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**Limited Phase Two
Environmental Site Assessment
Proposed Commercial Building
5506 Manotick Main Street
Manotick, Ontario**

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Submitted to:

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Ottawa, Ontario
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**Limited Phase Two
Environmental Site Assessment
Proposed Commercial Building
5506 Manotick Main Street
Manotick, Ontario**

February 13, 2020
Project: 65032.03

EXECUTIVE SUMMARY

GEMTEC Consulting Engineers and Scientists Limited (GEMTEC) was retained by KGMS Construction to complete a Limited Phase Two Environmental Site Assessment (ESA) for a proposed commercial development at 5506 Manotick Main Street.

Two Areas of Potential Environmental Concern (APECs) were identified through the Phase One ESA and investigated during the Phase Two ESA. APECs identified on the subject property include Gasoline and Associated Products Storage in Fixed Tanks, and a Volatile Organic Compound (VOC) plume in groundwater associated with a known regional historical spill.

A total of three boreholes (BH19-1, BH19-2, and BH19-3), two of which were completed as monitoring wells (MW19-1 and MW19-2) were advanced on the subject property in order to facilitate soil and groundwater investigations.

A total of three soil samples, including one duplicate, and one groundwater sample were submitted for analytical analyses based on the combustible headspace gas readings, visual, olfactory and tactile evidence of impacts. Samples were submitted to ALS Laboratory Group for analysis of contaminants of potential concern associated with each APEC. A summary of analytical results identified the following:

- Soil sample BH19-3 SA3, and BH19-3 SA103 exceeded the applicable MECP SCS for vanadium;
- Soil sample BH19-3 SA1 met the applicable MECP SCS for all parameters analyzed; and,
- Groundwater sample MW19-01 met the applicable MECP SCS for all parameters analyzed.

As indicated in Section 4.5, reliance on the Ottawa regional background clay concentration for vanadium as presented in the 2017 Sterling et al., was consulted in our assessment of concentrations of naturally occurring metals. The vanadium concentration identified in native soil from sample BH19-3 SA3 is below the proposed geo-regional background values from the Ottawa area. As such, GEMTEC does not consider vanadium in native soil as a contaminant.

No further work is recommended for the subject property at this time.

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1.0 INTRODUCTION

GEMTEC Consulting Engineers and Scientists Limited (GEMTEC) was retained by KGMS Construction to complete a Limited Phase Two Environmental Site Assessment (ESA) for a proposed commercial development at 5506 Manotick Main Street (the 'subject property'). The location of the subject property is shown on Figure A.1, Appendix A.

The Limited Phase Two ESA was completed following the recommendations provided in the GEMTEC, 2019, Phase One ESA submitted to KGMS Construction, under separate cover. GEMTEC understands that the Limited Phase Two ESA is being completed as a due diligence measure and in support of a Site Plan application with the City of Ottawa. As the property use will not be changing to a more sensitive land use, the filing of a Record of Site Condition (RSC), as regulated by Ontario Regulation 153/04 under the Environmental Protection Act, is not mandatory. This Limited Phase Two ESA has been completed in general 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.

1.1 Site Description

The subject property is 5506 Manotick Main Street, Ottawa, Ontario. The location of the subject property is shown on Figure A.1, Appendix A. The property is bounded by Manotick Main Street to the north and east, by Highcroft drive to the north and west, and adjacent residential properties, 1164 Highcroft Drive, and 5510 Manotick Main Street to the south.

The subject property located at 5506 Manotick Main Street, Ottawa, Ontario, has a total area of approximately 0.13 hectares (0.34 acres). The property's PIN is 04587-0071 (LT); and legal description for the subject site is PT LT 1 CON ABF N GOWER AS IN N691493; RIDEAU.

The representative for the subject site is Mr. Steven Horvath of KGMS Construction

1.2 Property Ownership

The subject property is 5506 Manotick Main Street, Ottawa, Ontario, owned by Cedar Sand Holdings Inc.

1.3 Current and Proposed Future Uses

The subject property is currently vacant, and has been used historically as commercial office space.

KGMS Construction is proposing a new commercial development for the subject property. The proposed construction involves the demolition of the existing building and the construction of a new two-storey commercial building on the southeast side of the site, fronting onto Manotick Main Street, with at grade parking behind the building along the west portion of the subject property.

2.0 BACKGROUND INFORMATION

2.1 Physical Setting

Topographic mapping available through the Ontario Basic Mapping (OBM, 2012) and the Ministry of Natural Resources and Forestry (MNR, 2014), were reviewed to determine topographic features in the vicinity of the subject property and study area. The elevation of the subject property is approximately 87 metres above sea level and topography at the subject site and surrounding area is generally flat sloping downward slightly to the northeast towards the Rideau River.

Based on the review, overburden in the vicinity of the subject property generally consists of glaciomarine deposits of clay, silty clay and silt (ESRI, 2016). Bedrock is mapped as dolostone, minor shale and sandstone rocks of the Oxford Formation (ESRI, 2016).

2.2 Past Investigations

One historical assessment report was available for review at part of this Limited Phase Two ESA.

2.2.1 Phase One Environmental Site Assessment - GEMTEC, 2020

An ESA was completed for the subject property in 2020 by GEMTEC. The report was entitled “Phase One Environmental Site Assessment, Proposed Commercial Building, 5506 Manotick Main Street, Manotick, Ontario”.

Through a review of historical information pertaining to the subject site and adjacent properties, GEMTEC identified two areas of potential environmental concern (APECs) at the subject property. The APECs resulted from one on-site, and one off-site PCA with a potential to result in contamination in soil and/or groundwater on the subject property. APECs identified at the subject property are summarized below:

- **APEC 1:** Gasoline and Associated Products Storage in Fixed Tanks; and
- **APEC 2:** Historical VOC Plume.

Based on the APECs identified on the subject property, a Limited Phase Two ESA was recommended to investigate the impacts of the identified Contaminants of Potential Concerns (CoPCs) in soil and groundwater on the subject property.

3.0 SCOPE OF THE INVESTIGATION

3.1 Overview of the Site Investigation

The intent of the Limited Phase Two ESA is to address both on-site and off-site PCAs, and APECs identified through the preparation of the Phase One ESA against MECP Table 2 SCS to support the development of a commercial structure. Figure A.1, Appendix A illustrates the location of the identified PCAs on site and off site and the location of the on-site APECs.

3.2 Media Investigated

Boreholes were advanced on site to assess if 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 CCC Geotechnical & Environmental Drilling Ltd. (CCC), of Ottawa, Ontario, and by GEMTEC personnel using portable drilling equipment. Standard penetration testing was carried out in the boreholes advanced by CCC using drive open sampling equipment, and bedrock coring was carried out at selected locations.

CoPCs identified in the Phase One ESA (GEMTEC, 2019) for soil and groundwater at the site include metals, petroleum hydrocarbons (PHCs), benzene, toluene, ethylene, xylene (BTEX), and possibly volatile organic compounds (VOCs). The Table 3.1 below indicates the rationale for each borehole and monitoring well location and the associated CoPCs.

Table 3.1: Summary of Borehole and Monitoring Well Location Rationale

Borehole ID	Rational for Location	Media of Concern	CoPCs
BH/MW 19-1	This borehole/ monitoring well finished in bedrock is situated at the up-gradient edge of the subject property where water is expected to enter onto the site. Bedrock groundwater quality impacts from APEC 2 will be investigated at this location.	Groundwater	VOCs
BH/MW 19-2	This borehole is situated in the southwest corner of the subject property, its placement is driven by geotechnical investigation. No APECs were investigated at this location.	None	None
BH 19-3	This borehole is situated just west of the current structure on the subject property, near the anticipated location of the historic oil-heating tank. Potential impacts from APEC 1 will be investigated at this location.	Soil	Metals PHCs BTEX

3.3 Phase One Conceptual Site Model

Based on the historical review and site reconnaissance, GEMTEC (2019) concluded that there is potential for soil or groundwater contamination at the subject property. Information presented in this report that contributes to the development of the CSM is presented as applicable in Figures A.2, and A.3 and is summarized as follows.

- Records identified a total of 134 water well records within the study area. The records were for 114 water supply wells (domestic, commercial, public, municipal, and livestock), five abandoned wells, 11 monitoring wells/ test holes, one recharge well, one observation well, and two alteration records to a domestic well;

- The subject property and study area is serviced with gas and electricity. Private water wells and septic systems are common in this area, although municipal services are available along Manotick Main Street;
- The subject property is currently a vacant structure historically used as a lawyer's office;
- The elevation of the subject property is approximately 87 metres above sea level and topography at the subject site and surrounding area is generally flat sloping downward slightly to the north/east;
- The Rideau River is situated in the study area, approximately 110 metres northeast of the subject property. No other water features, un-evaluated wetlands, or areas of natural significance were identified on the subject property, or within the study area;
- Buildings in the study area are serviced with hydro, water and natural gas, and sewers were observed in the streets adjacent to the subject property. There is potential for underground utilities to affect contaminant transport on or to the subject property;
- Surficial and bedrock geology maps of the Ottawa area were reviewed. Based on the review, overburden in the vicinity of the subject property generally consists of glaciomarine deposits of clay, silty clay and silt. Bedrock is mapped as dolostone, minor shale and sandstone rocks of the Oxford Formation; and,
- Based on the review of records, interviews and the site reconnaissance completed as part of the Phase One ESA, GEMTEC identified two APECs for the study area.

