entering the System (Q_i) =	9	m^3/day
Mass Balance Model (MOEE, 1995)		
$C_T = (Q_bC_b+Q_eC_e+Q_iC_i)/(Q_b+Q_e+Q_i)$ = Cumulative Nitrate Concentration		
Q_b = flow entering the system across the upgradient area	0	m^3/day
C_b = background nitrate concentration	0	mg/L
Q_e = flow entering the system from the septic drainfield	10	m^3/day
C_e = concentration of nitrates in the septic effluent	16	mg/L
Q_i = flow entering the system from infiltration	9	m^3/day
C_i = Concentration of nitrates in the infiltrate	0	mg/L
C_T =	**8.46**	**mg/L**

Notes: Site characteristic values were measured as approximate values from the available site plan. Daily Sewage Flow volume was calculted by Paterson Group as a preliminary design flow.



PATERSON GROUP
9 AURIGA DRIVE
OTTAWA, ON
K2E 7T9
TEL: (613) 226-7381

NO.	REVISIONS	DATE	INITIAL
1	UPDATED TO NEW CONCEPTUAL PLAN	28/01/2025	MK

W.O. STINSON AND SON LIMITED

PROPOSED COMMERCIAL DEVELOPMENT
5545 ALBION ROAD

OTTAWA, ONTARIO

Title:

ISOPACH PLAN - LOW HYDRAULIC CONDUCTIVITY IN SOILS

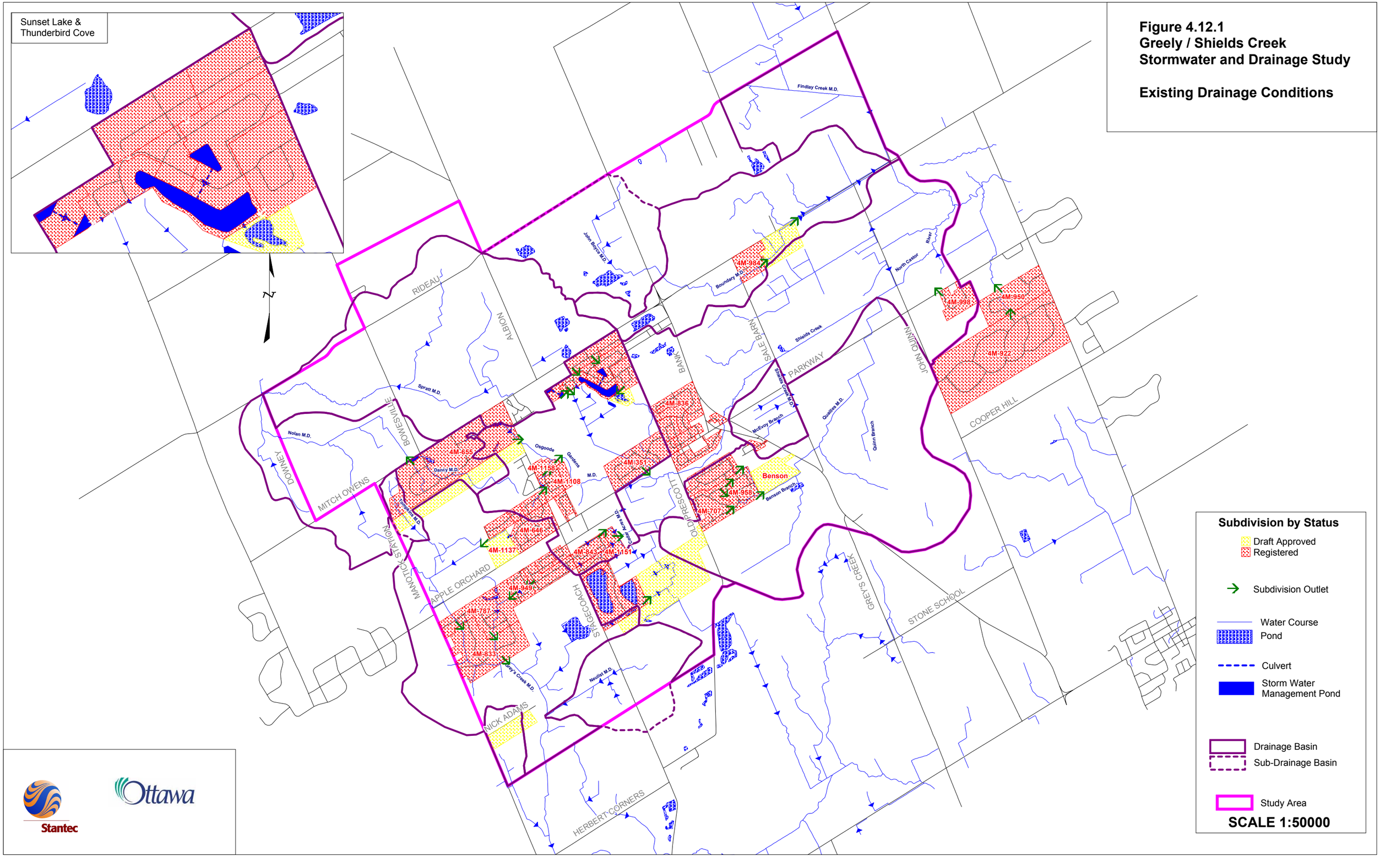
Scale: 1:1000	Date: 01/2025
Drawn by: ZS	Report No.: PH3645-LET.02
Checked by: MK	Dwg. No.: PH3645-4
Approved by: MK	Revision No.: 1

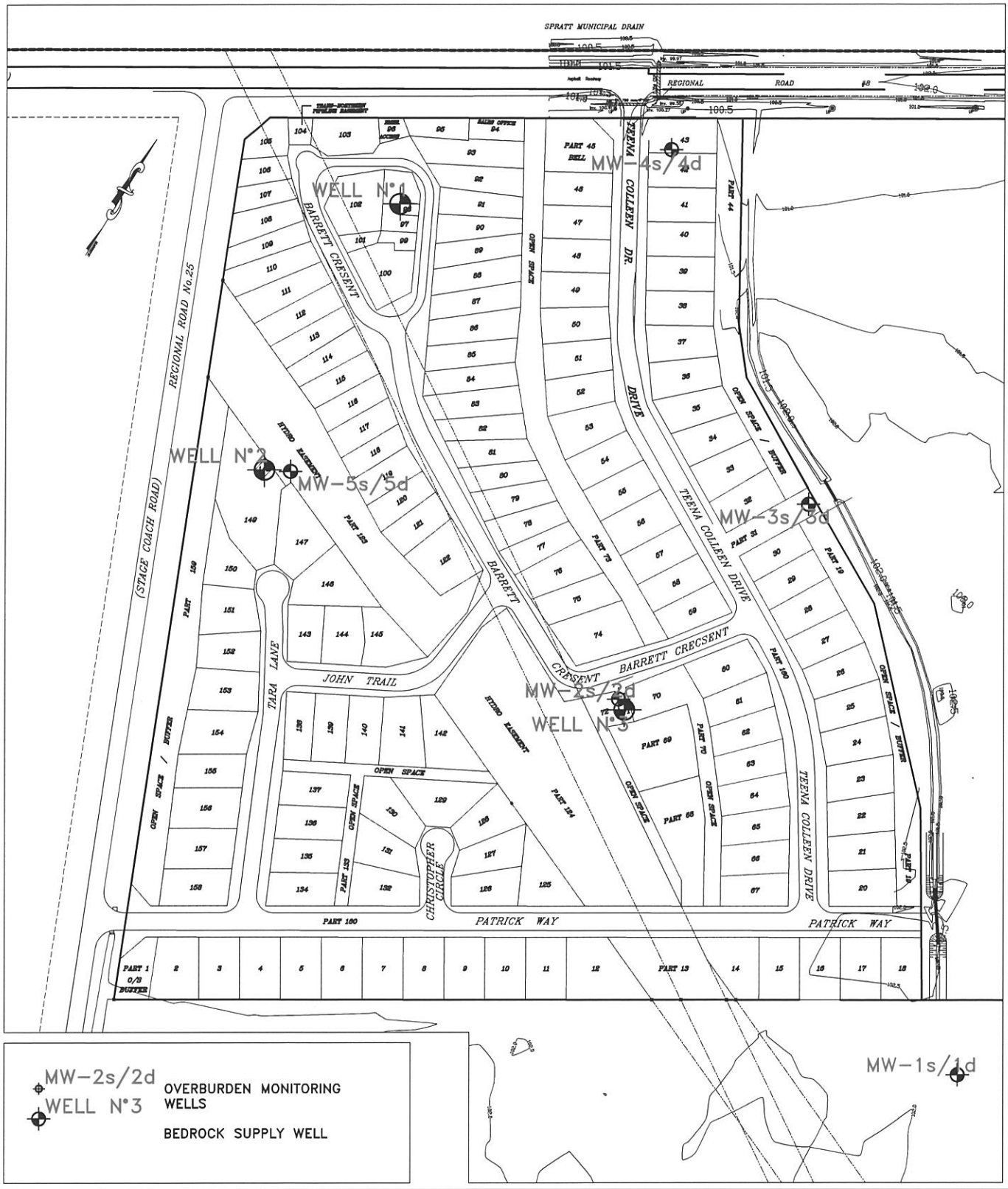
11x17

p:\autocad drawings\hydrogeology\ph36xx\ph3645\ph3645-4 isopach plan (rev.01).dwg

Figure 4.12.1
Greely / Shields Creek
Stormwater and Drainage Study

Existing Drainage Conditions



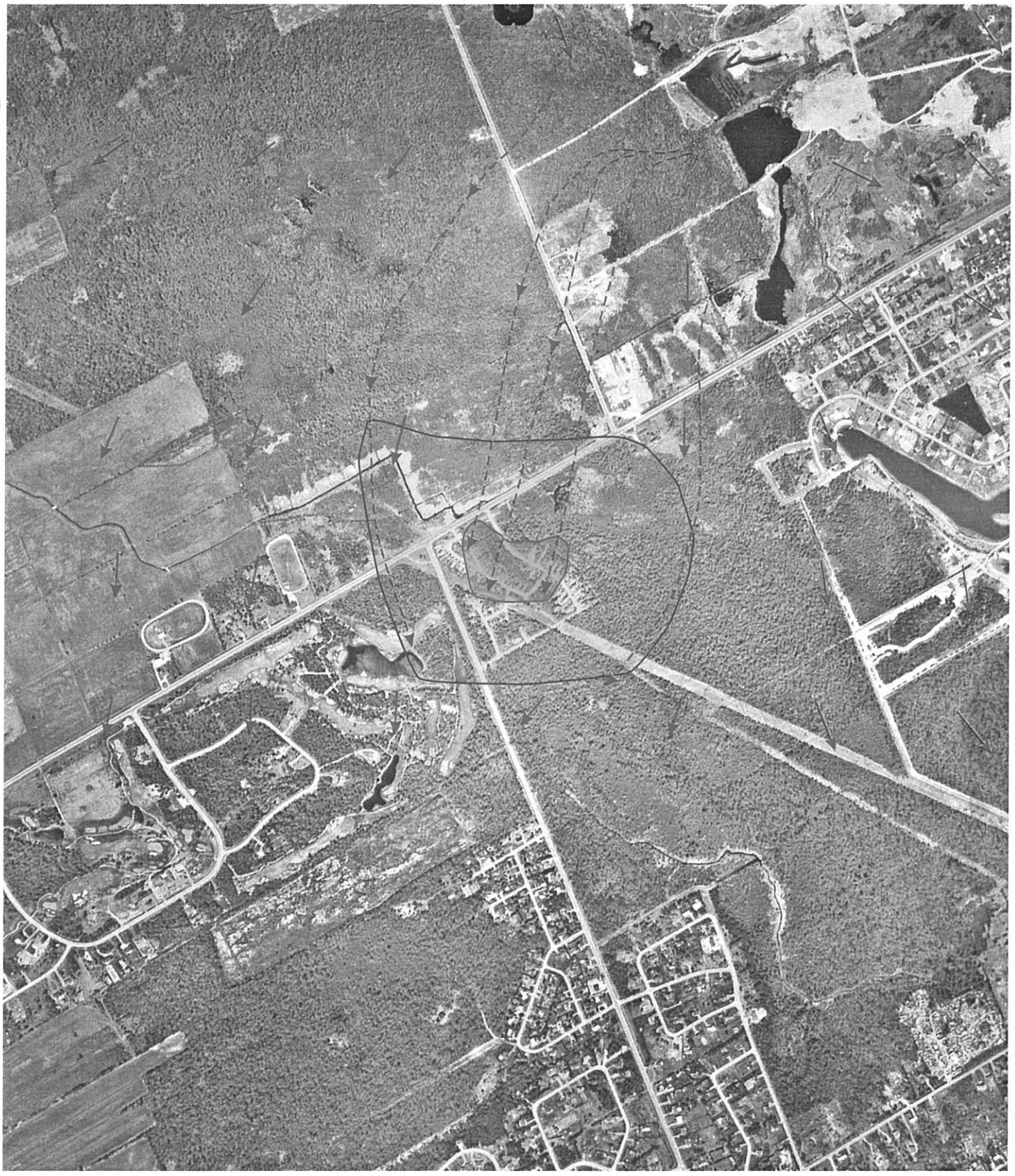


Trow Associates Inc.
154 Colonnade Road South, Ottawa, Ontario K2E 7J5
Tel: (613) 225-9940
Fax: (613) 225-7337

