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**Phase Two
Environmental Site Assessment
5986-5993 Hazeldean Road
Ottawa, Ontario**

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Submitted to:

Argue Construction Ltd.
2900 Carp Road
Carp, Ontario
K0A 1L0

**Phase Two
Environmental Site Assessment
5986-5993 Hazeldean Road
Ottawa, Ontario**

August 29, 2019
Project: 61730.62

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August 29, 2019

File: 61730.62

Argue Construction Ltd.
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Attention: Mr. Keith Riley, Chief Estimator & Project Manager

Re: Phase Two Environmental Site Assessment
5986-5992 Hazeldean Road
Ottawa, Ontario

Enclosed is the GEMTEC Phase Two Environmental Site Assessment report for the above-noted project based on the scope of work presented in our proposal dated June 7, 2019. This report was prepared by Nicole Soucy, B.A.Sc., M.A.Sc., and Drew Paulusse, B.Sc., and reviewed by Shaun Pelkey, M.Sc.E., P.Eng..



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Enclosures
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1.0 EXECUTIVE SUMMARY

GEMTEC Consulting Engineers and Scientists Limited (GEMTEC) was retained by Argue Construction Ltd., to complete a Phase Two Environmental Site Assessment (ESA) for the property located at 5986-5993 Hazeldean Road, Ottawa, Ontario.

The Phase Two ESA was completed following a Phase One ESA completed and submitted to Argue Construction Ltd., under separate cover. This Phase Two ESA has been completed in accordance with the requirements for Phase Two ESAs as defined in Part VII and Schedule E of Ontario Regulation 153/04, as amended by O. Reg. 511/09 for the purpose of obtaining a Record of Site Condition for the property.

The site consists of two separate municipal addresses (5986 and 5992 Hazeldean Road) located in the urban core of Stittsville, a suburb of Ottawa and has been subject to residential and commercial development since 1963, indicating several APECs on the site.

The site is currently comprised of an office/ rental shop and attached vacant residential dwelling at 5986 Hazeldean Road, and the main office building used for an Accounting Firm, and a garage at 5992 Hazeldean Road, and has undergone no significant changes since 1991.

Current development plans include demolishing an existing commercial structure on the west portion of the subject property (5992 Hazeldean Road) and residential structure on the east portion of the subject property (5986 Hazeldean Road), followed by construction of a new three-storey, mixed-use, wood frame building along the west side of subject property.

The geology at the site can be generally described as 0.75 m of granular subbase material underlain by a thin, discontinuous layer of clayey silt with some gravel and trace sand overlying fractured limestone bedrock of the Bobcaygon formation. Groundwater flow direction within the shallow bedrock beneath the site is primarily directed in a south-southwest direction, mirroring the local topography.

A total of seven soil samples and four groundwater samples were submitted to Paracel Laboratories for analysis of metals and inorganics, PAHs, PHCs and BTEX, and VOCs. Analytical results indicated that the site currently meets the applicable MECP Table 6 SCS for soil; however, due to exceedances of sodium and chloride at MW19-2, groundwater quality does not meet the applicable SCS.

Prior to obtaining a Record of Site Condition for the property, further assessment or remediation of groundwater impacts in the vicinity of MW19-2 will be required.

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2.0 INTRODUCTION

GEMTEC Consulting Engineers and Scientists Limited (GEMTEC) was retained by Argue Construction Ltd., to complete a Phase Two Environmental Site Assessment (ESA) for the property located at 5986-5993 Hazeldean Road, Ottawa, Ontario. The site location is provided on Figure 9.1 of Section 9. The site is currently owned by 2300104 Ontario Inc.

The Phase Two ESA was completed following a Phase One ESA (GEMTEC, 2019a) completed and submitted to Argue Construction Ltd., under separate cover. Following the completion of the Phase One ESA five Areas of Potential Environmental Concern (APECs) were identified on-site stemming from historical site use.

This Phase Two ESA has been completed in accordance with the requirements for Phase Two ESAs as defined in Part VII and Schedule E of Ontario Regulation 153/04, as amended by O. Reg. 511/09 for the purpose of obtaining a Records of Site Condition for the property.

2.1 Site Description

The subject property consists of two separate municipal addresses (5986 and 5992 Hazeldean Road) bounded to the north by Hazledean Road, to the east by residential developments along Oyster Bay Crescent, to the south by Old Orchard Crescent, and to the west by Springbrook Drive, and has an area of approximately 0.35 hectares (0.87 acres). The site layout is depicted on Figure 9.2.

The subject property was first developed sometime between 1947 and 1963. A structure is visible on the subject property in the 1963 aerial photograph but not in the photo from 1947. Additional minor development occurred on the subject site through 1991 at which time the site layout is the same as current.

Historical land use in the study area prior to 1963 was primarily agricultural with some undeveloped areas, followed by residential to the east and south and commercial development along Hazledean Road.

2.2 Property Ownership

The site is currently owned by 2300104 Ontario Inc., represented by Daniel Kelly, 2300104 Ontario Inc. business owner.

2.3 Current and Proposed Future Uses

The site is currently comprised of four structures with associated parking areas, two connected structures (one commercial and one vacant residential) at 5986 Hazeldean Road, and a house and a garage (both used commercially) at 5992 Hazeldean Road.

The proposed future site use will include the development of a new multi-storey, commercial-residential mixed-use building. Current development plans include demolishing an existing commercial structure on the west portion of the subject property and residential structure on the east portion of the subject property, followed by construction of a new three-storey, mixed-use, wood frame building along the west side of subject property, with a footprint of about 557 square metres (6,000 square feet). An access roadway (fire route) and parking areas are also part of the proposed development.

The commercial business on the east portion of the subject site is to remain unchanged.

2.4 Applicable Site Condition Standards

In accordance with the regulation, the applicable site conditions standards (SCS) for 5986-5993 Hazeldean Road is Ministry of Environment, Conservation and Parks (MECP) *Table 6 Generic Site Condition Standards for Shallow Soils in a Potable Ground Water Condition, Course Textured Soils* (MOE, 2011a).

The site is located within the urban area of Stittsville, a suburban community within the greater City of Ottawa, and is serviced by municipal water supply. Drinking water wells will not be established at the site as part of the future development; however, four properties with drinking water wells are present within a 250 metre radius of the site, as confirmed by the City of Ottawa.

The site has previously undergone development, and what little overburden exists on the site is generally native gravelly silty sand or silt and sand with trace gravel, with an average thickness of 0.1 metres. The nearest water body proximate to the site is the Carp River, located approximately 750 metres to the east.

The site is not environmental sensitive. It is not within, adjacent to or within 30 metres of an areas of natural significance and soil pH is within the acceptable range.

Although the site currently has commercial use, proposed future development and use includes residential structures or units in addition to commercial uses, therefore, residential standards are applied during the Phase Two ESA.

3.0 BACKGROUND INFORMATION

3.1 Physical Setting

A topographic map based on Ontario Base Mapping was reviewed for the subject site (ESRI, 2011). The subject property has an elevation of between 116 and 118 metres above sea level. The topography of the surrounding area generally slopes northeast towards a municipal drain, which is located east of the subject property.

Surficial and bedrock geology maps of the Ottawa area indicate that the overburden in the vicinity of the study area generally consists of clay, silt, sand, gravel, diamicton with a thickness ranging from 0 to 2 metres. The bedrock is mapped as paleozoic limestone, with minor shales in upper part of the Bobcaygeon Formation.

Groundwater flow often reflects topographic features and typically flows toward nearby lakes, drains and wetland areas, if not influenced by underground utilities. The nearest water body proximate to the site is the Carp River, located approximately 750 metres to the east. No wetlands or areas of natural or scientific interest (ANSI) were identified on the subject site or within the study area.

3.2 Past Investigations

Historical assessment reports have been prepared for the site and surrounding areas. The following list while not exhaustive, describe the pertinent information necessary for the purposes of the Phase Two ESA. Reports are provided in chronological order of completion date.

3.2.1 2013, Phase 1 Environmental Site Assessment for 5986 Hazeldean Road by McIntosh Perry

An ESA was completed for the “Rental Village” property at 5986 Hazeldean Road in 2013 by McIntosh Perry for Shawn Monette (1302054 Ontario Inc.). The report was entitled “Phase 1 Environmental Site Assessment, 5986 Hazeldean Road, Stittsville, ON, FINAL REPORT” and was completed in 2013.

The report identified two structures at 5986 Hazeldean road, (i) an office/ rental shop and garage area for the commercial activities; and (ii) an attached vacant residential dwelling. This report was not completed to the O.Reg 153/04 standards and therefore would not be suitable for the purpose of submitting a RSC. The document identified one APEC on the property at 5986 Hazeldean Road, storage and use of various hazardous materials including but not limited to oils, lubricants, fuels, and cleaners; and within 250 metres of 5986 Hazeldean Road, several waste generators, one spill record, a retail gasoline station, one expired TSSA site, and a pesticide vendor were identified.

3.2.2 2019, Phase One Environmental Site Assessment for 5986 Hazeldean Road by GEMTEC Consulting Engineers and Scientists Ltd

An ESA was completed for the subject site at 5986 Hazeldean Road in 2019 by GEMTEC. The report was entitled “Phase One Environmental Site Assessment, 5986-5992 Hazeldean Road, Ottawa, Ontario”.

A review of historical information pertaining to the subject site and adjacent properties identified, numerous historical spills and waste generators located in close proximity to the site and an on-site waste generator, tank, fill material, and substances used on site have been identified as PCAs, resulting in the identification of four APECs on the subject property, the report identified five APECS as being present on the subject site:

- APEC 1: Gasoline and Associated Products Storage in Fixed Tanks at 5986 Hazeldean Road – Rental Village;
- APEC 2: Gasoline and Associated Products Storage in Fixed Tanks at 5992 Hazeldean Road – Tennant Garage;
- APEC 3: Gasoline and Associated Products Storage in Fixed Tanks at 5992 Hazeldean Road – Historical heating oil tank;
- APEC 4: Fill of unknown origin on the subject site; and,
- APEC 5: Salt Manufacturing, Processing and Bulk Storage on the subject site.

Based on the APECs identified on the site, a Phase Two Environmental Site Assessment was recommended to investigate potential soil and groundwater impacts on the subject property.

4.0 SCOPE OF THE INVESTIGATION

4.1 Overview of the Site Investigation

The intent of the Phase Two ESA is to address both on-site and off-site Potentially Contaminating Activities (PCAs), and on-site Areas of Potential Environmental Concern (APECs) identified through the preparation of the Phase One ESA against MECP Table 6 SCS to support the development of a new multi-storey, mixed-use building. Figure 9.3 illustrates the location of the identified PCAs on site and off site and the location of the on-site APECs. The Phase Two ESA sampling and analysis plan is included in Appendix A of this report.

APECs identified during the Phase One ESA (GEMTEC, 2019) to exist on the subject site include:

- Gasoline and Associated Products Storage in Fixed Tanks;
- Fill of unknown origin on the subject site; and,
- Salt Manufacturing, Processing and Bulk Storage.

4.2 Media Investigated

Boreholes were advanced on site to access if the soil and groundwater conditions at selected test locations satisfy the applicable MECP SCS for the site. Boreholes were advanced using a truck-mounted drill rig supplied and operated by George Downing Estate Drilling Ltd. of Grenville-sur-la-Rouge, Quebec. Standard penetration testing were be carried out in the boreholes using drive open sampling equipment, and bedrock coring was be carried out at selected locations.

Potential contaminants of concern (COCs) identified in the Phase One ESA (GEMTEC, 2019) for soil and groundwater at the site include metals and inorganics, PAHs, PHCs and BTEX, and possibly volatile organic compounds.

The soil sampling program included the submission of a minimum of one representative overburden/fill soil sample from each borehole, where overburden thickness permitted, for laboratory analysis of the parameters summarized above. Duplicate soil samples were collected and analysed for QA/QC purposes at a frequency of 1 in 10 samples.

The groundwater investigation program consisted of the collection of groundwater elevations from all three monitoring wells and the development, purging and sampling of groundwater for laboratory analysis of COCs. Duplicate groundwater samples were collected and analysed for QA/QC purposes at a frequency of 1 in 10 samples.

The table below indicates the rational for each borehole and monitoring well location and the associated contaminants of concern.

Table 4.1: Summary of Borehole and Monitoring Well Location Rationale

Borehole ID	Rational for Location	Contaminants of Potential Concern
BH/MW 19-1	This borehole is situated down gradient of the rental tool facility at 5986 Hazeldean Road, adjacent to the location where daily maintenance of machines is preformed, and many potentially contaminating substances are stored. Soil and overburden groundwater quality impacts from APEC 1 will be investigated at this location.	Metals & Inorganics PHCs VOCs
BH/MW 19-2	This borehole is situated up gradient of the rental tool facility, adjacent to the structure where many potentially contaminating substances are stored. Soil and overburden groundwater quality impacts from APEC 1 will be investigated at this location.	Metals & Inorganics PHCs VOCs
BH/MW 19-3	This borehole is situated in the east corner of the lot at 5986 Hazeldean Road; its placement is driven by geotechnical investigation. Potential salt from winter maintenance impacts from APEC 5 will be investigated at this location.	Inorganics
BH/MW 19-4	This borehole is situated down gradient of the garage structure at 5992 Hazeldean Road, which has previously been used for an excavating contractor. Soil and overburden groundwater quality impacts from APEC 2 will be investigated at this location.	Metals & Inorganics PHCs VOCs
TP19-1	This test pit is situated west of the existing structure at 5992 Hazeldean road, its placement was driven by the existing fuel soil tank that existed in this area as well as the potential for fill material at the time the gas line was installed. Soil quality impacts for APECs 3 & 4 will be investigated at this location.	Metals & Inorganics PHCs
TP 19-2	This test pit is situated west of the existing structure at 5992 Hazeldean road, its placement was driven by the existing fuel soil tank that existed in this area as well as the potential for fill material at the time the gas line was installed. Soil quality impacts for APECs 3 & 4 will be investigated at this location.	Metals & Inorganics PHCs

4.3 Phase One CSM

Interpreting the probable environmental conditions of the 5986 and 5992 Hazeldean Road site is undertaken by reference to a Phase One Conceptual Site Model (CSM). A Conceptual Site Model is an idealization of potential site contaminants and their interaction with the hydrogeological system and surrounding properties, based on the known conditions of a site. The CSM includes a description of the potential contaminating activities at the Phase One ESA property and

surrounding properties, identifying COCs and their source locations, and defining on-site APECs for further investigation.

4.3.1 Current and Proposed Future Site Use

The subject property has an area of 0.35 hectares (0.87 acres) and is located at 5986 and 5992 Hazeldean Road in Ottawa, Ontario. The subject property was first developed sometime between 1947 and 1963. Historical land use in the study area prior to 1963 was primarily agricultural with some undeveloped areas, followed by residential to the east and south and commercial development along Hazeldean Road. The property is currently used commercially as a tool rental shop, and an accounting firm.

Current development plans include demolishing an existing commercial structure on the west portion of the subject property and residential structure on the east portion of the subject property, followed by construction of a new three-storey, mixed-use, wood frame building along the west side of subject property, with a footprint of about 557 square metres.

4.3.2 Waterbodies and Areas of Natural and Scientific Interest

No surface water, lagoon or standing water is located on-site or within 250 m of the site. A review of the interactive natural heritage map published by the Ministry of Natural Resources and Forestry (MNRF, 2015), identified no areas of natural and scientific interest on-site or within 250 m of the site.

A topographic map based on Ontario Basic Mapping identified the subject property as has an elevation of between 116 and 118 metres above sea level. The topography of the surrounding area generally slopes northeast towards a municipal drain, which is located east of the subject property. Groundwater flow often reflects topographic features and typically flows toward nearby lakes, drains and wetland areas. Based on the topography of the area, it is expected that the local shallow groundwater flow is northeast.

4.3.3 Existing Buildings and Structures

A total of four structures were observed on the subject property. Two structures at 5986 Hazeldean road, (i) an office/ rental shop and garage area for the commercial activities; and (ii) an attached vacant residential dwelling; and the additional two structures at 5992 Hazeldean Road (iii) Main office building used for an Accounting Firm, and (iv) a garage building.

4.3.4 PCAs, CoPCs and APECs

The Phase One ESA (GEMTEC, 2019) identified several PCAs APECs within the Phase One study area; defined in the Phase One as the area located within a 250 metre radius of the site. A summary of PCAs, and APECs as outlined on Table 2 in Schedule D of the Regulation and identified in the Phase One ESA is provided in Table 4.2 below.

Table 4.2: Summary of PCAs, and APECs

Type of PCA	PCA #	Address / Location	Distance from Subject Property	Description	PCA Resulted in APEC / No APEC	Rationale	Material of Concern	Contaminants of Concern
Gasoline and Associated Products Storage in Fixed Tanks	28	5986 Hazeldean Road	On Site	Substances including oil and gasoline identified on the subject site for use in the maintenance of rental equipment.	Yes	Based on oil and gasoline projects being used on the subject site	Soil and Groundwater	Metals & Inorganics, PHCs, and VOCs
Gasoline and Associated Products Storage in Fixed Tanks	28	5992 Hazeldean Road	On Site	Historical AST on site in basement of structure for heating oil, furnace upgraded in 2011 to natural gas.	Yes	Based on an aboveground storage tank historically present on the subject site	Soil and Groundwater	Metals & Inorganics, PHCs, and VOCs
Gasoline and Associated Products Storage in Fixed Tanks	28	5992 Hazledean Road	On Site	Listed as producing waste oils & lubricants from 1993 to 2001.	Yes	Based on confirmed oil and lubricant waste generation with no knowledge of management practices	Soil and Groundwater	Metals & Inorganics, PHCs, and VOCs
Fill Material of Unknown Quality	30	5992 Hazeldean Road	On Site	During soil sampling due to the historical AST on site fill material was identified.	Yes	Based on confirmed fill material present on the subject site	Soil	Metals, and PAHs
Salt Manufacturing, Processing and Bulk Storage	48	5986-5992 Hazeldean Road	On Site	Salt is used on the commercial properties as part of winter maintenance	Yes	Based on confirmed salt being used regularly on the subject site	Soil, and Groundwater	EC, SAR, Sodium, and Chloride

Type of PCA	PCA #	Address / Location	Distance from Subject Property	Description	PCA Resulted in APEC / No APEC	Rationale	Material of Concern	Contaminants of Concern
Pesticides Manufacturing, Processing, Bulk Storage and Large-Scale Applications	40	6001 Hazledean Road	40 metres north	Listed as a pesticide vendor.	No	Based on anticipated quantity of pesticides and storage at a Rona/ Home Hardware store.	-	-
Gasoline and Associated Products Storage in Fixed Tanks	28	5943 Hazledean Road	110 metres northeast	An ECA was approved in 2016 for industrial sewage works including surface storage and an oil/grit separator.	No	Based on anticipated groundwater flow direction, distance to subject site, and due lack of supporting evidence that the environment was negatively impacted.	-	-
Gasoline and Associated Products Storage in Fixed Tanks	28	5943 Hazledean Road	110 metres northeast	Three 50,000 litre double walled fiberglass liquid fuel tanks were installed in 2016.	No	Based on anticipated groundwater flow direction, distance to subject site, and due to double walled fiberglass tank being installed.	-	-
Gasoline and Associated Products Storage in Fixed Tanks	28	5938 Hazledean Road	180 metres northeast	Five fuel storage tanks were present on site for use in the gasoline service station. Tanks contained gasoline, diesel and propane. Exact location of tanks on the property is unknown.	No	Based on anticipated groundwater flow direction and distance to subject site.	-	-

Type of PCA	PCA #	Address / Location	Distance from Subject Property	Description	PCA Resulted in APEC / No APEC	Rationale	Material of Concern	Contaminants of Concern
Waste Disposal and Waste Management, including thermal treatment, landfilling and transfer of waste, other than use of biosolids as soil conditioners.	58	5938 Hazledean Road	180 metres northeast	Identified in the Ontario waste generators database as a waste collection location in 2012.	No	Based on anticipated groundwater flow direction and distance to subject site.	-	-
Gasoline and Associated Products Storage in Fixed Tanks	28	5977 Hazledean Road	45 metres north	Listed as producing paint/pigment/coating residues, petroleum distillate wastes, and waste oils & lubricants from 1992 to 2001 and 2003 to 2006.	No	Based on anticipated groundwater flow direction and lack of supporting evidence that the environment was negatively impacted.	-	-
Foam and Expanded Foam Manufacturing and Processing	26	5977 Hazledean Road	45 metres north	A record indicated urethane and other foam product manufacturing, and polystyrene foam product manufacturing in 1953.	No	Based on anticipated groundwater flow direction.	-	-
Plastics Manufacturing	43	5977 Hazledean Road	45 metres north	A record indicated all other plastic product manufacturing,	No	Based on anticipated groundwater flow direction.	-	-

Type of PCA	PCA #	Address / Location	Distance from Subject Property	Description	PCA Resulted in APEC / No APEC	Rationale	Material of Concern	Contaminants of Concern
and Processing				showcase, partition, shelving and locker manufacturing in 1953.				
Electronic and Computer Equipment Manufacturing	19	5977 Hazledean Road	45 metres north	Records indicated communication and energy wire and cable manufacturing, and wiring device manufacturing.	No	Based on anticipated groundwater flow direction.	-	-
Pulp, Paper and Paperboard Manufacturing and Processing	45	5977 Hazledean Road	45 metres north	A record indicated newsprint mills, and converted paper product manufacturing.	No	Based on anticipated groundwater flow direction.	-	-
Metal Fabrication	34	5977 Hazledean Road	45 metres north	Records indicated miscellaneous fabricated metal product manufacturing, and communication and energy wire and cable manufacturing in 1997.	No	Based on anticipated groundwater flow direction.	-	-
Gasoline and Associated Products Storage in Fixed Tanks	28	5933 Hazledean Road	230 metres northeast	Listed as producing aromatic solvent wastes from 1995 to 1998.	No	Based on anticipated groundwater flow direction and distance to subject site.	-	-

Type of PCA	PCA #	Address / Location	Distance from Subject Property	Description	PCA Resulted in APEC / No APEC	Rationale	Material of Concern	Contaminants of Concern
Gasoline and Associated Products Storage in Fixed Tanks	28	Lot 25, Concession 12	50 metres + north	A CA was approved in 1993 for industrial air including a 30KW diesel generator, identified contaminants were nitrogen oxides.	No	Based on anticipated groundwater flow direction.	-	-
Gasoline and Associated Products Storage in Fixed Tanks	58	Lot 25 Concession 11	adjacent to 250+ metres	Records identified a historic landfill at Lot 25 Concession 11.	No	Based on anticipated groundwater flow direction.	-	-

Figure 9.3 illustrates the location of on-site and off-site PCAs and the five APECs identified on the site from the Phase One ESA.

4.3.5 Subsurface Structures and Utilities

Buildings in the study area are fully serviced with hydro, water, natural gas, sanitary and storm sewers. Sewers were observed in the streets adjacent to the subject property. Structures in the study area are connected to overhead hydro and had natural gas hookups on the exterior of their homes. There is potential for underground utilities to affect contaminant transport on or to the subject property.

4.3.6 Uncertainty

There is uncertainty associated with the exact historical location of the AST and fill pipes on the subject site, as no records were available regarding the tank. There is also uncertainty associated with historical waste management practices at both on and off site locations.

4.4 Impediments and Deviations from Sampling and Analysis Plan

Physical impediments were present on the subject resulting in access limitations due to a septic system still in use in the southern portion of 5992 Hazeldean Road. Utilities, specifically a gas line along the west property boundary of 5992 Hazeldean Road also limited the drilling opportunities near APEC 3.

Additionally, due to the shallow bedrock at the subject site, there were significant limitations in the available soil samples for analytical analysis for all APECs.

5.0 INVESTIGATION METHOD

5.1 General

Prior to any intrusive investigations at the site, underground utility locates were completed. USL of Ottawa, Ontario, was contracted to identify the location of all underground buried utilities at the site. Utilities including telephone, gas, hydro, municipal services and private utilities were cleared through these services.

Shallow borehole drilling and soil sampling was completed between 0.0 and 1.0 mbgs using a truck-mounted drill rig. Boreholes were advanced through the overburden using a 203.2mm hollow stem auger, while advancing a 50mm diameter split-spoon at 0.6m intervals.

Soil samples were collected by split-spoon soil sampler. Soil samples were logged for stratigraphy, moisture and visual/olfactory evidence of contamination. In addition, soil samples were collected in air tight bags and screened in the field using a photoionization detector (PID). Bedrock core was logged for lithology, fracture frequency, rock quality designation, and for visual/olfactory evidence of contamination on fracture surfaces. Three of the four boreholes were completed as monitoring wells instrumented with 2" PVC risers, and well screens with 3.05m screen intervals.

All new monitoring wells were sampled for groundwater quality in July 2019. Prior to groundwater sampling each monitoring well developed by removing five well volumes several days in advance of to low-flow sampling to ensure that samples were representative of formation conditions. Well development activities were performed using dedicated Waterra inertial hand pumps with purge water being containerized for proper offsite disposal.

Groundwater samples were collected using peristaltic pump and dedicated sampling tubing following low-flow parameter stabilization techniques. Samples were collected directly into laboratory supplies sample containers and released to laboratory under chain-of-custody procedures. Samples were collected for analysis of metals, inorganics, PHC/BTEX, and VOCs. Metal samples were field filtered using in-line disposable filters.

Field quality control measured used during the Phase Two ESA consisted of the collection of one field duplicated sample for PHCs in soil and one field duplicate for metals, PHCs and BTEX analysis in groundwater. Additionally, relative percent difference (RPD) values for comparison of samples to corresponding field duplicates were calculated and compared to MECP quality requirements. In addition to the duplicate samples, one laboratory prepared groundwater trip blank and one groundwater field blank were completed and analyzed for VOCs/BTEX.

Residual wastes generated during drilling activities, such as contaminated soil cuttings and wash water, was contained and sealed on site in approved waste containers.

5.2 Drilling

Four boreholes, including three monitoring wells were advanced at the site to assess the soil and groundwater conditions in accordance with the sampling plan described in the Drilling Program from the Phase Two ESA Sampling and Analysis Plan. All boreholes were completed by George Downing Estate Drilling Ltd. All drilling was completed using hollow-stem auger, split-spoon techniques and coring methods. Monitoring wells were installed at three of the boreholes. The installed boreholes/monitoring wells are illustrated on Figure 9.2.