3.3.1 PCAs, CoCs and APECs

The Phase One ESA (GEMTEC, 2019) identified several PCAs, and 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 3.2 below.

Table 3.2: Summary of PCAs identified in the Phase One ESA

Description of PCA	Address of PCA	Distance From Subject Property	Data Source	PCA Resulted in APEC (Yes or No)	CoCs
28. Gasoline and Associated Products Storage in Fixed Tanks	5506 Manotick Main Street	On the site	Site Reconnaissance	Yes	Metals PHC BTEX
Ot. VOC Plume	Manotick Downtown Core	Across the study area	Records Review	Yes	VOC
Ot. Spill	5511 Rideau Valley Drive North	15 metres northeast	ERIS	No	None

Description of PCA	Address of PCA	Distance From Subject Property	Data Source	PCA Resulted in APEC (Yes or No)	CoCs
Ot. Spill	5511 Manotick Main Street	15 metres northeast	ERIS	No	None
Ot. Spill	Manotick Main Street at Bridge Street	50 metres east	ERIS	No	None
39. Paints Manufacturing, Processing and Bulk Storage	5517 Manotick Main Street	75 metres east	City Directory	No	None
58. Waste Disposal and Waste Management, including thermal treatment, landfilling and transfer of waste, other than use of biosoils as soil conditioners	5521 Manotick Main Street	80 metres east	ERIS	No	None
10. Commercial Autobody Shops	5521 Manotick Main Street	80 metres east	City Directory	No	None
10. Commercial Autobody Shops	1142 Clapp Lane	120 metres east	City Directory	No	None
37. Operation of Dry Cleaning Equipment (where chemicals are used)	1143 Clapp Lane	125 metres east	ERIS	No	None
58. Waste Disposal and Waste Management, including thermal treatment, landfilling and transfer of waste, other than use of biosoils as soil conditioners	1143 Clapp Lane	125 metres east	ERIS	No	None
Ot. Spill	Mill Street at Manotick Main Street	130 metres southeast	ERIS	No	None
28. Gasoline and Associated Products Storage in Fixed Tanks	5527 Manotick Main Street	140 metres southeast	ERIS	No	None
10. Commercial Autobody Shops	5527 Manotick Main Street	140 metres southeast	ERIS, City Directory	No	None
Ot. Spill	1168 Maple Street	165 metres south	ERIS	No	None
40. Pesticides (including Herbicides, Fungicides and Anti-Fouling Agents) Manufacturing, Processing, Bulk Storage and Large-Scale Applications	1168 Maple Street	165 metres south	ERIS	No	None
19. Electronic and Computer Equipment Manufacturing	5497 Colony Heights Road	175 metres southwest	ERIS	No	None

Description of PCA	Address of PCA	Distance From Subject Property	Data Source	PCA Resulted in APEC (Yes or No)	CoCs
58. Waste Disposal and Waste Management, including thermal treatment, landfilling and transfer of waste, other than use of biosoils as soil conditioners	1125 Clapp Lane	180 metres northeast	ERIS	No	None
31. Ink Manufacturing, Processing and Bulk Storage	5536 Ann Street	195 metres south	City Directory	No	None
10. Commercial Autobody Shops	5536 Ann Street	195 metres south	City Directory	No	None
58. Waste Disposal and Waste Management, including thermal treatment, landfilling and transfer of waste, other than use of biosoils as soil conditioners	Rideau Valley Drive at Manotick Main Street	240 metres northwest	ERIS	No	None

3.4 Impediments and Deviations from Sampling and Analysis Plan

Physical impediments and weather conditions were present on the subject site resulting in access limitations to the location of proposed borehole 19-3. Accordingly, borehole 19-3 was advanced by GEMTEC personnel using portable drilling equipment.

4.0 INVESTIGATION METHODOLOGY

4.1 General

Prior to any intrusive investigation at the site, underground utility locates were completed by CCC 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.

Borehole drilling and soil sampling was completed 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. Two of the three boreholes were completed as monitoring wells instrumented with 2" PVC risers, and well screens with 3.05m screen intervals.

Field quality control measured used during the Limited Phase Two ESA consisted of the collection of one field duplicate sample for metals, BTEX, and PHCs in soil. Relative percent difference (RPD) values for comparison of samples to corresponding field duplicates were calculated and compared to MECP quality requirements.

4.2 Borehole Drilling

Three boreholes, including two monitoring wells were advanced at the site to assess the soil and groundwater conditions. Boreholes 19-1, and 19-2 were completed by CCC while borehole 19-3 was advanced by GEMTEC with portable drilling equipment. All drilling was completed using split-spoon techniques. Monitoring wells were installed at two of the boreholes (MW19-1 at BH19-1, and MW19-2, and BH19-2). The installed boreholes/monitoring wells are illustrated on Figure A.2, Appendix A. Standard penetration testing was carried out in the boreholes using drive open sampling equipment. Bedrock coring was carried out with coring equipment.

Field work completed for this investigation was carried out between December 16, 2019, and December 17, 2019. During that time, a total of three boreholes (BH19-1, BH19-2, and BH19-3) were advanced on the subject property. Split spoon samples were obtained where possible and underlying bedrock was cored in boreholes 19-1 using N size rotary diamond drilling equipment to identify the type and quality of the bedrock. Well screens were sealed in the bedrock at borehole 19-1, and in the overburden at borehole 19-2. 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.

4.3 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 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.

Soil samples were recovered at regular intervals during drilling following the Guidance on Sampling and Analytical Methods for Use at Contaminated Sites in Ontario (MOE, 1996). Clean gloves were worn and changed between each sample to prevent cross contamination. Soil samples were collected directly into laboratory-supplied sampling containers. All samples were stored and shipped in laboratory supplied coolers. Samples were submitted to ALS Laboratory Group, of Nepean, Ontario, a CALA-certified analytical laboratory, under standard chain-of-custody procedures and in accordance with GEMTEC QA/QC procedures.

Soil samples were inspected in the field for visual, tactile and olfactory evidence of impact, and following a period of equilibration to ambient temperature, soil sample vapours were screened using a combustible gas detector (RKI Eagle combustible gas detector calibrated to hexane standards, with methane elimination enabled). The results of the soil vapour readings are provided on the Record of Borehole Sheets in Appendix B.

The soil sampling program included the submission of three soil samples. Soil samples were selected based on soil vapour concentrations, visual, olfactory and tactile evidence of impact, and proximity to APECs and CoPCs. A total of three soil samples, including one duplicate sample, were submitted to ALS Laboratory Group, a CALA certified laboratory, for analysis of selected parameters. Soil samples submitted for analyses of selected parameters are summarized in Table 4.1.

Table 4.1: Summary of Soil Analyses

Borehole	Sample	Depth Interval (m bgs)	Soil Description	Analytical Analyses
BH19-3	SA1	0.00 – 0.79	Fill material: brown silty clay with sand	Metals, PHCs, BTEX
BH19-3	SA3	1.22 – 1.65	Weathered crust: grey brown silty clay	Metals, PHCs, BTEX
BH19-3	SA103	1.22 – 1.65	Weathered crust: grey brown silty clay	Metals, PHCs, BTEX

1. bgs – Below ground surface
2. BTEX – Benzene, Toluene, Ethylbenzene and Xylene
3. PHCs – Petroleum Hydrocarbons
4. BH19-3 SA103 is a duplicate soil sample of BH19-3 SA3

For soil samples collected for the analysis of PHCs and for BTEX, a core of soil was placed in a pre-weighed laboratory prepared vial containing a measured amount of methanol.

4.4 Field Screening Measurements

Soil samples were screened in the field using a Portable 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.

4.5 Monitoring Well Installation

Monitoring wells were installed in boreholes MW19-1, and MW19-2 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 CCC, a MECP-licenced well driller. Monitoring wells were installed by hand, lowering PVC components through the surface drill casing. Wells were labelled sequentially as MW19-1, and MW19-2, 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 a flush-mount protective casing. 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 CCC under the direct supervision of GEMTEC personnel.

4.6 Groundwater Monitoring and Sampling

On January 7, 2020, 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.

Groundwater samples were collected using peristaltic pump and dedicated sample tubing following low-flow parameter stabilization techniques.

Samples were collected directly into laboratory supplied sample containers and released to laboratory under chain-of-custody procedures. One groundwater sample was collected from MW19-01 and submitted to ALS Laboratory Group for analysis of VOC parameters. Samples collected in the field for laboratory analysis of dissolved metals were field-filtered using dedicated in-line Waterra 0.45µm filters.