SCALE 1:2,500	CLIENT: ALBION SUN VISTA	JOB NO. MC14309A
DATE: JUNE 2004	TITLE: WELL LOCATIONS	FIG 2
DRAWN: RG		

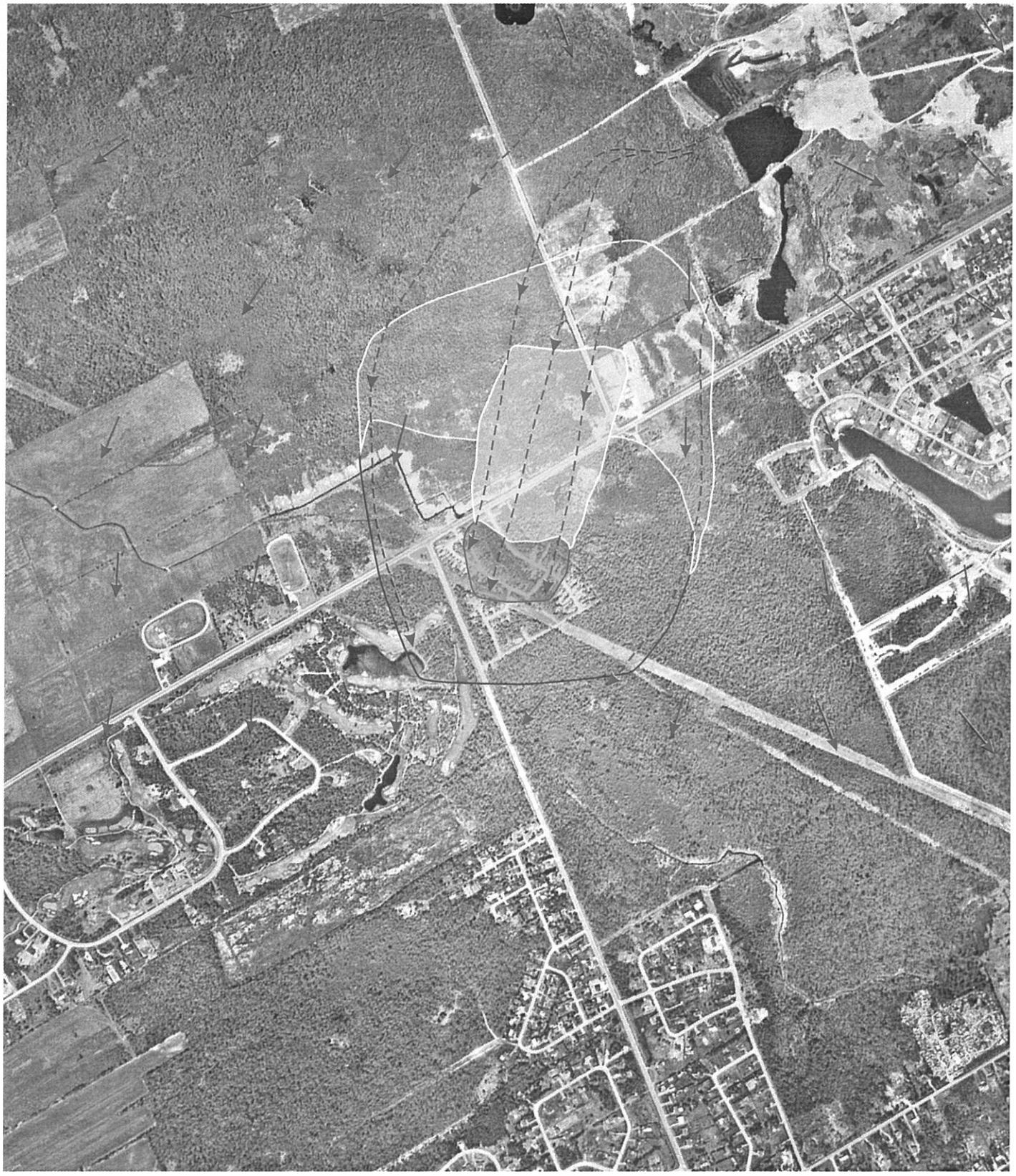
Trow Associates Inc.
154 Colonnade Road South, Ottawa, Ontario K2E 7J5
Tel: (613) 225-9940 Fax: (613) 225-7337

SCALE 1:15,000	CLIENT	JOB No.
	ALBION SUN VISTA	OTEN00014309_A
DATE JUNE 2004	TITLE	
DRAWN RG	CAPTURE ZONE - 0-50 DAYS	FIG 5



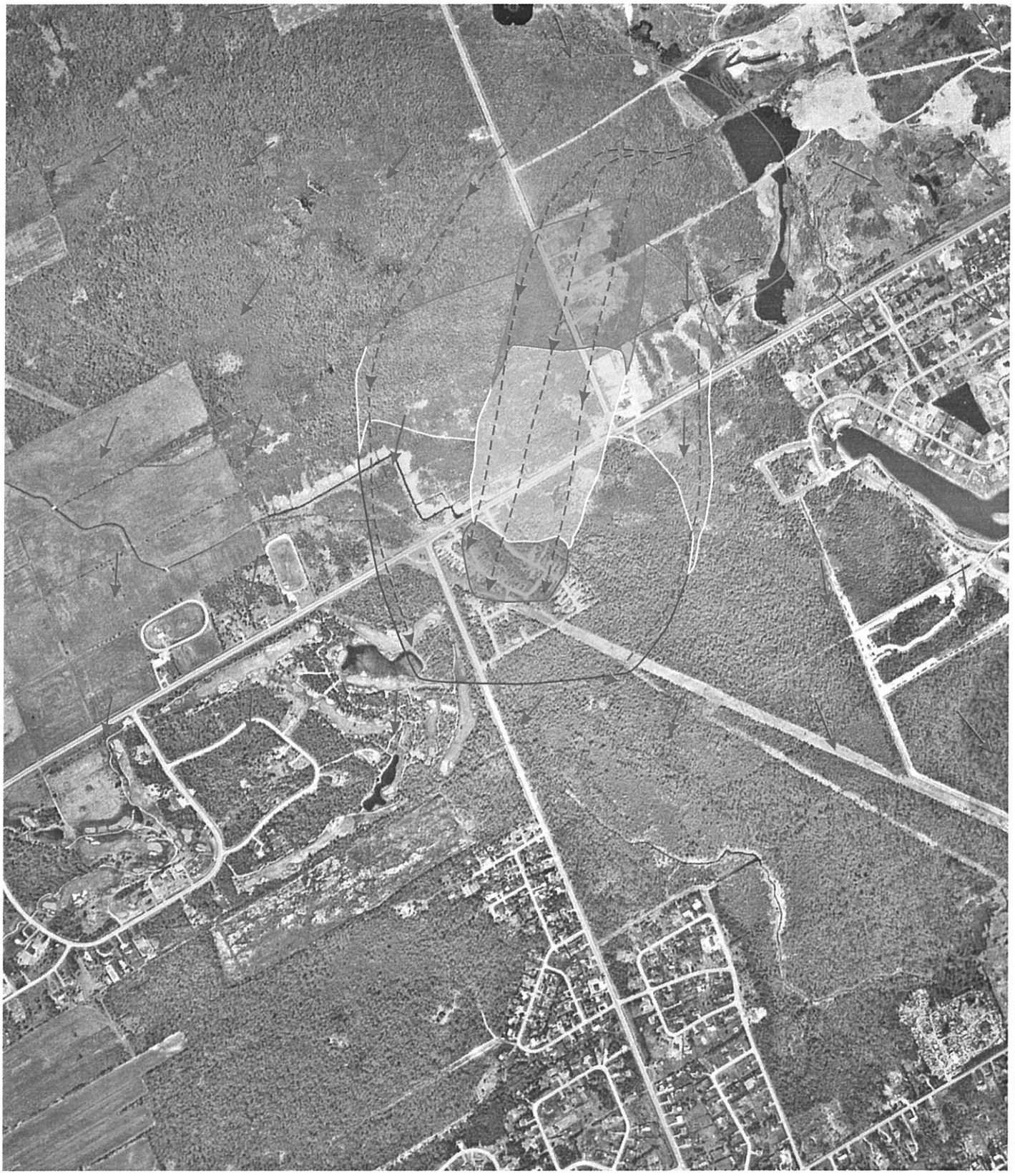
Trow Associates Inc.
154 Colonnade Road South, Ottawa, Ontario K2E 7J5
Tel: (613) 225-9940 Fax: (613) 225-7337

SCALE 1:15,000	CLIENT	JOB No.
	ALBION SUN VISTA	OTEN00014309_A
DATE JUNE 2004	TITLE	
DRAWN RG	CAPTURE ZONE - 50 DAYS - 2 YEARS	FIG 6



Trow Associates Inc.
154 Colonnade Road South, Ottawa, Ontario K2E 7J5
Tel: (613) 225-9940 Fax: (613) 225-7337

SCALE 1:15,000	CLIENT	JOB No.
	ALBION SUN VISTA	OTEN00014309_A
DATE JUNE 2004	TITLE	
DRAWN RG	CAPTURE ZONE - 2 YEARS - 10 YEARS	FIG 7