The boreholes were advanced using a truck-mounted drill rig supplied and operated by George Downing Estate Drilling Ltd. of Grenville-sur-la-Rouge, Quebec. Standard penetration testing was carried out in the boreholes using drive open sampling equipment. Bedrock coring was carried out with coring equipment. Prior to drilling, GEMTEC retained the services of an underground services locating company to coordinate clearance of the public and private buried utilities at the borehole locations.

The field work for the borehole investigation was carried out on July 22, 2019. During that time, four boreholes, numbered 19-1 to 19-4, were advanced at the site using both hollow stem auger and rotary diamond drilling techniques, supplied and operated by George Downing Estate Drilling Ltd. of Grenville-sur-la-Rouge, Quebec.

Auger and split spoon samples were obtained where possible within the overburden deposits. The underlying bedrock was cored in boreholes 19-1, 19-2 and 19-4 using N size rotary diamond drilling equipment to identify the type and quality of the bedrock. Well screens were sealed in the bedrock at boreholes 19-1, 19-2 and 19-4.

The boreholes were advanced to a maximum depth of between 1.0 and 8.4 mbgs, terminated within the bedrock and three environmental wells were instrumented with a monitoring well to intercept the groundwater. Monitoring well installation was completed using a 50-mm diameter, 3.05 metre, flush-threaded PVC screen and risers with a silica sand pack and bentonite seal.

Solid stem augers were used to drill through the asphalt surface (approximately 0.1m) prior to the beginning of continuous split spoon soil sampling. Following the collection of each soil sample, the remaining soil was containerized and each split spoon was cleaned.

Upon refusal on bedrock, casing was advanced and seated into the bedrock surface, and drill water control measures were implemented. Bedrock was continuously cored using coring equipment, producing a 96mm diameter borehole and 63mm diameter core. Recovered core was photographed and logged for visual and olfactory evidence of coal tar contamination.

If visual or olfactory evidence contamination was noted during the advancement of a particular borehole than all drilling equipment, including auger flights, split spoons, and drill rods used for

coring were decontaminated using a steam pressure washer prior to re-use at the next borehole location.

5.3 Soil Sampling

All soil samples were collected via a 50mm diameter split-spoon. Samples were split, with a portion transferred immediately into laboratory supplied containers, and placed in a cooler. The remainder of the split soils were placed in a re-sealable bag to allow for field screening.

Soil samples are identified as BH/MWX-Y where X indicates the year the borehole was constructed and Y is the borehole identifier. For example, BH/MW19-2 indicates the borehole was constructed in 2019 and is identified as borehole number two.

Boreholes 19-1, 19-2 and 19-3 encountered a layer of asphaltic concrete and an underlying layer of base/subbase material. Base/subbase material was encountered at ground surface in borehole 19-4. The base/subbase material can generally be described as grey, crushed sand and gravel, with trace to some silt.

Boreholes 19-3 and 19-4 contained fill material below the existing pavement. The fill material can generally be described as dark brown clayey silt with some gravel and trace sand in borehole 19-3 and dark brown clayey sandy silt with some gravel in borehole 19-4. Bedrock was encountered in boreholes 19-1, 19-2 and 19-4. The bedrock can generally be described as grey, faintly to slightly weathered, very poor to good quality, limestone bedrock.

Borehole stratigraphic logs are included in Appendix B, and borehole locations are shown on Figure 9.2.

In addition to the soil samples taken with the split spoon, three soil grab samples were taken using a hand shovel, and auger. The samples were taken on the west side of the subject property, adjacent to the existing building. These samples were labelled as G SA 19-1a, G SA 19-1b, and G SA 19-2. These samples were submitted to Paracel Laboratories Ltd., and analysed for PAH, metals, pH, EC, SAR, and BTEX.

Clean gloves were worn and changed between each sample and the split barrel sampler was washed and rinsed between each sampling event. Soil samples were inspected in the field for visual, tactile and olfactory evidence of impact.

5.4 Field Screening Measurements

Soil samples were screened in the field using an Eagle Series Portable Multi-Gas Detector device for field screening of volatile organic compounds. Field screening reading for the PID were collected by sampling the soil vapours in the headspace of the re-sealable plastic sample bags, after allowing sample temperatures to rise above freezing temperature.

The multi-gas detector was calibrated prior to use with isobutylene calibration gas and checked against background air conditions for accuracy. The recorded factory precision for this instrument is +/- 2% of the calibration gas value. The instrument's operation resolution is 0.1 parts per million at values between 0 to 999.9 ppm and 1 ppm for values between 1,000 and 15,000.

5.5 Groundwater Monitoring Well Installation

Monitoring wells were installed in three of the four boreholes and were completed in conjunction with the borehole drilling to determine static groundwater elevation, subsurface hydraulic properties, and to permit the collection of groundwater samples for geochemical analysis. Monitoring wells were installed by George Downing Estate Drilling Ltd, a MECP-licensed well driller. Monitoring wells were installed by hand, lowering PVC components through the surface drill casing. Wells were labelled sequentially as MW19-1, MW19-2, and MW19-4, following the same numbering as the boreholes.

Installation of all the monitoring wells were completed using a 50-mm diameter, 3.05 metre length, flush-threaded PVC screen and risers with a silica sand pack and bentonite seal. Each monitoring well was finished at surface with flush-mount protective casings. Silica sand was placed around the screened intervals and bentonite hole plug was used to seal the borehole to ground surface. Monitoring well instrumentation details are included on the borehole stratigraphic logs in Appendix B. Monitoring well instrumentation was completed by George Downing Estate Drilling Ltd., under the direct supervision of GEMTEC personnel.

Development of monitoring wells took place concurrently with monitoring well purging activities prior to groundwater sampling, and is discussed in greater detail in Section 5.1.

5.6 Groundwater Elevation Monitoring

On July 31, 2019, groundwater elevations were recorded in all newly installed monitoring wells to determine static groundwater elevations on site. Static groundwater levels were measured relative to Top of PVC Riser (TOPVC) using an electronic water level tape (Heron Instruments water meter). The water level meter probe was decontaminated between wells with soapy water (water andalconox solution) and deionised water. Static groundwater levels were recorded to the nearest 0.01m. Top of PVC riser elevations were surveyed into a geodetic elevation on July 25, 2019.

5.7 Groundwater Sampling

Groundwater samples were collected using peristaltic pump and dedicated sampling tubing following low-flow parameter stabilization techniques ensuring that the sampled groundwater is representative of formation conditions and not monitoring well conditions and in the process.

Groundwater samples were collected from monitoring wells using dedicated polyethylene tubing with a peristaltic pump. Groundwater samples were collected from MW 19-1, MW 19-2, and MW

19-4 using a peristaltic pump with tubing lowered to a depth of approximately the mid-point of the well screen.

Groundwater samples were collected from the monitoring wells in laboratory supplied bottles. The groundwater samples were collected, stored in dedicated coolers and then submitted to Paracel Laboratories Ltd., a CALA accredited laboratory for analyses.

Groundwater samples were collected for analysis of metals, PAHs, PHC/BTEX, and VOCs. Samples collected in the field for laboratory analysis of dissolved metals were field-filtered using dedicated in-line Waterra 0.45µm filters.

One laboratory prepared groundwater trip blank and one groundwater field blank were completed and analyzed for VOCs/BTEX. A duplicate groundwater sample was submitted to Paracel Laboratories Ltd. for analysis of selected parameters at a minimum rate of one field duplicate per 10 samples collected. The field duplicate samples will be assessed by calculating the relative percent difference and comparing the average of the analytical testing group to the scientific acceptance criteria.

5.8 Analytical Testing

Soil and groundwater samples collected for metals/inorganics, PAHs, PHC/BTEX, and VOC analysis were collected directly into laboratory-supplied sampling containers. All samples were stored and shipped in coolers with ice packs. Samples were submitted to Paracel Laboratories Ltd., of Ottawa, Ontario, a CALA-certified analytical laboratory, under standard chain-of-custody procedures and in accordance with GEMTEC QA/QC procedures. Complete laboratory analytical reports for 2019 analyses are included in Appendix C.

5.9 Residue Management Procedures

Residues produced as a by-product of the Phase Two ESA investigations were comprised of soil cuttings, groundwater, drill return water, wash water associated with the cleaning of drilling and sampling equipment and monitoring well development and purge water.

All residual media were containerized on-site and will be chemically characterised prior to proper off site disposal.

5.10 Elevation Surveying

The borehole locations were selected by GEMTEC Consulting Engineers and Scientists Limited personnel, and were constrained by accessibility and underground service locations. The ground surface elevations at the location of the boreholes (ground surface) and monitoring wells (with elevations from the PVC risers) were determined using a Trimble R10 global positioning system. The coordinates of the boreholes are referenced to NAD83 (CSRS) Epoch 2010, vertical network CGVD28 and are considered to be accurate within the tolerance of the instrument.

5.11 Quality Assurance and Quality Control Measures

Soil and groundwater samples collected for metals/inorganics, PAH, PHC/BTEX, VOC analysis were collected directly into laboratory-supplied sampling containers. All samples were stored and shipped in coolers. Samples were submitted to Paracel Laboratories Ltd., under standard chain-of-custody procedures and in accordance with GEMTEC QA/QC procedures.

Equipment cleaning procedures for soil sampling consisted of manual cleaning of both split spoons and auger flights. Following each split spoon sample all loose soils were removed from the spoons by heavy brush. Following the removal of loose soils, split spoons were washed prior to a final tap water rinse. If visual or olfactory evidence of contamination was noted during the advancement of a particular borehole, all drilling equipment including auger flights and split spoons were decontaminated with a steam cleaning pressure washer prior to use at the next borehole.

Prior to groundwater sampling, static groundwater levels were determined using an electronic water level tape. To ensure no cross contamination between wells, the water level meter probe was decontaminated between wells with soapy water (water andalconox solution) and then rinsed with deionised water. During the process of groundwater sampling, a multiparameter unit, Horiba U-52, was used to determine field parameters of the groundwater. To ensure no cross contamination, the unit probes as well as flow cell was triple rinsed with deionised water between each monitoring well.

Due to the dedicated nature of all monitoring well instrumentation (Waterra inertial hand pump, ¼-inch and ¾-inch tubing) no decontamination procedures were required during groundwater sampling. All required lengths of tubing for the groundwater sampling (both ¼-inch and ¾-inch tubing) were disposed of after usage at each designated well. New tubing (both ¼-inch and ¾-inch) was used for groundwater sampling at each well. Standard field protocols were strictly adhered to in effort to prevent the contamination of sampling equipment (peristaltic pump) during the groundwater sampling program.

Field quality control measures employed during the Phase Two ESA investigations consisted of the collection of field duplicate QA/QC sample for metals & inorganics, PAHs, BTEX, and VOCs, in groundwater. Duplicate soil and groundwater samples were submitted to Paracel Laboratories Ltd. for analysis of selected parameters at a minimum rate of one field duplicate per 10 samples collected. The field duplicate samples will be assessed by calculating the relative percent difference and comparing the average of the analytical testing group to the scientific acceptance criteria. In addition to the duplicate samples, one laboratory prepared groundwater trip blank and one groundwater field blank were completed and analyzed for VOCs/BTEX.

6.0 REVIEW AND EVALUATION

6.1 Geology and Hydrogeology

The geology at the site can be generally described as 0.75 m of granular subbase material underlain by a thin, discontinuous layer of clayey silt with some gravel and trace sand overlying fractured limestone bedrock of the Bobcaygon formation.

Soil and groundwater conditions logged in the boreholes are given on the Record of Borehole sheets in Appendix B. A summary of the stratigraphic units can be found in Table 6.1.

Table 6.1: Stratigraphic Units

Stratigraphic Unit	Description	Average Thickness (metres)	Top Elevation	Bottom Elevation
Fill	Dark brown clayey silt, some gravel, trace sand	0.19	117.47	117.05
Bedrock	Grey, faintly to slightly weathered limestone	7.32	117.40	< 109.25

The water table at the site is generally found within the bedrock unit, within the upper 4 metres, at depths between 4.8 and 5.8 mBGS. Groundwater monitoring wells were installed specifically to target the groundwater quality in the shallowest aquifer present beneath the site. No aquitard, perched aquifers or confined aquifers were identified during the 2019 investigations. Groundwater flow is discussed in further detail below.

Figure 9.6 and Figure 9.7 in Section 9 provide north-south and east-west cross sections illustrating the stratigraphy of the site.

6.2 Groundwater Elevations and Flow Direction

Groundwater elevations presented below were calculated based on depth to groundwater measurements collected on July 31, 2019. As free-phase product was not anticipated to occur in groundwater at the site, a interface probe was not employed during groundwater elevation surveys.

Groundwater depths were measured directly from the top of each monitoring well rise using an electronic contact water level tape. Depth measurements were converted to groundwater elevations by subtracting the measured depth from the elevation of the top of each monitoring well riser. Elevations of monitoring well risers were established following the elevation survey discussed in Section 5.10.

Table 6.2: Groundwater Levels

Borehole	Material	Groundwater elevation (m) July 31, 2019	Groundwater depth (m) July 31, 2019
19-1	Bedrock	112.9	4.8
19-2	Bedrock	112.4	5.2
19-4	Bedrock	112.2	5.8

Based on the groundwater elevations presented in Table 6.2 above and on Figure 9.4 in Section 9, groundwater flow direction within the shallow bedrock beneath the site is primarily directed in a south-southwest direction, mirroring the local topography.

6.3 Groundwater Hydraulic Gradients

The horizontal hydraulic gradients, calculated based on the following monitoring well pairs, are summarized below:

- BH19-1 to BH19-2 = 0.021 m/m
- BH19-1 to BH19-4 = 0.017 m/m
- BH19-2 to BH19-4 = 0.008 m/m

The average horizontal hydraulic gradient is approximately 0.015 m/m. It should be noted that vertical hydraulic gradients were not evaluated for the site as only one water bearing unit was encountered at the depths investigated at the site.

6.4 Soil Field Screening

Soil vapours were screened for six soil samples following a period of equilibration to ambient temperature, using a combustible gas detector (RKI Eagle combustible gas detector calibrated to hexane standards, with methane elimination enabled). Combustible headspace soil vapour readings ranged from 10 ppm and 35 ppm.

Field screening results are provided with the borehole logs in Appendix B.

6.5 Soil Quality

Soil samples were selected for analytical analysis based on the combustible headspace gas readings, visual, olfactory and tactile evidence of impact, fill material as well as the proximity to the groundwater table. A total of seven soil samples (including one duplicate) were submitted to Paracel Laboratories, a CALA accredited laboratory, for analysis of selected parameters.

The soil samples submitted for analyses and the selected parameters are summarized in Table 6.3:

Table 6.3: Summary of Soil Samples

Sample ID	UMT Coordinates		Sample Depth (mBGS)	Sample Collection Date	Analysis
BH 19-2 SA2	5013879	427477	0.76 - 0.94	22/07/2019	VOCs, PHCs, metals, EC, and SAR
BH 19-2	5013879	427477	0.76 - 0.94	22/07/2019	Sodium, Chloride, EC, and SAR
BH 19-4 SA1 Bot	5013856	427486	0.00 - 0.58	23/07/2019	VOCs, PHCs, metals, EC, and SAR
G SA 19-1a	-	-	0.00 - 0.30	29/07/2019	PAHs, metals, pH, EC, and SAR
G SA 19-1b	-	-	0.30 - 1.02	29/07/2019	Metals, pH, EC, SAR, PHCs, and BTEX
G SA 19-2	-	-	0.00 - 0.61	29/07/2019	PAHs, metals, pH, EC, and SAR

Analytical results for the soil samples submitted for analyses and the selected MECP Table 6 SCS are presented in Tables 9.3 through 9.8 in Section 9. Laboratory Certificates of Analysis for the soil samples are provided in Appendix C. Soil samples met the applicable MECP Table 6 SCS for all parameters analyzed.

6.6 Groundwater Quality

Well screens were installed in the overburden the three boreholes (MW19-1, MW19-2, and MW19-4), to measure the depth to groundwater and to facilitate groundwater sampling.

Groundwater samples were collected from the monitoring wells in laboratory supplied bottles using a peristaltic pump with disposable tubing. A total of four groundwater samples (including one duplicate) were submitted to Paracel Laboratories for analysis of selected parameters. The groundwater samples submitted for analyses of selected parameters is summarized in Table 6.4 - a more detailed description can be found in Table 9.9, in Section 9.

Table 6.4: Groundwater Sample Analyses

Sample ID	UMT Coordinates		Stratigraphic Unit	Screened Interval (mASL)	Analysis
	Easting	Northing			
MW 19-1	5013898	427492	Bedrock	109.25 - 112.30	PHCs, VOCs, metals & inorganics
MW 19-2	5013879	427477	Bedrock	109.53 - 112.58	PHCs, VOCs, metals & inorganics
MW 19-4	5013856	427486	Bedrock	109.90 - 112.95	PHCs, VOCs, metals & inorganics

Analytical results for the groundwater samples submitted for analyses and the selected MECP Table 6 SCS are presented in Tables 9.9 through 9.13 in Section 9. Laboratory Certificates of Analysis for the soil samples are provided in Appendix C. Groundwater samples met the applicable MECP Table 6 SCS for all parameters analyzed with the exception of chloride and sodium at MW 19-2. Groundwater exceedances are illustrated on Figure 9.5.

6.7 Quality Assurance and Quality Control Results

A quality assurance/quality control (QA/QC) program was implemented during the Phase Two ESA field investigations as described in Section 5.11. The QA/QC program consisted of the use of standard field protocols. The QA/QC program also included internal laboratory QC performed by Paracel Laboratories of Ottawa, Ontario.

The GEMTEC QA/QC program consisted of standard sampling protocols and the collection and submission of blind field duplicate soil and groundwater samples. Blind duplicate samples were collected at a frequency of one in ten samples. Duplicate sample results are presented in the summary analytical tables in Section 9. One duplicate samples were collected, for groundwater.

Laboratory analyses were completed by Paracel Laboratories, a CALA-certified laboratory. Paracel completed all analyses in accordance with internal laboratory QC programs that include referenceable standardized analytical methods and procedures, in accordance with O.Reg 153/04. Quality Assurance Reports were provided by Paracel for all completed analyses. These certificates summarize the laboratory results for laboratory QA/QC samples including matrix spikes, spiked blanks, method blanks and relative percent difference (RPD). Complete laboratory analytical reports are provided in Appendix C.

Laboratory quality assurance reports noted the following remarks or qualifications for soil analysis:

- GC-FID signal did not return to baseline by C50 for PHC f4 at BH 19-2 SA2;
- The spike recovery was outside acceptance limits for the MS and/or MSD. The batch was accepted based on other acceptable QC; and,
- Spike level outside of control limits. Analysis batch accepted based on other QC included in the batch.

Laboratory quality assurance reports noted the following remarks or qualifications for groundwater:

- The surrogate recovery for this sample is outside of established control limits due to a sample matrix effect at MW 19-2;
- The spike recovery was outside acceptance limits for the MS and/or MSD. The batch was accepted based on other acceptable QC;

- Spike level outside of control limits. Analysis batch accepted based on other QC included in the batch; and,
- Surrogate recovery outside of control limits. The data was accepted based on valid recovery of the remaining surrogate.

GEMTECs review of Paracels QA/QC certificates indicates that analytical results fell within acceptable QA/QC limits for constituent recovery as defined by the protocols for the analytical methods for almost all parameters analyzed.

GEMTECs QA/QC plan included submission one groundwater duplicate, in order to determine the precision of the analytical methods and field sampling procedures. Duplicate samples and their corresponding original sample are as follows;

- Groundwater – MW19-1 and duplicate sample MW19-101 submitted for metals, PHCs, VOCs, EC, and SAR.

Precision is determined by the relative percent difference (RPD) between the set of duplicate samples and was calculated as follows:

$$RPD = \frac{(x1 - x2)}{\left(\frac{x1 + x2}{2}\right)} \times 100$$

Where: X1 is the concentration of the original sample

X2 is the concentration of the duplicate sample

X3 is the average concentration of the original and duplicate sample

RPD values for homogeneous samples are generally considered acceptable in laboratory QC if they are less than 30%. As well, because the uncertainty associated with a value increases dramatically as the result approaches the MDL, the MOE recommends using a duplicate result in RPD calculations only if the average of the two duplicates is greater than five times the MDL (5x MDL) (MOE, 2004).

RPD values were calculated using the equation provided for all duplicate parameters sampled, including all values, even if the average was within 5x the MDL. Using this conservative approach, the calculated average RPD value for metals in soil, and groundwater were 7.1%, and 2.2% respectively, and inorganics in soil and groundwater were 4.4%, and 7.1% respectively. As the concentrations of duplicate samples were comparable to respective original samples, including RPD values within MECP guidelines and confirmation that laboratory internal quality control results are acceptable, the laboratory data presented and summarized within this report are considered acceptable for use without qualification.

6.8 Phase Two Conceptual Site Model

6.8.1 Overview

The subject property consists of two separate municipal addresses (5986 and 5992 Hazeldean Road) bounded to the north by Hazledean Road, to the east by residential developments along Oyster Bay Crescent, to the south by Old Orchard Crescent, and to the west by Springbrook Drive, and has an area of approximately 0.35 hectares (0.87 acres).

The subject property was first developed sometime between 1947 and 1963. A structure is visible on the subject property in the 1963 aerial photograph but not in the photo from 1947. Additional development occurred on the subject site through 1991 at which time the site layout is the same as during site reconnaissance. Historical land use in the study area prior to 1963 was primarily agricultural with some undeveloped areas, followed by residential to the east and south and commercial development along Hazledean Road.

6.8.2 Proposed Development

Current development plans include demolishing an existing commercial structure on the west portion of the subject property and residential structure on the east portion of the subject property, followed by construction of a new three-storey, mixed-use, wood frame building along the west side of subject property, with a footprint of about 557 square metres.

6.8.3 Site Stratigraphy

Site stratigraphy at 5986-5992 Hazeldean Road, is generally 0.06 m of asphaltic concrete, underlain by 0.7 metres of grey crushed sand and gravel, some silt base material, 0.2 metres of dark brown clayey silt, some gravel, trace sand fill, and grey, faintly to slightly weathered limestone at an average depth of 0.9 metres. Table 6.5 summarizes the description, average thickness and ranges of top and bottom elevations of each stratigraphic unit present at the site.

Table 6.5: Stratigraphic Units

Stratigraphic Unit	Description	Average Thickness (metres)	Top Elevation	Bottom Elevation
Fill	Dark brown clayey silt, some gravel, trace sand	0.19	117.47	117.05
Bedrock	Grey, faintly to slightly weathered limestone	7.32	117.40	109.25

6.8.4 Approximate Depth to Water Table

Based on groundwater levels measured on July 31, 2019, the depth to the water table at the site ranges from 4.8 mBGS to 5.8 mBGS (elevations of 112.2m to 112.9m).

6.8.5 Hydrogeological Characteristics

The site is located within the Mississippi watershed, within the larger hydrogeological region known as Central Ottawa (MOE, 2003).

To date, three groundwater monitoring wells have been advanced at the site and are identified as, BH19-1, BH19-2, and BH19-4, as illustrated on Figure 9.2. Based on groundwater elevations obtained during the Phase Two ESA (Section 5.5 of this report) flow is interpreted to be directed to the northeast, as illustrated on Figure 9.4.

The horizontal hydraulic gradient, calculated based on the two monitoring well pairs, are summarized below:

- BH19-1 to BH19-2 = 0.021 m/m
- BH19-1 to BH19-4 = 0.017 m/m
- BH19-2 to BH19-4 = 0.008 m/m

The average horizontal hydraulic gradient is approximately 0.015 m/m. It should be noted that vertical hydraulic gradients were not evaluated for the site as only one water bearing unit was encountered at the depths investigated at the site.

6.8.6 Applicability of Section 41 and 43.1 of the Regulation

The site is not part of, adjacent to, or within 30 metres of an area of natural scientific interest. Furthermore, pH analytical results indicate that the soil pH values collected from surface soil from depths less than 1.5 mBGS were within the acceptable range of 5 to 9.

6.8.7 Potential Receptors

On-site human and ecological receptors considered during future site residential use include tenants (potentially including pregnant females and/or children), sub-surface workers and outdoor workers. Off-site human receptors considered during future site residential use include sub-surface workers and indoor workers.

Ecological receptors are represented by on-site and off-site valued urban ecological components such as mammals and birds, plants, and soil organisms.

6.8.8 PCAs and APECs

The potentially contaminant activities (PCAs) that created an area of potential environmental concern (APECs) on the subject property are summarized in the Table 6.6 below.

Table 6.6: Areas of Potential Environmental Concern

APEC #	PCA and Location	Location of APEC on Phase One Property	Contaminants of Potential Concern	Media Potentially Impacted
1	Gasoline and Associated Products Storage in Fixed Tanks at 5986 Hazeldean Road	Northern area of 5986 Hazeldean Road around and including the structure currently used by the Rental Village company	Metals & Inorganics PHCs VOCs	Soil Groundwater
2	Gasoline and Associated Products Storage in Fixed Tanks at 5992 Hazeldean Road	From the southern wall of the garage structure at 5992 Hazeldean Road to approximately 15 feet north in the down gradient direction.	Metals & Inorganics PHCs VOCs	Soil Groundwater
3	Gasoline and Associated Products Storage in Fixed Tanks at 5992 Hazeldean Road	West property boundary to along office building structure at 5992 Hazeldean Road	Metals & Inorganics PHCs VOCs	Soil
4	Fill of unknown origin on the subject site	West property boundary at 5992 Hazeldean Road	PAH Metals	Soil
5	Salt Manufacturing, Processing and Bulk Storage	In the parking areas around 5986-5992 Hazeldean Road	EC SAR Chloride Sulphate	Soil Groundwater

6.8.9 Environmental Conditions

Based on the findings of the Phase One and Phase Two ESA reports, the applicable Site Condition Standards for the future use of the site is *Table 6 Generic Site Condition Standards for Shallow Soils in a Potable Ground Water Condition, Course Textured Soils* (MOE, 2011a). Environmental conditions at the subject site, as part of the Phase Two CSM are illustrated in plan view on Figure 9.4 and in cross sections A-A' and B-B', Figures 9.6 and 9.7, respectively.