4.7 Analytical Testing

Soil and groundwater samples were collected directly into laboratory-supplied sampling containers. All samples were stored and shipped in coolers with ice packs. Samples were submitted to ALS Laboratories Ltd., a CALA-certified analytical laboratory, under standard chain-of-custody procedures and in accordance with GEMTEC QA/QC procedures. Complete laboratory analytical reports for analyses are included in Appendix B.

4.8 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.

4.9 Quality Assurance and Quality Control Measures

Soil samples collected for metals, PAH, PHC/BTEX, and VOC analysis were collected directly into laboratory-supplied sampling containers. All samples were stored and shipped in coolers. Samples were submitted to ALS 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 deionised 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 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 and flow cell were 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.

Field quality control measures employed during the Phase Two ESA investigations consisted of the collection of field duplicate QA/QC sample for metals, PHC, and BTEX in soil. The duplicate soil sample was submitted to ALS 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.

5.0 REVIEW AND EVALUATION

5.1 Applicable Site Condition Standards

The Ministry of Environment, Conservation and Parks (MECP) Site Condition Standards (SCS) were selected based on site conditions and were selected for the site in accordance with the

requirements of Ontario Regulation 153/04, Record of Site Condition – Part XV.1 of the Environmental Protection Act (O. Reg. 153/04, Ministry of the Environment, Conservation and Parks, October 31, 2011).

The following information was considered in selecting the site condition standards:

- The most sensitive use of the property will be commercial;
- The site is not located within 30 m of a water body;
- Domestic water wells were identified within 250 metres of the subject site; and,
- Subsurface investigation completed on the subject site identified bedrock at depths greater than 2.0 m below ground surface.

Based on the above information the MECP Table 2 Full Depth Generic Site Condition Standards in a Potable Groundwater Condition, Commercial Property Use, Coarse Soils (MOE, April 15, 2011) was selected for the subject property.

5.2 Geology and Hydrogeology

The geology at the site can be generally described as asphaltic concrete, and base/subbase fill material underlain by a silty clay weathered crust, discontinuous layers of clayey silt, and glacial till followed by limestone bedrock of the Oxford formation.

Soil and groundwater conditions logged in the boreholes are given on the Record of Borehole sheets in Appendix C. The following presents an overview of the subsurface conditions encountered in the boreholes advanced as part of this investigation.

Asphaltic Concrete

Asphaltic concrete was encountered from ground surface. The pavement structure consists of about 10 and 40 millimetres of asphaltic concrete over about 390 and 240 millimetres of sand and gravel base layer in boreholes 19-1 and 19-2, respectively.

Silty Clay

Native deposits of silty clay were encountered below the pavement structure at boreholes 19-1 and 19-2, and at ground surface at borehole 19-3. The full thickness of the silty clay encountered in the boreholes has been weathered to a grey brown crust. The silty clay extends to depths of about 3.8 and 5.3 metres below ground surface in boreholes 19-1 and 19-2.

Clayey Silt

A deposit of clayey silt with some sand and gravel was encountered below the silty clay in borehole 19-2 at a depth of about 5.3 metres below ground surface (elevation of about 83.0 metres).

Glacial Till

A native deposit of glacial till was encountered below the silty clay at borehole 19-1 at a depth of about 3.8 metres below ground surface (elevation of about 84.0 metres), and extends to a depth of about 11.6 metres below surface grade (elevation of about 76.3 metres). The glacial till is considered to be a heterogeneous mixture of all grain sizes, which at this site, can be described as grey brown to grey gravelly silty sand with trace clay.

Limestone Bedrock

Grey limestone bedrock was encountered in borehole 19-1 at a depth of about 11.6 metres below ground surface (elevation of about 76.3 metres) and cored using rotary diamond drilling techniques while retrieving HQ sized bedrock core. The bedrock was cored to a depth of about 16.2 metres below ground surface (elevation of about 71.7 metres).

5.3 Groundwater Elevations and Flow Direction

Groundwater elevations presented below were calculated based on depth to groundwater measurements collected on January 7, 2020.

Groundwater depths were measured directly from the top of each monitoring well riser 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.

Table 5.1: Groundwater Levels

Borehole	Material	Groundwater elevation (m) January 7, 2020	Groundwater depth (m bgs) January 7, 2020
19-1	Bedrock	84.09	3.79
19-2	Overburden	86.10	2.21

The environmental groundwater monitoring well (MW19-2) was installed specifically to target the groundwater quality in the bedrock aquifer present beneath the site. Groundwater flow directions and hydraulic gradients could not be calculated on the subject property as only one well per water bearing unit was advanced.

5.4 Soil Field Screening

Soil vapours were screened for three 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 0 ppm and 45 ppm.

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

5.5 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 three soil samples (including one duplicate) were submitted to AGAT Laboratories, a CALA accredited laboratory, for analysis of selected parameters. The soil samples submitted for analyses and the selected parameters and analytical results are summarized in Table 5.2.

Table 5.2: Summary of Soil Samples

Borehole	Sample	UMT Coordinates		Depth Interval (m bgs)	Analytical Analyses	MECP Table 2 Exceedances
BH19-3	SA1	5008358	446057	0.00 – 0.79	Metals, PHCs, BTEX	None
BH19-3	SA3	5008366	446039	1.22 – 1.65	Metals, PHCs, BTEX	Vanadium
BH19-3	SA103	5008366	446039	1.22 – 1.65	Metals, PHCs, BTEX	Vanadium

Analytical results for the soil samples submitted for analyses and the selected MECP Table 2 SCS are presented in Table B1, in Appendix B. Laboratory Certificates of Analysis for the soil samples are provided in Appendix D.

Soil samples met the applicable MECP Table 2 SCS for all parameters analyzed, with the exception of vanadium at BH19-3.

In addition to MECP SCS, concentrations of some metals (barium, boron, chromium, cobalt, and vanadium) in native clay deposits within the project area, i.e., Champlain Sea deposits, were also compared to the 2017 document ‘Elevated Background Metals Concentrations in Champlain Sea Clay – Ottawa Region’ (Sterling, et al., 2017). The MECP soil values, published in the 1993 Ontario Ministry of Environment and Energy publication ‘Ontario Typical Range of Chemical Parameters in Soil, Vegetation, Moss Bags and Snow’ (MECP Table 1 values) were based on a statistical analysis (98th percentile) of 110 soil samples collected from various old urban and rural parks, primarily in southwestern Ontario, and are therefore not necessarily representative of natural background concentrations of metals within the unique clay deposits of the Champlain Sea found in eastern Ontario (Sterling, et al., 2017).

Reliance on the Ottawa regional background clay concentration for vanadium as presented in the 2017 Sterling et al., study is justified as the MECP has recommended that future updates to the Site Condition Standards (MOE, 2011) should consider using geo-regional approaches. As such, GEMTEC has consulted the above referenced document in our assessment when concentrations of naturally occurring metals were determined to exceed the generic MECP SCS. The vanadium

concentration identified in soil sample BH19-3 SA3 is less than the proposed geo-regional background values for the Ottawa area, as such, it is GEMTEC's opinion that vanadium in native soil is not a contaminant.

5.6 Groundwater Quality

Well screens were installed in one overburden (MW19-2), and one bedrock well (MW19-1), to measure the depth to groundwater and to facilitate groundwater sampling.

One groundwater sample from MW19-1 was collected in laboratory supplied bottles using a peristaltic pump with disposable tubing. No groundwater sample was collected from MW19-2 as this monitoring well was installed for geotechnical purposes. CoPCs in groundwater were only a concern for APEC #1 associated with the historical VOC plume in the vicinity of MW19-1. Accordingly, one groundwater sample was submitted to ALS Laboratories for analysis of selected parameters.

Analytical results for the groundwater samples submitted for analyses and the selected MECP Table 2 SCS are presented in Table B2, Appendix B. Laboratory Certificates of Analysis for the soil samples are provided in Appendix D. Groundwater samples met the applicable MECP Table 2 SCS for all parameters analyzed.

5.7 Quality Assurance and Quality Control Results

A quality assurance/quality control (QA/QC) program was implemented during the environmental sampling. The QA/QC program consisted of the use of standard field protocols. The QA/QC program also included internal laboratory QC performed by ALS Laboratory Group of Nepean, Ontario.

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 that QC Lot met ALS Data Quality Objectives. Complete laboratory analytical reports are provided in Appendix D.

Additionally, one duplicate soil sample was submitted to ALS Laboratory Group for analysis of selected parameters. The soil sample BH19-3 SA103 is a duplicate of sample BH19-3 SA3. Relative Standards Deviations (RPDs) were calculated for all parameters where the average of the original and duplicate sample concentrations exceeded five times the reportable detection limits (RDL). The average RDL was calculated as 10%. All of the QA/QC RPDs (with average sample values greater than 5 times the RDL) for the duplicate samples were within the acceptable limit for soils (MOE, 2011).

Based on the measures discussed above, sample collection and handling protocols are considered acceptable and associated analytical results reproducible. The quality of the data from the investigation was sufficient in that decision making was not affected, and the overall objectives of the investigation and assessment were met.