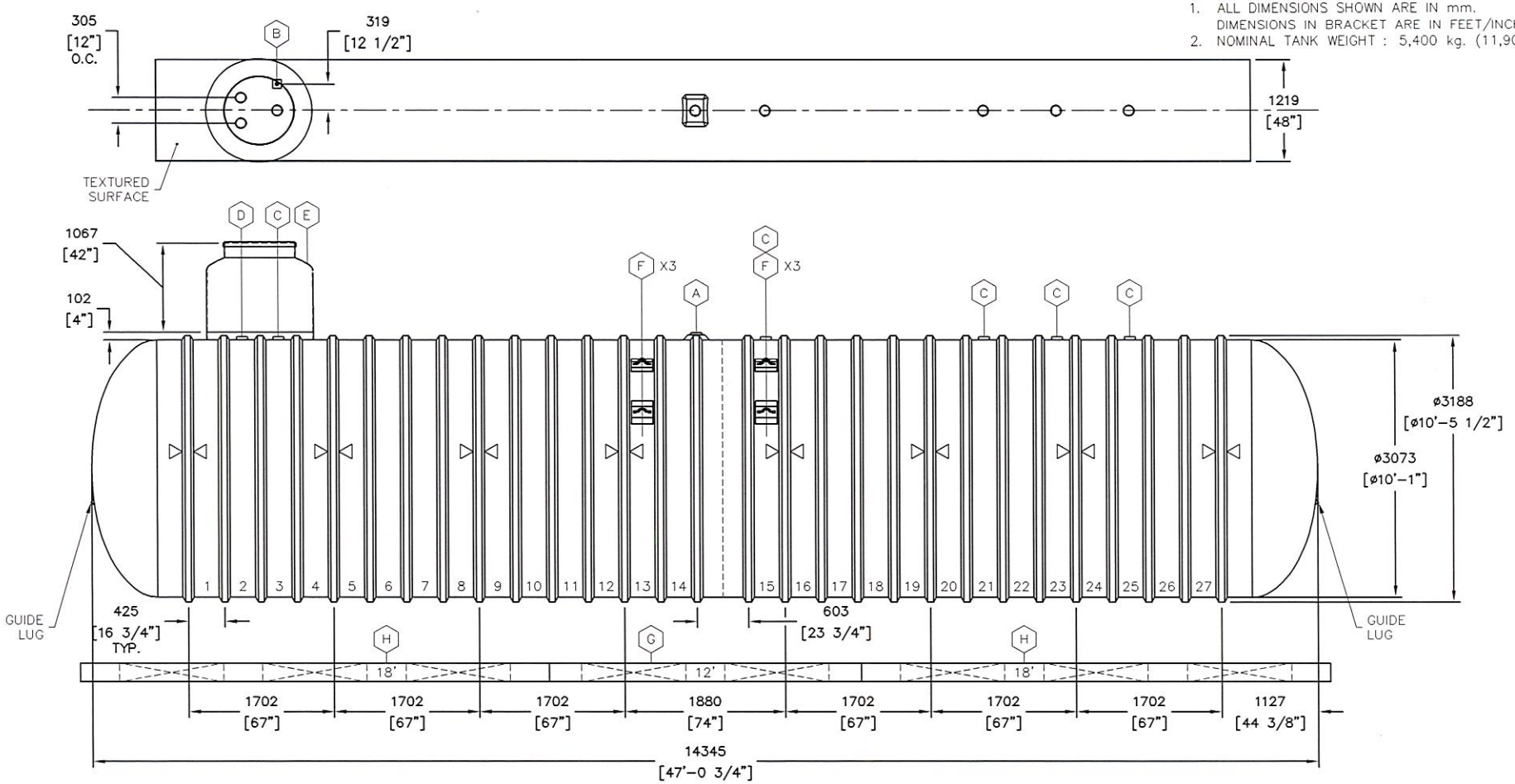
Trow Associates Inc.
154 Colonnade Road South, Ottawa, Ontario K2E 7J5
Tel: (613) 225-9940 Fax: (613) 225-7337

SCALE 1:15,000	CLIENT	JOB No.
	ALBION SUN VISTA	OTEN00014309_A
DATE JUNE 2004	TITLE	
DRAWN RG	CAPTURE ZONE - 10 YEARS - 25 YEARS	FIG 8

Trow Associates Inc. 154 Colonnade Road South, Ottawa, Ontario K2E 7J5 Tel: (613) 225-9940 Fax: (613) 225-7337

SCALE 1:15,000	CLIENT	JOB No.
	ALBION SUN VISTA	OTEN00014309_A
DATE JUNE 2004	TITLE	
DRAWN RG	CAPTURE ZONE LIMIT	FIG 9

NOTE:
1. ALL DIMENSIONS SHOWN ARE IN mm.
   DIMENSIONS IN BRACKET ARE IN FEET/INCHES.
2. NOMINAL TANK WEIGHT : 5,400 kg. (11,900 lbs.).



ITEM	QTY	DESCRIPTION
A	1	4" NPT MONITOR FITTING
B	1	1" NPT INTERSTITIAL VACUUM MONITOR
C	5	4" NPT SERVICE FITTING WITH STRIKER PLATE
D	1	4" NPT (12" CENTER TO CENTER) DUPLEX SERVICE FITTING WITH STRIKER PLATE
E	1	48" DIA. SW CONTAINMENT COLLAR & 42" HIGH SW SUMP WITH 32" DIA. WATERTIGHT TOP COVER
F	6	LIFTING LUG (12" x 10") 31-5/8", 31-5/8", 33-7/8"
G	2	12' PREFABRICATED CONCRETE DEADMEN
H	4	18' PREFABRICATED CONCRETE DEADMEN
▷◁	8	HOLD DOWN STRAP LOCATION

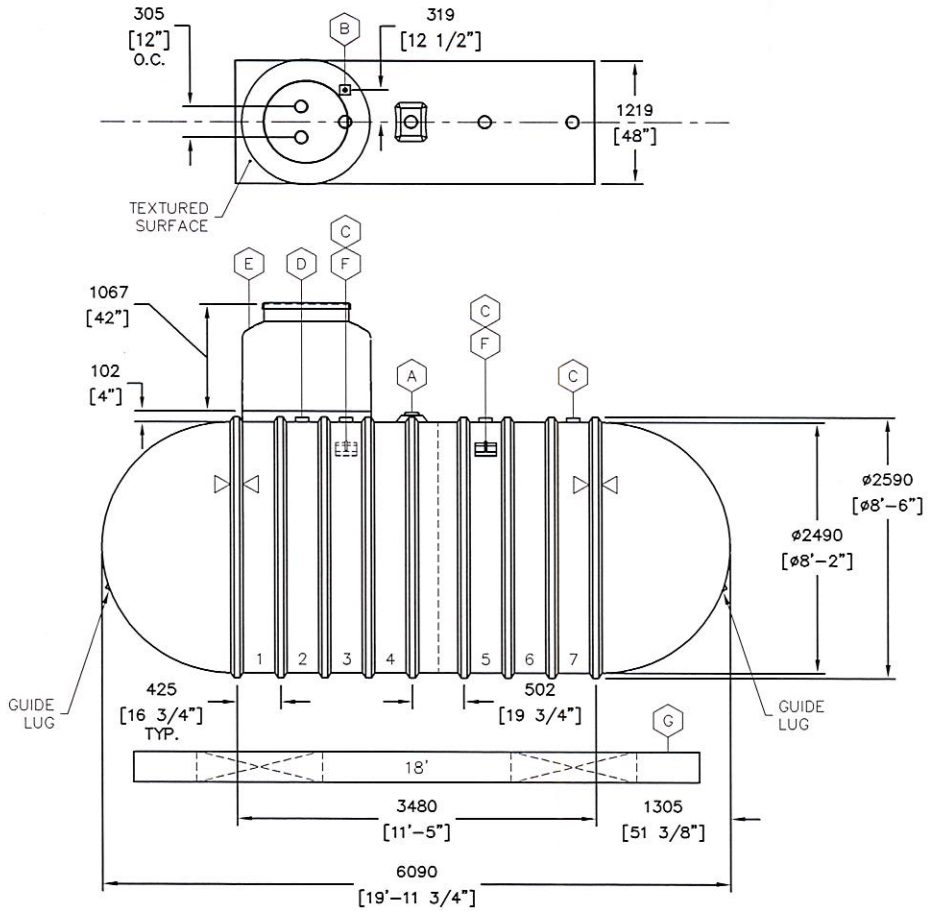
Feb 25/22

0	-					
DRN: -	DATE: -	CHK'D: -	DATE: -	APP'D: -	DATE: -	

XERXES
BY SHAWCOR

DRN: DD	DATE: FEB 25/22	TITLE: P100DW – 100,000 L DOUBLE WALL UL TANK NATIONAL ENERGY EQUIPMENT INC.	
CHK'D: PWM	DATE: FEB 25/22		
APP'D: -	DATE: -		
SALES MANAGER: Richard Whitford	DWG. SIZE: A	DRAWING NO.: XS-001086	REV No.: 00
	SCALE: N.T.S.	SHEET: 1 of 1	
INDUSTRY TYPE: M101 Fuel Markets			

NOTE:
1. ALL DIMENSIONS SHOWN ARE IN mm.
   DIMENSIONS IN BRACKET ARE IN FEET/INCHES.
2. NOMINAL TANK WEIGHT : 1,400 kg. (3,100 lbs.).



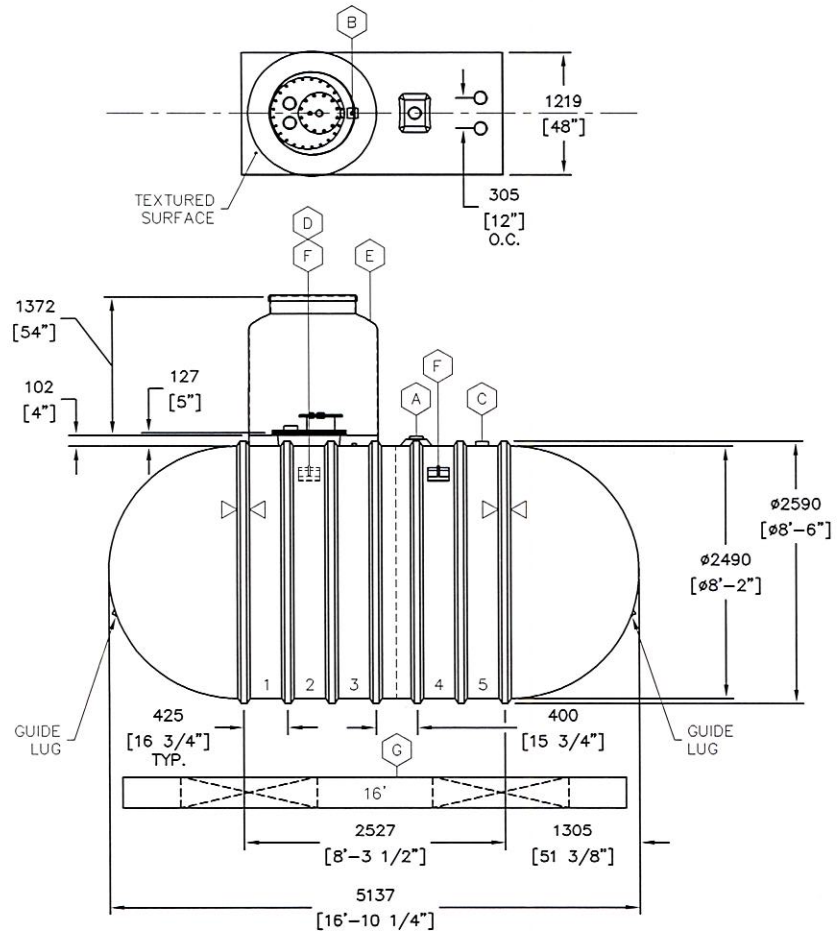
ITEM	QTY	DESCRIPTION
A	1	4" NPT MONITOR FITTING
B	1	1" NPT INTERSTITIAL VACUUM MONITOR
C	3	4" NPT SERVICE FITTING WITH STRIKER PLATE
D	1	4" NPT (12" CENTER TO CENTER) DUPLEX SERVICE FITTING WITH STRIKER PLATE
E	1	48" DIA. SW CONTAINMENT COLLAR & 42" HIGH SW SUMP WITH 32" DIA. WATERTIGHT TOP COVER
F	2	LIFTING LUG (10" x 8") 35" 35"
G	2	18' PREFABRICATED CONCRETE DEADMEN
▷◁	2	HOLD DOWN STRAP LOCATION