6.8.10 Soil Quality

Soil samples were selected for analytical analysis based on the combustible headspace gas readings, visual, olfactory and tactile evidence of impact, fill material as well as the proximity to the groundwater table. A total of six soil samples were submitted to Paracel Laboratories, a CALA accredited laboratory, for analysis of selected parameters. The soil samples submitted for analyses and the selected parameters are summarized in Table 6.7:

Table 6.7: Summary of Soil Samples

Sample ID	UMT Coordinates		Sample Depth (mBGS)	Sample Collection Date	Analysis
BH 19-2 SA2	5013879	427477	0.76 - 0.94	22/07/2019	VOCs, PHCs, metals, EC, and SAR
BH 19-2	5013879	427477	0.76 - 0.94	22/07/2019	Sodium, Chloride, EC, and SAR
BH 19-4 SA1 Bot	5013856	427486	0.00 - 0.58	23/07/2019	VOCs, PHCs, metals, EC, and SAR
G SA 19-1a	-	-	0.00 - 0.30	29/07/2019	PAHs, metals, pH, EC, and SAR
G SA 19-1b	-	-	0.30 - 1.02	29/07/2019	Metals, pH, EC, SAR, PHCs, and BTEX
G SA 19-2	-	-	0.00 - 0.61	29/07/2019	PAHs, metals, pH, EC, and SAR

Analytical results for the soil samples submitted for analyses and the selected MECP Table 6 SCS are presented in Tables 9.3 through 9.8 in Section 9. Laboratory Certificates of Analysis for the soil samples are provided in Appendix C. Soil samples met the applicable MECP Table 6 SCS for all parameters analyzed.

6.8.11 Groundwater Quality

Well screens were installed in the overburden the three boreholes (MW19-1, MW19-2, and MW 19-4), to measure the depth to groundwater and to facilitate groundwater sampling. The depth to the static groundwater table in each monitoring well was measured using a Heron Instruments oil/water interface meter.

Groundwater samples were collected from the monitoring wells in laboratory supplied bottles using a peristaltic pump with disposable tubing. A total of three groundwater samples were submitted to Paracel Laboratories for analysis of selected parameters. The groundwater samples submitted for analyses of selected parameters is summarized in Table 6.8 - a more detailed description can be found in Table 9.9, in Section 9 following the text of this report.

Table 6.8: Groundwater Sample Analyses

Sample ID	UMT Coordinates		Stratigraphic Unit	Screened Interval (mASL)	Analysis
	Easting	Northing			
MW 19-1	5013898	427492	Bedrock	109.25 - 112.30	PHCs, VOCs, metals & inorganics
MW 19-2	5013879	427477	Bedrock	109.53 - 112.58	PHCs, VOCs, metals & inorganics
MW 19-4	5013856	427486	Bedrock	109.90 - 112.95	PHCs, VOCs, metals & inorganics

Analytical results for the groundwater samples submitted for analyses and the selected MECP Table 6 SCS are presented in Tables 9.9 through 9.13 in Section 9. Laboratory Certificates of Analysis for the soil samples are provided in Appendix C. Groundwater samples met the applicable MECP Table 6 SCS for all parameters analyzed with the exception of chloride and sodium at MW 19-2.

6.8.12 Areas Where Contaminants Are Present

The results of the Phase Two indicate the presence of one area of groundwater contamination at the property at concentrations exceeding MECP Table 6 SCS. The area of groundwater contamination was east of the main rental facility along the asphaltic concrete pathway. The location of the area of groundwater contamination is shown in plan in Figure 9.5.

7.0 CONCLUSIONS

Based on a review of historical information, and completion of the Phase Two ESA investigations described herein, the following provides a summary of the conclusions regarding 5986 and 5992 Hazeldean Road, Ottawa.

The site consists of two separate municipal addresses (5986 and 5992 Hazeldean Road) located in the urban core of Stittsville, a suburb of Ottawa and has been subject to residential and commercial development since 1963, indicating several APECs on the site.

- APECs 1, 2 & 3 Gasoline and Associated Products Storage in Fixed Tanks at 5986-5992 Hazeldean Road;
- APEC 4: Fill of unknown origin on the subject site; and,
- APEC 5: Salt Manufacturing, Processing and Bulk Storage

The site is currently comprised of an office/ rental shop and attached vacant residential dwelling at 5986 Hazeldean Road, and the main office building used for an Accounting Firm, and a garage at 5992 Hazeldean Road, and has undergone no significant changes since 1991. Current development plans include demolishing an existing commercial structure on the west portion of the subject property (5992 Hazeldean Road) and residential structure on the east portion of the subject property (5986 Hazeldean Road), followed by construction of a new three-storey, mixed-use, wood frame building along the west side of subject property. An access roadway (fire route) and parking areas are also part of the proposed development. The development will involve the removal of shallow bedrock and overburden at the subject site.

The geology at the site can be generally described as 0.75 m of granular subbase material underlain by a thin, discontinuous layer of clayey silt with some gravel and trace sand overlying fractured limestone bedrock of the Bobcaygon formation. Based on the groundwater elevations presented in Table 6.2 above and on Figure 9.4 in Section 9, groundwater flow direction within the shallow bedrock beneath the site is primarily directed in a south-southwest direction, mirroring the local topography.

A total of seven soil samples and four groundwater samples (including one duplicate each for soil and groundwater) were selected based on the combustible headspace gas readings, visual, olfactory and tactile evidence of impacts and submitted to Paracel Laboratories for analysis of selected parameters. Parameters identified in the Phase One ESA (GEMTEC, 2019) for soil and groundwater at the site include metals and inorganics, PAHs, PHCs and BTEX, and VOCs.

Analytical results indicated that the site currently meets the applicable MECP Table 6 SCS for soil; however, due to exceedances of sodium and chloride at MW19-2, groundwater quality does not meet the applicable SCS.

Prior to obtaining a Record of Site Condition for the property, further assessment or remediation of groundwater impacts in the vicinity of MW19-2 will be required.

8.0 REFERENCES

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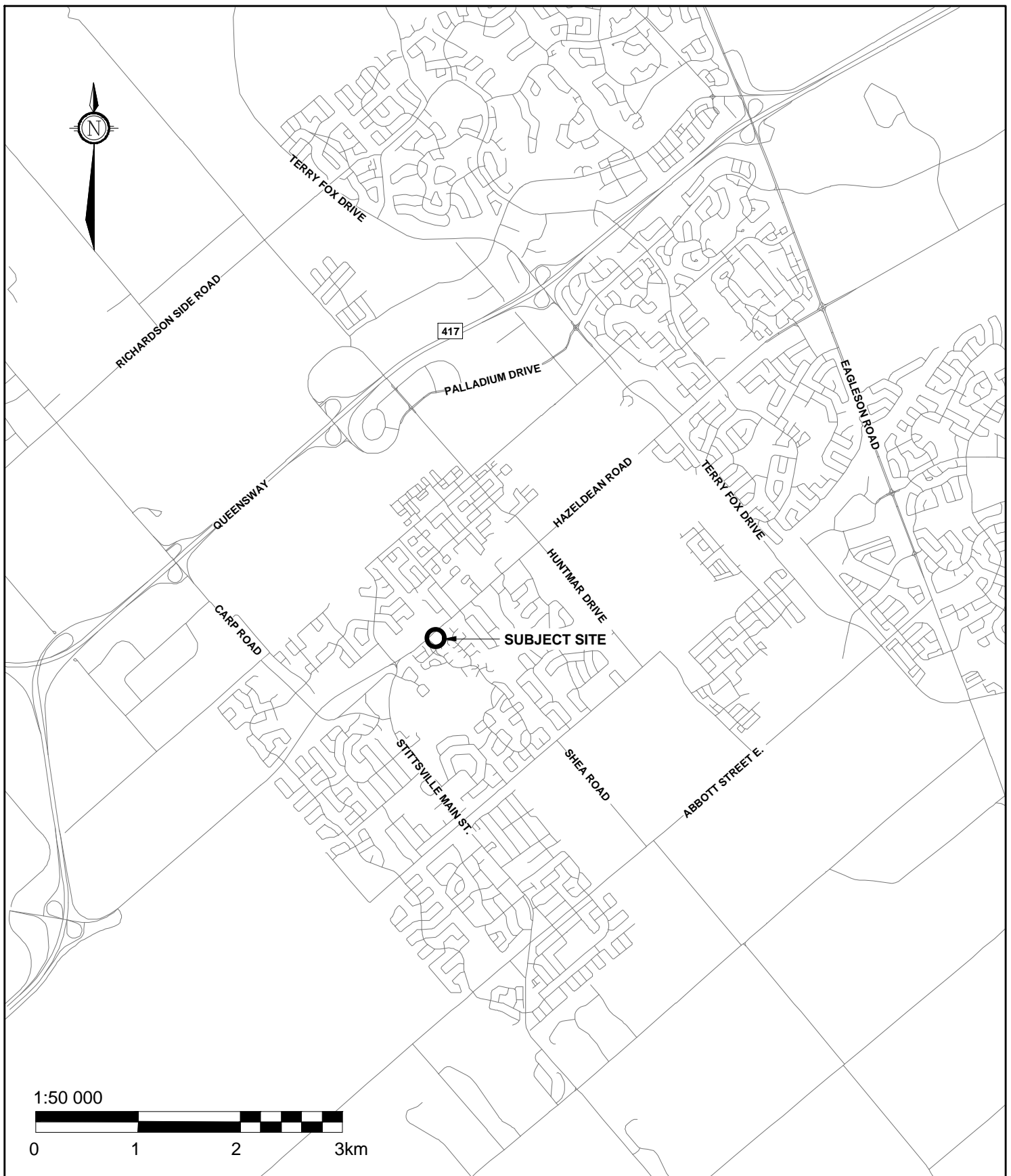
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9.0 FIGURES AND TABLES



GEMTEC

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Project PHASE TWO ESA/RECORD
OF SITE CONDITION
5986-5992 HAZELDEAN ROAD
OTTAWA, ONTARIO

Drwn By	Chkd By	Date
P.C.	N.S.	AUGUST 2019

Drawing

KEY PLAN

Project No.
61730.62

Revision No.
0

FIGURE 9.1



LEGEND

SUBJECT SITE



BH/TP # ← BOREHOLE/TEST PIT ID
XX.XX ← GROUND SURFACE ELEVATION, IN METRES
 GEODETIC DATUM



CROSS SECTION LOCATION IN PLAN
(current investigation by GEMTEC)

Scale 1:500

A horizontal scale bar with alternating black and white segments. Below the bar are numerical markers at 0, 10, 20, and 30m.



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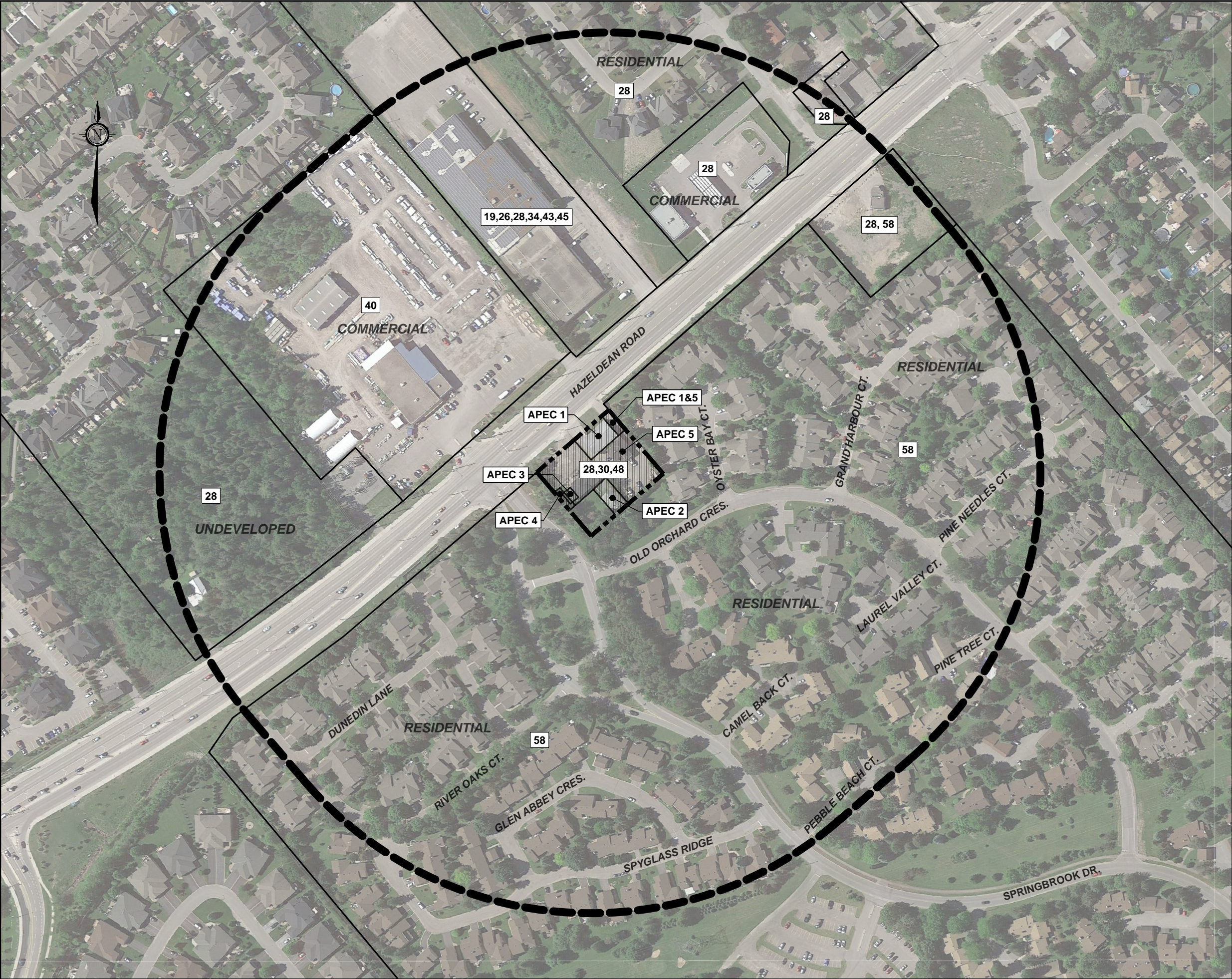
Drawing

SITE LAYOUT

Client	ARGUE CONSTRUCTION LTD.
--------	-------------------------

Project 61730.62		PHASE TWO ESA/RECORD OF SITE CONDITION 5986-5992 HAZELDEAN ROAD OTTAWA, ONTARIO
Drwn by P.C.	Chkd by N.S.	

Date	AUGUST 2019	Rev.	0	FIGURE 9.2
------	-------------	------	---	-------------------



LEGEND

----- SUBJECT SITE

----- 250 METRE BUFFER SHOWING EXTENT OF STUDY AREA

POTENTIALLY CONTAMINATING ACTIVITIES

19	ELECTRONIC AND COMPUTER EQUIPMENT MANUFACTURING
26	FOAM AND EXPANDED FOAM MANUFACTURING AND PROCESSING
28	GASOLINE ASSOCIATED PRODUCTS STORAGE IN FIXED TANKS
30	FILL MATERIAL OF UNKNOWN QUALITY
34	METAL FABRICATION
40	PESTICIDE MANUFACTURING, PROCESSING, BULK STORAGE, AND LARGE SCALE APPLICATIONS
43	PLASTICS MANUFACTURING AND PROCESSING
45	PULP, PAPER AND PAPERBOARD MANUFACTURING AND PROCESSING
48	SALT MANUFACTURING, PROCESSING AND BULK
58	WASTE DISPOSAL AND WASTE MANAGEMENT

----- AREAS OF POTENTIAL ENVIRONMENTAL CONCERN (APEC)

Scale 1:2500

0 50 100 150m

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Drawing

PHASE ONE CONCEPTUAL SITE MODEL

Client

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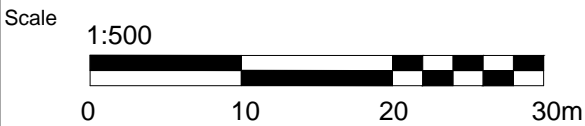
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Drwn by	P.C.	
Chkd by	N.S.	

Date	AUGUST 2019	Rev.	0	FIGURE 9.3
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LEGEND

- SUBJECT SITE
- BOREHOLE LOCATION IN PLAN
(current investigation by GEMTEC)
- BOREHOLE WITH MONITORING WELL
(current investigation by GEMTEC)
- TEST PIT LOCATION IN PLAN
(current investigation by GEMTEC)
- BH # (XX.XX) — BOREHOLE ID
GROUNDWATER ELEVATION, IN METRES
GEODETIC DATUM
- 113.00— GROUNDWATER ELEVATION (mASL)
July 31, 2019
- INTERPRETED GROUNDWATER
FLOW DIRECTION





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Drawing

GROUNDWATER
ELEVATIONS AND FLOW

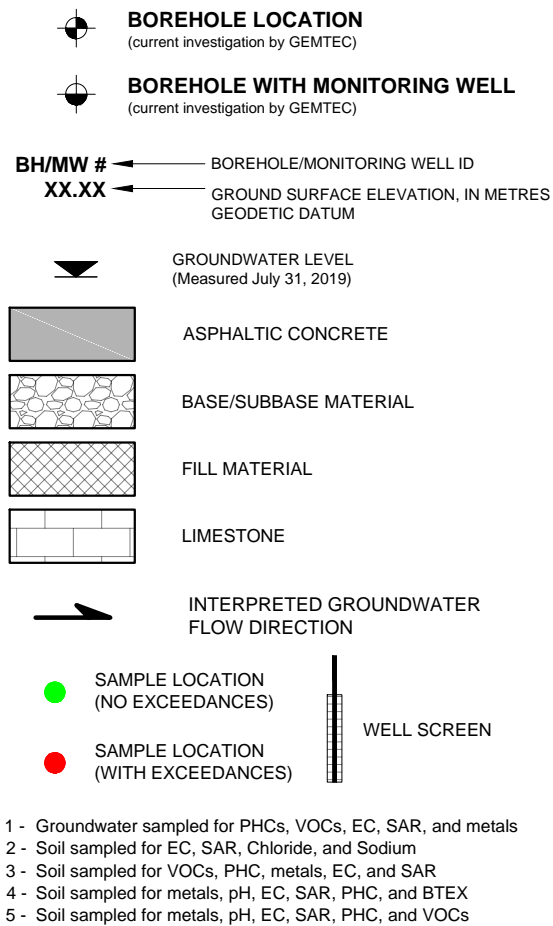
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ARGUE CONSTRUCTION LTD.

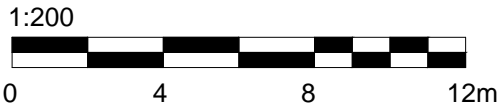
Project	61730.62	PHASE TWO ESA/RECORD OF SITE CONDITION 5986-5992 HAZELDEAN ROAD OTTAWA, ONTARIO
Drwn by	P.C.	
Chkd by	N.S.	

Date	AUGUST 2019	Rev.	0	FIGURE 9.4
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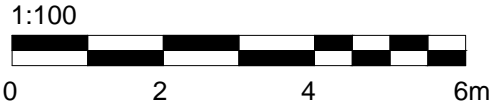
LEGEND



Horizontal Scale



Vertical Scale



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Drawing

CROSS SECTION A-A'
SOIL QUALITY EXCEEDANCES

Client

ARGUE CONSTRUCTION LTD.

Project

61730.62

Drwn by

P.C.

Chkd by

N.S.

PHASE TWO ESA/RECORD
OF SITE CONDITION
5986-5992 HAZELDEAN ROAD
OTTAWA, ONTARIO

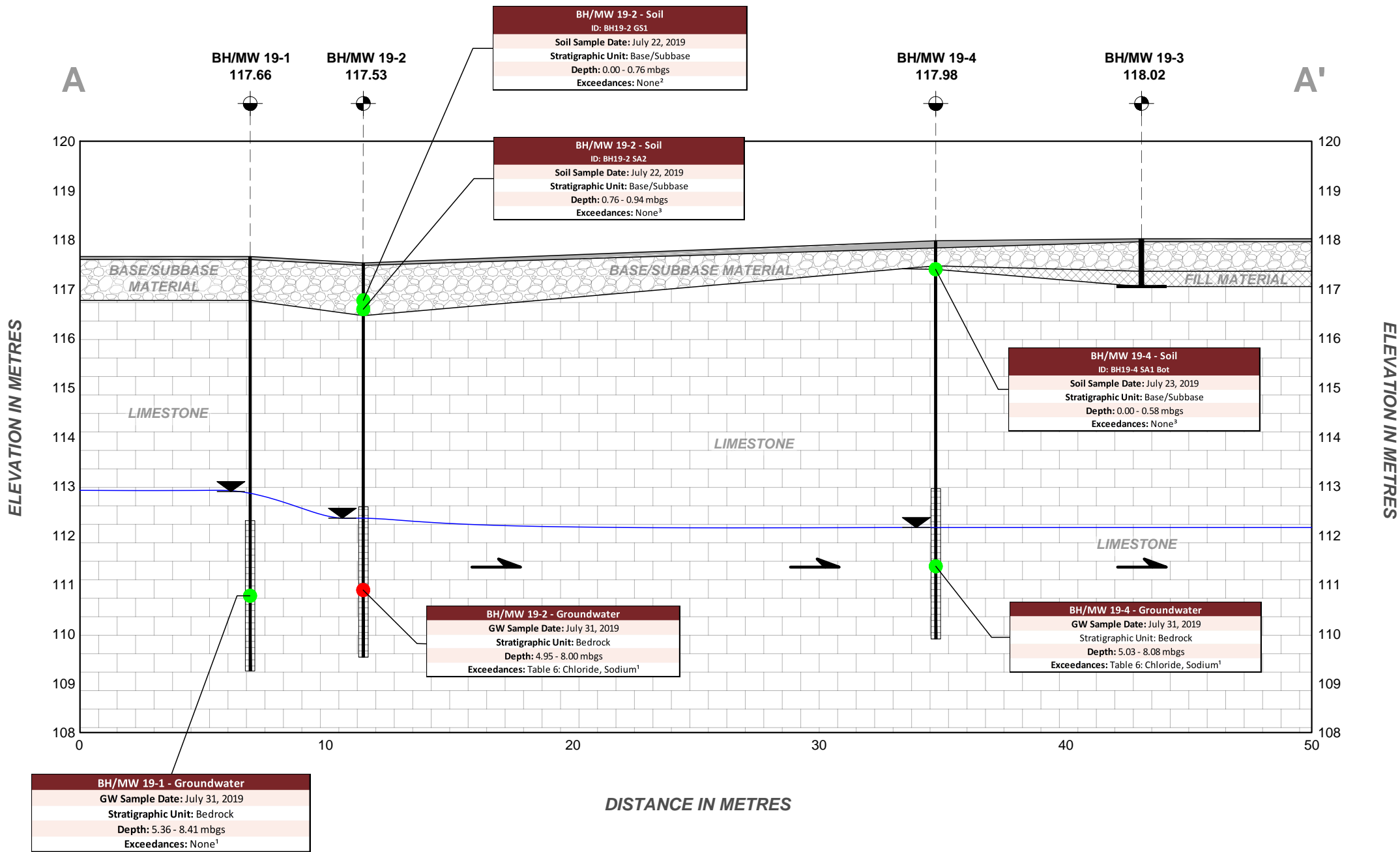
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AUGUST 2019

Rev.