6.0 CONCLUSIONS

GEMTEC was retained by KGMS Construction, to complete a Limited Phase Two ESA for the property located at 5506 Manotick Main Street, in Manotick, Ontario.

Two APECs were identified through review of the Phase One ESA (GEMTEC, 2019) and investigated during the Phase Two ESA, a summary of the APECs can be found below:

- **APEC 1:** Gasoline and Associated Products Storage in Fixed Tanks; and,
- **APEC 2:** Historical VOC Plume.

The geology at the site can be generally described as asphaltic concrete, and base/subbase fill material underlain by a silty clay weathered crust, discontinuous layers of clayey silt, and glacial till followed by limestone bedrock of the Oxford formation.

A total of three soil samples, including one duplicate, and one groundwater sample were selected for analytical analysis based on the combustible headspace gas readings, visual, olfactory and tactile evidence of impacts and submitted to ALS Laboratory Group for analysis of CoPCs associated with each APEC. A summary of analytical results can be found below:

- Soil sample BH19-3 SA3, and BH19-3 SA103 exceeded the applicable MECP SCS for vanadium;
- Soil sample BH19-3 SA1 met the applicable MECP SCS for all parameters analyzed; and,
- Groundwater sample MW19-01 met the applicable MECP SCS for all parameters analyzed.

As indicated in Section 4.5, reliance on the Ottawa regional background clay concentration for vanadium as presented in the 2017 Sterling et al., was consulted in our assessment of concentrations of naturally occurring metals. The vanadium concentration identified in native soil from sample BH19-3 SA3 is below the proposed geo-regional background values from the Ottawa area. As such, GEMTEC does not consider vanadium in native soil as a contaminant.

No further work is recommended for the subject property at this time.

7.0 REFERENCES

City of Ottawa (Ottawa). 2019. GeoOttawa Maps Accessed: January 2020. Available: <http://maps.ottawa.ca/geoottawa/>.

Environmental Systems Research Institute (ESRI). 2011. ArcGIS Desktop: Release 10. Redlands, CA: Environmental Systems Research Institute.

GEMTEC. January 2020. Phase One Environmental Site Assessment, Proposed Development, 5506 Manotick Main Street, Manotick, Ontario.

Geography Network Canada (GNC). October 2004. Ontario Basic Mapping Accessed: January 2020. Available: <http://www.geographynetwork.ca/website/obm/viewer.htm>.

Google Earth™ Satellite Imagery, 2019

Ontario Ministry of Natural Resources and Forestry (MNR). 2014. Make A Map: Natural Heritage Areas.

Ontario Ministry of the Environment and Climate Change. Environment and Energy. Map Well Records. Accessed: January 2020. Available: <https://www.ontario.ca/environment-and-energy/map-well-records>

Ontario Ministry of the Environment and Climate Change. 1996. Guidance on sampling and analytical methods for use at contaminated sites in Ontario. Revised December 2019.

Ontario Ministry of the Environment (MOE). 2011. Soil, Groundwater and Sediment Standards for use under part XV.1 of the Environmental Protection Act. April 15. Revised December 2019.

Ontario Ministry of the Environment. 2014. Ontario Regulation 153/04, Made under the Environmental Protection Act, Part XV.1 – Records of Site Condition. Revised December 2019.

8.0 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, M.A.Sc., P.Eng
Environmental Engineer



Drew Paulusse, B.Sc.
Senior Environmental Scientist



9.0 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 KGMS Construction. It is intended for the exclusive use of KGMS Construction. This report may not be relied upon by any other person or entity without the express written consent of GEMTEC, and KGMS Construction. Nothing in this report is intended to provide a legal opinion.

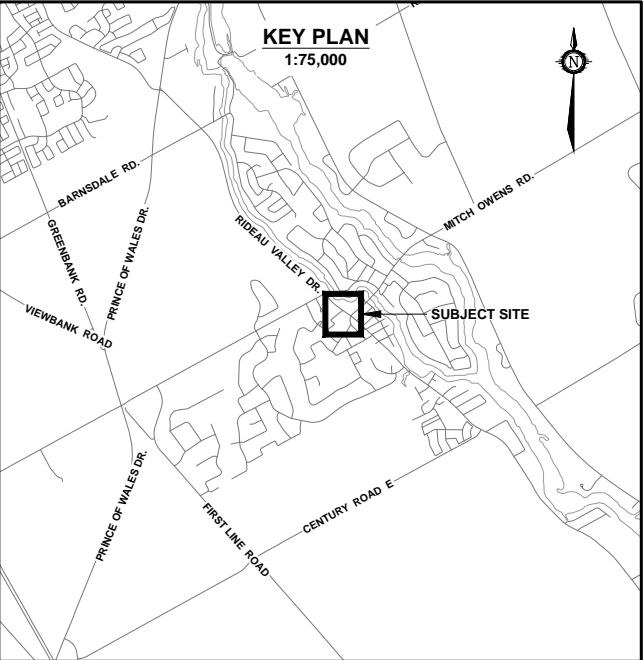
The investigation undertaken by GEMTEC with respect to this report and any conclusions or recommendations made in this report reflect the best judgements of GEMTEC based on the site conditions observed during the investigations undertaken at the date(s) identified in the report and on the information 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, reassess the conclusions presented herein.



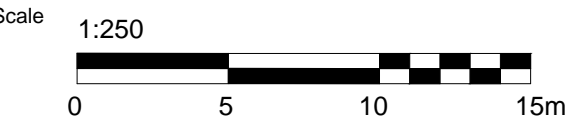
APPENDIX A

Figures



- LEGEND**
- BOREHOLE LOCATION**
(current investigation by GEMTEC)
 - BOREHOLE WITH MONITORING WELL LOCATION**
(current investigation by GEMTEC)
 - BH #** ——— BOREHOLE ID
 - XX.XX** ——— GROUND SURFACE ELEVATION, IN METRES
GEODETIC DATUM

NOTE:
ALL PROPOSED STRUCTURES HAVE BEEN ILLUSTRATED BY USING DRAWING SP1-0, SITE PLAN BY GRANT+HENLEY DESIGN GROUP. THUS, ALL PROPOSED STRUCTURES SHOWN ARE FOR ILLUSTRATION PURPOSES ONLY.



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Drawing		BOREHOLE LOCATION PLAN	
Client		KGMS CONSTRUCTION	
Project		PHASE TWO ESA 5506 MANOTTICK MAIN ST. OTTAWA, ONTARIO	
Drwn by	Chkd by		
P.C.	N.S.		
Date	Rev.	FIGURE A.1	
FEBRUARY 2020	0		



APPENDIX B

Analytical Summary Tables

TABLE B1
SOIL ANALYTICAL RESULTS

Sample Location: 5506 Manotick Main Street						
Sample ID: BH19-3 SA1			BH19-3 SA3		BH19-3 SA103	
Sample Depth (mbgs): 0.00 – 0.79			1.22 – 1.65		1.22 – 1.65	
Date Sampled: 18-Dec-19			18-Dec-19		18-Dec-19	
Parameter	Units	RDL	Table 2			
Physical Tests (Soil)						
% Moisture	%	0.25	NS	23.7	27.2	25.4
Metals (Soil)						
Antimony (Sb)	ug/g	1	40	<1.0	<1.0	<1.0
Arsenic (As)	ug/g	1	18	3.3	2.3	2
Barium (Ba)	ug/g	1	670	195	480	409
Beryllium (Be)	ug/g	0.5	8	0.65	0.97	0.84
Boron (B), Hot Water Ext.	ug/g	0.1	2	0.26	0.15	<0.10
Boron (B)	ug/g	5	120	5.4	<5.0	<5.0
Cadmium (Cd)	ug/g	0.5	1.9	<0.50	<0.50	<0.50
Chromium (Cr)	ug/g	1	160	47.2	91.3	89.7
Cobalt (Co)	ug/g	1	80	12.6	24.1	20
Copper (Cu)	ug/g	1	230	20.7	45.4	41.3
Lead (Pb)	ug/g	1	120	15.1	7.7	6.4
Mercury (Hg)	ug/g	0.005	3.9	0.0291	0.0151	0.0079
Molybdenum (Mo)	ug/g	1	40	1.2	<1.0	<1.0
Nickel (Ni)	ug/g	1	270	24.7	51	46.5
Selenium (Se)	ug/g	1	5.5	<1.0	<1.0	<1.0
Silver (Ag)	ug/g	0.2	40	0.28	<0.20	<0.20
Thallium (Tl)	ug/g	0.5	3.3	<0.50	<0.50	<0.50
Uranium (U)	ug/g	1	33	1.4	1	1
Vanadium (V)	ug/g	1	86	65.6	111	105
Zinc (Zn)	ug/g	5	340	86.7	129	118
Volatile Organic Compounds						
Benzene	ug/g	0.0068	0.32	<0.0068	<0.0068	<0.0068
Ethylbenzene	ug/g	0.018	1.1	<0.018	<0.018	<0.018
Toluene	ug/g	0.08	6.4	<0.080	<0.080	<0.080
o-Xylene	ug/g	0.02	NS	<0.020	<0.020	<0.020
m+p-Xylenes	ug/g	0.03	NS	<0.030	<0.030	<0.030
Xylenes (Total)	ug/g	0.05	26	<0.050	<0.050	<0.050
4-Bromofluorobenzene	%	-	NS	102.6	104.3	104.5
1,4-Difluorobenzene	%	-	NS	112.8	114	116.8
Hydrocarbons (Soil)						
F1 (C6-C10)	ug/g	5	55	<5.0	<5.0	<5.0
F1-BTEX	ug/g	5	55	<5.0	<5.0	<5.0
F2 (C10-C16)	ug/g	10	230	<10	<10	<10
F3 (C16-C34)	ug/g	50	1700	<50	123	<50
F4 (C34-C50)	ug/g	50	3300	<50	153	<50
F4G-SG (GHH-Silica)	ug/g	250	3300	-	450	-
Total Hydrocarbons (C6-C50)	ug/g	72	NS	<72	275	<72
Chrom. to baseline at nC50	-	-	NS	YES	NO	YES
2-Bromobenzotrifluoride	%	-	NS	97.8	94.3	97.2
3,4-Dichlorotoluene	%	-	NS	84.7	86.8	90.3