FEB 28/22

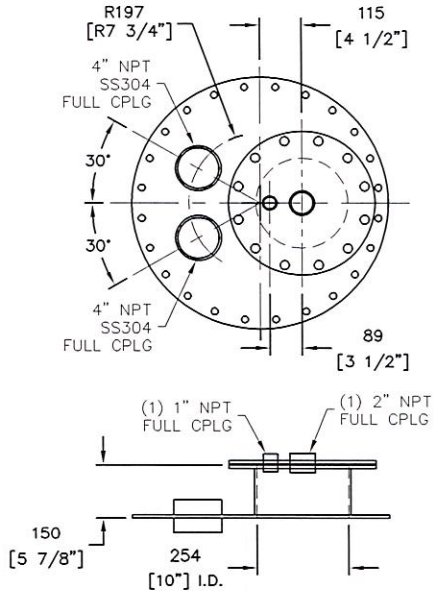
0	-					
DRN: -	DATE: -	CHK'D: -	DATE: -	APP'D: -	DATE: -	

XERXES
BY SHAWCOR

DRN: DD	DATE: FEB 25/22	TITLE: P86DW – 25,000 L DOUBLE WALL UL TANK NATIONAL ENERGY EQUIPMENT INC.
CHK'D: PWM	DATE: FEB 25/22	
APP'D: -	DATE: -	
SALES MANAGER: Richard Whitford	DWG. SIZE: A	DRAWING NO.: XS–001085
	SCALE: N.T.S.	SHEET: 1 of 1
INDUSTRY TYPE: M101 Fuel Markets		REV No.: 00



NOTE:
1. TANK USAGE: UREA DEF STORAGE.
2. ALL FITTINGS, STRIKER PLATES, MANWAY COVER AND MANWAY HARDWARE MUST BE AISI SS304.
3. GASKET FOR MANWAY COVER AND FLANGE TO BE EPDM. PEROXIDE CURED.
4. MONITOR FITTING IS NOT STAINLESS STEEL.
5. ALL DIMENSIONS SHOWN ARE IN mm. DIMENSIONS IN BRACKET ARE IN FEET/INCHES.
6. NOMINAL TANK WEIGHT : 1,200 kg. (2,700 lbs.).



DETAIL – SPECIAL COVER
XERXES CODE: 20754

ITEM	QTY	DESCRIPTION
A	1	4" NPT MONITOR FITTING
B	1	1" NPT INTERSTITIAL VACUUM MONITOR
C	1	4" NPT (12" CENTER TO CENTER) DUPLEX SS304 SERVICE FITTING WITH SS304 STRIKER PLATE
D	1	22" DIA. MANWAY WITH 'SPECIAL' (S.S.) COVER & (S.S.) STRIKER PLATE (CODE: 20754)
E	1	48" DIA. SW CONTAINMENT COLLAR & 54" HIGH SW SUMP WITH 32" DIA. WATERTIGHT TOP COVER
F	2	LIFTING LUG (10" x 8") 35" 35"
G	2	16' PREFABRICATED CONCRETE DEADMEN
▷◁	2	HOLD DOWN STRAP LOCATION

0	-					
DRN: -	DATE: -	CHK'D: -	DATE: -	APP'D: -	DATE: -	

XERXES BY SHAWCOR

DRN: DD	DATE: FEB 25/22	TITLE: P86DW – 20,000 L DOUBLE WALL UL DEF TANK NATIONAL ENERGY EQUIPMENT INC.
CHK'D: PWM	DATE: FEB 25/22	
APP'D: -	DATE: -	
SALES MANAGER: Richard Whitford	DWG. SIZE: A	DRAWING NO.: XS-001084
	SCALE: N.T.S.	SHEET: 1 of 1
INDUSTRY TYPE: M101 Fuel Markets		REV No.: 00

SHAWCOR

ZCL | XERXES®

Water and Wastewater

Fiberglass Storage Tanks

THE ZCL | XERXES ADVANTAGE

ZCL | Xerxes is an industry leader in the design and manufacture of fiberglass-reinforced plastic (FRP) tanks. Over the past 40 years, we have protected the environment with secure, watertight fuel storage solutions. Our proven track record – of more than 200,000 tanks shipped – gives customers peace of mind when they need corrosion-resistant liquid storage.

We also provide customers in the water and wastewater markets with durable, innovative and customizable storage tanks. Our expert sales, engineering and manufacturing teams provide customers with high-performance solutions to fit the requirements of their projects.

WATER AND WASTEWATER APPLICATIONS

- Onsite wastewater/septic
- Stormwater
- Rainwater harvesting
- Wastewater reuse
- Fire protection
- Potable water storage (NSF 61-listed)
- Grease interceptor
- Oil interceptor
- Solids-sand interceptor
- Oil-water separator
- Industrial wastewater
- Decontamination

THE FIBERGLASS ADVANTAGE

ZCL | Xerxes FRP storage tanks offer customers significant advantages over other tank options. Our water and wastewater tanks comply with the ANSI/AWWA D120 standard.

Depending on the application, they also comply with other industry standards. (See specific application sections for more details.)

DESIGN FLEXIBILITY

- Single-wall and double-wall models
- Single tank sizes up to 60,000 gallons [227,000 liters] for some applications
- Wide range of underground and select aboveground installations
- Single-tank and multiple-tank installations
- Horizontal and vertical models
- Accessories to fit wide range of applications

EASY TO SHIP, INSTALL AND MAINTAIN

- Lightweight – easy and cost-effective to ship
- Six strategically located manufacturing facilities across North America
- Large-capacity tank can ship on one truck bed
- Easy to install in remote locations
- Easy to install in tight footprints
- Smooth, rounded tank walls easy to clean – debris doesn't get trapped in corners

MATERIAL ADVANTAGES

- Corrosion-resistant to surrounding soil
- Corrosion-resistant to stored liquids
- Premium resin – no fillers
- No protective lining or coating needed
- Watertight design
- No ongoing maintenance or inspections required

STRUCTURAL STRENGTH

- Not limited by burial depth
- Not limited by water table
- Tanks designed to withstand H-20/HS-20 and H-25/HS-25 axle loads
- Integral, high-profile fiberglass ribs increase strength
- Vacuum testing available for certain applications

WASTEWATER TANKS

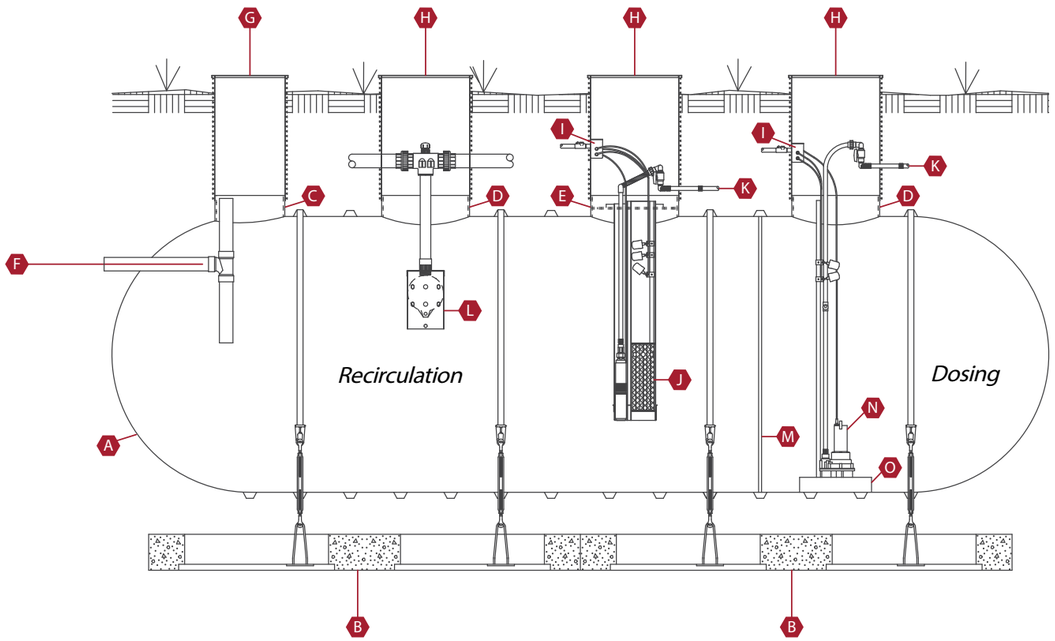
In both onsite and municipal wastewater systems, secure storage of corrosive wastewater is essential. Our corrosion-resistant tanks provide watertight storage with no need for added liners, which require ongoing inspection and maintenance. The smooth, rounded walls of our tanks are easy to clean and won't trap debris like tanks with corners.

Our tanks can be part of onsite septic systems. They can be manufactured to comply with the IAPMO/ANSI Z1000 standard.

COMPATIBLE WITH TREATMENT SYSTEMS

We work with treatment system packagers to ensure our tanks are designed and manufactured to meet multiple configurations:

- Primary/secondary treatment
- Aerobic treatment
- Fixed-film media
- Recirculation
- Dosing



CODE	DESCRIPTION
A	ZCL I Xerxes Single-Wall FRP Tank
B	ZCL I Xerxes Prefabricated Deadman System w/ Anchor Strap and Turnbuckle
C	24" FRP Opening
D	30" FRP Opening
E	30" FRP Opening with Internal Flange
F	4" SCH. 40 PVC Inlet Piping w/ Sanitary Tee
G	24" Ribbed PVC Riser with FRP Lid
H	30" Ribbed PVC Riser with FRP Lid
I	PVC Splice Box with Cord Grips
J	Suspended Effluent Pump with Filter and Level Control Float Assembly
K	Effluent Discharge
L	Recirculation Splitter Valve
M	Full Solid FRP Baffle Wall
N	Base-Mounted Effluent Pump with Level Control Float Assembly
O	24" x 24" FRP Pump Platform

STORMWATER

ZCL I Xerxes stormwater tanks can help engineers, developers and contractors handle stormwater with a variety of options. FRP underground tanks are a watertight, corrosion-resistant solution for controlling stormwater flows. Our stormwater tanks can be manufactured to comply with the IAPMO/ANSI Z1002 standard.

TYPICAL APPLICATIONS

- Stormwater retention
- Stormwater detention
- Combined sewer overflow (CSO) management
- Sanitary sewer overflow (SSO) management

DESIGN FLEXIBILITY OPTIONS

- Tank sizes up to 12' diameters
- Tank capacities up to 60,000 gallons [227,000 liters]
- Inlet pipes up to 48" diameters
- Inlet diffuser system for slowing high-velocity flows
- Baffles to separate solids and hydrocarbons
- Access-openings up to 60" diameters
- FRP inspection ladders
- Inspection ports: 4", 6" and 8" diameters
- Outlets or interconnection piping up to 48" diameters
- Outlet-control structure (OCS) for restricted discharge

RAINWATER HARVESTING

Rainwater collection helps reduce water consumption, and helps provide sustainable benefits for homes, businesses and communities. Collected water is often used for irrigation and landscaping. It can also be treated and then used in a building to flush toilets. This may require our NSF 61-listed tanks.

Our rainwater tanks can be manufactured to comply with the IAPMO/ANSI Z1002 standard.

WASTEWATER REUSE

Wastewater systems can collect all used water, greywater and wastewater from within a building. Our tanks store this used water that is then treated and reused for nonpotable water uses, such as toilet flushing and irrigation.

Our tanks are ideal for use with treatment system packages because they are corrosion-resistant, both inside and out.