0

FIGURE 9.6



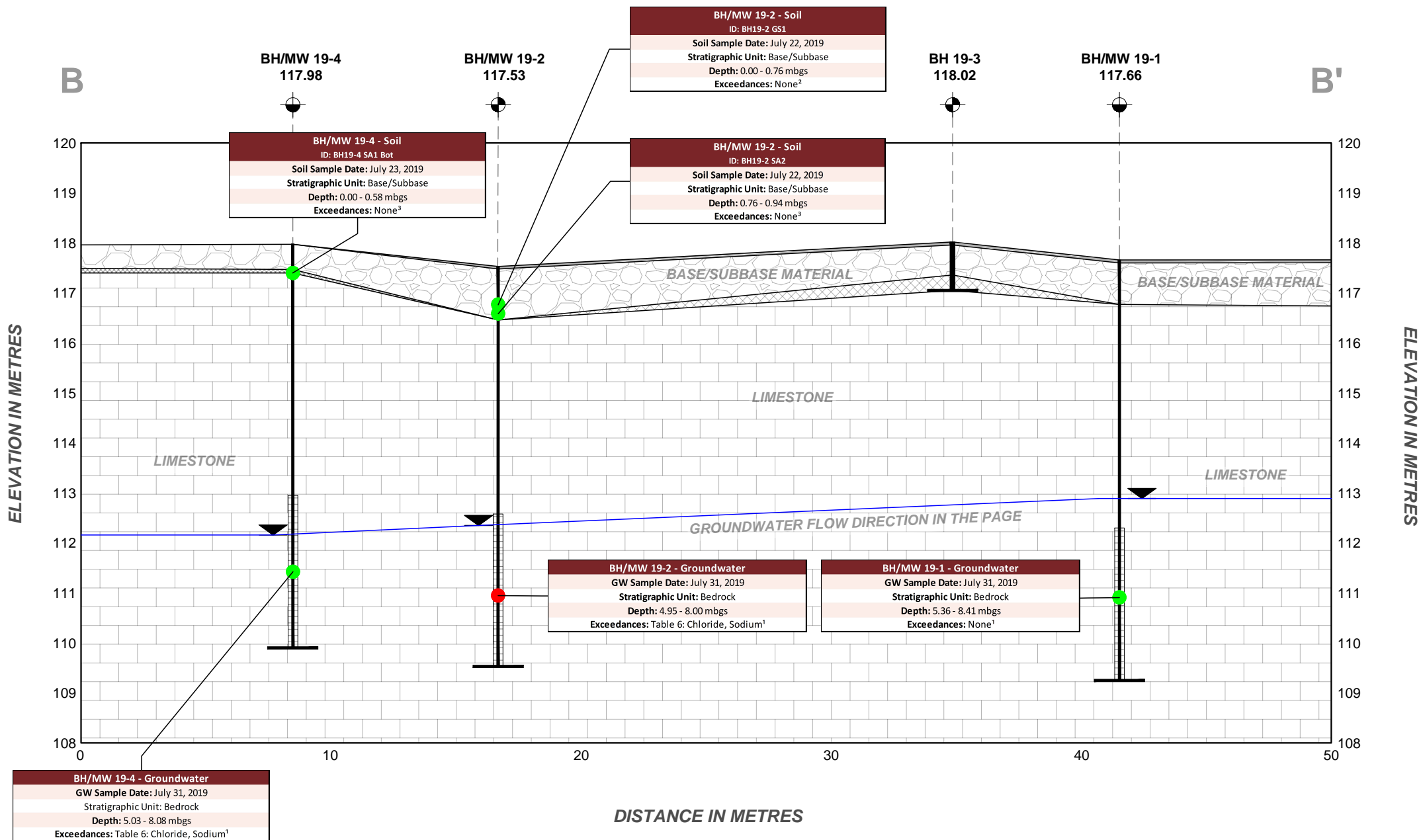


TABLE 9.1
Borehole and Monitoring Well Location and Completion Details

Monitoring Well ID	UMT Coordinates		Ground Surface Elevation (mASL)	Top of Riser Elevation (mASL)	Total Depth (m)	Depth (mASL)	Stratigraphic Unit	Screen Length (m)	Screened Interval (mASL)
	Easting	Northing							
MW 19-1	5013898	427492	117.66	117.59	8.41	109.25	Bedrock	3.05	109.25 - 112.30
MW 19-2	5013879	427477	117.53	117.44	8.00	109.53	Bedrock	3.05	109.53 - 112.58
BH 19-3	5013866	427511	118.02	-	0.97	117.05	Overburden	-	-
MW 19-4	5013856	427486	117.98	117.82	8.08	109.90	Bedrock	3.05	109.90 - 112.95

Notes:

1 mASL - Metres Above Sea Level

TABLE 9.2
Groundwater Elevations, 5986-5992 Hazeldean Road

Monitoring Well ID	Ground Surface Elevation (mASL)	Top of Riser Elevation (mASL)	31/07/2019	
			Water Level (mBGS)	Groundwater Elevation (mASL)
MW 19-1	117.66	117.59	4.77	112.89
MW 19-2	117.53	117.44	5.18	112.35
MW 19-4	117.98	117.82	5.82	112.16

Notes:

- 1 mBGS - Metres Below Ground Surface
- 2 mASL - Metres Above Sea Level

TABLE 9.3
Soil Sample Locations and Laboratory Analyses

Monitoring Well ID	Sample ID	Sample Depth (mBGS)	Sample Collection Date	Sample Analysis Date															Laboratory Report Number
				Boron	Chromium	Conductivity	Mercury	pH	PHC F1	PHC F4G	PHC F2 to F4	PAHs	Metals	BTEX	VOCs	SAR	Solids		
BH 19-2	BH 19-2 SA2	0.76 - 0.94	22/07/2019	31-Jul-19	29-Jul-19	30-Jul-19	30-Jul-19	29-Jul-19	29-Jul-19	30-Jul-19	29-Jul-19	--	31-Jul-19	--	29-Jul-19	31-Jul-19	30-Jul-19	1930586	
BH19-4	BH 19-4 SA1 Bot	0.00 - 0.58	23/07/2019	31-Jul-19	29-Jul-19	30-Jul-19	30-Jul-19	29-Jul-19	29-Jul-19	30-Jul-19	29-Jul-19	--	31-Jul-19	--	29-Jul-19	31-Jul-19	30-Jul-19	1930586	
TP 19-1	G SA 19-1a	0.00 - 0.30	29/07/2019	08-Aug-19	07-Aug-19	06-Aug-19	09-Aug-19	02-Aug-19	04-Aug-19	--	04-Aug-19	04-Aug-19	08-Aug-19	--	--	08-Aug-19	02-Aug-19	1931452	
TP 19-1	G SA 19-1b	0.30 - 1.02	29/07/2019	08-Aug-19	07-Aug-19	06-Aug-19	09-Aug-19	02-Aug-19	04-Aug-19	--	04-Aug-19	--	08-Aug-19	04-Aug-19	--	08-Aug-19	02-Aug-19	1931452	
TP 19-2	G SA 19-2	0.00 - 0.61	29/07/2019	08-Aug-19	07-Aug-19	06-Aug-19	09-Aug-19	02-Aug-19	04-Aug-19	--	04-Aug-19	04-Aug-19	08-Aug-19	--	--	08-Aug-19	02-Aug-19	1931452	

Notes:

1 mBGS - Metres Below Ground Surface

2 -- - Parameter Not Analyzed

TABLE 9.4
Soil Analytical Results - Metals

Parameter	Units	RDL	MECP Table 6*	Sample ID:	BH 19-2 SA2	BH 19-4 SA1 Bot	G SA 19-1a	G SA 19-1b	G SA 19-2
				Sample Depth:	0.76 - 0.94	0.00 - 0.58	0.00 - 0.30	0.30 - 1.02	0.00 - 0.61
				Date Sampled:	22/07/2019	23/07/2019	29/07/2019	29/07/2019	29/07/2019
Metals									
Boron, available	ug/g dry	0.5	1.5	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)
Chromium (VI)	ug/g dry	0.2	8	ND (0.2)	ND (0.2)	ND (0.2)	ND (0.2)	ND (0.2)	ND (0.2)
Mercury	ug/g dry	0.1	0.27	ND (0.1)	ND (0.1)	ND (0.1)	ND (0.1)	ND (0.1)	ND (0.1)
Antimony	ug/g dry	1.0	7.5	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)
Arsenic	ug/g dry	1.0	18	1.6	3.5	2.0	2.1	2.6	
Barium	ug/g dry	1.0	390	93.0	70.4	45.4	30.2	76.2	
Beryllium	ug/g dry	0.5	4	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)
Boron	ug/g dry	5.0	120	ND (5.0)	7.4	ND (5.0)	ND (5.0)	6.9	
Cadmium	ug/g dry	0.5	1.2	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	0.6	
Chromium	ug/g dry	5.0	160	6.3	16.7	12.6	13.6	19.7	
Cobalt	ug/g dry	1.0	22	1.3	4.1	4.4	4.8	5.8	
Copper	ug/g dry	5.0	140	ND (5.0)	7.8	9.2	8.3	11.6	
Lead	ug/g dry	1.0	120	8.9	10.1	13.3	4.2	26.6	
Molybdenum	ug/g dry	1.0	6.9	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)
Nickel	ug/g dry	5.0	100	ND (5.0)	9.2	7.9	8.0	12.1	
Selenium	ug/g dry	1.0	2.4	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)
Silver	ug/g dry	0.3	20	ND (0.3)	ND (0.3)	ND (0.3)	ND (0.3)	ND (0.3)	ND (0.3)
Thallium	ug/g dry	1.0	1	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)
Uranium	ug/g dry	1.0	23	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)
Vanadium	ug/g dry	10.0	86	ND (10.0)	18.2	22.3	28.8	30.2	
Zinc	ug/g dry	20.0	340	ND (20.0)	45.5	46.1	ND (20.0)	52.0	
SAR	N/A	0.01	5	1.60	1.55	0.24	0.28	0.07	
Conductivity	uS/cm	5	0.7	246	256	132	105	140	
% Solids	% by Wt.	0.1	NS	97.8	96.8	95.8	96.9	94.6	
pH	pH Units	0.05	NS	7.78	7.73	6.89	7.09	7.13	

Notes:

1 RDL - Reported Detection Limit

2 N/A - Not Analyzed

3 NS - No Standard

4 ND- Non-detect

5 * - Table 6: Generic Site Condition Standards for Shallow Soils in a Potable Groundwater Condition, Residential Property Use - Coarse Textures Soils (MOE, April 15, 2011)

6 **Bold** - Exceeds MECP Table 6 SCS

TABLE 9.5
Soil Analytical Results - PAHs

Parameter	Units	RDL	MECP Table 6*	Sample ID:	BH 19-2 SA2	BH 19-4 SA1 Bot	G SA 19-1a	G SA 19-1b	G SA 19-2
				Sample Depth:	0.76 - 0.94	0.00 - 0.58	0.00 - 0.30	0.30 - 1.02	0.00 - 0.61
				Date Sampled:	22/07/2019	23/07/2019	29/07/2019	29/07/2019	29/07/2019
Polycyclic Aromatic Hydrocarbons									
Acenaphthene	ug/g dry	0.02	7.9	N/A	N/A	ND (0.02)	N/A	ND (0.02)	
Acenaphthylene	ug/g dry	0.02	0.15	N/A	N/A	ND (0.02)	N/A	ND (0.02)	
Anthracene	ug/g dry	0.02	0.67	N/A	N/A	ND (0.02)	N/A	ND (0.02)	
Benzo[a]anthracene	ug/g dry	0.02	0.5	N/A	N/A	ND (0.02)	N/A	ND (0.02)	
Benzo[a]pyrene	ug/g dry	0.02	0.3	N/A	N/A	ND (0.02)	N/A	ND (0.02)	
Benzo[b]fluoranthene	ug/g dry	0.02	0.78	N/A	N/A	ND (0.02)	N/A	ND (0.02)	
Benzo[g,h,i]perylene	ug/g dry	0.02	6.6	N/A	N/A	ND (0.02)	N/A	ND (0.02)	
Benzo[k]fluoranthene	ug/g dry	0.02	0.78	N/A	N/A	ND (0.02)	N/A	ND (0.02)	
Chrysene	ug/g dry	0.02	7	N/A	N/A	ND (0.02)	N/A	ND (0.02)	
Dibenzo[a,h]anthracene	ug/g dry	0.02	0.1	N/A	N/A	ND (0.02)	N/A	ND (0.02)	
Fluoranthene	ug/g dry	0.02	0.69	N/A	N/A	ND (0.02)	N/A	ND (0.02)	
Fluorene	ug/g dry	0.02	62	N/A	N/A	ND (0.02)	N/A	ND (0.02)	
Indeno[1,2,3-cd]pyrene	ug/g dry	0.02	0.38	N/A	N/A	ND (0.02)	N/A	ND (0.02)	
1-Methylnaphthalene	ug/g dry	0.02	0.99	N/A	N/A	ND (0.02)	N/A	ND (0.02)	
2-Methylnaphthalene	ug/g dry	0.02	0.99	N/A	N/A	ND (0.02)	N/A	ND (0.02)	
Methylnaphthalene (1&2)	ug/g dry	0.04	0.99	N/A	N/A	ND (0.04)	N/A	ND (0.04)	
Naphthalene	ug/g dry	0.01	0.6	N/A	N/A	ND (0.01)	N/A	ND (0.01)	
Phenanthrene	ug/g dry	0.02	6.2	N/A	N/A	ND (0.02)	N/A	ND (0.02)	
Pyrene	ug/g dry	0.02	78	N/A	N/A	ND (0.02)	N/A	ND (0.02)	

Notes:

1 RDL - Reported Detection Limit

2 N/A - Not Analyzed

3 NS - No Standard

4 ND- Non-detect

5 * - Table 6: Generic Site Condition Standards for Shallow Soils in a Potable Groundwater Condition, Residential Property Use - Coarse Textures Soils (MOE, April 15, 2011)

6 **Bold** - Exceeds MECP Table 6 SCS

TABLE 9.6
Soil Analytical Results - PHC/ BTEX

Parameter	Units	RDL	Sample ID:	BH 19-2 SA2	BH 19-4 SA1 Bot	G SA 19-1a	G SA 19-1b	G SA 19-2
			Sample Depth:	0.76 - 0.94	0.00 - 0.58	0.00 - 0.30	0.30 - 1.02	0.00 - 0.61
			Date Sampled:	22/07/2019	23/07/2019	29/07/2019	29/07/2019	29/07/2019
			MECP Table 6*					
Petroleum Hydrocarbons & BTEX								
F1 PHCs (C6-C10)	ug/g dry	7	55	ND (7)	ND (7)	N/A	ND (7)	N/A
F2 PHCs (C10-C16)	ug/g dry	4	98	ND (4)	ND (4)	N/A	ND (4)	N/A
F3 PHCs (C16-C34)	ug/g dry	8	300	118	26	N/A	ND (8)	N/A
F4 PHCs (C34-C50)	ug/g dry	6	2800	371	16	N/A	ND (6)	N/A
F4G PHCs (gravimetric)	ug/g dry	50	2800	869	N/A	N/A	N/A	N/A
Benzene	ug/g dry	0.02	0.21	ND (0.02)	ND (0.02)	N/A	ND (0.02)	N/A
Ethylbenzene	ug/g dry	0.05	1.1	ND (0.05)	ND (0.05)	N/A	ND (0.05)	N/A
Toluene	ug/g dry	0.05	2.3	ND (0.05)	ND (0.05)	N/A	ND (0.05)	N/A
m/p-Xylene	ug/g dry	0.05	NS	ND (0.05)	ND (0.05)	N/A	ND (0.05)	N/A
o-Xylene	ug/g dry	0.05	NS	ND (0.05)	ND (0.05)	N/A	ND (0.05)	N/A
Xylenes, total	ug/g drv	0.05	3.1	ND (0.05)	ND (0.05)	N/A	ND (0.05)	N/A

Notes:

1 RDL - Reported Detection Limit

2 N/A - Not Analyzed

3 NS - No Standard

4 ND- Non-detect

5 * - Table 6: Generic Site Condition Standards for Shallow Soils in a Potable Groundwater Condition, Residential Property Use - Coarse Textures Soils (MOE, April 15, 2011)

6 **Bold** - Exceeds MECP Table 6 SCS

TABLE 9.7
Soil Analytical Results - VOCs

Parameter	Units	RDL	MECP Table 6*	Sample ID:	BH 19-2 SA2	BH 19-4 SA1 Bot	G SA 19-1a	G SA 19-1b	G SA 19-2
				Sample Depth:	0.76 - 0.94	0.00 - 0.58	0.00 - 0.30	0.30 - 1.02	0.00 - 0.61
				Date Sampled:	22/07/2019	23/07/2019	29/07/2019	29/07/2019	29/07/2019
Volatile Organic Compounds									
Acetone	ug/g dry	0.50	16	ND (0.50)	ND (0.50)	N/A	N/A	N/A	
Bromodichloromethane	ug/g dry	0.05	1.5	ND (0.05)	ND (0.05)	N/A	N/A	N/A	
Bromoform	ug/g dry	0.05	0.27	ND (0.05)	ND (0.05)	N/A	N/A	N/A	
Bromomethane	ug/g dry	0.05	0.05	ND (0.05)	ND (0.05)	N/A	N/A	N/A	
Carbon Tetrachloride	ug/g dry	0.05	0.05	ND (0.05)	ND (0.05)	N/A	N/A	N/A	
Chlorobenzene	ug/g dry	0.05	2.4	ND (0.05)	ND (0.05)	N/A	N/A	N/A	
Chloroform	ug/g dry	0.05	0.05	ND (0.05)	ND (0.05)	N/A	N/A	N/A	
Dibromochloromethane	ug/g dry	0.05	2.3	ND (0.05)	ND (0.05)	N/A	N/A	N/A	
Dichlorodifluoromethane	ug/g dry	0.05	16	ND (0.05)	ND (0.05)	N/A	N/A	N/A	
1,2-Dichlorobenzene	ug/g dry	0.05	1.2	ND (0.05)	ND (0.05)	N/A	N/A	N/A	
1,3-Dichlorobenzene	ug/g dry	0.05	4.8	ND (0.05)	ND (0.05)	N/A	N/A	N/A	
1,4-Dichlorobenzene	ug/g dry	0.05	0.083	ND (0.05)	ND (0.05)	N/A	N/A	N/A	
1,1-Dichloroethane	ug/g dry	0.05	0.47	ND (0.05)	ND (0.05)	N/A	N/A	N/A	
1,2-Dichloroethane	ug/g dry	0.05	0.05	ND (0.05)	ND (0.05)	N/A	N/A	N/A	
1,1-Dichloroethylene	ug/g dry	0.05	0.05	ND (0.05)	ND (0.05)	N/A	N/A	N/A	
cis-1,2-Dichloroethylene	ug/g dry	0.05	1.9	ND (0.05)	ND (0.05)	N/A	N/A	N/A	
trans-1,2-Dichloroethylene	ug/g dry	0.05	0.084	ND (0.05)	ND (0.05)	N/A	N/A	N/A	
1,2-Dichloropropane	ug/g dry	0.05	0.05	ND (0.05)	ND (0.05)	N/A	N/A	N/A	
cis-1,3-Dichloropropylene	ug/g dry	0.05	#VALUE!	ND (0.05)	ND (0.05)	N/A	N/A	N/A	
trans-1,3-Dichloropropylene	ug/g dry	0.05	#VALUE!	ND (0.05)	ND (0.05)	N/A	N/A	N/A	
1,3-Dichloropropene, total	ug/g dry	0.05	0.05	ND (0.05)	ND (0.05)	N/A	N/A	N/A	
Ethylene dibromide	ug/g dry	0.05	0.05	ND (0.05)	ND (0.05)	N/A	N/A	N/A	
Hexane	ug/g dry	0.05	2.8	ND (0.05)	ND (0.05)	N/A	N/A	N/A	
Methyl Ethyl Ketone	ug/g dry	0.50	16	ND (0.50)	ND (0.50)	N/A	N/A	N/A	
Methyl Isobutyl Ketone	ug/g dry	0.50	1.7	ND (0.50)	ND (0.50)	N/A	N/A	N/A	
Methyl tert-butyl ether	ug/g dry	0.05	0.75	ND (0.05)	ND (0.05)	N/A	N/A	N/A	
Methylene Chloride	ug/g dry	0.05	0.1	ND (0.05)	ND (0.05)	N/A	N/A	N/A	
Styrene	ug/g dry	0.05	0.7	ND (0.05)	ND (0.05)	N/A	N/A	N/A	
1,1,1,2-Tetrachloroethane	ug/g dry	0.05	0.058	ND (0.05)	ND (0.05)	N/A	N/A	N/A	
1,1,2,2-Tetrachloroethane	ug/g dry	0.05	0.05	ND (0.05)	ND (0.05)	N/A	N/A	N/A	
Tetrachloroethylene	ug/g dry	0.05	0.28	ND (0.05)	ND (0.05)	N/A	N/A	N/A	
1,1,1-Trichloroethane	ug/g dry	0.05	0.38	ND (0.05)	ND (0.05)	N/A	N/A	N/A	
1,1,2-Trichloroethane	ug/g dry	0.05	0.05	ND (0.05)	ND (0.05)	N/A	N/A	N/A	
Trichloroethylene	ug/g dry	0.05	0.061	ND (0.05)	ND (0.05)	N/A	N/A	N/A	
Trichlorofluoromethane	ug/g dry	0.05	4	ND (0.05)	ND (0.05)	N/A	N/A	N/A	
Vinyl Chloride	ug/g dry	0.02	0.02	ND (0.02)	ND (0.02)	N/A	N/A	N/A	

Notes:

1 RDL - Reported Detection Limit

2 N/A - Not Analyzed

3 NS - No Standard

4 ND- Non-detect

5 * - Table 6: Generic Site Condition Standards for Shallow Soils in a Potable Groundwater Condition, Residential Property Use - Coarse Textures Soils (MOE, April 15, 2011)

6 **Bold** - Exceeds MECP Table 6 SCS

TABLE 9.8
Maximum Concentrations in Soil

Parameter	Max Soil Concentration (ug/g)	Sample Location	Sample Depth (mBGS)	Parameter	Max Soil Concentration (ug/g)	Sample Location	Sample Depth (mBGS)
Metals				Petroleum Hydrocarbons & BTEX			
Boron, available	ND (0.5)	-	-	F1 PHCs (C6-C10)	ND (7)	-	-
Chromium (VI)	ND (0.2)	-	-	F2 PHCs (C10-C16)	ND (4)	-	-
Mercury	ND (0.1)	-	-	F3 PHCs (C16-C34)	118	BH 19-2 SA2	0.76 - 0.94
Antimony	ND (1.0)	-	-	F4 PHCs (C34-C50)	371	BH 19-2 SA2	0.76 - 0.94
Arsenic	3.5	BH 19-4 SA1 Bot	0.00 - 0.58	F4G PHCs (gravimetric)	869	BH 19-2 SA2	0.76 - 0.94
Barium	93	BH 19-2 SA2	0.76 - 0.94	Benzene	ND (0.02)	-	-
Beryllium	ND (0.5)	-	-	Ethylbenzene	ND (0.05)	-	-
Boron	7.4	BH 19-4 SA1 Bot	0.00 - 0.58	Toluene	ND (0.05)	-	-
Cadmium	0.6	-	-	m/p-Xylene	ND (0.05)	-	-
Chromium	19.7	G SA 19-2	0.00 - 0.61	o-Xylene	ND (0.05)	-	-
Cobalt	5.8	G SA 19-2	0.00 - 0.61	Xylenes, total	ND (0.05)	-	-
Copper	11.6	G SA 19-2	0.00 - 0.61	Volatile Organic Compounds			
Lead	26.6	G SA 19-2	0.00 - 0.61	Acetone	ND (0.50)	-	-
Molybdenum	ND (1.0)	-	-	Bromodichloromethane	ND (0.05)	-	-
Nickel	12.1	G SA 19-2	0.00 - 0.61	Bromoform	ND (0.05)	-	-
Selenium	ND (1.0)	-	-	Bromomethane	ND (0.05)	-	-
Silver	ND (0.3)	-	-	Carbon Tetrachloride	ND (0.05)	-	-
Thallium	ND (1.0)	-	-	Chlorobenzene	ND (0.05)	-	-
Uranium	ND (1.0)	-	-	Chloroform	ND (0.05)	-	-
Vanadium	30.2	G SA 19-2	0.00 - 0.61	Dibromochloromethane	ND (0.05)	-	-
Zinc	52	G SA 19-2	0.00 - 0.61	Dichlorodifluoromethane	ND (0.05)	-	-
SAR	1.6	BH 19-2 SA2	0.76 - 0.94	1,2-Dichlorobenzene	ND (0.05)	-	-
Conductivity	256	BH 19-4 SA1 Bot	0.00 - 0.58	1,3-Dichlorobenzene	ND (0.05)	-	-
% Solids	97.8	BH 19-2 SA2	0.76 - 0.94	1,4-Dichlorobenzene	ND (0.05)	-	-
pH	7.78	BH 19-2 SA2	0.76 - 0.94	1,1-Dichloroethane	ND (0.05)	-	-
Polycyclic Aromatic				1,2-Dichloroethane	ND (0.05)	-	-
Acenaphthene	ND (0.02)	-	-	1,1-Dichloroethylene	ND (0.05)	-	-
Acenaphthylene	ND (0.02)	-	-	cis-1,2-Dichloroethylene	ND (0.05)	-	-
Anthracene	ND (0.02)	-	-	trans-1,2-Dichloroethylene	ND (0.05)	-	-
Benzo[a]anthracene	ND (0.02)	-	-	1,2-Dichloropropane	ND (0.05)	-	-
Benzo[a]pyrene	ND (0.02)	-	-	cis-1,3-Dichloropropylene	ND (0.05)	-	-
Benzo[b]fluoranthene	ND (0.02)	-	-	trans-1,3-Dichloropropylene	ND (0.05)	-	-
Benzo[g,h,i]perylene	ND (0.02)	-	-	1,3-Dichloropropene, total	ND (0.05)	-	-
Benzo[k]fluoranthene	ND (0.02)	-	-	Ethylene dibromide	ND (0.05)	-	-
Chrysene	ND (0.02)	-	-	Hexane	ND (0.05)	-	-
Dibenzo[a,h]anthracene	ND (0.02)	-	-	Methyl Ethyl Ketone	ND (0.50)	-	-
Fluoranthene	ND (0.02)	-	-	Methyl Isobutyl Ketone	ND (0.50)	-	-
Fluorene	ND (0.02)	-	-	Methyl tert-butyl ether	ND (0.05)	-	-
Indeno[1,2,3-cd]pyrene	ND (0.02)	-	-	Methylene Chloride	ND (0.05)	-	-
1-Methylnaphthalene	ND (0.02)	-	-	Styrene	ND (0.05)	-	-
2-Methylnaphthalene	ND (0.02)	-	-	1,1,1,2-Tetrachloroethane	ND (0.05)	-	-
Methylnaphthalene (1&2)	ND (0.04)	-	-	1,1,2,2-Tetrachloroethane	ND (0.05)	-	-
Naphthalene	ND (0.01)	-	-	Tetrachloroethylene	ND (0.05)	-	-
Phenanthrene	ND (0.02)	-	-	1,1,1-Trichloroethane	ND (0.05)	-	-
Pyrene	ND (0.02)	-	-	1,1,2-Trichloroethane	ND (0.05)	-	-
Notes:				Trichloroethylene	ND (0.05)	-	-
1 mBGS - Metres Below Ground Surface				Trichlorofluoromethane	ND (0.05)	-	-
				Vinyl Chloride	ND (0.02)	-	-

TABLE 9.9
Groundwater Sample Locations and Laboratory Analyses

Monitoring Well ID	Sample Depth Interval (mASL)	Sample Collection Date	Sample Analysis Date											Laboratory Report Number
			Anions	Chroium	Conductivity	Cyanide	Mercury	Metals	pH	PHS F1	PHC F2 to F4	VOCs	SAR	
MW 19-1	109.25 - 112.30	31/07/2019	02-Aug-19	06-Aug-19	06-Aug-19	07-Aug-19	06-Aug-19	08-Aug-19	06-Aug-19	08-Aug-19	07-Aug-19	07-Aug-19	08-Aug-19	1931480
MW19-2	109.53 - 112.58	31/07/2019	02-Aug-19	06-Aug-19	06-Aug-19	07-Aug-19	06-Aug-19	08-Aug-19	06-Aug-19	08-Aug-19	07-Aug-19	07-Aug-19	08-Aug-19	1931480
MW19-3	109.90 - 112.95	30/07/2019	02-Aug-19	06-Aug-19	06-Aug-19	07-Aug-19	06-Aug-19	08-Aug-19	06-Aug-19	08-Aug-19	07-Aug-19	07-Aug-19	08-Aug-19	1931480

Notes:

1 mASL - Metres Above Sea Level

2 -- - Parameter Not Analyzed

TABLE 9.10
Groundwater Analytical Results - Metals

Parameter	Units	RDL	Sample ID:	MW 19-1	MW 19-2	MW 19-4
			Stratigraphic Unit:	Bedrock	Bedrock	Bedrock
			Date Sampled:	31/07/2019	31/07/2019	30/07/2019
			MECP Table 6*			
Metals						
Mercury	ug/L	0.1	0.1	ND (0.1)	ND (0.1)	ND (0.1)
Antimony	ug/L	0.5	6	ND (0.5)	ND (0.5)	ND (0.5)
Arsenic	ug/L	1	25	ND (1)	ND (1)	ND (1)
Barium	ug/L	1	1000	227	522	271
Beryllium	ug/L	0.5	4	ND (0.5)	ND (0.5)	ND (0.5)
Boron	ug/L	10	5000	88	34	40
Cadmium	ug/L	0.1	2.1	ND (0.1)	ND (0.1)	ND (0.1)
Chromium	ug/L	1	50	ND (1)	ND (1)	ND (1)
Chromium (VI)	ug/L	10	25	ND (10)	ND (10)	ND (10)
Cobalt	ug/L	0.5	3.8	ND (0.5)	0.6	1.1
Copper	ug/L	0.5	69	1.2	1.3	1.8
Lead	ug/L	0.1	10	ND (0.1)	ND (0.1)	0.4
Molybdenum	ug/L	0.5	70	3.6	2.4	6.2
Nickel	ug/L	1	100	1	2	7
Selenium	ug/L	1	10	ND (1)	ND (1)	ND (1)
Silver	ug/L	0.1	1.2	ND (0.1)	ND (0.1)	ND (0.1)
Sodium	ug/L	200	490000	147000	549000	393000
Thallium	ug/L	0.1	2	ND (0.1)	0.1	0.5
Uranium	ug/L	0.1	20	1.6	1.3	4.2
Vanadium	ug/L	0.5	6.2	ND (0.5)	ND (0.5)	0.7
Zinc	ug/L	5	890	15	10	ND (5)
SAR	-	0.01	NS	3.72	9.04	6.33
Conductivity	uS/cm	5	NS	1280	3640	3000
Cyanide, free	ug/L	2	52	ND (2)	ND (2)	ND (2)
pH	pH Units	0.1	NS	7.6	7.6	7.4
Chloride	mg/L	1	790	214	963	722

Notes:

1 RDL - Reported Detection Limit

2 N/A - Not Analyzed

3 NS - No Standard

4 ND- Non-detect

5 * - Table 6: Generic Site Condition Standards for Shallow Soils in a Potable Groundwater Condition, Residential Property Use - Coarse Textures Soils (MOE, April 15, 2011)

6 **Exceeds** - Exceeds MECP Table 6 SCS

TABLE 9.12
Groundwater Analytical Results - PHCs and BTEX

Parameter	Units	RDL	Sample ID:	MW 19-1	MW 19-2	MW 19-4
			Stratigraphic Unit:	Bedrock	Bedrock	Bedrock
			Date Sampled:	31/07/2019	31/07/2019	30/07/2019
			MECP Table 6*			
Petroleum Hydrocarbons & BTEX						
F1 PHCs (C6-C10)	ug/L	25	420	ND (25)	N/A	ND (25)
F2 PHCs (C10-C16)	ug/L	100	150	ND (100)	N/A	ND (100)
F3 PHCs (C16-C34)	ug/L	100	500	ND (100)	N/A	ND (100)
F4 PHCs (C34-C50)	ug/L	100	500	ND (100)	N/A	ND (100)
Benzene	ug/L	0.5	0.5	ND (0.5)	N/A	ND (0.5)
Ethylbenzene	ug/L	0.5	2.4	ND (0.5)	N/A	ND (0.5)
Toluene	ug/L	0.5	24	ND (0.5)	N/A	ND (0.5)
m/p-Xylene	ug/L	0.5	NS	ND (0.5)	N/A	ND (0.5)
o-Xylene	ug/L	0.5	NS	ND (0.5)	N/A	ND (0.5)
Xylenes, total	ug/L	0.5	72	ND (0.5)	N/A	ND (0.5)

Notes:

1 RDL - Reported Detection Limit

2 N/A - Not Analyzed

3 NS - No Standard

4 ND- Non-detect

5 * - Table 6: Generic Site Condition Standards for Shallow Soils in a Potable Groundwater Condition, Residential Property Use - Coarse Textures Soils (MOE, April 15, 2011)

6 **Bold** - Exceeds MECP Table 6 SCS

TABLE 9.13
Groundwater Analytical Results - VOCs

				Sample ID:	MW 19-1	MW 19-2	MW 19-4
				Stratigraphic Unit:	Bedrock	Bedrock	Bedrock
				Date Sampled:	31/07/2019	31/07/2019	30/07/2019
Parameter	Units	RDL	MECP Table 6*				
<i>Volatile Organic Compounds</i>							
Acetone	ug/L	5.0	2700		ND (5.0)	N/A	ND (5.0)
Bromodichloromethane	ug/L	0.5	16		ND (0.5)	N/A	ND (0.5)
Bromoform	ug/L	0.5	5		ND (0.5)	N/A	ND (0.5)
Bromomethane	ug/L	0.5	0.89		ND (0.5)	N/A	ND (0.5)
Carbon Tetrachloride	ug/L	0.2	0.2		ND (0.2)	N/A	ND (0.2)
Chlorobenzene	ug/L	0.5	30		ND (0.5)	N/A	ND (0.5)
Chloroform	ug/L	0.5	2		ND (0.5)	N/A	ND (0.5)
Dibromochloromethane	ug/L	0.5	25		ND (0.5)	N/A	ND (0.5)
Dichlorodifluoromethane	ug/L	1.0	590		ND (1.0)	N/A	ND (1.0)
1,2-Dichlorobenzene	ug/L	0.5	3		ND (0.5)	N/A	ND (0.5)
1,3-Dichlorobenzene	ug/L	0.5	59		ND (0.5)	N/A	ND (0.5)
1,4-Dichlorobenzene	ug/L	0.5	0.5		ND (0.5)	N/A	ND (0.5)
1,1-Dichloroethane	ug/L	0.5	5		ND (0.5)	N/A	ND (0.5)
1,2-Dichloroethane	ug/L	0.5	0.5		ND (0.5)	N/A	ND (0.5)
1,1-Dichloroethylene	ug/L	0.5	0.5		ND (0.5)	N/A	ND (0.5)
cis-1,2-Dichloroethylene	ug/L	0.5	1.6		ND (0.5)	N/A	ND (0.5)
trans-1,2-Dichloroethylene	ug/L	0.5	1.6		ND (0.5)	N/A	ND (0.5)
1,2-Dichloropropane	ug/L	0.5	0.58		ND (0.5)	N/A	ND (0.5)
cis-1,3-Dichloropropylene	ug/L	0.5	NS		ND (0.5)	N/A	ND (0.5)
trans-1,3-Dichloropropylene	ug/L	0.5	NS		ND (0.5)	N/A	ND (0.5)
1,3-Dichloropropene, total	ug/L	0.5	0.5		ND (0.5)	N/A	ND (0.5)
Ethylene dibromide (dibromoe	ug/L	0.2	0.2		ND (0.2)	N/A	ND (0.2)
Hexane	ug/L	1.0	5		ND (1.0)	N/A	ND (1.0)
Methyl Ethyl Ketone (2-Butanc	ug/L	5.0	1800		ND (5.0)	N/A	ND (5.0)
Methyl Isobutyl Ketone	ug/L	5.0	640		ND (5.0)	N/A	ND (5.0)
Methyl tert-butyl ether	ug/L	2.0	15		ND (2.0)	N/A	ND (2.0)
Methylene Chloride	ug/L	5.0	26		ND (5.0)	N/A	ND (5.0)
Styrene	ug/L	0.5	5.4		ND (0.5)	N/A	ND (0.5)
1,1,1,2-Tetrachloroethane	ug/L	0.5	1.1		ND (0.5)	N/A	ND (0.5)
1,1,2,2-Tetrachloroethane	ug/L	0.5	0.5		ND (0.5)	N/A	ND (0.5)
Tetrachloroethylene	ug/L	0.5	0.5		ND (0.5)	N/A	ND (0.5)
1,1,1-Trichloroethane	ug/L	0.5	23		ND (0.5)	N/A	ND (0.5)
1,1,2-Trichloroethane	ug/L	0.5	0.5		ND (0.5)	N/A	ND (0.5)
Trichloroethylene	ug/L	0.5	0.5		ND (0.5)	N/A	ND (0.5)
Trichlorofluoromethane	ug/L	1.0	150		ND (1.0)	N/A	ND (1.0)
Vinyl Chloride	ug/L	0.5	0.5		ND (0.5)	N/A	ND (0.5)

Notes:

1 RDL - Reported Detection Limit

**TABLE B1
SOIL ANALYTICAL RESULTS
CONTINUED**

Parameter	Units	RDL	Sample ID:	MW 19-1	MW 19-2	MW 19-4
			Stratigraphic Unit:	Bedrock	Bedrock	Bedrock
			Date Sampled:	31/07/2019	31/07/2019	30/07/2019
			MECP Table 6*			

2 N/A - Not Analyzed

3 NS - No Standard

4 ND- Non-detect

5 * - Table 6: Generic Site Condition Standards for Shallow Soils in a Potable Groundwater Condition, Residential Property Use - Coarse Textures Soils (MOE, April 15, 2011)

6 **Bold** - Exceeds MECP Table 6 SCS

TABLE 9.14
Maximum Concentrations in Groundwater

Parameter	Max Soil Concentration (ug/g)	Sample Location	Parameter	Max Soil Concentration (ug/g)	Sample Location
Metals			Volatile Organic Compounds		
Mercury	ND (0.1)	-	Acetone	ND (5.0)	-
Antimony	ND (0.5)	-	Bromodichloromethane	ND (0.5)	-
Arsenic	ND (1)	-	Bromoform	ND (0.5)	-
Barium	522	MW 19-2	Bromomethane	ND (0.5)	-
Beryllium	ND (0.5)	-	Carbon Tetrachloride	ND (0.2)	-
Boron	88	MW 19-1	Chlorobenzene	ND (0.5)	-
Cadmium	ND (0.1)	-	Chloroform	ND (0.5)	-
Chromium	ND (1)	-	Dibromochloromethane	ND (0.5)	-
Chromium (VI)	ND (10)	-	Dichlorodifluoromethane	ND (1.0)	-
Cobalt	1.1	MW 19-4	1,2-Dichlorobenzene	ND (0.5)	-
Copper	1.8	MW 19-4	1,3-Dichlorobenzene	ND (0.5)	-
Lead	0.4	MW 19-4	1,4-Dichlorobenzene	ND (0.5)	-
Molybdenum	6.2	MW 19-4	1,1-Dichloroethane	ND (0.5)	-
Nickel	7	MW 19-4	1,2-Dichloroethane	ND (0.5)	-
Selenium	ND (1)	-	1,1-Dichloroethylene	ND (0.5)	-
Silver	ND (0.1)	-	cis-1,2-Dichloroethylene	ND (0.5)	-
Sodium	549000	MW 19-2	trans-1,2-Dichloroethylene	ND (0.5)	-
Thallium	0.5	MW 19-4	1,2-Dichloropropane	ND (0.5)	-
Uranium	4.2	MW 19-4	cis-1,3-Dichloropropylene	ND (0.5)	-
Vanadium	0.7	MW 19-4	trans-1,3-Dichloropropylene	ND (0.5)	-
Zinc	15	MW 19-1	1,3-Dichloropropene, total	ND (0.5)	-
SAR	9.04	MW 19-2	Ethylene dibromide	ND (0.2)	-
Conductivity	3640	MW 19-2	Hexane	ND (1.0)	-
Cyanide, free	ND (2)	-	Methyl Ethyl Ketone	ND (5.0)	-
pH	7.6	MW 19-1	Methyl Isobutyl Ketone	ND (5.0)	-
Chloride	963	MW 19-2	Methyl tert-butyl ether	ND (2.0)	-
Petroleum Hydrocarbons &			Methylene Chloride	ND (5.0)	-
F1 PHCs (C6-C10)	ND (25)	-	Styrene	ND (0.5)	-
F2 PHCs (C10-C16)	ND (100)	-	1,1,1,2-Tetrachloroethane	ND (0.5)	-
F3 PHCs (C16-C34)	ND (100)	-	1,1,2,2-Tetrachloroethane	ND (0.5)	-
F4 PHCs (C34-C50)	ND (100)	-	Tetrachloroethylene	ND (0.5)	-
Benzene	ND (0.5)	-	1,1,1-Trichloroethane	ND (0.5)	-
Ethylbenzene	ND (0.5)	-	1,1,2-Trichloroethane	ND (0.5)	-
Toluene	ND (0.5)	-	Trichloroethylene	ND (0.5)	-
m/p-Xylene	ND (0.5)	-	Trichlorofluoromethane	ND (1.0)	-
o-Xylene	ND (0.5)	-	Vinyl Chloride	ND (0.5)	-
Xylenes, total	ND (0.5)	-			

Notes:

1 mBGS - Metres Below Ground Surface

10.0 LIMITATION OF LIABILITY

This report was prepared for and the work referred to within it has been undertaken by GEMTEC Consulting Engineers and Scientists Ltd for Argue Construction Ltd. It is intended for the exclusive use of Argue Construction Ltd.. This report may not be relied upon by any other person or entity without the express written consent of GEMTEC, and Argue Construction Ltd.. Nothing in this report is intended to provide a legal opinion.

The investigation undertaken by GEMTEC with respect to this report and any conclusions or recommendations made in this report reflect the best judgements of GEMTEC based on the site conditions observed during the investigations undertaken at the date(s) identified in the report and on the information available at the time the report was prepared. This report has been prepared for the application noted and it is based, in part, on visual observations made at the site, subsurface investigations at discrete locations and depths and laboratory analyses of specific chemical parameters and material during a specific time interval, all as described in the report. Unless otherwise stated, the findings contained in this report cannot be extrapolated or extended to previous or future site conditions, portions of the site that were unavailable for direct investigation, subsurface locations on the site that were not investigated directly, or chemical parameters, materials or analysis which were not addressed. Chemical parameters other than those addressed by the investigation described in this report may exist in soil and groundwater elsewhere on the site, the chemical parameters addressed in the report may exist in soil and groundwater at other locations at the site that were not investigated and concentrations of the chemical parameters addressed which are different than those reported may exist at other locations on the site than those from where the samples were taken.

Should new information become available during future work, including excavations, borings or other studies, GEMTEC should be requested to review the information and, if necessary, re-assess the conclusions presented herein.

11.0 CLOSURE

We trust this report provides sufficient information for your present purposes. If you have any questions concerning this report, please do not hesitate to contact our office.



Nicole Soucy, B.A.Sc., M.A.Sc.
Environmental Scientist



Drew Paulusse, B.Sc.
Senior Environmental Scientist



Shaun Pelkey, M.Sc.E., P.Eng.
Principal, Environmental Engineer





APPENDIX A

Phase Two ESA Sampling Plan



APPENDIX B

Borehole Logs

PROJECT:
OUR PROJECT No.:
LOCATION: See Borehole Location Plan, Figure 1
BORING DATE: 22 July 2019

RECORD OF BOREHOLE 19-1

SHEET 1 OF 1
DATUM: CGVD28
DRILL RIG:
SPT HAMMER:

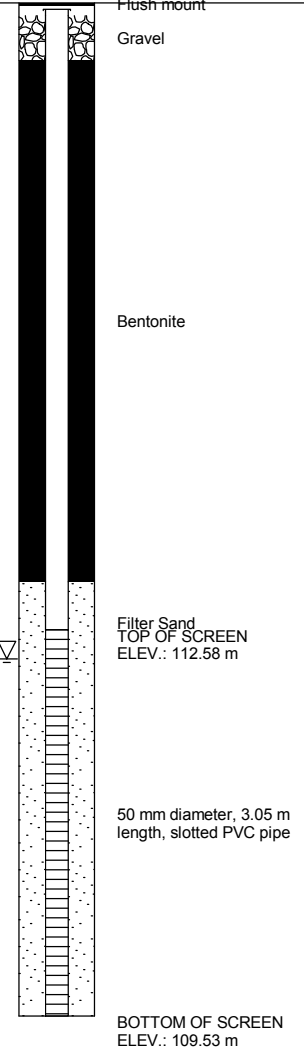
DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE			SAMPLE DATA				COMBUSTIBLE VAPOUR CONCENTRATION (ppm)▲				MONITORING WELL INSTALLATION AND NOTES																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																									
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PROJECT:
OUR PROJECT No.:
LOCATION: See Borehole Location Plan, Figure 1
BORING DATE: 22 July 2019

RECORD OF BOREHOLE 19-2

SHEET 1 OF 1
DATUM: CGVD28
DRILL RIG:
SPT HAMMER:

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE			SAMPLE DATA				COMBUSTIBLE VAPOUR CONCENTRATION (ppm)▲					MONITORING WELL INSTALLATION AND NOTES																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																						
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GROUNDWATER OBSERVATIONS

DATE	TIME	DEPTH (m)	ELEVATION (m)
Jul. 31/19	00:00	5.18	112.35

PROJECT:

OUR PROJECT No.:

LOCATION: See Borehole Location Plan, Figure 1

BORING DATE: 23 July 2019





RECORD OF BOREHOLE 19-3

SHEET 1 OF 1

DATUM: CGVD28

DRILL RIG:

SPT HAMMER:

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE		SAMPLE DATA					COMBUSTIBLE VAPOUR CONCENTRATION (ppm)▲				MONITORING WELL INSTALLATION AND NOTES		
		DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m	RECOVERY (%)	LABORATORY ANALYSES	100	200	300		400	
										COMBUSTIBLE VAPOUR CONCENTRATION (%LEL)●					
										20	40	60		80	
0	Power Auger Hollow Stem Auger (210mm OD)	Ground Surface		118.02											
		Asphaltic concrete		117.96											
		Light grey, crushed, gravel, trace sand (BASE/SUBBASE MATERIAL)		0.06	1	AS									
				117.64											
		Dark grey, crushed, sand and gravel, some silt (BASE/SUBBASE MATERIAL)		0.38	2	AS									
				117.36											
		Dark brown clayey silt, some gravel, trace sand (FILL MATERIAL)		0.66	3	AS									
				117.05											
		Auger refusal on inferred bedrock		0.97											
		End of borehole													



Asphaltic cold mix

Auger cuttings

PROJECT:
OUR PROJECT No.:
LOCATION: See Borehole Location Plan, Figure 1
BORING DATE: 23 July 2019

RECORD OF BOREHOLE 19-4

SHEET 1 OF 1
DATUM: CGVD28
DRILL RIG:
SPT HAMMER:

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE			SAMPLE DATA				COMBUSTIBLE VAPOUR CONCENTRATION (ppm)▲				MONITORING WELL INSTALLATION AND NOTES																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																															
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APPENDIX C

Laboratory Analytical Reports

Certificate of Analysis

GEMTEC Consulting Engineers and Scientists Limited

32 Steacie Drive
Kanata, ON K2K 2A9
Attn: Nicole Soucy

Client PO:
Project: 61730.62
Custody: 49184

Report Date: 31-Jul-2019
Order Date: 25-Jul-2019

Order #: 1930586

This Certificate of Analysis contains analytical data applicable to the following samples as submitted:

Paracel ID

1930586-01
1930586-02

Client ID

BH 19-2 SA2
BH 19-4 SA1 BOT

Approved By:



Mark Foto, M.Sc.
Lab Supervisor

Certificate of Analysis

Report Date: 31-Jul-2019

Client: GEMTEC Consulting Engineers and Scientists Limited

Order Date: 25-Jul-2019

Client PO:

Project Description: 61730.62

Analysis Summary Table

Analysis	Method Reference/Description	Extraction Date	Analysis Date
Boron, available	MOE (HWE), EPA 200.7 - ICP-OES	31-Jul-19	31-Jul-19
Chromium, hexavalent - soil	MOE E3056 - Extraction, colourimetric	25-Jul-19	29-Jul-19
Conductivity	MOE E3138 - probe @25 °C, water ext	30-Jul-19	30-Jul-19
Mercury by CVAA	EPA 7471B - CVAA, digestion	30-Jul-19	30-Jul-19
pH, soil	EPA 150.1 - pH probe @ 25 °C, CaCl buffered ext.	28-Jul-19	29-Jul-19
PHC F1	CWS Tier 1 - P&T GC-FID	29-Jul-19	29-Jul-19
PHC F4G (gravimetric)	CWS Tier 1 - Extraction Gravimetric	29-Jul-19	30-Jul-19
PHCs F2 to F4	CWS Tier 1 - GC-FID, extraction	26-Jul-19	29-Jul-19
REG 153: Metals by ICP/MS, soil	EPA 6020 - Digestion - ICP-MS	31-Jul-19	31-Jul-19
REG 153: VOCs by P&T GC/MS	EPA 8260 - P&T GC-MS	29-Jul-19	29-Jul-19
SAR	Calculated	29-Jul-19	31-Jul-19
Solids, %	Gravimetric, calculation	30-Jul-19	30-Jul-19

Certificate of Analysis
Client: **GEMTEC Consulting Engineers and Scientists Limited**
Client PO:

Report Date: 31-Jul-2019

Order Date: 25-Jul-2019

Project Description: 61730.62

Client ID:	BH 19-2 SA2	BH 19-4 SA1 BOT	-	-
Sample Date:	22-Jul-19 09:00	23-Jul-19 09:00	-	-
Sample ID:	1930586-01	1930586-02	-	-
MDL/Units	Soil	Soil	-	-

Physical Characteristics

% Solids	0.1 % by Wt.	97.8	96.8	-	-
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General Inorganics

SAR	0.01 N/A	1.60	1.55	-	-
Conductivity	5 uS/cm	246	256	-	-
pH	0.05 pH Units	7.78	7.73	-	-

Metals

Antimony	1.0 ug/g dry	<1.0	<1.0	-	-
Arsenic	1.0 ug/g dry	1.6	3.5	-	-
Barium	1.0 ug/g dry	93.0	70.4	-	-
Beryllium	0.5 ug/g dry	<0.5	<0.5	-	-
Boron	5.0 ug/g dry	<5.0	7.4	-	-
Boron, available	0.5 ug/g dry	<0.5	<0.5	-	-
Cadmium	0.5 ug/g dry	<0.5	<0.5	-	-
Chromium	5.0 ug/g dry	6.3	16.7	-	-
Chromium (VI)	0.2 ug/g dry	<0.2	<0.2	-	-
Cobalt	1.0 ug/g dry	1.3	4.1	-	-
Copper	5.0 ug/g dry	<5.0	7.8	-	-
Lead	1.0 ug/g dry	8.9	10.1	-	-
Mercury	0.1 ug/g dry	<0.1	<0.1	-	-
Molybdenum	1.0 ug/g dry	<1.0	<1.0	-	-
Nickel	5.0 ug/g dry	<5.0	9.2	-	-
Selenium	1.0 ug/g dry	<1.0	<1.0	-	-
Silver	0.3 ug/g dry	<0.3	<0.3	-	-
Thallium	1.0 ug/g dry	<1.0	<1.0	-	-
Uranium	1.0 ug/g dry	<1.0	<1.0	-	-
Vanadium	10.0 ug/g dry	<10.0	18.2	-	-
Zinc	20.0 ug/g dry	<20.0	45.5	-	-

Volatiles

Acetone	0.50 ug/g dry	<0.50	<0.50	-	-
Benzene	0.02 ug/g dry	<0.02	<0.02	-	-
Bromodichloromethane	0.05 ug/g dry	<0.05	<0.05	-	-
Bromoform	0.05 ug/g dry	<0.05	<0.05	-	-
Bromomethane	0.05 ug/g dry	<0.05	<0.05	-	-
Carbon Tetrachloride	0.05 ug/g dry	<0.05	<0.05	-	-
Chlorobenzene	0.05 ug/g dry	<0.05	<0.05	-	-

Certificate of Analysis

Client: GEMTEC Consulting Engineers and Scientists Limited

Client PO:

Report Date: 31-Jul-2019

Order Date: 25-Jul-2019

Project Description: 61730.62

	Client ID: Sample Date: Sample ID:	BH 19-2 SA2 22-Jul-19 09:00 1930586-01 Soil	BH 19-4 SA1 BOT 23-Jul-19 09:00 1930586-02 Soil	-	-
	MDL/Units			-	-
Chloroform	0.05 ug/g dry	<0.05	<0.05	-	-
Dibromochloromethane	0.05 ug/g dry	<0.05	<0.05	-	-
Dichlorodifluoromethane	0.05 ug/g dry	<0.05	<0.05	-	-
1,2-Dichlorobenzene	0.05 ug/g dry	<0.05	<0.05	-	-
1,3-Dichlorobenzene	0.05 ug/g dry	<0.05	<0.05	-	-
1,4-Dichlorobenzene	0.05 ug/g dry	<0.05	<0.05	-	-
1,1-Dichloroethane	0.05 ug/g dry	<0.05	<0.05	-	-
1,2-Dichloroethane	0.05 ug/g dry	<0.05	<0.05	-	-
1,1-Dichloroethylene	0.05 ug/g dry	<0.05	<0.05	-	-
cis-1,2-Dichloroethylene	0.05 ug/g dry	<0.05	<0.05	-	-
trans-1,2-Dichloroethylene	0.05 ug/g dry	<0.05	<0.05	-	-
1,2-Dichloropropane	0.05 ug/g dry	<0.05	<0.05	-	-
cis-1,3-Dichloropropylene	0.05 ug/g dry	<0.05	<0.05	-	-
trans-1,3-Dichloropropylene	0.05 ug/g dry	<0.05	<0.05	-	-
1,3-Dichloropropene, total	0.05 ug/g dry	<0.05	<0.05	-	-
Ethylbenzene	0.05 ug/g dry	<0.05	<0.05	-	-
Ethylene dibromide (dibromoethane)	0.05 ug/g dry	<0.05	<0.05	-	-
Hexane	0.05 ug/g dry	<0.05	<0.05	-	-
Methyl Ethyl Ketone (2-Butanone)	0.50 ug/g dry	<0.50	<0.50	-	-
Methyl Isobutyl Ketone	0.50 ug/g dry	<0.50	<0.50	-	-
Methyl tert-butyl ether	0.05 ug/g dry	<0.05	<0.05	-	-
Methylene Chloride	0.05 ug/g dry	<0.05	<0.05	-	-
Styrene	0.05 ug/g dry	<0.05	<0.05	-	-
1,1,1,2-Tetrachloroethane	0.05 ug/g dry	<0.05	<0.05	-	-
1,1,1,2,2-Tetrachloroethane	0.05 ug/g dry	<0.05	<0.05	-	-
Tetrachloroethylene	0.05 ug/g dry	<0.05	<0.05	-	-
Toluene	0.05 ug/g dry	<0.05	<0.05	-	-
1,1,1-Trichloroethane	0.05 ug/g dry	<0.05	<0.05	-	-
1,1,2-Trichloroethane	0.05 ug/g dry	<0.05	<0.05	-	-
Trichloroethylene	0.05 ug/g dry	<0.05	<0.05	-	-
Trichlorofluoromethane	0.05 ug/g dry	<0.05	<0.05	-	-
Vinyl chloride	0.02 ug/g dry	<0.02	<0.02	-	-
m,p-Xylenes	0.05 ug/g dry	<0.05	<0.05	-	-
o-Xylene	0.05 ug/g dry	<0.05	<0.05	-	-
Xylenes, total	0.05 ug/g dry	<0.05	<0.05	-	-
4-Bromofluorobenzene	Surrogate	101%	101%	-	-