Notes:

- 1 RDL - Reported Detection Limit
- 2 NS - No Standard
- 3 mbgs - Metres Below Ground Surface
- 4 Table 2: Full Depth Generic Site Condition Standards in a Potable Groundwater Condition, Commercial Property Use, Coarse Soils (MOE, April 15, 2011)
- 5 **Bolded** - Exceeds MECP Table 2 SCS

TABLE B2
GROUNDWATER ANALYTICAL RESULTS

Sample Location: 5506 Manotick Main Street				
Sample ID: MW19-01				
Screened Interval (mbgs): 13.1 – 16.15				
Date Sampled: 07/01/2020				
Parameter	Units	RDL	Table 2	
Volatile Organic Compounds				
Acetone	ug/L	30	2700	<30
Benzene	ug/L	0.5	5	<0.50
Bromodichloromethane	ug/L	2	16	<2.0
Bromoform	ug/L	5	25	<5.0
Bromomethane	ug/L	0.5	0.89	<0.50
Carbon tetrachloride	ug/L	0.2	0.79	<0.20
Chlorobenzene	ug/L	0.5	30	<0.50
Dibromochloromethane	ug/L	2	25	<2.0
Chloroform	ug/L	1	2.4	<1.0
1,2-Dibromoethane	ug/L	0.2	NS	<0.20
1,2-Dichlorobenzene	ug/L	0.5	3	<0.50
1,3-Dichlorobenzene	ug/L	0.5	59	<0.50
1,4-Dichlorobenzene	ug/L	0.5	1	<0.50
Dichlorodifluoromethane	ug/L	2	590	<2.0
1,1-Dichloroethane	ug/L	0.5	5	<0.50
1,2-Dichloroethane	ug/L	0.5	1.6	<0.50
1,1-Dichloroethylene	ug/L	0.5	1.6	<0.50
cis-1,2-Dichloroethylene	ug/L	0.5	1.6	<0.50
trans-1,2-Dichloroethylene	ug/L	0.5	1.6	<0.50
Methylene Chloride	ug/L	5	50	<5.0
1,2-Dichloropropane	ug/L	0.5	5	<0.50
cis-1,3-Dichloropropene	ug/L	0.3	0.5	<0.30
trans-1,3-Dichloropropene	ug/L	0.3	0.5	<0.30
1,3-Dichloropropene (cis & trans)	ug/L	0.5	0.5	<0.50
Ethylbenzene	ug/L	0.5	2.4	<0.50
n-Hexane	ug/L	0.5	51	<0.50
Methyl Ethyl Ketone	ug/L	20	1800	<20
Methyl Isobutyl Ketone	ug/L	20	640	<20
MTBE	ug/L	2	15	<2.0
Styrene	ug/L	0.5	5.4	<0.50
1,1,1,2-Tetrachloroethane	ug/L	0.5	1.1	<0.50
1,1,2,2-Tetrachloroethane	ug/L	0.5	1	<0.50
Tetrachloroethylene	ug/L	0.5	1.6	<0.50
Toluene	ug/L	0.5	24	<0.50
1,1,1-Trichloroethane	ug/L	0.5	200	<0.50
1,1,2-Trichloroethane	ug/L	0.5	4.7	<0.50
Trichloroethylene	ug/L	0.5	1.6	<0.50
Trichlorofluoromethane	ug/L	5	150	<5.0
Vinyl chloride	ug/L	0.5	0.5	<0.50
o-Xylene	ug/L	0.3	NS	<0.30
m+p-Xylenes	ug/L	0.4	NS	<0.40
Xylenes (Total)	ug/L	0.5	300	<0.50
4-Bromofluorobenzene	%	-	NS	89.1
1,4-Difluorobenzene	%	-	NS	91.3

Notes:

- 1 RDL - Reported Detection Limit
- 2 NS - No Standard
- 3 mbgs - Metres Below Ground Surface
- 4 Table 2: Full Depth Generic Site Condition Standards in a Potable Groundwater Condition, Commercial Property Use, Coarse Soils (MOE, April 15, 2011)
- 5 **Bolded** - Exceeds MECP Table 2 SCS



APPENDIX C

Borehole Logs

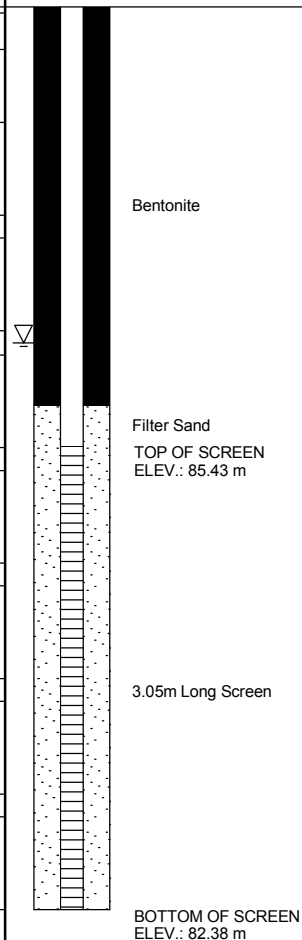
SHEET: 1 OF 1
DATUM: CGVD28
BORING DATE: Dec 16 2019

RECORD OF BOREHOLE 19-2

CLIENT: KGMS Construction
 PROJECT: 5506 Manotick Main Street, Ottawa, Ontario
 JOB#: 65032.03
 LOCATION: See Figure 1, Borehole Location Plan

SHEET: 1 OF 1
 DATUM: CGVD28
 BORING DATE: Dec 17 2019

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE			SAMPLE DATA				COMBUSTIBLE VAPOUR CONCENTRATION (ppm)	ODOUR	TPH (mg/kg)	MONITORING WELL INSTALLATION AND NOTES
		DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	RECOVERY (mm)	BLOWS/0.3m				
0		Ground Surface		88.32								
		ASPHALTIC CONCRETE		0.04	1a	GS	-		0			
		Brown sand and gravel (BASE MATERIAL)		0.28								
1		Stiff to very stiff, grey brown SILTY CLAY (WEATHERED CRUST)			1	SS	230	7	0			
2					2	SS	610	8	0			
3					3	SS	610	6	0			
4					4	SS	610	5	0			
5					5	SS	610	4	5			
					6	SS	460	9	0			
		Stiff, grey CLAYEY SILT, some sand and gravel		82.99								
				5.33	7	SS	230	5				
		End of Borehole		82.38								
				5.94								






GROUNDWATER OBSERVATIONS		
DATE	DEPTH (m)	ELEVATION (m)
Jan. 07/20	2.21	86.11

RECORD OF BOREHOLE 19-3

CLIENT: KGMS Construction
 PROJECT: 5506 Manotick Main Street, Ottawa, Ontario
 JOB#: 65032.03
 LOCATION: See Figure 1, Borehole Location Plan

SHEET: 1 OF 1
 DATUM: CGVD28
 BORING DATE: Dec 18 2019

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE			SAMPLE DATA				COMBUSTIBLE VAPOUR CONCENTRATION (ppm)	ODOUR	TPH (mg/kg)	MONITORING WELL INSTALLATION AND NOTES
		DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	RECOVERY (mm)	BLOWS/0.3m				
0	Portable Drill Rig Open Hole	Ground Surface		87.67								
		Brown silty clay with sand (FILL MATERIAL)		86.88	1	SS	230	5	0			 Native Backfill
1		Stiff to very stiff, grey brown SILTY CLAY (WEATHERED CRUST)		0.79	2	SS	355	14	0			
				86.02	3	SS	430	22	0			
		End of Borehole		1.65								



APPENDIX D

Laboratory Analytical Reports



GEMTEC Consulting Engineers & Scientists
Limited
ATTN: Nicole Soucy
32 Steacie Drive
Ottawa ON K2K 2A9