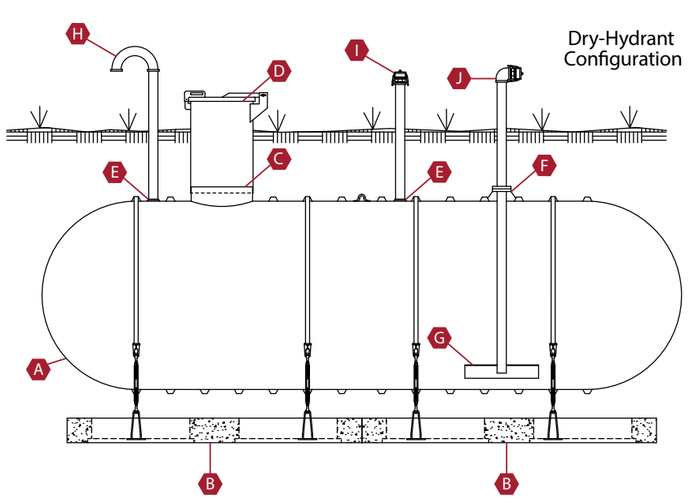
Case Study: Rainwater Collection

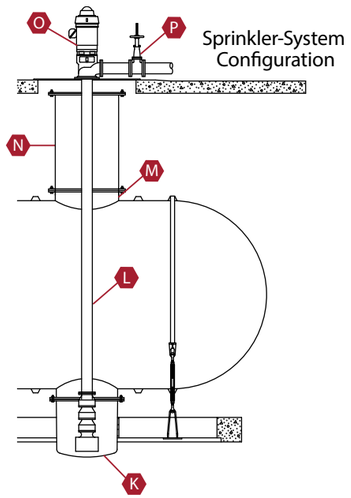
Four ZCL I Xerxes 20,000-gallon [75,000-liter] tanks collect water from a 60,000-square-foot glass rooftop of the Milwaukee County Greenhouses in Wisconsin. They are part of a system that filters, disinfects and redistributes water for year-round irrigation inside the greenhouses. This translates into the collection and use of up to one million gallons of rainwater each year.

FIRE PROTECTION TANKS

Our tanks can be used to store either primary or secondary water supplies for fire protection. Municipalities and developers often install fire protection water tanks when developments are far from municipal water supplies. The tanks are also an ideal solution for sites that don't have sufficient water volume or pressure for fire protection needs.

The tanks can provide water for a building's sprinkler system or give fire trucks quick, easy access to water for dry-hydrant connections. Our fire protection tanks comply with NFPA 20, 22 and 1142 standards. When used as dual-purpose water tanks that store potable water, they are available as NSF 61-listed (and labeled) tanks.





CODE	DESCRIPTION
A	ZCL I Xerxes Single-Wall FRP Tank
B	ZCL I Xerxes Prefabricated Deadman System with Anchor Strap and Turnbuckle Assembly
C	30" I.D. Access Opening w/Alignment Ring
D	30" FRP Riser Pipe with Hinged and Lockable Top and Gel Coat

E	4" NPT Service Fitting
F	4" FRP Flanged and Gusseted Down Pipe
G	FRP Anti-vortex Plate
H	4" Vent Pipe with Bird Screen
I	4" Fill with Cam Lock Connection
J	4" Suction with Fire Department Connection
K	30" FRP Flanged Bottom Sump

L	6" Vertical Pump Shaft Housing with Bowl Assembly and Strainer
M	30" Manway with Blank Cover
N	30" Manway Extension
O	Vertical Pump with Discharge Head and Mounting Plate
P	Discharge Valve and Piping

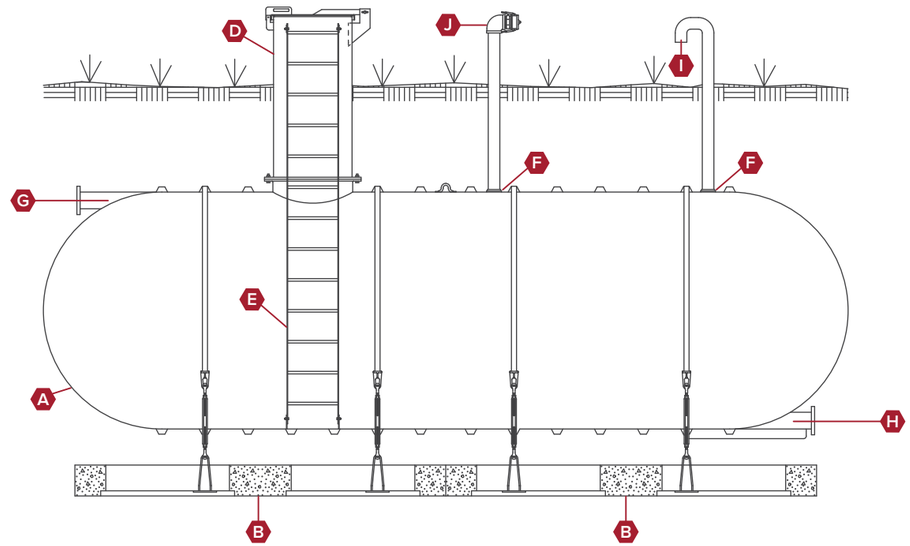
POTABLE WATER TANKS

ZCL I Xerxes NSF 61-listed potable water tanks are manufactured in our NSF-certified facilities. Our potable water tanks have a 30-year limited warranty.

Locations with remote water sources or low-performing wells require water storage tanks. Some customers store potable water and fire protection water in the same vessel.

TYPICAL APPLICATIONS

- Parks
- Schools and churches
- Campgrounds
- Private residences
- Subdivisions
- Hospitals (emergency storage)



CODE	DESCRIPTION
A	ZCL I Xerxes Single-Wall FRP Storage Tank
B	ZCL I Xerxes Prefabricated Deadman System with Anchor Strap and Turnbuckle Assembly
C	30" Manway with (Blank Cover For Tank Testing Only)

D	30" Manway Extension Access with Hinged and Lockable Top (UV Protected)
E	NSF-Approved FRP Ladder
F	4" NPT Service Fitting
G	6" NSF-Approved Tangential Nozzle

H	6" NSF-Approved Tangential Full Bottom Drain Nozzle
I	4" Vent Pipe with Gooseneck and Bug Screen
J	4" Auxiliary Fill with CAM Lock Connection

Case Study: Supplemental Water

As Stantec developed the design for a Toronto college's new aerospace center, they realized that the available fire protection water flow from the onsite system did not meet the city's requirement for water supply. Three ZCL I Xerxes 35,000-gallon [132,000-liter] tanks now provide the supplemental water. This installation took less than four hours from offloading to burying the tanks.

Case Study: Water for Remote Sites

When the US Forest Service needed to install potable water tanks in their campgrounds, they came to ZCL I Xerxes because they needed corrosion-resistant tanks with an NSF 61 label. They also needed lightweight tanks. Remote sites like these require tanks that are easy to offload in a parking lot or narrow road and then moved to the excavation with a small crane or excavator. We provided hinged, lockable lids for the risers, and gel coated them to blend into the forest environment.

INTERCEPTOR AND SEPARATOR TANKS

GREASE INTERCEPTORS

Food-service establishments install grease interceptors to collect fats, oils and grease (FOG) before wastewater enters the municipal or onsite wastewater systems.

Aging grease traps built out of steel or concrete inevitably fail over time because they are not corrosion-resistant. When they fail, local governments may have to pay substantial costs for sewer system cleanup. Facility owners may incur fines in addition to the cost of repairing or replacing their grease-trap system. Our fiberglass grease interceptor is a long-term, cost-effective solution that comes with a 30-year limited warranty.

ZCL | Xerxes fiberglass grease interceptors do not require ongoing maintenance aside from scheduled pump-outs. The tank's rounded shape allows for easy pump-out and cleaning.

In contrast to maintenance-free fiberglass, porous concrete is susceptible to deterioration caused by the bacteria that generates hydrogen sulfide and sulfuric acid.

Our grease interceptors comply with the IAPMO/ANSI Z1001 standard. They can be labeled to indicate compliance with the UPC® code.

TYPICAL APPLICATIONS

- Restaurants
- Grocery stores
- Food-processing plants
- Sports stadiums
- Airports
- Schools and universities
- Hospitals and clinics
- Assisted-living facilities
- Correctional institutions

Case Study: Mall Food Court

Most restaurants and food-processing facilities need a single grease interceptor, but larger projects can require more. We provided 20 grease interceptors to an upscale mall in Northern California. In this highly regulated, environmentally sensitive location, our corrosion-resistant tanks provide maximum environmental protection.

OIL INTERCEPTORS

Business owners install oil interceptors to prevent environmental pollution and avoid costly fines. Drains in parking garages, vehicle-maintenance facilities and manufacturing plants collect water runoff. Oil interceptors slow the water flow so oil can float to the surface and sediment can fall to the bottom of the tank.

TYPICAL APPLICATIONS

- Auto dealerships
- Car washes
- Vehicle maintenance facilities
- Parking decks
- State, provincial and municipal transportation facilities

SOLIDS-SAND INTERCEPTORS

These ZCL | Xerxes tanks allow for heavier solids, sand and grit to drop out of suspension prior to leaving the facility. Some facilities need a two-step separation process, which is met by installing our solids-sand interceptor in combination with either our oil interceptor or oil-water separator.

TYPICAL APPLICATIONS

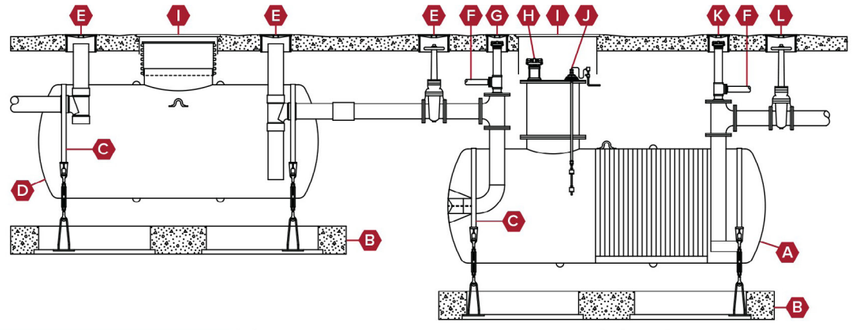
- Car-wash bays
- Hospitals
- Schools and universities
- Grocery and convenience stores
- State, provincial and municipal transportation facilities
- Food-processing plants

OIL-WATER SEPARATORS

Our oil-water separators remove free-floating oils and settleable sands from oil-water mixtures. A coalescer option is available to produce effluent quality acceptable to most regulatory requirements for water runoff. Our oil-water separators are available as labeled tanks indicating they are UL 2215-listed and ULC S656-listed models.

TYPICAL APPLICATIONS

- Parking lots
- Equipment washdown stations
- Vehicle repair garages
- Bulk fuel plants
- Truck stops



CODE	DESCRIPTION
A	Xerxes Single-Wall Fiberglass Storage Tank
B	Prefabricated Concrete Deadman System
C	Anchor Strap with Turnbuckle Assembly
D	Xerxes Single-Wall Solids Interceptor

E	12" Round Manhole (Influent Shut Off)*
F	Vent to Aboveground*
G	8" Round Manhole (Influent Sampling)*
H	Pump-Out Cap & Adapter*

I	36" Round Manhole*
J	Level Probe*
K	8" Round Manhole (Effluent Sampling)*
L	12" Round Manhole (Effluent Shut Off)*

* Supplied by others

INDUSTRIAL WASTEWATER TANKS

Our corrosion-resistant fiberglass tanks are ideal for factory washdown, emergency spills and landfill leachate runoff. The tanks securely collect benign or hazardous materials before they are treated or removed from the site. We offer single-wall tanks and double-wall tanks with interstitial monitoring for added protection.

We also manufacture tanks to collect chemically contaminated fire-protection water and aqueous film-forming foam (AFFF) runoff.

TYPICAL APPLICATIONS

- Food- and beverage-processing facilities
- Aircraft hangar AFFF collection
- Shower decontamination
- Landfills
- Chemical-fire contaminated-water collection

DECONTAMINATION TANKS

Medical centers, laboratories and manufacturing facilities remove chemical and biological contaminants from personnel, clothing, equipment, floors and other surfaces. Our corrosion-resistant decontamination tanks securely store the decontamination washdown.