Certificate of Analysis

Client: GEMTEC Consulting Engineers and Scientists Limited

Client PO:

Report Date: 31-Jul-2019

Order Date: 25-Jul-2019

Project Description: 61730.62

	Client ID:	BH 19-2 SA2	BH 19-4 SA1 BOT	-	-
	Sample Date:	22-Jul-19 09:00	23-Jul-19 09:00	-	-
	Sample ID:	1930586-01	1930586-02	-	-
	MDL/Units	Soil	Soil	-	-
Dibromofluoromethane	Surrogate	96.3%	96.1%	-	-
Toluene-d8	Surrogate	98.3%	95.7%	-	-

Hydrocarbons

F1 PHCs (C6-C10)	7 ug/g dry	<7	<7	-	-
F2 PHCs (C10-C16)	4 ug/g dry	<4	<4	-	-
F3 PHCs (C16-C34)	8 ug/g dry	118	26	-	-
F4 PHCs (C34-C50)	6 ug/g dry	371 [1]	16	-	-
F4G PHCs (gravimetric)	50 ug/g dry	869	-	-	-

Certificate of Analysis
Client: GEMTEC Consulting Engineers and Scientists Limited
Client PO:

Report Date: 31-Jul-2019

Order Date: 25-Jul-2019

Project Description: 61730.62

Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
General Inorganics									
Conductivity	ND	5	uS/cm						
Hydrocarbons									
F1 PHCs (C6-C10)	ND	7	ug/g						
F2 PHCs (C10-C16)	ND	4	ug/g						
F3 PHCs (C16-C34)	ND	8	ug/g						
F4 PHCs (C34-C50)	ND	6	ug/g						
F4G PHCs (gravimetric)	ND	50	ug/g						
Metals									
Antimony	ND	1.0	ug/g						
Arsenic	ND	1.0	ug/g						
Barium	ND	1.0	ug/g						
Beryllium	ND	0.5	ug/g						
Boron, available	ND	0.5	ug/g						
Boron	ND	5.0	ug/g						
Cadmium	ND	0.5	ug/g						
Chromium (VI)	ND	0.2	ug/g						
Chromium	ND	5.0	ug/g						
Cobalt	ND	1.0	ug/g						
Copper	ND	5.0	ug/g						
Lead	ND	1.0	ug/g						
Mercury	ND	0.1	ug/g						
Molybdenum	ND	1.0	ug/g						
Nickel	ND	5.0	ug/g						
Selenium	ND	1.0	ug/g						
Silver	ND	0.3	ug/g						
Thallium	ND	1.0	ug/g						
Uranium	ND	1.0	ug/g						
Vanadium	ND	10.0	ug/g						
Zinc	ND	20.0	ug/g						
Volatiles									
Acetone	ND	0.50	ug/g						
Benzene	ND	0.02	ug/g						
Bromodichloromethane	ND	0.05	ug/g						
Bromoform	ND	0.05	ug/g						
Bromomethane	ND	0.05	ug/g						
Carbon Tetrachloride	ND	0.05	ug/g						
Chlorobenzene	ND	0.05	ug/g						
Chloroform	ND	0.05	ug/g						
Dibromochloromethane	ND	0.05	ug/g						
Dichlorodifluoromethane	ND	0.05	ug/g						
1,2-Dichlorobenzene	ND	0.05	ug/g						
1,3-Dichlorobenzene	ND	0.05	ug/g						
1,4-Dichlorobenzene	ND	0.05	ug/g						
1,1-Dichloroethane	ND	0.05	ug/g						
1,2-Dichloroethane	ND	0.05	ug/g						
1,1-Dichloroethylene	ND	0.05	ug/g						
cis-1,2-Dichloroethylene	ND	0.05	ug/g						
trans-1,2-Dichloroethylene	ND	0.05	ug/g						
1,2-Dichloropropane	ND	0.05	ug/g						
cis-1,3-Dichloropropylene	ND	0.05	ug/g						
trans-1,3-Dichloropropylene	ND	0.05	ug/g						
1,3-Dichloropropene, total	ND	0.05	ug/g						
Ethylbenzene	ND	0.05	ug/g						
Ethylene dibromide (dibromoethane)	ND	0.05	ug/g						
Hexane	ND	0.05	ug/g						
Methyl Ethyl Ketone (2-Butanone)	ND	0.50	ug/g						
Methyl Isobutyl Ketone	ND	0.50	ug/g						
Methyl tert-butyl ether	ND	0.05	ug/g						

Certificate of Analysis

Client: GEMTEC Consulting Engineers and Scientists Limited

Client PO:

Report Date: 31-Jul-2019

Order Date: 25-Jul-2019

Project Description: 61730.62

Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Methylene Chloride	ND	0.05	ug/g						
Styrene	ND	0.05	ug/g						
1,1,1,2-Tetrachloroethane	ND	0.05	ug/g						
1,1,2,2-Tetrachloroethane	ND	0.05	ug/g						
Tetrachloroethylene	ND	0.05	ug/g						
Toluene	ND	0.05	ug/g						
1,1,1-Trichloroethane	ND	0.05	ug/g						
1,1,2-Trichloroethane	ND	0.05	ug/g						
Trichloroethylene	ND	0.05	ug/g						
Trichlorofluoromethane	ND	0.05	ug/g						
Vinyl chloride	ND	0.02	ug/g						
m,p-Xylenes	ND	0.05	ug/g						
o-Xylene	ND	0.05	ug/g						
Xylenes, total	ND	0.05	ug/g						
Surrogate: 4-Bromofluorobenzene	9.32		ug/g		117	50-140			
Surrogate: Dibromofluoromethane	9.23		ug/g		115	50-140			
Surrogate: Toluene-d8	7.41		ug/g		92.7	50-140			

Certificate of Analysis
Client: **GEMTEC Consulting Engineers and Scientists Limited**
Client PO:

Report Date: 31-Jul-2019

Order Date: 25-Jul-2019

Project Description: 61730.62

Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
General Inorganics									
SAR	5.32	0.01	N/A	5.40			1.5	200	
Conductivity	257	5	uS/cm	256			0.1	5	
pH	7.05	0.05	pH Units	7.10			0.7	2.3	
Hydrocarbons									
F1 PHCs (C6-C10)	ND	7	ug/g dry	ND				40	
F2 PHCs (C10-C16)	14	4	ug/g dry	15			2.5	30	
F3 PHCs (C16-C34)	37	8	ug/g dry	32			15.0	30	
F4 PHCs (C34-C50)	22	6	ug/g dry	19			18.5	30	
Metals									
Antimony	1.6	1.0	ug/g dry	ND			0.0	30	
Arsenic	7.6	1.0	ug/g dry	7.3			3.7	30	
Barium	87.6	1.0	ug/g dry	84.9			3.1	30	
Beryllium	0.8	0.5	ug/g dry	0.7			18.1	30	
Boron, available	ND	0.5	ug/g dry	ND			0.0	35	
Boron	21.4	5.0	ug/g dry	19.4			9.9	30	
Cadmium	ND	0.5	ug/g dry	ND			0.0	30	
Chromium (VI)	ND	0.2	ug/g dry	ND				35	
Chromium	25.2	5.0	ug/g dry	24.3			3.7	30	
Cobalt	7.9	1.0	ug/g dry	7.6			3.7	30	
Copper	20.8	5.0	ug/g dry	20.3			2.6	30	
Lead	15.6	1.0	ug/g dry	14.5			7.0	30	
Mercury	ND	0.1	ug/g dry	ND			0.0	30	
Molybdenum	2.4	1.0	ug/g dry	2.0			15.0	30	
Nickel	23.4	5.0	ug/g dry	22.8			2.9	30	
Selenium	ND	1.0	ug/g dry	ND			0.0	30	
Silver	ND	0.3	ug/g dry	ND			0.0	30	
Thallium	ND	1.0	ug/g dry	ND			0.0	30	
Uranium	1.1	1.0	ug/g dry	ND			0.0	30	
Vanadium	38.8	10.0	ug/g dry	37.9			2.5	30	
Zinc	70.9	20.0	ug/g dry	68.2			3.9	30	
Physical Characteristics									
% Solids	81.4	0.1	% by Wt.	81.4			0.1	25	
Volatiles									
Acetone	ND	0.50	ug/g dry	ND				50	
Benzene	ND	0.02	ug/g dry	ND				50	
Bromodichloromethane	ND	0.05	ug/g dry	ND				50	
Bromoform	ND	0.05	ug/g dry	ND				50	
Bromomethane	ND	0.05	ug/g dry	ND				50	
Carbon Tetrachloride	ND	0.05	ug/g dry	ND				50	
Chlorobenzene	ND	0.05	ug/g dry	ND				50	
Chloroform	ND	0.05	ug/g dry	ND				50	
Dibromochloromethane	ND	0.05	ug/g dry	ND				50	
Dichlorodifluoromethane	ND	0.05	ug/g dry	ND				50	
1,2-Dichlorobenzene	ND	0.05	ug/g dry	ND				50	
1,3-Dichlorobenzene	ND	0.05	ug/g dry	ND				50	
1,4-Dichlorobenzene	ND	0.05	ug/g dry	ND				50	
1,1-Dichloroethane	ND	0.05	ug/g dry	ND				50	
1,2-Dichloroethane	ND	0.05	ug/g dry	ND				50	
1,1-Dichloroethylene	ND	0.05	ug/g dry	ND				50	
cis-1,2-Dichloroethylene	ND	0.05	ug/g dry	ND				50	
trans-1,2-Dichloroethylene	ND	0.05	ug/g dry	ND				50	
1,2-Dichloropropane	ND	0.05	ug/g dry	ND				50	
cis-1,3-Dichloropropylene	ND	0.05	ug/g dry	ND				50	
trans-1,3-Dichloropropylene	ND	0.05	ug/g dry	ND				50	
Ethylbenzene	ND	0.05	ug/g dry	ND				50	
Ethylene dibromide (dibromoethane)	ND	0.05	ug/g dry	ND				50	

Certificate of Analysis

Client: GEMTEC Consulting Engineers and Scientists Limited

Client PO:

Report Date: 31-Jul-2019

Order Date: 25-Jul-2019

Project Description: 61730.62

Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hexane	ND	0.05	ug/g dry	ND				50	
Methyl Ethyl Ketone (2-Butanone)	ND	0.50	ug/g dry	ND				50	
Methyl Isobutyl Ketone	ND	0.50	ug/g dry	ND				50	
Methyl tert-butyl ether	ND	0.05	ug/g dry	ND				50	
Methylene Chloride	ND	0.05	ug/g dry	ND				50	
Styrene	ND	0.05	ug/g dry	ND				50	
1,1,1,2-Tetrachloroethane	ND	0.05	ug/g dry	ND				50	
1,1,2,2-Tetrachloroethane	ND	0.05	ug/g dry	ND				50	
Tetrachloroethylene	ND	0.05	ug/g dry	ND				50	
Toluene	ND	0.05	ug/g dry	ND				50	
1,1,1-Trichloroethane	ND	0.05	ug/g dry	ND				50	
1,1,2-Trichloroethane	ND	0.05	ug/g dry	ND				50	
Trichloroethylene	ND	0.05	ug/g dry	ND				50	
Trichlorofluoromethane	ND	0.05	ug/g dry	ND				50	
Vinyl chloride	ND	0.02	ug/g dry	ND				50	
m,p-Xylenes	ND	0.05	ug/g dry	ND				50	
o-Xylene	ND	0.05	ug/g dry	ND				50	
Surrogate: 4-Bromofluorobenzene	8.32		ug/g dry		102	50-140			
Surrogate: Dibromofluoromethane	7.83		ug/g dry		95.7	50-140			
Surrogate: Toluene-d8	7.68		ug/g dry		93.9	50-140			

Certificate of Analysis
Client: **GEMTEC Consulting Engineers and Scientists Limited**
Client PO:

Report Date: 31-Jul-2019

Order Date: 25-Jul-2019

Project Description: 61730.62

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	200	7	ug/g		100	80-120			
F2 PHCs (C10-C16)	111	4	ug/g	15	117	60-140			
F3 PHCs (C16-C34)	279	8	ug/g	32	123	60-140			
F4 PHCs (C34-C50)	167	6	ug/g	19	117	60-140			
F4G PHCs (gravimetric)	840	50	ug/g		84.0	80-120			
Metals									
Antimony	39.3		ug/L	ND	78.5	70-130			
Arsenic	51.7		ug/L	2.9	97.5	70-130			
Barium	83.2		ug/L	34.0	98.5	70-130			
Beryllium	46.5		ug/L	ND	92.5	70-130			
Boron, available	4.84	0.5	ug/g	ND	96.9	70-122			
Boron	49.1		ug/L	7.7	82.7	70-130			
Cadmium	47.8		ug/L	ND	95.3	70-130			
Chromium (VI)	4.2	0.2	ug/g		84.5	70-130			
Chromium	59.4		ug/L	9.7	99.4	70-130			
Cobalt	50.1		ug/L	3.1	94.1	70-130			
Copper	55.4		ug/L	8.1	94.5	70-130			
Lead	51.3		ug/L	5.8	91.1	70-130			
Mercury	2.90		ug/L	ND	94.5	70-130			
Molybdenum	47.7		ug/L	ND	93.9	70-130			
Nickel	56.3		ug/L	9.1	94.3	70-130			
Selenium	46.6		ug/L	ND	92.9	70-130			
Silver	43.9		ug/L	ND	87.7	70-130			
Thallium	46.2		ug/L	ND	92.1	70-130			
Uranium	48.0		ug/L	ND	95.2	70-130			
Vanadium	64.6		ug/L	15.1	98.9	70-130			
Zinc	72.9		ug/L	27.3	91.2	70-130			
Volatiles									
Acetone	7.64	0.50	ug/g		76.4	50-140			
Benzene	4.58	0.02	ug/g		115	60-130			
Bromodichloromethane	4.34	0.05	ug/g		109	60-130			
Bromoform	4.36	0.05	ug/g		109	60-130			
Bromomethane	3.02	0.05	ug/g		75.5	50-140			
Carbon Tetrachloride	4.05	0.05	ug/g		101	60-130			
Chlorobenzene	4.23	0.05	ug/g		106	60-130			
Chloroform	4.32	0.05	ug/g		108	60-130			
Dibromochloromethane	3.74	0.05	ug/g		93.5	60-130			
Dichlorodifluoromethane	4.13	0.05	ug/g		103	50-140			
1,2-Dichlorobenzene	4.12	0.05	ug/g		103	60-130			
1,3-Dichlorobenzene	4.36	0.05	ug/g		109	60-130			
1,4-Dichlorobenzene	4.00	0.05	ug/g		100	60-130			
1,1-Dichloroethane	4.23	0.05	ug/g		106	60-130			
1,2-Dichloroethane	3.95	0.05	ug/g		98.7	60-130			
1,1-Dichloroethylene	4.37	0.05	ug/g		109	60-130			
cis-1,2-Dichloroethylene	4.21	0.05	ug/g		105	60-130			
trans-1,2-Dichloroethylene	4.43	0.05	ug/g		111	60-130			
1,2-Dichloropropane	4.77	0.05	ug/g		119	60-130			
cis-1,3-Dichloropropylene	3.92	0.05	ug/g		98.1	60-130			
trans-1,3-Dichloropropylene	4.00	0.05	ug/g		100	60-130			
Ethylbenzene	4.32	0.05	ug/g		108	60-130			

Certificate of Analysis

Report Date: 31-Jul-2019

Client: GEMTEC Consulting Engineers and Scientists Limited

Order Date: 25-Jul-2019

Client PO:

Project Description: 61730.62

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Ethylene dibromide (dibromoethane)	4.26	0.05	ug/g		107	60-130			
Hexane	4.72	0.05	ug/g		118	60-130			
Methyl Ethyl Ketone (2-Butanone)	12.5	0.50	ug/g		125	50-140			
Methyl Isobutyl Ketone	12.2	0.50	ug/g		122	50-140			
Methyl tert-butyl ether	13.3	0.05	ug/g		133	50-140			
Methylene Chloride	4.78	0.05	ug/g		120	60-130			
Styrene	4.08	0.05	ug/g		102	60-130			
1,1,1,2-Tetrachloroethane	4.66	0.05	ug/g		116	60-130			
1,1,2,2-Tetrachloroethane	4.43	0.05	ug/g		111	60-130			
Tetrachloroethylene	3.74	0.05	ug/g		93.5	60-130			
Toluene	4.22	0.05	ug/g		106	60-130			
1,1,1-Trichloroethane	4.72	0.05	ug/g		118	60-130			
1,1,2-Trichloroethane	3.62	0.05	ug/g		90.5	60-130			
Trichloroethylene	3.82	0.05	ug/g		95.5	60-130			
Trichlorofluoromethane	4.56	0.05	ug/g		114	50-140			
Vinyl chloride	3.05	0.02	ug/g		76.2	50-140			
m,p-Xylenes	8.15	0.05	ug/g		102	60-130			
o-Xylene	4.30	0.05	ug/g		107	60-130			
Surrogate: 4-Bromofluorobenzene	7.09		ug/g		88.7	50-140			

Certificate of Analysis

Client: GEMTEC Consulting Engineers and Scientists Limited

Client PO:

Report Date: 31-Jul-2019

Order Date: 25-Jul-2019

Project Description: 61730.62

Qualifier Notes:

Sample Qualifiers :

1 : GC-FID signal did not return to baseline by C50

Sample Data Revisions

None

Work Order Revisions / Comments:

None

Other Report Notes:

n/a: not applicable

ND: Not Detected

MDL: Method Detection Limit

Source Result: Data used as source for matrix and duplicate samples

%REC: Percent recovery.

RPD: Relative percent difference.

Soil results are reported on a dry weight basis when the units are denoted with 'dry'.

Where %Solids is reported, moisture loss includes the loss of volatile hydrocarbons.

CCME PHC additional information:

- The method for the analysis of PHCs complies with the Reference Method for the CWS PHC and is validated for use in the laboratory. All prescribed quality criteria identified in the method has been met.
- F1 range corrected for BTEX.
- F2 to F3 ranges corrected for appropriate PAHs where available.
- The gravimetric heavy hydrocarbons (F4G) are not to be added to C6 to C50 hydrocarbons.
- In the case where F4 and F4G are both reported, the greater of the two results is to be used for comparison to CWS PHC criteria.
- When reported, data for F4G has been processed using a silica gel cleanup.



Client Name: GEMTEC	Project Reference: 61730.62	Turnaround Time: <input type="checkbox"/> 1 Day <input type="checkbox"/> 3 Day <input type="checkbox"/> 2 Day <input checked="" type="checkbox"/> Regular Date Required: _____
Contact Name: 613-836-1422	Quote #	
Address: 32 Steacie Dr	PO #	
Telephone: 613-836-1422	Email Address: nicole.soury@gemtec.ca	

Criteria: ☒ O. Reg. 153/04 (As Amended) Table ___ ☐ RSC Filing ☐ O. Reg. 558/00 ☐ PWQO ☐ CCME ☐ SUB (Storm) ☐ SUB (Sanitary) Municipality: _____ ☐ Other: _____

Matrix Type: S (Soil/Sed.) GW (Ground Water) SW (Surface Water) SS (Storm-Sanitary Sewer) P (Paint) A (Air) O (Other)

Paracel Order Number:

1930586

Required Analyses

Sample ID/Location Name	Matrix	Air Volume	# of Containers	Sample Taken		VOC	PHC	Metals	EC	SAR						
				Date	Time											
1 BH 19-2 SA2	S		2	July 22/19		X	X	X	X	X						
2 BH 19-4 SA1 Bot	S		2	July 23/19		X	X	X	X	X						
3																
4																
5																
6																
7																
8																
9																
10																

Comments: *Note due to low recovery please prioritize PHC/VOC, EC, SAR then Metals

Method of Delivery:

Paracel Courier

Relinquished By (Sign): <i>NS</i>	Received by Driver/Depot: <i>A. Fleury</i>	Received at Lab: <i>hoh</i>	Verified By: <i>hoh</i>
Relinquished By (Print): Nicole Soury	Date/Time: 25/07/19 4:24 PM	Date/Time: 7-25-19 12:31	Date/Time: 7-25-19 17:37
Date/Time: July 25/19	Temperature: _____ °C	Temperature: 9.2 °C	pH Verified By: _____

Certificate of Analysis

GEMTEC Consulting Engineers and Scientists Limited

32 Steacie Drive
Kanata, ON K2K 2A9
Attn: Nicole Soucy

Client PO:
Project: 61730.62
Custody: 49233

Report Date: 9-Aug-2019
Order Date: 1-Aug-2019

Order #: 1931452

This Certificate of Analysis contains analytical data applicable to the following samples as submitted:

Paracel ID	Client ID
1931452-01	G SA19-1a
1931452-02	G SA19-1b
1931452-03	G SA19-2

Approved By:



Dale Robertson, BSc
Laboratory Director

Certificate of Analysis

Report Date: 09-Aug-2019

Client: GEMTEC Consulting Engineers and Scientists Limited

Order Date: 1-Aug-2019

Client PO:

Project Description: 61730.62

Analysis Summary Table

Analysis	Method Reference/Description	Extraction Date	Analysis Date
Boron, available	MOE (HWE), EPA 200.7 - ICP-OES	8-Aug-19	8-Aug-19
BTEX by P&T GC-MS	EPA 8260 - P&T GC-MS	2-Aug-19	4-Aug-19
Chromium, hexavalent - soil	MOE E3056 - Extraction, colourimetric	1-Aug-19	7-Aug-19
Conductivity	MOE E3138 - probe @25 °C, water ext	6-Aug-19	6-Aug-19
Mercury by CVAA	EPA 7471B - CVAA, digestion	8-Aug-19	9-Aug-19
pH, soil	EPA 150.1 - pH probe @ 25 °C, CaCl buffered ext.	2-Aug-19	2-Aug-19
PHC F1	CWS Tier 1 - P&T GC-FID	2-Aug-19	4-Aug-19
PHCs F2 to F4	CWS Tier 1 - GC-FID, extraction	1-Aug-19	4-Aug-19
REG 153: Metals by ICP/MS, soil	EPA 6020 - Digestion - ICP-MS	8-Aug-19	8-Aug-19
REG 153: PAHs by GC-MS	EPA 8270 - GC-MS, extraction	1-Aug-19	4-Aug-19
SAR	Calculated	8-Aug-19	8-Aug-19
Solids, %	Gravimetric, calculation	2-Aug-19	2-Aug-19

Certificate of Analysis
Client: **GEMTEC Consulting Engineers and Scientists Limited**
Client PO:

Report Date: 09-Aug-2019

Order Date: 1-Aug-2019

Project Description: **61730.62**

Client ID:	G SA19-1a	G SA19-1b	G SA19-2	-
Sample Date:	29-Jul-19 09:00	29-Jul-19 09:00	29-Jul-19 09:00	-
Sample ID:	1931452-01	1931452-02	1931452-03	-
MDL/Units	Soil	Soil	Soil	-

Physical Characteristics

% Solids	0.1 % by Wt.	95.8	96.9	94.6	-
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General Inorganics

SAR	0.01 N/A	0.24	0.28	0.07	-
Conductivity	5 uS/cm	132	105	140	-
pH	0.05 pH Units	6.89	7.09	7.13	-

Metals

Antimony	1.0 ug/g dry	<1.0	<1.0	<1.0	-
Arsenic	1.0 ug/g dry	2.0	2.1	2.6	-
Barium	1.0 ug/g dry	45.4	30.2	76.2	-
Beryllium	0.5 ug/g dry	<0.5	<0.5	<0.5	-
Boron	5.0 ug/g dry	<5.0	<5.0	6.9	-
Boron, available	0.5 ug/g dry	<0.5	<0.5	<0.5	-
Cadmium	0.5 ug/g dry	<0.5	<0.5	0.6	-
Chromium	5.0 ug/g dry	12.6	13.6	19.7	-
Chromium (VI)	0.2 ug/g dry	<0.2	<0.2	<0.2	-
Cobalt	1.0 ug/g dry	4.4	4.8	5.8	-
Copper	5.0 ug/g dry	9.2	8.3	11.6	-
Lead	1.0 ug/g dry	13.3	4.2	26.6	-
Mercury	0.1 ug/g dry	<0.1	<0.1	<0.1	-
Molybdenum	1.0 ug/g dry	<1.0	<1.0	<1.0	-
Nickel	5.0 ug/g dry	7.9	8.0	12.1	-
Selenium	1.0 ug/g dry	<1.0	<1.0	<1.0	-
Silver	0.3 ug/g dry	<0.3	<0.3	<0.3	-
Thallium	1.0 ug/g dry	<1.0	<1.0	<1.0	-
Uranium	1.0 ug/g dry	<1.0	<1.0	<1.0	-
Vanadium	10.0 ug/g dry	22.3	28.8	30.2	-
Zinc	20.0 ug/g dry	46.1	<20.0	52.0	-