Date Received: 18-DEC-19
Report Date: 02-JAN-20 14:45 (MT)
Version: FINAL

Client Phone: 613-836-1422

Certificate of Analysis

Lab Work Order #: L2398556

Project P.O. #: 65032.03

Job Reference: 65032.03

C of C Numbers:

Legal Site Desc:

Emily Smith
Account Manager

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ALS CANADA LTD Part of the ALS Group An ALS Limited Company

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters		Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2398556-1 BH19-3 SA1								
Sampled By: CLIENT on 18-DEC-19								
Matrix: SOIL								
Physical Tests								
% Moisture		23.7		0.25	%	19-DEC-19	20-DEC-19	R4948024
Metals								
Antimony (Sb)		<1.0		1.0	ug/g	23-DEC-19	24-DEC-19	R4954079
Arsenic (As)		3.3		1.0	ug/g	23-DEC-19	24-DEC-19	R4954079
Barium (Ba)		195		1.0	ug/g	23-DEC-19	24-DEC-19	R4954079
Beryllium (Be)		0.65		0.50	ug/g	23-DEC-19	24-DEC-19	R4954079
Boron (B)		5.4		5.0	ug/g	23-DEC-19	24-DEC-19	R4954079
Boron (B), Hot Water Ext.		0.26		0.10	ug/g	30-DEC-19	30-DEC-19	R4957328
Cadmium (Cd)		<0.50		0.50	ug/g	23-DEC-19	24-DEC-19	R4954079
Chromium (Cr)		47.2		1.0	ug/g	23-DEC-19	24-DEC-19	R4954079
Cobalt (Co)		12.6		1.0	ug/g	23-DEC-19	24-DEC-19	R4954079
Copper (Cu)		20.7		1.0	ug/g	23-DEC-19	24-DEC-19	R4954079
Lead (Pb)		15.1		1.0	ug/g	23-DEC-19	24-DEC-19	R4954079
Mercury (Hg)		0.0291		0.0050	ug/g	29-DEC-19	30-DEC-19	R4957031
Molybdenum (Mo)		1.2		1.0	ug/g	23-DEC-19	24-DEC-19	R4954079
Nickel (Ni)		24.7		1.0	ug/g	23-DEC-19	24-DEC-19	R4954079
Selenium (Se)		<1.0		1.0	ug/g	23-DEC-19	24-DEC-19	R4954079
Silver (Ag)		0.28		0.20	ug/g	23-DEC-19	24-DEC-19	R4954079
Thallium (Tl)		<0.50		0.50	ug/g	23-DEC-19	24-DEC-19	R4954079
Uranium (U)		1.4		1.0	ug/g	23-DEC-19	24-DEC-19	R4954079
Vanadium (V)		65.6		1.0	ug/g	23-DEC-19	24-DEC-19	R4954079
Zinc (Zn)		86.7		5.0	ug/g	23-DEC-19	24-DEC-19	R4954079
Speciated Metals								
Chromium, Hexavalent		0.44		0.20	ug/g	31-DEC-19	02-JAN-20	R4958424
Volatile Organic Compounds								
Benzene		<0.0068		0.0068	ug/g	20-DEC-19	20-DEC-19	R4949907
Ethylbenzene		<0.018		0.018	ug/g	20-DEC-19	20-DEC-19	R4949907
Toluene		<0.080		0.080	ug/g	20-DEC-19	20-DEC-19	R4949907
o-Xylene		<0.020		0.020	ug/g	20-DEC-19	20-DEC-19	R4949907
m+p-Xylenes		<0.030		0.030	ug/g	20-DEC-19	20-DEC-19	R4949907
Xylenes (Total)		<0.050		0.050	ug/g		20-DEC-19	
Surrogate: 4-Bromofluorobenzene		102.6		50-140	%	20-DEC-19	20-DEC-19	R4949907
Surrogate: 1,4-Difluorobenzene		112.8		50-140	%	20-DEC-19	20-DEC-19	R4949907
Hydrocarbons								
F1 (C6-C10)		<5.0		5.0	ug/g	20-DEC-19	20-DEC-19	R4949907
F1-BTEX		<5.0		5.0	ug/g		24-DEC-19	
F2 (C10-C16)		<10		10	ug/g	20-DEC-19	23-DEC-19	R4954369
F3 (C16-C34)		<50		50	ug/g	20-DEC-19	23-DEC-19	R4954369
F4 (C34-C50)		<50		50	ug/g	20-DEC-19	23-DEC-19	R4954369
Total Hydrocarbons (C6-C50)		<72		72	ug/g		24-DEC-19	
Chrom. to baseline at nC50		YES				20-DEC-19	23-DEC-19	R4954369
Surrogate: 2-Bromobenzotrifluoride		97.8		60-140	%	20-DEC-19	23-DEC-19	R4954369

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters		Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2398556-1	BH19-3 SA1							
	Sampled By: CLIENT on 18-DEC-19							
Matrix: SOIL								
Hydrocarbons								
Surrogate: 3,4-Dichlorotoluene		84.7		60-140	%	20-DEC-19	20-DEC-19	R4949907
L2398556-2	BH19-3 SA3							
	Sampled By: CLIENT on 18-DEC-19							
Matrix: SOIL								
Physical Tests								
% Moisture		27.2		0.25	%	19-DEC-19	20-DEC-19	R4948024
Metals								
Antimony (Sb)		<1.0		1.0	ug/g	23-DEC-19	24-DEC-19	R4954079
Arsenic (As)		2.3		1.0	ug/g	23-DEC-19	24-DEC-19	R4954079
Barium (Ba)		480		1.0	ug/g	23-DEC-19	24-DEC-19	R4954079
Beryllium (Be)		0.97		0.50	ug/g	23-DEC-19	24-DEC-19	R4954079
Boron (B)		<5.0		5.0	ug/g	23-DEC-19	24-DEC-19	R4954079
Boron (B), Hot Water Ext.		0.15		0.10	ug/g	30-DEC-19	30-DEC-19	R4957328
Cadmium (Cd)		<0.50		0.50	ug/g	23-DEC-19	24-DEC-19	R4954079
Chromium (Cr)		91.3		1.0	ug/g	23-DEC-19	24-DEC-19	R4954079
Cobalt (Co)		24.1		1.0	ug/g	23-DEC-19	24-DEC-19	R4954079
Copper (Cu)		45.4		1.0	ug/g	23-DEC-19	24-DEC-19	R4954079
Lead (Pb)		7.7		1.0	ug/g	23-DEC-19	24-DEC-19	R4954079
Mercury (Hg)		0.0151		0.0050	ug/g	29-DEC-19	30-DEC-19	R4957031
Molybdenum (Mo)		<1.0		1.0	ug/g	23-DEC-19	24-DEC-19	R4954079
Nickel (Ni)		51.0		1.0	ug/g	23-DEC-19	24-DEC-19	R4954079
Selenium (Se)		<1.0		1.0	ug/g	23-DEC-19	24-DEC-19	R4954079
Silver (Ag)		<0.20		0.20	ug/g	23-DEC-19	24-DEC-19	R4954079
Thallium (Tl)		<0.50		0.50	ug/g	23-DEC-19	24-DEC-19	R4954079
Uranium (U)		1.0		1.0	ug/g	23-DEC-19	24-DEC-19	R4954079
Vanadium (V)		111		1.0	ug/g	23-DEC-19	24-DEC-19	R4954079
Zinc (Zn)		129		5.0	ug/g	23-DEC-19	24-DEC-19	R4954079
Speciated Metals								
Chromium, Hexavalent		0.71		0.20	ug/g	31-DEC-19	02-JAN-20	R4958424
Volatile Organic Compounds								
Benzene		<0.0068		0.0068	ug/g	20-DEC-19	20-DEC-19	R4949907
Ethylbenzene		<0.018		0.018	ug/g	20-DEC-19	20-DEC-19	R4949907
Toluene		<0.080		0.080	ug/g	20-DEC-19	20-DEC-19	R4949907
o-Xylene		<0.020		0.020	ug/g	20-DEC-19	20-DEC-19	R4949907
m+p-Xylenes		<0.030		0.030	ug/g	20-DEC-19	20-DEC-19	R4949907
Xylenes (Total)		<0.050		0.050	ug/g		20-DEC-19	
Surrogate: 4-Bromofluorobenzene		104.3		50-140	%	20-DEC-19	20-DEC-19	R4949907
Surrogate: 1,4-Difluorobenzene		114.0		50-140	%	20-DEC-19	20-DEC-19	R4949907
Hydrocarbons								
F1 (C6-C10)		<5.0		5.0	ug/g	20-DEC-19	20-DEC-19	R4949907
F1-BTEX		<5.0		5.0	ug/g		24-DEC-19	
F2 (C10-C16)		<10		10	ug/g	20-DEC-19	23-DEC-19	R4954369