TYPICAL APPLICATIONS

- Industrial manufacturing facilities
- Hospitals
- Laboratories
- Medical facilities

ACCESSORIES

We offer a wide selection of accessories and fittings to support a variety of project and site requirements. Our sales and engineering teams help customers find the right solution for their projects.

COMMON ACCESSORIES

- Access openings/manways
- Access risers/extensions
- Baffles, weirs and partition walls
- Pump platforms
- Anti-vortex plates
- FRP or PVC pipe penetrations
- FRP or PVC flanged fittings
- NPT threaded fittings
- Engineered anchoring systems
- Other accessories available

US TANK DATA CHART

	Nominal tank capacities (gallons)	Single-wall and double-wall tank lengths (inches)	Single-wall tank weights (pounds)	Double-wall tank weights (pounds)
4-foot-diameter tanks	600	6'-11⅞" SW 7' 3½" DW	600	900
	1,000	11'-3⅞" SW 11' 7½" DW	900	1,400
	1,500	16'-0" SW 16'-3⅝" DW	1,400	2,100
6-foot-diameter tanks	1,500	10'-7¼"	1,000	1,700
	2,000	13'-5¾"	1,300	—
	2,500	13'-5¾"	—	2,200
	3,000	16'-4¼"	1,600	2,600
	4,000	21'-11⅛" SW 20'-8" DW	2,200	3,600
	5,000	26'-5"	2,600	4,300
	6,000	30'-8¾"	3,000	5,000
8-foot-diameter tanks	3,000	12'-3"	1,400	2,100
	4,000	15'-½"	1,800	2,700
	5,000	17'-8½"	2,200	3,200
	6,000	20'-6½"	2,600	3,700
	7,000	23'-1"	3,000	4,300
	8,000	26'-½"	3,400	4,800
	9,000	28'-9"	3,800	5,400
	10,000	31'-6½"	4,200	5,900
	11,000	34'-4"	4,700	6,400
	12,000	37'- ½"	5,100	7,000
	13,000	41'-2"	5,600	7,600
	14,000	43'-11½"	6,000	8,200
	15,000	46'-9"	6,600	9,100
10-foot-diameter tanks	10,000	21'-5¼"	4,500	4,900
	11,000	22'-9¾"	4,800	5,200
	12,000	24'-¼"	5,100	5,600
	13,000	25'-6¾"	5,500	5,900
	14,000	26'-11¼"	5,800	6,300
	15,000	29'-5¾"	6,600	7,000
	20,000	37'-8¾"	8,600	9,000
	22,000	42'-¾"	9,700	10,500
	25,000	47'-6¾"	11,100	11,800
	30,000	55'-9¾"	13,200	14,000
	35,000	64'-¾"	15,400	16,500
	40,000	73'-8¼"	17,900	19,000
12-foot-diameter tanks	20,000	29'-4"	9,200	14,000
	25,000	35'-7"	10,800	16,600
	30,000	43'-1"	13,100	19,900
	35,000	49'-4"	14,700	22,500
	40,000	54'-4"	16,100	24,600
	48,000	65'-7"	19,300	29,500
	50,000	68'-1"	20,000	30,500

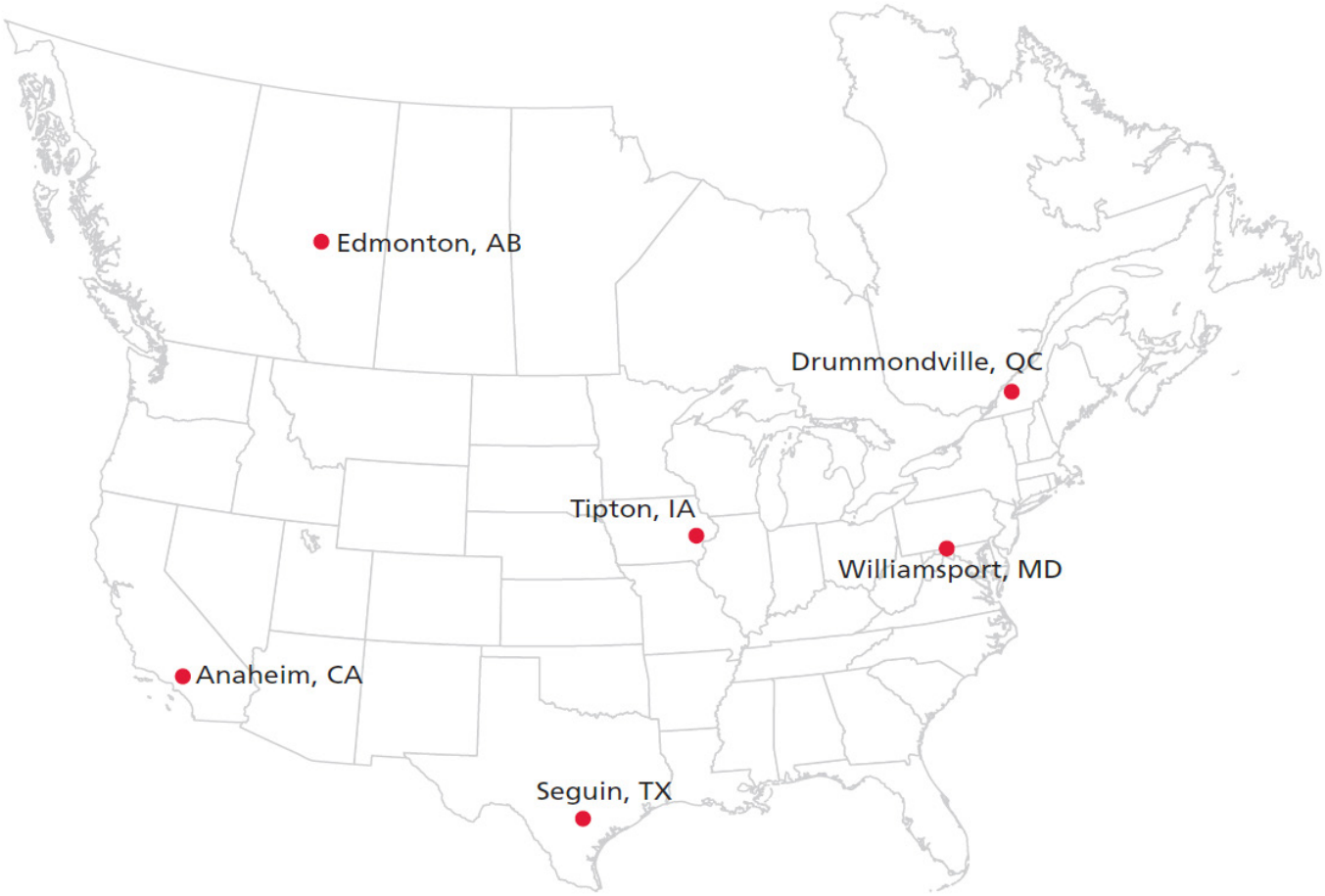
CANADIAN TANK DATA CHART

	Nominal tank capacities (liters)	Single-wall tank lengths (millimeters)	Double-wall tank lengths (millimeters)	Single-wall tank weights (kilograms)	Double-wall tank weights (kilograms)
4-foot-diameter tanks	2,500	2,295	2,303	300	400
	3,900	3,387	3,395	400	500
	5,000	4,368	4,380	500	600
6-foot-diameter tanks	10,000	4,520	4,520	500	900
	15,000	6,528	6,604	800	1,300
	20,000	8,426	8,465	1,000	1,700
	25,000	10,287	10,420	1,300	2,200
8-foot-diameter tanks	15,000	3,981	3,994	600	900
	20,000	5,086	5,137	900	1,200
	25,000	6,064	6,090	1,100	1,400
	30,000	7,214	7,264	1,300	1,700
	35,000	8,141	8,185	1,500	2,000
	40,000	9,341	9,392	1,800	2,300
	45,000	10,363	10,363	1,900	2,500
	50,000	11,259	11,328	2,100	2,700
	60,000	13,500	13,500	2,600	3,400
	65,000	14,522	14,522	2,900	3,700
10-foot-diameter tanks	50,000	7,449	7,449	2,600	2,900
	55,000	8,280	8,280	2,900	3,200
	60,000	8,827	8,827	3,100	3,300
	65,000	9,576	9,576	3,400	3,600
	70,000	10,395	10,395	3,600	3,900
	75,000	10,903	10,903	3,800	4,100
	80,000	11,582	11,582	4,000	4,400
	85,000	12,268	12,268	4,200	4,700
	90,000	13,068	13,068	4,500	5,000
	100,000	14,345	14,345	5,000	5,400
	110,000	15,723	15,723	5,400	5,900
	115,000	16,097	16,097	5,500	6,100
	135,000	18,745	18,745	6,400	7,100
	150,000	21,406	21,406	7,300	8,100
12-foot-diameter tanks	80,000	8,941	8,941	4,200	6,400
	95,000	10,846	10,846	4,900	7,600
	120,000	13,132	13,132	6,000	9,100
	135,000	15,037	15,037	6,700	10,300
	150,000	16,561	16,561	7,400	11,200
	185,000	19,990	19,990	8,800	13,400
	190,000	20,752	20,752	9,100	13,900

MULTIPLE FACILITIES FOR TIMELY MANUFACTURING AND DELIVERY

With six ZCL | Xerxes manufacturing facilities in North America, no matter where customers need fiberglass tanks and accessories shipped, a manufacturing facility is not far away. No other tank producer offers this kind of manufacturing capability in North America.

In April 2019, ZCL | Xerxes became a product line of storage tanks within the Composite Production Systems division of Shawcor Ltd. Shawcor continues to grow significantly, expanding both its service offerings and geographical scope. The Shawcor network is engineered to handle your most challenging projects and most demanding specifications – wherever you are in the world.



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ZCL | XERXES®

ZCL | XERXES®
making a lasting difference®

Fiberglass Underground Storage Tanks

ZCL | XERXES

RELIABLE, CORROSION-RESISTANT TANKS

OVER **200,000** FIBERGLASS STORAGE TANKS MANUFACTURED AND SHIPPED IN NORTH AMERICA

A history of **innovation** in the **fuel industry**

When ZCL Composites Inc. and Xerxes Corporation joined in 2007, it brought together North America's two leading fiberglass tank brands: ZCL (founded in 1987) and Xerxes (founded in 1979). Today, ZCL | Xerxes is one of the world's leading innovators in composite tank engineering. Nearly 40 years of manufacturing experience and more than 200,000 tanks manufactured and shipped stand as proof of the reliability and quality of our products.

This solid track record provides our customers with peace of mind, which is why petroleum equipment distributors, fuel marketers and commercial accounts rely on our double-wall tanks for safe underground storage of fuel products. We have provided customers with durable and sustainable products that protect the environment for decades. Our proven track record along with our financial strength assures customers that we will be around to support our industry-leading products and warranties. Currently, 29 of the 30 top c-store marketers[1] choose E15-, E85- and ULSD-compatible, corrosion-resistant fiberglass storage tanks from industry leaders like ZCL | Xerxes.

1 CSP's Convenience Top 101, http://www.cspdailynews.com/industry-news-analysis/top-convenience-stores/archive/2015

Our history of **storage solutions** includes:

- developing the first UL-listed double-wall fiberglass tank
- incorporating our factory-installed hydrostatic monitoring system (TRUCHEK®)
- incorporating our unique 3D glass fabric (Parabeam®) into our tank design

WHY CHOOSE A FIBERGLASS TANK?