Volatiles

Benzene	0.02 ug/g dry	-	<0.02	-	-
Ethylbenzene	0.05 ug/g dry	-	<0.05	-	-
Toluene	0.05 ug/g dry	-	<0.05	-	-
m,p-Xylenes	0.05 ug/g dry	-	<0.05	-	-
o-Xylene	0.05 ug/g dry	-	<0.05	-	-
Xylenes, total	0.05 ug/g dry	-	<0.05	-	-
Toluene-d8	Surrogate	-	90.8%	-	-

Certificate of Analysis

Report Date: 09-Aug-2019

Client: GEMTEC Consulting Engineers and Scientists Limited

Order Date: 1-Aug-2019

Client PO:

Project Description: 61730.62

Client ID:	G SA19-1a	G SA19-1b	G SA19-2	-
Sample Date:	29-Jul-19 09:00	29-Jul-19 09:00	29-Jul-19 09:00	-
Sample ID:	1931452-01	1931452-02	1931452-03	-
MDL/Units	Soil	Soil	Soil	-

Hydrocarbons

F1 PHCs (C6-C10)	7 ug/g dry	-	<7	-	-
F2 PHCs (C10-C16)	4 ug/g dry	-	<4	-	-
F3 PHCs (C16-C34)	8 ug/g dry	-	<8	-	-
F4 PHCs (C34-C50)	6 ug/g dry	-	<6	-	-

Semi-Volatiles

Acenaphthene	0.02 ug/g dry	<0.02	-	<0.02	-
Acenaphthylene	0.02 ug/g dry	<0.02	-	<0.02	-
Anthracene	0.02 ug/g dry	<0.02	-	<0.02	-
Benzo [a] anthracene	0.02 ug/g dry	<0.02	-	<0.02	-
Benzo [a] pyrene	0.02 ug/g dry	<0.02	-	<0.02	-
Benzo [b] fluoranthene	0.02 ug/g dry	<0.02	-	<0.02	-
Benzo [g,h,i] perylene	0.02 ug/g dry	<0.02	-	<0.02	-
Benzo [k] fluoranthene	0.02 ug/g dry	<0.02	-	<0.02	-
Chrysene	0.02 ug/g dry	<0.02	-	<0.02	-
Dibenzo [a,h] anthracene	0.02 ug/g dry	<0.02	-	<0.02	-
Fluoranthene	0.02 ug/g dry	<0.02	-	<0.02	-
Fluorene	0.02 ug/g dry	<0.02	-	<0.02	-
Indeno [1,2,3-cd] pyrene	0.02 ug/g dry	<0.02	-	<0.02	-
1-Methylnaphthalene	0.02 ug/g dry	<0.02	-	<0.02	-
2-Methylnaphthalene	0.02 ug/g dry	<0.02	-	<0.02	-
Methylnaphthalene (1&2)	0.04 ug/g dry	<0.04	-	<0.04	-
Naphthalene	0.01 ug/g dry	<0.01	-	<0.01	-
Phenanthrene	0.02 ug/g dry	<0.02	-	<0.02	-
Pyrene	0.02 ug/g dry	<0.02	-	<0.02	-
2-Fluorobiphenyl	Surrogate	68.9%	-	73.4%	-
Terphenyl-d14	Surrogate	90.6%	-	112%	-

Certificate of Analysis

Report Date: 09-Aug-2019

Client: GEMTEC Consulting Engineers and Scientists Limited

Order Date: 1-Aug-2019

Client PO:

Project Description: 61730.62

Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
General Inorganics									
Conductivity	ND	5	uS/cm						
Hydrocarbons									
F1 PHCs (C6-C10)	ND	7	ug/g						
F2 PHCs (C10-C16)	ND	4	ug/g						
F3 PHCs (C16-C34)	ND	8	ug/g						
F4 PHCs (C34-C50)	ND	6	ug/g						
Metals									
Antimony	ND	1.0	ug/g						
Arsenic	ND	1.0	ug/g						
Barium	ND	1.0	ug/g						
Beryllium	ND	0.5	ug/g						
Boron, available	ND	0.5	ug/g						
Boron	ND	5.0	ug/g						
Cadmium	ND	0.5	ug/g						
Chromium (VI)	ND	0.2	ug/g						
Chromium	ND	5.0	ug/g						
Cobalt	ND	1.0	ug/g						
Copper	ND	5.0	ug/g						
Lead	ND	1.0	ug/g						
Mercury	ND	0.1	ug/g						
Molybdenum	ND	1.0	ug/g						
Nickel	ND	5.0	ug/g						
Selenium	ND	1.0	ug/g						
Silver	ND	0.3	ug/g						
Thallium	ND	1.0	ug/g						
Uranium	ND	1.0	ug/g						
Vanadium	ND	10.0	ug/g						
Zinc	ND	20.0	ug/g						
Semi-Volatiles									
Acenaphthene	ND	0.02	ug/g						
Acenaphthylene	ND	0.02	ug/g						
Anthracene	ND	0.02	ug/g						
Benzo [a] anthracene	ND	0.02	ug/g						
Benzo [a] pyrene	ND	0.02	ug/g						
Benzo [b] fluoranthene	ND	0.02	ug/g						
Benzo [g,h,i] perylene	ND	0.02	ug/g						
Benzo [k] fluoranthene	ND	0.02	ug/g						
Chrysene	ND	0.02	ug/g						
Dibenzo [a,h] anthracene	ND	0.02	ug/g						
Fluoranthene	ND	0.02	ug/g						
Fluorene	ND	0.02	ug/g						
Indeno [1,2,3-cd] pyrene	ND	0.02	ug/g						
1-Methylnaphthalene	ND	0.02	ug/g						
2-Methylnaphthalene	ND	0.02	ug/g						
Methylnaphthalene (1&2)	ND	0.04	ug/g						
Naphthalene	ND	0.01	ug/g						
Phenanthrene	ND	0.02	ug/g						
Pyrene	ND	0.02	ug/g						
Surrogate: 2-Fluorobiphenyl	0.988		ug/g		74.1	50-140			
Surrogate: Terphenyl-d14	1.41		ug/g		106	50-140			
Volatiles									
Benzene	ND	0.02	ug/g						
Ethylbenzene	ND	0.05	ug/g						
Toluene	ND	0.05	ug/g						
m,p-Xylenes	ND	0.05	ug/g						
o-Xylene	ND	0.05	ug/g						
Xylenes, total	ND	0.05	ug/g						

Certificate of Analysis

Report Date: 09-Aug-2019

Client: GEMTEC Consulting Engineers and Scientists Limited

Order Date: 1-Aug-2019

Client PO:

Project Description: 61730.62

Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Surrogate: Toluene-d8	8.05		ug/g		101	50-140			

Certificate of Analysis

Report Date: 09-Aug-2019

Client: GEMTEC Consulting Engineers and Scientists Limited

Order Date: 1-Aug-2019

Client PO:

Project Description: 61730.62

Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
General Inorganics									
SAR	0.25	0.01	N/A	0.24			4.1	200	
Conductivity	1200	5	uS/cm	1190			0.7	5	
pH	7.56	0.05	pH Units	7.51			0.7	2.3	
Hydrocarbons									
F1 PHCs (C6-C10)	107	7	ug/g dry	106			1.1	40	
Metals									
Antimony	2.0	1.0	ug/g dry	ND			0.0	30	
Arsenic	2.9	1.0	ug/g dry	2.8			2.0	30	
Barium	97.5	1.0	ug/g dry	95.5			2.0	30	
Beryllium	ND	0.5	ug/g dry	ND			0.0	30	
Boron, available	0.93	0.5	ug/g dry	0.96			3.2	35	
Boron	5.8	5.0	ug/g dry	5.1			12.4	30	
Cadmium	ND	0.5	ug/g dry	ND			0.0	30	
Chromium (VI)	ND	0.2	ug/g dry	ND				35	
Chromium	31.4	5.0	ug/g dry	31.1			1.1	30	
Cobalt	7.8	1.0	ug/g dry	7.6			3.0	30	
Copper	17.6	5.0	ug/g dry	16.8			4.3	30	
Lead	20.3	1.0	ug/g dry	20.5			0.9	30	
Mercury	ND	0.1	ug/g dry	ND			0.0	30	
Molybdenum	1.0	1.0	ug/g dry	ND			0.0	30	
Nickel	19.0	5.0	ug/g dry	18.4			3.3	30	
Selenium	ND	1.0	ug/g dry	ND			0.0	30	
Silver	ND	0.3	ug/g dry	ND			0.0	30	
Thallium	ND	1.0	ug/g dry	ND			0.0	30	
Uranium	ND	1.0	ug/g dry	ND			0.0	30	
Vanadium	34.4	10.0	ug/g dry	33.2			3.6	30	
Zinc	41.9	20.0	ug/g dry	39.6			5.6	30	
Physical Characteristics									
% Solids	92.1	0.1	% by Wt.	89.5			2.8	25	
Semi-Volatiles									
Acenaphthene	ND	0.02	ug/g dry	ND				40	
Acenaphthylene	ND	0.02	ug/g dry	ND				40	
Anthracene	ND	0.02	ug/g dry	ND				40	
Benzo [a] anthracene	ND	0.02	ug/g dry	ND				40	
Benzo [a] pyrene	ND	0.02	ug/g dry	ND				40	
Benzo [b] fluoranthene	ND	0.02	ug/g dry	ND				40	
Benzo [g,h,i] perylene	ND	0.02	ug/g dry	ND				40	
Benzo [k] fluoranthene	ND	0.02	ug/g dry	ND				40	
Chrysene	ND	0.02	ug/g dry	ND				40	
Dibenzo [a,h] anthracene	ND	0.02	ug/g dry	ND				40	
Fluoranthene	ND	0.02	ug/g dry	ND				40	
Fluorene	ND	0.02	ug/g dry	ND				40	
Indeno [1,2,3-cd] pyrene	ND	0.02	ug/g dry	ND				40	
1-Methylnaphthalene	ND	0.02	ug/g dry	ND				40	
2-Methylnaphthalene	ND	0.02	ug/g dry	ND				40	
Naphthalene	ND	0.01	ug/g dry	ND				40	
Phenanthrene	ND	0.02	ug/g dry	ND				40	
Pyrene	ND	0.02	ug/g dry	ND				40	
Surrogate: 2-Fluorobiphenyl	1.07		ug/g dry		76.0	50-140			
Surrogate: Terphenyl-d14	1.21		ug/g dry		85.6	50-140			
Volatiles									
Benzene	1.19	0.02	ug/g dry	1.14			3.9	50	
Ethylbenzene	2.55	0.05	ug/g dry	2.29			10.9	50	
Toluene	11.1	0.05	ug/g dry	10.6			4.4	50	
m,p-Xylenes	8.75	0.05	ug/g dry	7.92			9.9	50	

Certificate of Analysis

Report Date: 09-Aug-2019

Client: GEMTEC Consulting Engineers and Scientists Limited

Order Date: 1-Aug-2019

Client PO:

Project Description: 61730.62

Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
o-Xylene	3.10	0.05	ug/g dry	2.80			10.0	50	
Surrogate: Toluene-d8	8.71		ug/g dry		109	50-140			

Certificate of Analysis

Report Date: 09-Aug-2019

Client: GEMTEC Consulting Engineers and Scientists Limited

Order Date: 1-Aug-2019

Client PO:

Project Description: 61730.62

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	192	7	ug/g		95.9	80-120			
F2 PHCs (C10-C16)	93	4	ug/g		116	80-120			
F3 PHCs (C16-C34)	240	8	ug/g		122	80-120			QS-02
F4 PHCs (C34-C50)	136	6	ug/g		110	80-120			
Metals									
Antimony	40.6		ug/L	ND	81.0	70-130			
Arsenic	42.0		ug/L	1.1	81.7	70-130			
Barium	82.3		ug/L	38.2	88.2	70-130			
Beryllium	39.2		ug/L	ND	78.1	70-130			
Boron, available	5.02	0.5	ug/g		100	70-122			
Boron	39.3		ug/L	ND	74.5	70-130			
Cadmium	39.3		ug/L	ND	78.6	70-130			
Chromium (VI)	3.7	0.2	ug/g		74.0	70-130			
Chromium	61.5		ug/L	12.4	98.2	70-130			
Cobalt	49.9		ug/L	3.0	93.6	70-130			
Copper	53.4		ug/L	6.7	93.3	70-130			
Lead	52.6		ug/L	8.2	88.7	70-130			
Mercury	1.40	0.1	ug/g		93.3	80-120			
Molybdenum	50.0		ug/L	ND	99.3	70-130			
Nickel	56.3		ug/L	7.4	97.9	70-130			
Selenium	33.1		ug/L	ND	66.1	70-130			QM-07
Silver	43.9		ug/L	ND	87.8	70-130			
Thallium	46.6		ug/L	ND	93.0	70-130			
Uranium	48.5		ug/L	ND	96.6	70-130			
Vanadium	62.2		ug/L	13.3	97.7	70-130			
Zinc	52.7		ug/L	ND	73.8	70-130			
Semi-Volatiles									
Acenaphthene	0.152	0.02	ug/g	ND	86.3	50-140			
Acenaphthylene	0.132	0.02	ug/g	ND	75.0	50-140			
Anthracene	0.140	0.02	ug/g	ND	79.5	50-140			
Benzo [a] anthracene	0.160	0.02	ug/g	ND	90.9	50-140			
Benzo [a] pyrene	0.133	0.02	ug/g	ND	75.5	50-140			
Benzo [b] fluoranthene	0.172	0.02	ug/g	ND	97.7	50-140			
Benzo [g,h,i] perylene	0.150	0.02	ug/g	ND	85.1	50-140			
Benzo [k] fluoranthene	0.181	0.02	ug/g	ND	103	50-140			
Chrysene	0.161	0.02	ug/g	ND	91.4	50-140			
Dibenzo [a,h] anthracene	0.173	0.02	ug/g	ND	98.1	50-140			
Fluoranthene	0.183	0.02	ug/g	ND	104	50-140			
Fluorene	0.155	0.02	ug/g	ND	88.2	50-140			
Indeno [1,2,3-cd] pyrene	0.165	0.02	ug/g	ND	93.7	50-140			
1-Methylnaphthalene	0.118	0.02	ug/g	ND	67.1	50-140			
2-Methylnaphthalene	0.140	0.02	ug/g	ND	79.7	50-140			
Naphthalene	0.162	0.01	ug/g	ND	92.2	50-140			
Phenanthrene	0.130	0.02	ug/g	ND	73.9	50-140			
Pyrene	0.181	0.02	ug/g	ND	103	50-140			
Surrogate: 2-Fluorobiphenyl	1.20		ug/g		84.9	50-140			
Volatiles									
Benzene	4.97	0.02	ug/g		124	60-130			
Ethylbenzene	4.30	0.05	ug/g		108	60-130			
Toluene	3.83	0.05	ug/g		95.8	60-130			

Certificate of Analysis

Report Date: 09-Aug-2019

Client: GEMTEC Consulting Engineers and Scientists Limited

Order Date: 1-Aug-2019

Client PO:

Project Description: 61730.62

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
m,p-Xylenes	8.35	0.05	ug/g		104	60-130			
o-Xylene	4.56	0.05	ug/g		114	60-130			

Certificate of Analysis

Client: GEMTEC Consulting Engineers and Scientists Limited

Client PO:

Report Date: 09-Aug-2019

Order Date: 1-Aug-2019

Project Description: 61730.62

Qualifier Notes:

QC Qualifiers :

QM-07 : The spike recovery was outside acceptance limits for the MS and/or MSD. The batch was accepted based on other acceptable QC.

QS-02 : Spike level outside of control limits. Analysis batch accepted based on other QC included in the batch.

Sample Data Revisions

None

Work Order Revisions / Comments:

None

Other Report Notes:

n/a: not applicable

ND: Not Detected

MDL: Method Detection Limit

Source Result: Data used as source for matrix and duplicate samples

%REC: Percent recovery.

RPD: Relative percent difference.

Soil results are reported on a dry weight basis when the units are denoted with 'dry'.

Where %Solids is reported, moisture loss includes the loss of volatile hydrocarbons.

CCME PHC additional information:

- The method for the analysis of PHCs complies with the Reference Method for the CWS PHC and is validated for use in the laboratory. All prescribed quality criteria identified in the method has been met.
- F1 range corrected for BTEX.
- F2 to F3 ranges corrected for appropriate PAHs where available.
- The gravimetric heavy hydrocarbons (F4G) are not to be added to C6 to C50 hydrocarbons.
- In the case where F4 and F4G are both reported, the greater of the two results is to be used for comparison to CWS PHC criteria.
- When reported, data for F4G has been processed using a silica gel cleanup.



Client Name: GEMTEC	Project Reference: 61730.62	Turnaround Time: <input type="checkbox"/> 1 Day <input type="checkbox"/> 3 Day <input type="checkbox"/> 2 Day <input checked="" type="checkbox"/> Regular Date Required: _____
Contact Name: NS	Quote # _____	
Address: 32 Stencie Dr	PO # _____	
Telephone: 613-836-1422	Email Address: nicole.soucy@gemtec.ca	

Criteria: ☒ O. Reg. 153/04 (As Amended) Table __ ☐ RSC Filing ☐ O. Reg. 558/00 ☐ PWQO ☐ CCME ☐ SUB (Storm) ☐ SUB (Sanitary) Municipality: _____ ☐ Other: _____

Matrix Type: S (Soil Sed.) GW (Ground Water) SW (Surface Water) SS (Storm/Sanitary Sewer) P (Paint) A (Air) O (Other)

Paracel Order Number: 1931452			Required Analyses									
Sample ID/Location Name	Matrix	Air Volume	# of Containers	Sample Taken		PAH	Metals 153/04 Full List	PH	EC	SAR	PHC	BTEX
				Date	Time							
1 G SA19-1a	S		2	July 29/19		X	X	X	X	X		
2 G SA19-1b	S		2				X	X	X	X	X	
3 G SA19-2	S		2			X	X	X	X	X		
4												
5												
6												
7												
8												
9												
10												

Comments: _____ Method of Delivery: **Paracel**

Relinquished By (Sign): M. Duffy	Received by Driver/Depot: M. FENIE	Received at Lab: SCOT	Verified By: M. Duffy
Relinquished By (Print): Melanie Duffy	Date/Time: 01/08/19 11:50 AM	Date/Time: Aug 1/19	Date/Time: 8-1-19 14:12
Date/Time: August 1, 2019	Temperature: 1°C	Temperature: 11.5°C	pH Verified By: _____

Certificate of Analysis

GEMTEC Consulting Engineers and Scientists Limited

32 Steacie Drive
Kanata, ON K2K 2A9
Attn: Nicole Soucy

Client PO:
Project: 61730.62
Custody:

Report Date: 9-Aug-2019
Order Date: 1-Aug-2019

Order #: 1931480

This Certificate of Analysis contains analytical data applicable to the following samples as submitted:

Paracel ID	Client ID
1931480-01	MW 19-1
1931480-03	MW 19-2(Reg 153)
1931480-04	MW 19-4
1931480-05	MW 19-101
1931480-06	Trip Blank
1931480-07	Field Blank

Approved By:



Dale Robertson, BSc
Laboratory Director

Certificate of Analysis

Report Date: 09-Aug-2019

Client: GEMTEC Consulting Engineers and Scientists Limited

Order Date: 1-Aug-2019

Client PO:

Project Description: 61730.62

Analysis Summary Table

Analysis	Method Reference/Description	Extraction Date	Analysis Date
Anions	EPA 300.1 - IC	2-Aug-19	2-Aug-19
Chromium, hexavalent - water	MOE E3056 - colourimetric	6-Aug-19	6-Aug-19
Conductivity	EPA 9050A- probe @25 °C	6-Aug-19	6-Aug-19
Cyanide, free	MOE E3015 - Auto Colour	7-Aug-19	7-Aug-19
Mercury by CVAA	EPA 245.2 - Cold Vapour AA	6-Aug-19	6-Aug-19
Metals, ICP-MS	EPA 200.8 - ICP-MS	7-Aug-19	8-Aug-19
pH	EPA 150.1 - pH probe @25 °C	6-Aug-19	6-Aug-19
PHC F1	CWS Tier 1 - P&T GC-FID	7-Aug-19	8-Aug-19
PHCs F2 to F4	CWS Tier 1 - GC-FID, extraction	7-Aug-19	7-Aug-19
REG 153: VOCs by P&T GC/MS	EPA 624 - P&T GC-MS	7-Aug-19	7-Aug-19
SAR	Calculated	8-Aug-19	8-Aug-19

Certificate of Analysis

Report Date: 09-Aug-2019

Client: GEMTEC Consulting Engineers and Scientists Limited

Order Date: 1-Aug-2019

Client PO:

Project Description: 61730.62

	Client ID:	MW 19-1	MW 19-2(Reg 153)	MW 19-4	MW 19-101
	Sample Date:	31-Jul-19 10:10	31-Jul-19 12:00	29-Jul-19 15:00	31-Jul-19 10:35
	Sample ID:	1931480-01	1931480-03	1931480-04	1931480-05
	MDL/Units	Water	Water	Water	Water

General Inorganics

SAR	0.01	3.72	9.04	6.33	3.46
Conductivity	5 uS/cm	1280	3640	3000	1300
Cyanide, free	2 ug/L	<2	<2	<2	<2
pH	0.1 pH Units	7.6	7.6	7.4	7.6

Anions

Chloride	1 mg/L	214	963	722	214
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Metals

Mercury	0.1 ug/L	<0.1	<0.1	<0.1	0.1
Antimony	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
Arsenic	1 ug/L	<1	<1	<1	<1
Barium	1 ug/L	227	522	271	227
Beryllium	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
Boron	10 ug/L	88	34	40	85
Cadmium	0.1 ug/L	<0.1	<0.1	<0.1	<0.1
Chromium	1 ug/L	<1	<1	<1	<1
Chromium (VI)	10 ug/L	<10	<10	<10	<10
Cobalt	0.5 ug/L	<0.5	0.6	1.1	<0.5
Copper	0.5 ug/L	1.2	1.3	1.8	<0.5
Lead	0.1 ug/L	<0.1	<0.1	0.4	<0.1
Molybdenum	0.5 ug/L	3.6	2.4	6.2	3.3
Nickel	1 ug/L	1	2	7	<1
Selenium	1 ug/L	<1	<1	<1	<1
Silver	0.1 ug/L	<0.1	<0.1	<0.1	<0.1
Sodium	200 ug/L	147000	549000	393000	151000
Thallium	0.1 ug/L	<0.1	0.1	0.5	<0.1
Uranium	0.1 ug/L	1.6	1.3	4.2	1.3
Vanadium	0.5 ug/L	<0.5	<0.5	0.7	<0.5
Zinc	5 ug/L	15	10	<5	13

Volatiles

Acetone	5.0 ug/L	<5.0	-	<5.0	<5.0
Benzene	0.5 ug/L	<0.5	-	<0.5	<0.5
Bromodichloromethane	0.5 ug/L	<0.5	-	<0.5	<0.5
Bromoform	0.5 ug/L	<0.5	-	<0.5	<0.5
Bromomethane	0.5 ug/L	<0.5	-	<0.5	<0.5
Carbon Tetrachloride	0.2 ug/L	<0.2	-	<0.2	<0.2

Certificate of Analysis

Client: GEMTEC Consulting Engineers and Scientists Limited

Client PO:

Report Date: 09-Aug-2019

Order Date: 1-Aug-2019

Project Description: 61730.62

	Client ID: Sample Date: Sample ID:	MW 19-1 31-Jul-19 10:10 1931480-01 Water	MW 19-2(Reg 153) 31-Jul-19 12:00 1931480-03 Water	MW 19-4 29-Jul-19 15:00 1931480-04 Water	MW 19-101 31-Jul-19 10:35 1931480-05 Water
	MDL/Units				
Chlorobenzene	0.5 ug/L	<0.5	-	<0.5	<0.5
Chloroform	0.5 ug/L	<0.5	-	<0.5	<0.5
Dibromochloromethane	0.5 ug/L	<0.5	-	<0.5	<0.5
Dichlorodifluoromethane	1.0 ug/L	<1.0	-	<1.0	<1.0
1,2-Dichlorobenzene	0.5 ug/L	<0.5	-	<0.5	<0.5
1,3-Dichlorobenzene	0.5 ug/L	<0.5	-	<0.5	<0.5
1,4-Dichlorobenzene	0.5 ug/L	<0.5	-	<0.5	<0.5
1,1-Dichloroethane	0.5 ug/L	<0.5	-	<0.5	<0.5
1,2-Dichloroethane	0.5 ug/L	<0.5	-	<0.5	<0.5
1,1-Dichloroethylene	0.5 ug/L	<0.5	-	<0.5	<0.5
cis-1,2-Dichloroethylene	0.5 ug/L	<0.5	-	<0.5	<0.5
trans-1,2-Dichloroethylene	0.5 ug/L	<0.5	-	<0.5	<0.5
1,2-Dichloropropane	0.5 ug/L	<0.5	-	<0.5	<0.5
cis-1,3-Dichloropropylene	0.5 ug/L	<0.5	-	<0.5	<0.5
trans-1,3-Dichloropropylene	0.5 ug/L	<0.5	-	<0.5	<0.5
1,3-Dichloropropene, total	0.5 ug/L	<0.5	-	<0.5	<0.5
Ethylbenzene	0.5 ug/L	<0.5	-	<0.5	<0.5
Ethylene dibromide (dibromoethane)	0.2 ug/L	<0.2	-	<0.2	<0.2
Hexane	1.0 ug/L	<1.0	-	<1.0	<1.0
Methyl Ethyl Ketone (2-Butanone)	5.0 ug/L	<5.0	-	<5.0	<5.0
Methyl Isobutyl Ketone	5.0 ug/L	<5.0	-	<5.0	<5.0
Methyl tert-butyl ether	2.0 ug/L	<2.0	-	<2.0	<2.0
Methylene Chloride	5.0 ug/L	<5.0	-	<5.0	<5.0
Styrene	0.5 ug/L	<0.5	-	<0.5	<0.5
1,1,1,2-Tetrachloroethane	0.5 ug/L	<0.5	-	<0.5	<0.5
1,1,2,2-Tetrachloroethane	0.5 ug/L	<0.5	-	<0.5	<0.5
Tetrachloroethylene	0.5 ug/L	<0.5	-	<0.5	<0.5
Toluene	0.5 ug/L	<0.5	-	<0.5	<0.5
1,1,1-Trichloroethane	0.5 ug/L	<0.5	-	<0.5	<0.5
1,1,2-Trichloroethane	0.5 ug/L	<0.5	-	<0.5	<0.5
Trichloroethylene	0.5 ug/L	<0.5	-	<0.5	<0.5
Trichlorofluoromethane	1.0 ug/L	<1.0	-	<1.0	<1.0
Vinyl chloride	0.5 ug/L	<0.5	-	<0.5	<0.5
m,p-Xylenes	0.5 ug/L	<0.5	-	<0.5	<0.5
o-Xylene	0.5 ug/L	<0.5	-	<0.5	<0.5