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters		Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2398556-2 BH19-3 SA3 Sampled By: CLIENT on 18-DEC-19 Matrix: SOIL								
Hydrocarbons								
F3 (C16-C34)		123		50	ug/g	20-DEC-19	23-DEC-19	R4954369
F4 (C34-C50)		153		50	ug/g	20-DEC-19	23-DEC-19	R4954369
F4G-SG (GHH-Silica)		450		250	ug/g	20-DEC-19	20-DEC-19	R4955000
Total Hydrocarbons (C6-C50)		275		72	ug/g		24-DEC-19	
Chrom. to baseline at nC50		NO				20-DEC-19	23-DEC-19	R4954369
Surrogate: 2-Bromobenzotrifluoride		94.3		60-140	%	20-DEC-19	23-DEC-19	R4954369
Surrogate: 3,4-Dichlorotoluene		86.8		60-140	%	20-DEC-19	20-DEC-19	R4949907
L2398556-3 BH19-3 SA103 Sampled By: CLIENT on 18-DEC-19 Matrix: SOIL								
Physical Tests								
% Moisture		25.4		0.25	%	19-DEC-19	20-DEC-19	R4948024
Metals								
Antimony (Sb)		<1.0		1.0	ug/g	23-DEC-19	24-DEC-19	R4954079
Arsenic (As)		2.0		1.0	ug/g	23-DEC-19	24-DEC-19	R4954079
Barium (Ba)		409		1.0	ug/g	23-DEC-19	24-DEC-19	R4954079
Beryllium (Be)		0.84		0.50	ug/g	23-DEC-19	24-DEC-19	R4954079
Boron (B)		<5.0		5.0	ug/g	23-DEC-19	24-DEC-19	R4954079
Boron (B), Hot Water Ext.		<0.10		0.10	ug/g	30-DEC-19	30-DEC-19	R4957328
Cadmium (Cd)		<0.50		0.50	ug/g	23-DEC-19	24-DEC-19	R4954079
Chromium (Cr)		89.7		1.0	ug/g	23-DEC-19	24-DEC-19	R4954079
Cobalt (Co)		20.0		1.0	ug/g	23-DEC-19	24-DEC-19	R4954079
Copper (Cu)		41.3		1.0	ug/g	23-DEC-19	24-DEC-19	R4954079
Lead (Pb)		6.4		1.0	ug/g	23-DEC-19	24-DEC-19	R4954079
Mercury (Hg)		0.0079		0.0050	ug/g	29-DEC-19	30-DEC-19	R4957031
Molybdenum (Mo)		<1.0		1.0	ug/g	23-DEC-19	24-DEC-19	R4954079
Nickel (Ni)		46.5		1.0	ug/g	23-DEC-19	24-DEC-19	R4954079
Selenium (Se)		<1.0		1.0	ug/g	23-DEC-19	24-DEC-19	R4954079
Silver (Ag)		<0.20		0.20	ug/g	23-DEC-19	24-DEC-19	R4954079
Thallium (Tl)		<0.50		0.50	ug/g	23-DEC-19	24-DEC-19	R4954079
Uranium (U)		1.0		1.0	ug/g	23-DEC-19	24-DEC-19	R4954079
Vanadium (V)		105		1.0	ug/g	23-DEC-19	24-DEC-19	R4954079
Zinc (Zn)		118		5.0	ug/g	23-DEC-19	24-DEC-19	R4954079
Speciated Metals								
Chromium, Hexavalent		0.64		0.20	ug/g	31-DEC-19	02-JAN-20	R4958424
Volatile Organic Compounds								
Benzene		<0.0068		0.0068	ug/g	20-DEC-19	20-DEC-19	R4949907
Ethylbenzene		<0.018		0.018	ug/g	20-DEC-19	20-DEC-19	R4949907
Toluene		<0.080		0.080	ug/g	20-DEC-19	20-DEC-19	R4949907
o-Xylene		<0.020		0.020	ug/g	20-DEC-19	20-DEC-19	R4949907
m+p-Xylenes		<0.030		0.030	ug/g	20-DEC-19	20-DEC-19	R4949907
Xylenes (Total)		<0.050		0.050	ug/g		20-DEC-19	

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters		Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2398556-3	BH19-3 SA103							
Sampled By:	CLIENT on 18-DEC-19							
Matrix:	SOIL							
Volatile Organic Compounds								
Surrogate: 4-Bromofluorobenzene		104.5		50-140	%	20-DEC-19	20-DEC-19	R4949907
Surrogate: 1,4-Difluorobenzene		116.8		50-140	%	20-DEC-19	20-DEC-19	R4949907
Hydrocarbons								
F1 (C6-C10)		<5.0		5.0	ug/g	20-DEC-19	20-DEC-19	R4949907
F1-BTEX		<5.0		5.0	ug/g		24-DEC-19	
F2 (C10-C16)		<10		10	ug/g	20-DEC-19	23-DEC-19	R4954369
F3 (C16-C34)		<50		50	ug/g	20-DEC-19	23-DEC-19	R4954369
F4 (C34-C50)		<50		50	ug/g	20-DEC-19	23-DEC-19	R4954369
Total Hydrocarbons (C6-C50)		<72		72	ug/g		24-DEC-19	
Chrom. to baseline at nC50		YES				20-DEC-19	23-DEC-19	R4954369
Surrogate: 2-Bromobenzotrifluoride		97.2		60-140	%	20-DEC-19	23-DEC-19	R4954369
Surrogate: 3,4-Dichlorotoluene		90.3		60-140	%	20-DEC-19	20-DEC-19	R4949907

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

Reference Information

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
B-HWS-R511-WT	Soil	Boron-HWE-O.Reg 153/04 (July 2011)	HW EXTR, EPA 6010B
A dried solid sample is extracted with calcium chloride, the sample undergoes a heating process. After cooling the sample is filtered and analyzed by ICP/OES.			
Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011).			
BTX-511-HS-WT	Soil	BTEX-O.Reg 153/04 (July 2011)	SW846 8260
BTX is determined by extracting a soil or sediment sample as received with methanol, then analyzing by headspace-GC/MS.			
Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011).			
CR-CR6-IC-WT	Soil	Hexavalent Chromium in Soil	SW846 3060A/7199
This analysis is carried out using procedures adapted from "Test Methods for Evaluating Solid Waste" SW-846, Method 7199, published by the United States Environmental Protection Agency (EPA). The procedure involves analysis for chromium (VI) by ion chromatography using diphenylcarbazide in a sulphuric acid solution.			
Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011).			
F1-F4-511-CALC-WT	Soil	F1-F4 Hydrocarbon Calculated Parameters	CCME CWS-PHC, Pub #1310, Dec 2001-S

Analytical methods used for analysis of CCME Petroleum Hydrocarbons have been validated and comply with the Reference Method for the CWS PHC.

Hydrocarbon results are expressed on a dry weight basis.

In cases where results for both F4 and F4G are reported, the greater of the two results must be used in any application of the CWS PHC guidelines and the gravimetric heavy hydrocarbons cannot be added to the C6 to C50 hydrocarbons.
In samples where BTEX and F1 were analyzed , F1-BTEX represents a value where the sum of Benzene, Toluene, Ethylbenzene and total Xylenes has been subtracted from F1.

In samples where PAHs, F2 and F3 were analyzed, F2-Naphth represents the result where Naphthalene has been subtracted from F2. F3-PAH represents a result where the sum of Benzo(a)anthracene, Benzo(a)pyrene, Benzo(b)fluoranthene, Benzo(k)fluoranthene, Dibenzo(a,h)anthracene, Fluoranthene, Indeno(1,2,3-cd)pyrene, Phenanthrene, and Pyrene has been subtracted from F3.

Unless otherwise qualified, the following quality control criteria have been met for the F1 hydrocarbon range:

1. All extraction and analysis holding times were met.
2. Instrument performance showing response factors for C6 and C10 within 30% of the response factor for toluene.
3. Linearity of gasoline response within 15% throughout the calibration range.

Unless otherwise qualified, the following quality control criteria have been met for the F2-F4 hydrocarbon ranges:

1. All extraction and analysis holding times were met.
2. Instrument performance showing C10, C16 and C34 response factors within 10% of their average.
3. Instrument performance showing the C50 response factor within 30% of the average of the C10, C16 and C34 response factors.
4. Linearity of diesel or motor oil response within 15% throughout the calibration range.

F1-HS-511-WT	Soil	F1-O.Reg 153/04 (July 2011)	E3398/CCME TIER 1-HS
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Fraction F1 is determined by extracting a soil or sediment sample as received with methanol, then analyzing by headspace-GC/FID.

Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011), unless a subset of the Analytical Test Group (ATG) has been requested (the Protocol states that all analytes in an ATG must be reported).

F2-F4-511-WT	Soil	F2-F4-O.Reg 153/04 (July 2011)	CCME Tier 1
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Petroleum Hydrocarbons (F2-F4 fractions) are extracted from soil with 1:1 hexane:acetone using a rotary extractor. Extracts are treated with silica gel to remove polar organic interferences. F2, F3, & F4 are analyzed by GC-FID. F4G-sg is analyzed gravimetrically.