Best Product Investment

Fiberglass tanks have rapidly grown in popularity since they were first introduced more than 50 years ago as the corrosion-resistant alternative to underground steel tanks that were rusting, leaking and creating serious environmental damage. Major oil companies and large fuel marketers were the first to realize the benefits of fiberglass over steel for underground tanks. Today, a large majority of North American fuel marketers choose fiberglass, and the preference for fiberglass reaches all segments of the market, including industrial, commercial and government accounts who specify, install and own underground storage tanks. The growing understanding of fiberglass' benefits goes well beyond external corrosion protection with the recognition that fiberglass is corrosion-resistant, both inside and out.

FIBERGLASS OUTPERFORMS STEEL

CORROSION RESISTANCE

It's now common knowledge that fiberglass tanks are protected from external rusting due to corrosive soil environments. Today, the widespread use of ethanol-blended gasoline (E10, E15, E85), biodiesel fuels and ultra-low sulfur diesel (ULSD) has shifted the concern about corrosion to include internal protection. Most significantly, new ethanol-blended fuels raise questions about the compatibility of storage tank materials with stored fuel. When today's buyers compare fiberglass and steel tanks they see the clear advantage of our fiberglass tanks, which are not vulnerable to aggressive internal corrosion caused by storage of today's biofuels. The fact that fiberglass tanks are corrosion-resistant both inside and out give them a distinct advantage over steel tanks.

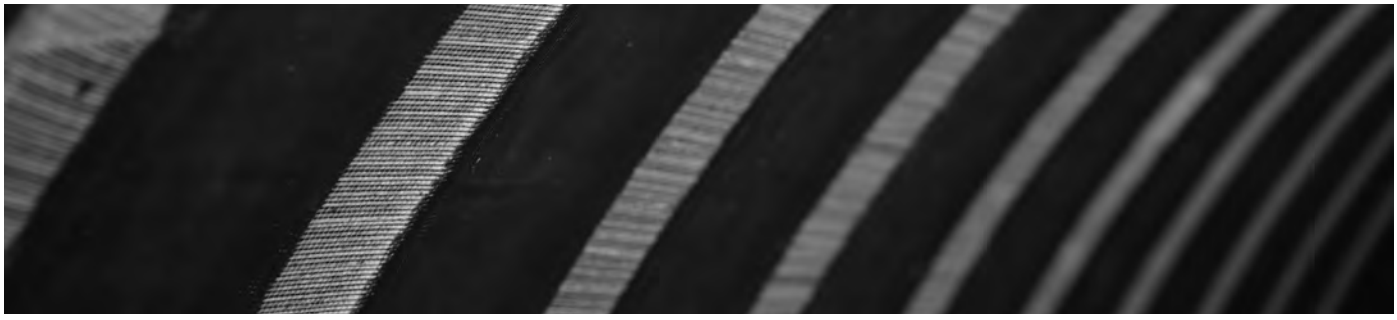
FUEL COMPATIBILITY

Customers today want to be confident that they are choosing a tank material that is compatible with the new fuels as well as traditional fuels. Our UL-listed (1316) and ULC-listed (S615) double-wall fiberglass tanks are UL-compatible with 0-100 percent ethanol storage. They are also warranted for the full range of ethanol-blended gasoline. The correlating UL listing (58) for steel fuel tanks does not require testing for ethanol compatibility. This third-party compatibility verification for fiberglass tanks – that steel tanks do not have – makes fiberglass the clear and superior choice for fuel tanks.

OUR FIBERGLASS TANKS PROVIDE **UNMATCHED BENEFITS**

The ZCL | Xerxes Advantage

ZCL | Xerxes double-wall underground storage tanks offer customers several significant design and performance differences that make them a superior choice to both steel tanks and other fiberglass tanks.



RIB DESIGN FOR STRUCTURAL INTEGRITY

As engineers, system designers and customers compare products, the rib geometry of our tanks is an important consideration in their analysis. Our uniform, high-profile ribs are fabricated directly into the tank cylinder. In some other tanks, ribs are incorporated as a separate step in the manufacturing process. Integrally constructed ribs increase the overall strength of the tank and create a structurally superior product.

30-YEAR WARRANTY

ZCL | Xerxes offers a 30-year limited warranty with no restrictions regarding water-bottom monitoring and removal. In contrast, many steel tank manufacturers now have a 10-year rather than 30-year warranty, and make ongoing maintenance and water-bottom removal a condition of warranty coverage.

PARABEAM®

Our proprietary 3D glass fabric, Parabeam®, also enhances the overall structural integrity of our tank by creating a bond between the tank walls, while providing a free-flowing interstitial space for monitoring capabilities. This technology also eliminates the potential for false alarms (created by fluctuating reservoir levels) that can occur in other hydrostatically monitored tanks.

MAINTENANCE-FREE

The presence of water in the bottom of fuel tanks is a common condition. Maintenance to remove it can be frequent and expensive. The requirement to do so, which is found in most steel-tank warranties, can leave a steel-tank owner vulnerable to a denied warranty claim should the tank corrode internally.

TRUCHEK® CONTINUOUS LEAK DETECTION

Our patented TRUCHEK® hydrostatic tank monitoring system for double-wall tanks is an easy, reliable method for true continuous leak detection and tank-tightness testing. Hydrostatic monitoring – now the industry standard for continuous monitoring – gives tank owners greater peace of mind than with a simple liquid sensor, which can fail to detect an outer-wall breach. (See p. 10 for more information.)

ZCL | XERXES
STORAGE TANK SOLUTIONS

Today, double-wall tanks are the industry standard in fuel applications. To meet the needs of our customers we also offer several other fiberglass tank options for a variety of applications and requirements. Our tank options include: double-wall tanks, multicompartment tanks, triple-wall tanks, diesel exhaust fluid tanks and oil-water separators. We also have a tank upgrade system when tank replacement is not viable.

DOUBLE-WALL TANKS

Tank owners and system designers of underground fuel systems need tanks that provide secure storage of fuel over time. ZCL | Xerxes fiberglass double-wall tanks are an excellent solution because they are corrosion-resistant, both inside and out. Our tanks have a proven record of compatibility with traditional petroleum fuel as well as with new biofuels, which are increasing in use. Our double-wall fiberglass tanks are not vulnerable to the corrosion problems inherent in storing ethanol-blended fuels (E10, E15, E85), biodiesel fuels and ultra-low sulfur diesel (ULSD). Nor are they vulnerable to rust caused by corrosive soil environments. Options such as protective coatings and cathodic protection don't guard entirely against external corrosion and rust. This makes ZCL | Xerxes fiberglass double-wall tanks a superior choice for a wider range of fuel applications.

FEATURES

- UL-listed (1316) & ULC-listed (S615) for alcohol fuels
- Secondary containment around full tank circumference
- Dry & hydrostatic monitoring options
- Capacities up to 50,000 gal. (USA)
- Capacities up to 155,000 L (Canada)

MULTICOMPARTMENT TANKS

These tanks are a popular choice among retail gasoline marketers and fleet fueling owners. The ability to store two or three grades or types of fuel in a single tank is particularly appealing when the amount of onsite space makes multiple tanks impossible or difficult. Customers may also find installation and insurance cost savings with a multicompartment tank.

The ZCL | Xerxes double-wall multicompartment tank comes standard with a double-wall bulkhead, while some other tank manufacturers require an upgrade to a double-wall bulkhead. Tanks are available in a wide range of capacities and in diameters of 6 to 10 feet.

FEATURES

- UL-Listed (1316) & ULC-listed (S615) for alcohol fuels
- Secondary containment around full tank circumference
- Dry & hydrostatic monitoring options
- Two- & three-compartment models
- Capacities up to 40,000 gal. (USA)
- Capacities up to 155,000 L (Canada)

TRIPLE-WALL TANKS

Some customers and regulatory agencies now require protection beyond secondary containment. Site conditions that could lead to a requirement for tertiary containment are the following: the presence of sensitive groundwater aquifers, lakes or streams. Our UL-listed triple-wall tank, with an additional Parabeam® interstice, is the innovative and cost-effective answer for this level of containment.

FEATURES

- UL-listed (1316) for alcohol fuels
- Tertiary containment around full tank circumference
- Dry & hydrostatic monitoring options
- Capacities up to 50,000 gal. (USA)
- Capacities up to 155,000 L (Canada)

DIESEL EXHAUST FLUID TANKS

ZCL | Xerxes has become a leading provider of diesel exhaust fluid (DEF) tanks in truck stops and vehicle fleet fuel facilities in the relatively short time DEF has been in demand in North America. Many fueling facilities now need to add bulk storage of DEF to meet the growing number of vehicles with diesel engines that require diesel exhaust fluid. A fiberglass underground storage tank has a number of benefits over the alternatives.

Since DEF cannot be exposed to carbon steel, a tank constructed of fiberglass is the clear choice. Using our fiberglass underground tank avoids the need for protective coatings or linings to protect the integrity of the product.

Underground storage of DEF has clear advantages over aboveground storage, in part because of the product's specific temperature requirements. An underground DEF tank also allows for storage of larger capacities than an aboveground tank and avoids an unsightly, space-consuming aboveground installation.

FEATURES

- Single-wall & double-wall models
- UL label available for future product storage flexibility
- Extensive third-party compatibility testing
- Capacities up to 50,000 gal. (USA)
- Capacities up to 155,000 L (Canada)

OIL-WATER SEPARATORS

With a fiberglass underground tank at the heart of the design, a ZCL | Xerxes oil-water separator incorporates unique refinements within the vessel to create a separator that removes free-floating oils and settleable solids from oil-water mixtures.

A properly sized coalescer is designed to produce effluent quality acceptable to most regulatory requirements for water runoff. Our oil-water separator is an excellent choice for managing water runoff from parking lots or equipment washdown stations.

This product is also available as a UL-listed (2215) and ULC-listed (S656) model.

FEATURES

- UL-listed (2215) & ULC-listed (S656) models available
- Single-wall & double-wall models
- Flexible design options
- Coalescer & gravity-flow models available
- Capacities up to 30,000 gal. (USA)
- Capacities up to 113,000 L (Canada)

ZCL | XERXES
STORAGE TANK SOLUTIONS

TANK UPGRADE SYSTEM

In a growing number of situations, secondary containment needs to be added to single-wall tanks, and site challenges make removal of existing tanks either cost-prohibitive or difficult. In instances where tanks are covered or surrounded by buildings, roads or rail lines, adding secondary containment to a single-wall fiberglass or steel tank can be accomplished with our Phoenix System®.

This upgrade system consists of two corrosion-resistant laminates with the proprietary Parabeam® glass fabric between the laminates creating an interstitial space. The interstice can be either dry or hydrostatically monitored. The Phoenix System®, applied onsite by trained installers, is compatible with biofuels, including ethanol-blended fuels and biodiesels.

FEATURES

- ULC/ORD-listed (C58)
- Corrosion-resistant fiberglass system
- Viable alternative in difficult tank replacement situations
- Suitable for both fiberglass & steel tanks

ZCL | XERXES
FUEL TANK ACCESSORIES

Your Complete Solution

Today's retail and commercial fueling facilities are sophisticated systems that are installed in a highly regulated environment. While the storage tank is the critical component in an underground fuel system, other important accessories are necessary to provide spill containment, tank anchoring, secondary pipe-drain collection, leak detection and other important functions. ZCL | Xerxes engineers have designed innovative, complementary products that provide system designers and installers with cost-effective, easy-to-install accessories. Very few tank manufacturers provide the wide range of accessories that we can supply. This is yet another example of how our innovative spirit benefits customers.

Installation & Technical Support

ZCL | Xerxes provides a comprehensive Installation Manual and Operating Guidelines (IMOG) document that outlines the proper – yet easy – steps necessary for a successful installation.