Certificate of Analysis

Client: GEMTEC Consulting Engineers and Scientists Limited

Client PO:

Report Date: 09-Aug-2019

Order Date: 1-Aug-2019

Project Description: 61730.62

	Client ID:	MW 19-1	MW 19-2(Reg 153)	MW 19-4	MW 19-101
	Sample Date:	31-Jul-19 10:10	31-Jul-19 12:00	29-Jul-19 15:00	31-Jul-19 10:35
	Sample ID:	1931480-01	1931480-03	1931480-04	1931480-05
	MDL/Units	Water	Water	Water	Water
Xylenes, total	0.5 ug/L	<0.5	-	<0.5	<0.5
4-Bromofluorobenzene	Surrogate	110%	-	120%	105%
Dibromofluoromethane	Surrogate	102%	-	106%	104%
Toluene-d8	Surrogate	106%	-	107%	105%

Hydrocarbons

F1 PHCs (C6-C10)	25 ug/L	<25	-	<25	<25
F2 PHCs (C10-C16)	100 ug/L	<100	-	<100	<100
F3 PHCs (C16-C34)	100 ug/L	<100	-	<100	<100
F4 PHCs (C34-C50)	100 ug/L	<100	-	<100	<100

Certificate of Analysis

Report Date: 09-Aug-2019

Client: GEMTEC Consulting Engineers and Scientists Limited

Order Date: 1-Aug-2019

Client PO:

Project Description: 61730.62

	Client ID:	Trip Blank	Field Blank	-	-
	Sample Date:	29-Jul-19 00:00	29-Jul-19 00:00	-	-
	Sample ID:	1931480-06	1931480-07	-	-
	MDL/Units	Water	Water	-	-

Volatiles

Acetone	5.0 ug/L	<5.0	<5.0	-	-
Benzene	0.5 ug/L	<0.5	<0.5	-	-
Bromodichloromethane	0.5 ug/L	<0.5	<0.5	-	-
Bromoform	0.5 ug/L	<0.5	<0.5	-	-
Bromomethane	0.5 ug/L	<0.5	<0.5	-	-
Carbon Tetrachloride	0.2 ug/L	<0.2	<0.2	-	-
Chlorobenzene	0.5 ug/L	<0.5	<0.5	-	-
Chloroform	0.5 ug/L	<0.5	<0.5	-	-
Dibromochloromethane	0.5 ug/L	<0.5	<0.5	-	-
Dichlorodifluoromethane	1.0 ug/L	<1.0	<1.0	-	-
1,2-Dichlorobenzene	0.5 ug/L	<0.5	<0.5	-	-
1,3-Dichlorobenzene	0.5 ug/L	<0.5	<0.5	-	-
1,4-Dichlorobenzene	0.5 ug/L	<0.5	<0.5	-	-
1,1-Dichloroethane	0.5 ug/L	<0.5	<0.5	-	-
1,2-Dichloroethane	0.5 ug/L	<0.5	<0.5	-	-
1,1-Dichloroethylene	0.5 ug/L	<0.5	<0.5	-	-
cis-1,2-Dichloroethylene	0.5 ug/L	<0.5	<0.5	-	-
trans-1,2-Dichloroethylene	0.5 ug/L	<0.5	<0.5	-	-
1,2-Dichloropropane	0.5 ug/L	<0.5	<0.5	-	-
cis-1,3-Dichloropropylene	0.5 ug/L	<0.5	<0.5	-	-
trans-1,3-Dichloropropylene	0.5 ug/L	<0.5	<0.5	-	-
1,3-Dichloropropene, total	0.5 ug/L	<0.5	<0.5	-	-
Ethylbenzene	0.5 ug/L	<0.5	<0.5	-	-
Ethylene dibromide (dibromoethane)	0.2 ug/L	<0.2	<0.2	-	-
Hexane	1.0 ug/L	<1.0	<1.0	-	-
Methyl Ethyl Ketone (2-Butanone)	5.0 ug/L	<5.0	<5.0	-	-
Methyl Isobutyl Ketone	5.0 ug/L	<5.0	<5.0	-	-
Methyl tert-butyl ether	2.0 ug/L	<2.0	<2.0	-	-
Methylene Chloride	5.0 ug/L	<5.0	<5.0	-	-
Styrene	0.5 ug/L	<0.5	<0.5	-	-
1,1,1,2-Tetrachloroethane	0.5 ug/L	<0.5	<0.5	-	-
1,1,2,2-Tetrachloroethane	0.5 ug/L	<0.5	<0.5	-	-
Tetrachloroethylene	0.5 ug/L	<0.5	<0.5	-	-
Toluene	0.5 ug/L	<0.5	<0.5	-	-

Certificate of Analysis

Client: **GEMTEC Consulting Engineers and Scientists Limited**

Client PO:

Report Date: 09-Aug-2019

Order Date: 1-Aug-2019

Project Description: **61730.62**

	Client ID:	Trip Blank	Field Blank	-	-
	Sample Date:	29-Jul-19 00:00	29-Jul-19 00:00	-	-
	Sample ID:	1931480-06	1931480-07	-	-
	MDL/Units	Water	Water	-	-
1,1,1-Trichloroethane	0.5 ug/L	<0.5	<0.5	-	-
1,1,2-Trichloroethane	0.5 ug/L	<0.5	<0.5	-	-
Trichloroethylene	0.5 ug/L	<0.5	<0.5	-	-
Trichlorofluoromethane	1.0 ug/L	<1.0	<1.0	-	-
Vinyl chloride	0.5 ug/L	<0.5	<0.5	-	-
m,p-Xylenes	0.5 ug/L	<0.5	<0.5	-	-
o-Xylene	0.5 ug/L	<0.5	<0.5	-	-
Xylenes, total	0.5 ug/L	<0.5	<0.5	-	-
4-Bromofluorobenzene	Surrogate	102%	104%	-	-
Dibromofluoromethane	Surrogate	106%	108%	-	-
Toluene-d8	Surrogate	103%	105%	-	-

Certificate of Analysis

Report Date: 09-Aug-2019

Client: GEMTEC Consulting Engineers and Scientists Limited

Order Date: 1-Aug-2019

Client PO:

Project Description: 61730.62

Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Anions									
Chloride	ND	1	mg/L						
General Inorganics									
Conductivity	ND	5	uS/cm						
Cyanide, free	ND	2	ug/L						
Hydrocarbons									
F1 PHCs (C6-C10)	ND	25	ug/L						
F2 PHCs (C10-C16)	ND	100	ug/L						
F3 PHCs (C16-C34)	ND	100	ug/L						
F4 PHCs (C34-C50)	ND	100	ug/L						
Metals									
Mercury	ND	0.1	ug/L						
Antimony	ND	0.5	ug/L						
Arsenic	ND	1	ug/L						
Barium	ND	1	ug/L						
Beryllium	ND	0.5	ug/L						
Boron	ND	10	ug/L						
Cadmium	ND	0.1	ug/L						
Chromium (VI)	ND	10	ug/L						
Chromium	ND	1	ug/L						
Cobalt	ND	0.5	ug/L						
Copper	ND	0.5	ug/L						
Lead	ND	0.1	ug/L						
Molybdenum	ND	0.5	ug/L						
Nickel	ND	1	ug/L						
Selenium	ND	1	ug/L						
Silver	ND	0.1	ug/L						
Sodium	ND	200	ug/L						
Thallium	ND	0.1	ug/L						
Uranium	ND	0.1	ug/L						
Vanadium	ND	0.5	ug/L						
Zinc	ND	5	ug/L						
Volatiles									
Acetone	ND	5.0	ug/L						
Benzene	ND	0.5	ug/L						
Bromodichloromethane	ND	0.5	ug/L						
Bromoform	ND	0.5	ug/L						
Bromomethane	ND	0.5	ug/L						
Carbon Tetrachloride	ND	0.2	ug/L						
Chlorobenzene	ND	0.5	ug/L						
Chloroform	ND	0.5	ug/L						
Dibromochloromethane	ND	0.5	ug/L						
Dichlorodifluoromethane	ND	1.0	ug/L						
1,2-Dichlorobenzene	ND	0.5	ug/L						
1,3-Dichlorobenzene	ND	0.5	ug/L						
1,4-Dichlorobenzene	ND	0.5	ug/L						
1,1-Dichloroethane	ND	0.5	ug/L						
1,2-Dichloroethane	ND	0.5	ug/L						
1,1-Dichloroethylene	ND	0.5	ug/L						
cis-1,2-Dichloroethylene	ND	0.5	ug/L						
trans-1,2-Dichloroethylene	ND	0.5	ug/L						
1,2-Dichloropropane	ND	0.5	ug/L						
cis-1,3-Dichloropropylene	ND	0.5	ug/L						
trans-1,3-Dichloropropylene	ND	0.5	ug/L						
1,3-Dichloropropene, total	ND	0.5	ug/L						
Ethylbenzene	ND	0.5	ug/L						
Ethylene dibromide (dibromoethane)	ND	0.2	ug/L						
Hexane	ND	1.0	ug/L						

Certificate of Analysis

Report Date: 09-Aug-2019

Client: GEMTEC Consulting Engineers and Scientists Limited

Order Date: 1-Aug-2019

Client PO:

Project Description: 61730.62

Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Methyl Ethyl Ketone (2-Butanone)	ND	5.0	ug/L						
Methyl Isobutyl Ketone	ND	5.0	ug/L						
Methyl tert-butyl ether	ND	2.0	ug/L						
Methylene Chloride	ND	5.0	ug/L						
Styrene	ND	0.5	ug/L						
1,1,1,2-Tetrachloroethane	ND	0.5	ug/L						
1,1,2,2-Tetrachloroethane	ND	0.5	ug/L						
Tetrachloroethylene	ND	0.5	ug/L						
Toluene	ND	0.5	ug/L						
1,1,1-Trichloroethane	ND	0.5	ug/L						
1,1,2-Trichloroethane	ND	0.5	ug/L						
Trichloroethylene	ND	0.5	ug/L						
Trichlorofluoromethane	ND	1.0	ug/L						
Vinyl chloride	ND	0.5	ug/L						
m,p-Xylenes	ND	0.5	ug/L						
o-Xylene	ND	0.5	ug/L						
Xylenes, total	ND	0.5	ug/L						
Surrogate: 4-Bromofluorobenzene	35.0		ug/L		109	50-140			
Surrogate: Dibromofluoromethane	29.0		ug/L		90.6	50-140			
Surrogate: Toluene-d8	33.4		ug/L		104	50-140			

Certificate of Analysis

Report Date: 09-Aug-2019

Client: GEMTEC Consulting Engineers and Scientists Limited

Order Date: 1-Aug-2019

Client PO:

Project Description: 61730.62

Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Anions									
Chloride	40.4	1	mg/L	40.5			0.3	10	
General Inorganics									
SAR	3.6	0.01	[blank]	3.7			2.5	200	
Conductivity	1490	5	uS/cm	1490			0.5	5	
Cyanide, free	ND	2	ug/L	ND				20	
pH	8.0	0.1	pH Units	8.0			0.3	3.3	
Hydrocarbons									
F1 PHCs (C6-C10)	ND	25	ug/L	ND				30	
Metals									
Mercury	ND	0.1	ug/L	ND			0.0	20	
Antimony	0.84	0.5	ug/L	ND			0.0	20	
Arsenic	ND	1	ug/L	ND			0.0	20	
Barium	21.8	1	ug/L	21.7			0.6	20	
Beryllium	ND	0.5	ug/L	ND			0.0	20	
Boron	21	10	ug/L	20			3.3	20	
Cadmium	ND	0.1	ug/L	ND			0.0	20	
Chromium (VI)	ND	10	ug/L	ND			0.0	20	
Chromium	ND	1	ug/L	ND			0.0	20	
Cobalt	ND	0.5	ug/L	ND			0.0	20	
Copper	0.99	0.5	ug/L	0.97			2.0	20	
Lead	ND	0.1	ug/L	ND			0.0	20	
Molybdenum	2.81	0.5	ug/L	2.71			3.7	20	
Nickel	ND	1	ug/L	ND			0.0	20	
Selenium	ND	1	ug/L	ND			0.0	20	
Silver	ND	0.1	ug/L	ND			0.0	20	
Sodium	16200	200	ug/L	16600			2.4	20	
Thallium	ND	0.1	ug/L	ND			0.0	20	
Uranium	ND	0.1	ug/L	ND			0.0	20	
Vanadium	ND	0.5	ug/L	ND			0.0	20	
Zinc	9	5	ug/L	9			3.9	20	
Volatiles									
Acetone	ND	5.0	ug/L	ND				30	
Benzene	ND	0.5	ug/L	ND				30	
Bromodichloromethane	ND	0.5	ug/L	ND				30	
Bromoform	ND	0.5	ug/L	ND				30	
Bromomethane	ND	0.5	ug/L	ND				30	
Carbon Tetrachloride	ND	0.2	ug/L	ND				30	
Chlorobenzene	ND	0.5	ug/L	ND				30	
Chloroform	ND	0.5	ug/L	ND				30	
Dibromochloromethane	ND	0.5	ug/L	ND				30	
Dichlorodifluoromethane	ND	1.0	ug/L	ND				30	
1,2-Dichlorobenzene	ND	0.5	ug/L	ND				30	
1,3-Dichlorobenzene	ND	0.5	ug/L	ND				30	
1,4-Dichlorobenzene	ND	0.5	ug/L	ND				30	
1,1-Dichloroethane	ND	0.5	ug/L	ND				30	
1,2-Dichloroethane	ND	0.5	ug/L	ND				30	
1,1-Dichloroethylene	ND	0.5	ug/L	ND				30	
cis-1,2-Dichloroethylene	ND	0.5	ug/L	ND				30	
trans-1,2-Dichloroethylene	ND	0.5	ug/L	ND				30	
1,2-Dichloropropane	ND	0.5	ug/L	ND				30	
cis-1,3-Dichloropropylene	ND	0.5	ug/L	ND				30	
trans-1,3-Dichloropropylene	ND	0.5	ug/L	ND				30	
Ethylbenzene	ND	0.5	ug/L	ND				30	
Ethylene dibromide (dibromoethane)	ND	0.2	ug/L	ND				30	
Hexane	ND	1.0	ug/L	ND				30	
Methyl Ethyl Ketone (2-Butanone)	ND	5.0	ug/L	ND				30	

Certificate of Analysis

Report Date: 09-Aug-2019

 Client: **GEMTEC Consulting Engineers and Scientists Limited**

Order Date: 1-Aug-2019

Client PO:

Project Description: 61730.62
Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Methyl Isobutyl Ketone	ND	5.0	ug/L	ND				30	
Methyl tert-butyl ether	ND	2.0	ug/L	ND				30	
Methylene Chloride	ND	5.0	ug/L	ND				30	
Styrene	ND	0.5	ug/L	ND				30	
1,1,1,2-Tetrachloroethane	ND	0.5	ug/L	ND				30	
1,1,2,2-Tetrachloroethane	ND	0.5	ug/L	ND				30	
Tetrachloroethylene	ND	0.5	ug/L	ND				30	
Toluene	ND	0.5	ug/L	ND				30	
1,1,1-Trichloroethane	ND	0.5	ug/L	ND				30	
1,1,2-Trichloroethane	ND	0.5	ug/L	ND				30	
Trichloroethylene	ND	0.5	ug/L	ND				30	
Trichlorofluoromethane	ND	1.0	ug/L	ND				30	
Vinyl chloride	ND	0.5	ug/L	ND				30	
m,p-Xylenes	ND	0.5	ug/L	ND				30	
o-Xylene	ND	0.5	ug/L	ND				30	
Surrogate: 4-Bromofluorobenzene	34.1		ug/L		107	50-140			
Surrogate: Dibromofluoromethane	31.4		ug/L		98.2	50-140			
Surrogate: Toluene-d8	33.6		ug/L		105	50-140			

Certificate of Analysis
Client: **GEMTEC Consulting Engineers and Scientists Limited**
Client PO:

Report Date: 09-Aug-2019
Order Date: 1-Aug-2019
Project Description: **61730.62**

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Anions									
Chloride	48.9	1	mg/L	40.5	83.2	77-123			
General Inorganics									
Cyanide, free	31.7	2	ug/L	ND	106	70-130			
Hydrocarbons									
F1 PHCs (C6-C10)	1730	25	ug/L		86.4	68-117			
F2 PHCs (C10-C16)	1560	100	ug/L		97.5	60-140			
F3 PHCs (C16-C34)	3950	100	ug/L		101	60-140			
F4 PHCs (C34-C50)	3020	100	ug/L		122	60-140			
Metals									
Mercury	3.32	0.1	ug/L	ND	111	70-130			
Antimony	36.5		ug/L	ND	72.2	80-120			QM-07
Arsenic	46.7		ug/L	ND	92.5	80-120			
Barium	67.2		ug/L	21.7	91.0	80-120			
Beryllium	44.5		ug/L	ND	88.9	80-120			
Boron	64		ug/L	20	87.0	80-120			
Cadmium	44.6		ug/L	ND	89.2	80-120			
Chromium (VI)	170	10	ug/L	ND	85.0	70-130			
Chromium	46.2		ug/L	ND	91.9	80-120			
Cobalt	43.7		ug/L	ND	87.3	80-120			
Copper	45.4		ug/L	0.97	88.9	80-120			
Lead	43.7		ug/L	ND	87.4	80-120			
Molybdenum	42.8		ug/L	2.71	80.1	80-120			
Nickel	44.2		ug/L	ND	87.4	80-120			
Selenium	44.9		ug/L	ND	89.4	80-120			
Silver	42.4		ug/L	ND	84.7	80-120			
Sodium	24200		ug/L	16600	75.8	80-120			QM-07
Thallium	41.0		ug/L	ND	82.1	80-120			
Uranium	42.3		ug/L	ND	84.6	80-120			
Vanadium	45.6		ug/L	ND	90.8	80-120			
Zinc	52		ug/L	9	84.8	80-120			
Volatiles									
Acetone	81.2	5.0	ug/L		81.2	50-140			
Benzene	32.3	0.5	ug/L		80.8	60-130			
Bromodichloromethane	27.8	0.5	ug/L		69.4	60-130			
Bromoform	32.5	0.5	ug/L		81.3	60-130			
Bromomethane	43.7	0.5	ug/L		109	50-140			
Carbon Tetrachloride	31.9	0.2	ug/L		79.8	60-130			
Chlorobenzene	32.8	0.5	ug/L		82.0	60-130			
Chloroform	31.0	0.5	ug/L		77.6	60-130			
Dibromochloromethane	30.8	0.5	ug/L		76.9	60-130			
Dichlorodifluoromethane	31.0	1.0	ug/L		77.5	50-140			
1,2-Dichlorobenzene	36.2	0.5	ug/L		90.5	60-130			
1,3-Dichlorobenzene	36.9	0.5	ug/L		92.2	60-130			
1,4-Dichlorobenzene	40.2	0.5	ug/L		101	60-130			
1,1-Dichloroethane	33.6	0.5	ug/L		84.0	60-130			
1,2-Dichloroethane	31.6	0.5	ug/L		79.0	60-130			
1,1-Dichloroethylene	34.2	0.5	ug/L		85.5	60-130			
cis-1,2-Dichloroethylene	33.1	0.5	ug/L		82.8	60-130			
trans-1,2-Dichloroethylene	30.0	0.5	ug/L		75.0	60-130			
1,2-Dichloropropane	33.5	0.5	ug/L		83.7	60-130			

Certificate of Analysis

Report Date: 09-Aug-2019

Client: GEMTEC Consulting Engineers and Scientists Limited

Order Date: 1-Aug-2019

Client PO:

Project Description: 61730.62

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
cis-1,3-Dichloropropylene	37.5	0.5	ug/L		93.8	60-130			
trans-1,3-Dichloropropylene	27.5	0.5	ug/L		68.6	60-130			
Ethylbenzene	36.6	0.5	ug/L		91.5	60-130			
Ethylene dibromide (dibromoethane)	34.7	0.2	ug/L		86.8	60-130			
Hexane	43.4	1.0	ug/L		108	60-130			
Methyl Ethyl Ketone (2-Butanone)	89.2	5.0	ug/L		89.2	50-140			
Methyl Isobutyl Ketone	105	5.0	ug/L		105	50-140			
Methyl tert-butyl ether	82.3	2.0	ug/L		82.3	50-140			
Methylene Chloride	28.0	5.0	ug/L		70.0	60-130			
Styrene	36.2	0.5	ug/L		90.4	60-130			
1,1,1,2-Tetrachloroethane	31.2	0.5	ug/L		77.9	60-130			
1,1,2,2-Tetrachloroethane	31.3	0.5	ug/L		78.3	60-130			
Tetrachloroethylene	31.0	0.5	ug/L		77.6	60-130			
Toluene	31.9	0.5	ug/L		79.8	60-130			
1,1,1-Trichloroethane	29.1	0.5	ug/L		72.7	60-130			
1,1,2-Trichloroethane	35.0	0.5	ug/L		87.4	60-130			
Trichloroethylene	31.4	0.5	ug/L		78.5	60-130			
Trichlorofluoromethane	40.1	1.0	ug/L		100	60-130			
Vinyl chloride	31.2	0.5	ug/L		78.0	50-140			
m,p-Xylenes	67.9	0.5	ug/L		84.8	60-130			
o-Xylene	34.3	0.5	ug/L		85.7	60-130			
Surrogate: 4-Bromofluorobenzene	24.5		ug/L		76.7	50-140			

Certificate of Analysis

Client: GEMTEC Consulting Engineers and Scientists Limited

Client PO:

Report Date: 09-Aug-2019

Order Date: 1-Aug-2019

Project Description: 61730.62

Qualifier Notes:

QC Qualifiers :

QM-07 : The spike recovery was outside acceptance limits for the MS and/or MSD. The batch was accepted based on other acceptable QC.

Sample Data Revisions

None

Work Order Revisions / Comments:

None

Other Report Notes:

n/a: not applicable

ND: Not Detected

MDL: Method Detection Limit

Source Result: Data used as source for matrix and duplicate samples

%REC: Percent recovery.

RPD: Relative percent difference.

CCME PHC additional information:

- The method for the analysis of PHCs complies with the Reference Method for the CWS PHC and is validated for use in the laboratory. All prescribed quality criteria identified in the method has been met.
- F1 range corrected for BTEX.
- F2 to F3 ranges corrected for appropriate PAHs where available.
- The gravimetric heavy hydrocarbons (F4G) are not to be added to C6 to C50 hydrocarbons.
- In the case where F4 and F4G are both reported, the greater of the two results is to be used for comparison to CWS PHC criteria.
- When reported, data for F4G has been processed using a silica gel cleanup.



Client Name: <u>Gemtec</u>	Project Reference: <u>61730.62</u>	Turnaround Time: <input type="checkbox"/> 1 Day <input type="checkbox"/> 3 Day <input type="checkbox"/> 2 Day <input checked="" type="checkbox"/> Regular Date Required: _____
Contact Name: <u>NS</u>	Quote #	
Address: <u>32 Steacie Dr.</u>	PO #	
Telephone: <u>613-836-1422</u>	Email Address: <u>nicole.soucy@gemtec.ca</u>	

Criteria: ☒ O. Reg. 153/04 (As Amended) Table ☐ RSC Filing ☐ O. Reg. 558/00 ☐ PWQO ☐ CCME ☒ SUB (Storm) ☒ SUB (Sanitary) Municipality: _____ ☐ Other: _____

Matrix Type: S (Soil/Sed.) GW (Ground Water) SW (Surface Water) SS (Storm/Sanitary Sewer) P (Paint) A (Air) O (Other)

Paracel Order Number:

1931480

Required Analyses

Sample ID/Location Name	Matrix	Air Volume	# of Containers	Sample Taken		PHCs F1-F4+BTX	VOCs	PAHs	Metals by ICP	Hg	C+V	B (HWS)	Sewer Use	153/04 Metals, +In	EC/SAR
				Date	Time										
1 MW 19-1	GW		9	26/31/19	10:10am	X	X						X	X	
2 MW 19-2			16	26/31/19	12:00pm	X	X						X	X	
3 MW 19-4			9	26/29/19	3:00pm	X	X						X	X	
4 MW 19-101			9	26/31/19	10:35am	X	X						X	X	
5 Trip Blank			1	26/29/19			X								
6 Field Blank			2	26/29/19			X								
7															
8															
9															
10															

Comments:

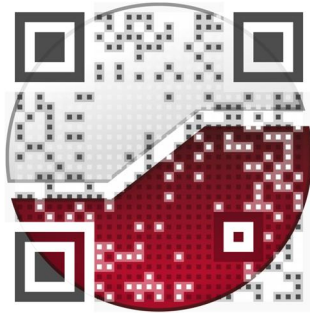
② PHCs + VOC's added as per client Aug 2/19

Method of Delivery:

Paracel

Relinquished By (Sign): <u>M. Duffy</u>	Received by Driver/Depot: <u>A. Blouin</u>	Received at Lab: <u>Suneedarm Bokmai</u>	Verified By: <u>[Signature]</u>
Relinquished By (Print): <u>Melanie Duffy</u>	Date/Time: <u>01/08/19 11:50 AM</u>	Date/Time: <u>Aug 6, 2019 01:55</u>	Date/Time: <u>14/15 8:27-19</u>
Date/Time: <u>August 1, 2019</u>	Temperature: <u>10.4°C</u>	Temperature: <u>10.4°C</u>	pH Verified: <u>X</u> By: <u>[Signature]</u>

experience • knowledge • integrity



civil	civil
geotechnical	géotechnique
environmental	environnementale
field services	surveillance de chantier
materials testing	service de laboratoire des matériaux

expérience • connaissance • intégrité