LEARN MORE ONLINE

Search our online database (zcl.com) for hundreds of resources for our fuel tanks and accessories, including:

- a pdf version of the Installation Manual
- a video of our Installation Manual
- technical drawings (available in CAD, DWG & BIM)
- guide specifications
- typical installation drawings

CONTAINMENT SUMPS AND COLLARS

Sumps and collars are common accessories found on virtually all double-wall tanks installed today. ZCL | Xerxes offers factory-installed containment collars that provide secondary containment around tank fittings and manways.

Designed to be a custom-match to the collar, our containment sump comes in a variety of models and sizes, all engineered to accommodate different customer preferences and needs. Our sumps and collars are also available in double-wall models, which are growing in popularity given changes to tank regulations.

FEATURES

- Flat-sided & round models for various piping layouts
- Watertight or friction-fit cover & open top options
- Diameters of 42 & 48 inches
- Heights of 36-72 inches
- Field-adjustable heights
- Custom options

ANCHORING SYSTEM

Site-specific installation conditions generally dictate whether a tank-anchoring system is necessary. Some customers choose to anchor all their tanks.

ZCL | Xerxes offers a complete tank-anchoring system, including reinforced precast concrete deadmen (designed to American Concrete Institute standards), fiberglass anchoring straps and galvanized turnbuckles.

Each component is engineered to specific tank sizes and for ease of installation. In most cases, concrete deadmen can be delivered on the same trailer as the tank, which minimizes the shipping cost and assures that deadmen are ready when the tank is set.

FEATURES

- Deadmen sizes for tank diameters 6-12 feet
- Corrosion-resistant anchor straps
- Optional man-out-of-hole straps available
- Galvanized turnbuckles

TRUCHEK® CONTINUOUS MONITORING

TRUCHEK® is the ideal solution to the growing regulatory interest in leak-detection methods that provide true continuous leak detection. Unlike dry interstitial monitoring methods, TRUCHEK® is able to monitor both walls of a tank 24/7 in all installation conditions.

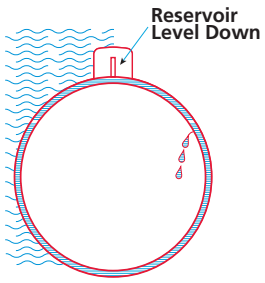
When you order our double-wall tank with the TRUCHEK® option, the interstice is filled at the factory with a calcium-chloride fluid that also partially fills a reservoir, creating an interstitial hydrostatic pressure. An electronic probe placed in the tank's reservoir alarms when the fluid level falls below or rises above the acceptable level.

FEATURES

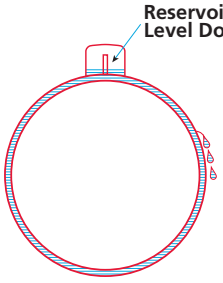
- 24/7 continuous tank monitoring regardless of installation conditions
- UL-verified as meeting the EPA criteria for tank-tightness testing
- Designed for dry-hole & wet-hole installations

How TRUCHEK® Works

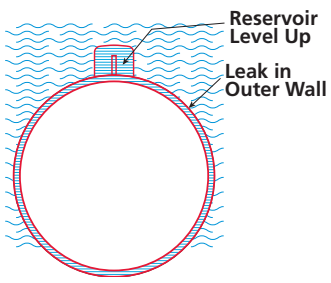
Primary-Tank Leak in Wet Hole or Dry Hole



Secondary-Tank Leak in Dry Hole



Secondary-Tank Leak in Wet Hole



TANK-TIGHTNESS TESTING

Besides providing true continuous monitoring of both tank walls – regardless of site conditions – TRUCHEK® also provides a simple and precise method to perform tank-tightness tests. A 10-hour tightness-test procedure meets the strict NFPA329 criteria. A 4-hour test (while product is dispensing) exceeds EPA's criteria for a tank-tightness test.

ZCL | Xerxes

Underground Double-Wall Tank Data

	Nominal Capacity (gallons)	Tank Length (feet/inches)	Nominal Shipping Weights (lbs) (dry interstitial)	Nominal Shipping Weights (lbs) (wet interstitial)	Number of Anchor Straps Required	Nominal Capacity (liters)	Tank Length (mm)	Nominal Shipping Weights(Kg) (dry interstitial)	Nominal Shipping Weights (Kg) (wet interstitial)	Number of Anchor Straps Required
4′	600	7′-3 1/2″	900	1,100	2	2,500	2,303	400	500	2
	1,000	11′-7 1/2″	1,100	1,300	2	3,900	3,395	500	600	2
	2,000	22′ -3 5/8″	2,800	3,400	2	5,000	4,380	600	700	2
6′	2,500	13′-5 3/4″	2,200	2,800	2	10,000	4,520	900	1,100	2
	3,000	16′-4 1/4″	2,600	3,300	2	15,000	6,604	1,300	1,600	4
	4,000	20′-8″	3,600	4,400	2	20,000	8,465	1,700	2,000	4
	5,000	26′-5″	4,300	5,200	4	25,000	10,420	2,200	2,500	4
	6,000	30′-8 3/4″	5,000	6,100	4					
8′	4,000	15′- 1/2″	2,700	3,600	2	15,000	3,994	900	1,100	2
	5,000	17′-8 1/2″	3,200	4,200	2	20,000	5,137	1,200	1,500	2
	6,000	20′-6 1/2″	3,700	4,900	2	25,000	6,090	1,400	1,700	2
	8,000	26′- 1/2″	4,800	6,200	4	30,000	7,264	1,700	2,100	4
	10,000	31′-6 1/2″	5,900	7,500	4	35,000	8,185	2,000	2,300	4
	12,000	37′- 1/2″	7,000	8,800	4	40,000	9,392	2,300	2,700	4
	15,000	46′- 9″	9,100	11,200	6	45,000	10,363	2,500	3,000	4
						50,000	11,328	2,700	3,200	4
						60,000	13,500	3,400	3,900	6
						65,000	14,522	3,700	4,300	6
10′	10,000	21′-5 1/4″	4,900	6,400	4	50,000	7,449	2,900	3,300	4
	12,000	24′- 1/4″	5,600	7,200	4	55,000	8,280	3,200	3,600	4
	15,000	29′-5 3/4″	7,000	8,900	4	60,000	8,827	3,300	3,800	5
	20,000	37′-8 3/4″	9,000	11,300	6	65,000	9,576	3,600	4,200	5
	25,000	47′-6 3/4″	11,800	14,600	8	70,000	10,395	3,900	4,500	6
	30,000	55′-9 3/4″	14,000	17,200	10	75,000	10,903	4,100	4,700	6
	35,000	64′- 3/4″	16,500	20,100	12	80,000	11,582	4,400	4,900	6
	40,000	73′-8 1/4″	19,000	23,100	14	85,000	12,268	4,700	5,300	7
						90,000	13,068	5,000	5,600	7
						100,000	14,345	5,400	6,100	8
						110,000	15,723	5,900	6,700	9
12′	20,000	29′ -4″	14,000	16,700	6					
	25,000	35′ -7″	16,600	19,700	8					
	30,000	43′ -1″	19,900	23,500	10					
	35,000	49′ -4″	22,500	26,500	12					
	40,000	54′ -4″	24,600	28,900	12					
	45,000	60′ -7″	27,400	32,100	16					
	48,000	65′ -7″	29,500	34,500	18					
	50,000	68′ -1″	30,500	35,700	18					

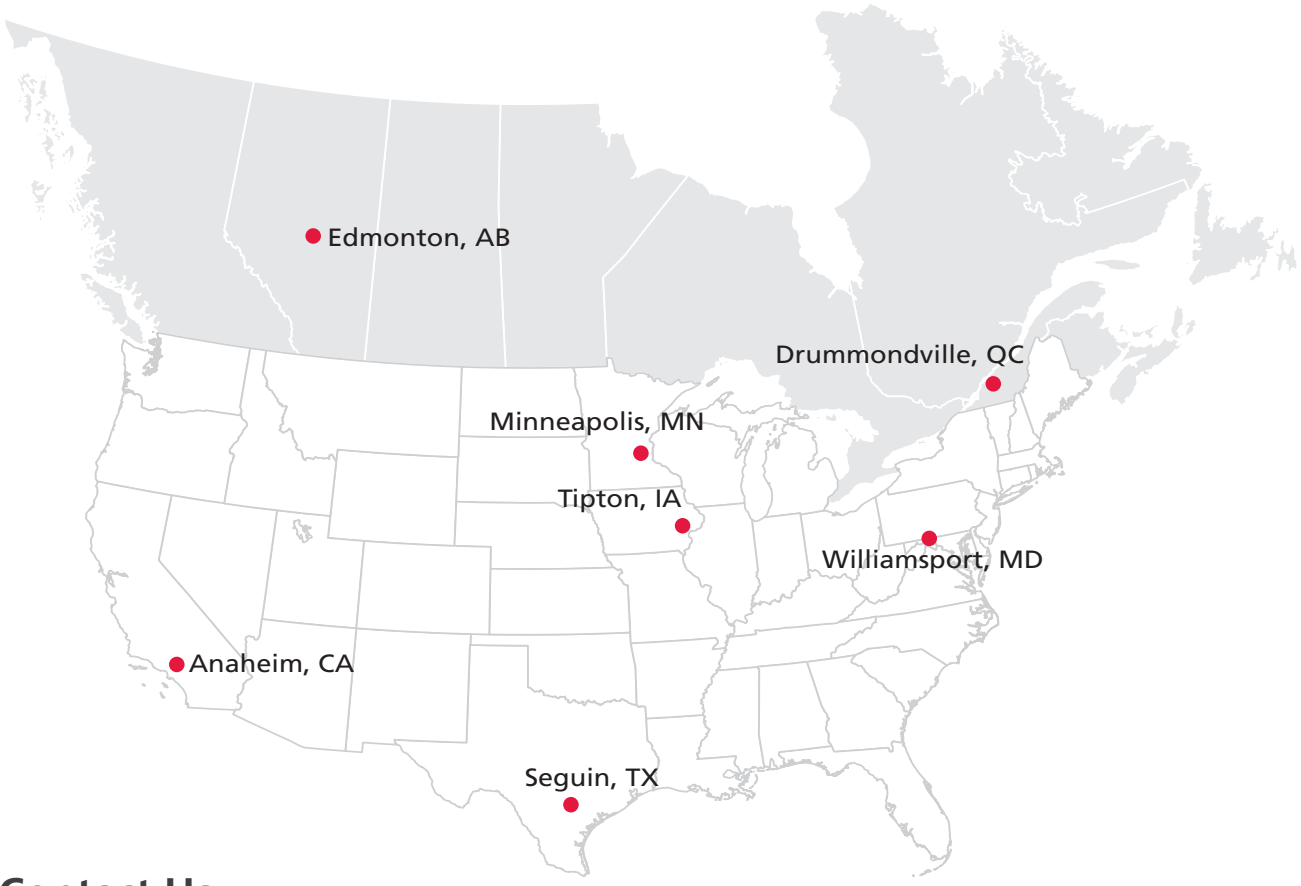
Notes:

1. Tank data for multicompartment tank models is available at www.zcl.com.
2. Actual height of the tank may be greater than the actual diameter due to fittings and accessories. Load height during shipping may vary due to tank placement on the shipping trailer.
3. If an overfill-protection device is installed in the tank, the actual capacity will be reduced.

Multiple Facilities

Customers Can Rely on Timely Manufacturing and Delivery of Tanks and Accessories.

With six manufacturing facilities – four in the United States and two in Canada – no matter where customers need fiberglass tanks and accessories shipped, a ZCL | Xerxes manufacturing facility is not far away. No other tank producer offers this kind of manufacturing capability in North America. All our facilities are either UL-listed or ULC-listed.



Contact Us

We're ready to design a double-wall tank, multi-compartment tank, triple-wall tank, diesel exhaust fluid tank or oil-water separator for your next project.

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