- Notes:
1. F2 (C10-C16): Sum of all hydrocarbons that elute between nC10 and nC16.
 2. F3 (C16-C34): Sum of all hydrocarbons that elute between nC16 and nC34.
 3. F4 (C34-C50): Sum of all hydrocarbons that elute between nC34 and nC50.
 4. F4G: Gravimetric Heavy Hydrocarbons
 5. F4G-sg: Gravimetric Heavy Hydrocarbons (F4G) after silica gel treatment.
 6. Where both F4 (C34-C50) and F4G-sg are reported for a sample, the larger of the two values is used for comparison against the relevant CCME guideline for F4.
 7. F4G-sg cannot be added to the C6 to C50 hydrocarbon results to obtain an estimate of total extractable hydrocarbons.
 8. This method is validated for use.

9. Data from analysis of validation and quality control samples is available upon request.
10. Reported results are expressed as milligrams per dry kilogram, unless otherwise indicated.

Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011), unless a subset of the Analytical Test Group (ATG) has been requested (the Protocol states that all analytes in an ATG must be reported).

F4G-ADD-511-WT	Soil	F4G SG-O.Reg 153/04 (July 2011)	MOE DECPH-E3398/CCME TIER 1
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F4G, gravimetric analysis, is determined if the chromatogram does not return to baseline at or before C50. A soil sample is extracted with a solvent mix, the solvent is evaporated and the weight of the residue is determined.

Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011).

HG-200.2-CVAA-WT	Soil	Mercury in Soil by CVAAS	EPA 200.2/1631E (mod)
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Soil samples are digested with nitric and hydrochloric acids, followed by analysis by CVAAS.

Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011).

MET-200.2-CCMS-WT	Soil	Metals in Soil by CRC ICPMS	EPA 200.2/6020A (mod)
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Soil/sediment is dried, disaggregated, and sieved (2 mm). For tests intended to support Ontario regulations, the <2mm fraction is ground to pass through a 0.355 mm sieve. Strong Acid Leachable Metals in the <2mm fraction are solubilized by heated digestion with nitric and hydrochloric acids. Instrumental analysis is by Collision / Reaction Cell ICPMS.

Limitations: This method is intended to liberate environmentally available metals. Silicate minerals are not solubilized. Some metals may be only partially recovered (matrix dependent), including Al, Ba, Be, Cr, S, Sr, Ti, Tl, V, W, and Zr. Elemental Sulfur may be poorly recovered by this method. Volatile forms of sulfur (e.g. sulfide, H2S) may be excluded if lost during sampling, storage, or digestion.

Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011), unless a subset of the Analytical Test Group (ATG) has been requested (the Protocol states that all analytes in an ATG must be reported).

MOISTURE-WT	Soil	% Moisture	CCME PHC in Soil - Tier 1 (mod)
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XYLENES-SUM-CALC-WT	Soil	Sum of Xylene Isomer Concentrations	CALCULATION
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Total xylenes represents the sum of o-xylene and m&p-xylene.

** ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
WT	ALS ENVIRONMENTAL - WATERLOO, ONTARIO, CANADA

Chain of Custody Numbers:

GLOSSARY OF REPORT TERMS

Surrogates are compounds that are similar in behaviour to target analyte(s), but that do not normally occur in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery. In reports that display the D.L. column, laboratory objectives for surrogates are listed there.

mg/kg - milligrams per kilogram based on dry weight of sample

mg/kg wwt - milligrams per kilogram based on wet weight of sample

mg/kg lwt - milligrams per kilogram based on lipid weight of sample

mg/L - unit of concentration based on volume, parts per million.

< - Less than.

D.L. - The reporting limit.

N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.

UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.

Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

Quality Control Report

Workorder: L2398556

Report Date: 02-JAN-20

Page 1 of 7

Client: GEMTEC Consulting Engineers & Scientists Limited
32 Steacie Drive
Ottawa ON K2K 2A9

Contact: Nicole Soucy

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
B-HWS-R511-WT		Soil						
Batch	R4957328							
WG3250511-4	DUP	L2398556-1						
Boron (B), Hot Water Ext.		0.26	0.26		ug/g	2.3	30	30-DEC-19
WG3250511-2	IRM	WT SAR3						
Boron (B), Hot Water Ext.			115.6		%		70-130	30-DEC-19
WG3250511-3	LCS							
Boron (B), Hot Water Ext.			109.0		%		70-130	30-DEC-19
WG3250511-1	MB							
Boron (B), Hot Water Ext.			<0.10		ug/g		0.1	30-DEC-19
BTX-511-HS-WT		Soil						
Batch	R4949907							
WG3246911-4	DUP	WG3246911-3						
Benzene		<0.0068	<0.0068	RPD-NA	ug/g	N/A	40	20-DEC-19
Ethylbenzene		<0.018	<0.018	RPD-NA	ug/g	N/A	40	23-DEC-19
m+p-Xylenes		<0.030	<0.030	RPD-NA	ug/g	N/A	40	23-DEC-19
o-Xylene		<0.020	<0.020	RPD-NA	ug/g	N/A	40	23-DEC-19
Toluene		<0.080	<0.080	RPD-NA	ug/g	N/A	40	20-DEC-19
WG3246911-2	LCS							
Benzene			105.0		%		70-130	20-DEC-19
Ethylbenzene			102.0		%		70-130	20-DEC-19
m+p-Xylenes			102.7		%		70-130	20-DEC-19
o-Xylene			103.4		%		70-130	20-DEC-19
Toluene			102.5		%		70-130	20-DEC-19
WG3246911-1	MB							
Benzene			<0.0068		ug/g		0.0068	20-DEC-19
Ethylbenzene			<0.018		ug/g		0.018	20-DEC-19
m+p-Xylenes			<0.030		ug/g		0.03	20-DEC-19
o-Xylene			<0.020		ug/g		0.02	20-DEC-19
Toluene			<0.080		ug/g		0.08	20-DEC-19
Surrogate: 1,4-Difluorobenzene			124.8		%		50-140	20-DEC-19
Surrogate: 4-Bromofluorobenzene			112.7		%		50-140	20-DEC-19
WG3246911-5	MS	L2398984-1						
Benzene			101.9		%		60-140	20-DEC-19
Ethylbenzene			98.3		%		60-140	20-DEC-19
m+p-Xylenes			96.1		%		60-140	20-DEC-19
o-Xylene			97.1		%		60-140	20-DEC-19
Toluene			100.2		%		60-140	20-DEC-19



Environmental

Quality Control Report

Workorder: L2398556

Report Date: 02-JAN-20

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Client: GEMTEC Consulting Engineers & Scientists Limited
32 Steacie Drive
Ottawa ON K2K 2A9

Contact: Nicole Soucy

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
CR-CR6-IC-WT		Soil						
Batch	R4958424							
WG3251256-4 CRM		WT-SQC012						
Chromium, Hexavalent			75.1		%		70-130	02-JAN-20
WG3251256-3 DUP		L2398556-3						
Chromium, Hexavalent		0.64	0.46		ug/g	32	35	02-JAN-20
WG3251256-2 LCS								
Chromium, Hexavalent			88.3		%		80-120	02-JAN-20
WG3251256-1 MB								
Chromium, Hexavalent			<0.20		ug/g		0.2	02-JAN-20
F1-HS-511-WT		Soil						
Batch	R4949907							
WG3246911-4 DUP		WG3246911-3						
F1 (C6-C10)		<5.0	<5.0	RPD-NA	ug/g	N/A	30	20-DEC-19
WG3246911-2 LCS								
F1 (C6-C10)			93.4		%		80-120	20-DEC-19
WG3246911-1 MB								
F1 (C6-C10)			<5.0		ug/g		5	20-DEC-19
Surrogate: 3,4-Dichlorotoluene			101.9		%		60-140	20-DEC-19
WG3246911-6 MS		L2398401-2						
F1 (C6-C10)			71.4		%		60-140	20-DEC-19
F2-F4-511-WT		Soil						
Batch	R4954369							
WG3246895-3 DUP		WG3246895-5						
F2 (C10-C16)		<10	<10	RPD-NA	ug/g	N/A	30	23-DEC-19
F3 (C16-C34)		<50	<50	RPD-NA	ug/g	N/A	30	23-DEC-19
F4 (C34-C50)		<50	<50	RPD-NA	ug/g	N/A	30	23-DEC-19
WG3246895-2 LCS								
F2 (C10-C16)			105.3		%		80-120	23-DEC-19
F3 (C16-C34)			104.0		%		80-120	23-DEC-19
F4 (C34-C50)			109.5		%		80-120	23-DEC-19
WG3246895-1 MB								
F2 (C10-C16)			<10		ug/g		10	23-DEC-19
F3 (C16-C34)			<50		ug/g		50	23-DEC-19
F4 (C34-C50)			<50		ug/g		50	23-DEC-19
Surrogate: 2-Bromobenzotrifluoride			98.9		%		60-140	23-DEC-19
WG3246895-4 MS		WG3246895-5						
F2 (C10-C16)			111.4		%		60-140	23-DEC-19
F3 (C16-C34)			114.2		%		60-140	

Quality Control Report

Workorder: L2398556

Report Date: 02-JAN-20

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Client: GEMTEC Consulting Engineers & Scientists Limited
32 Steacie Drive
Ottawa ON K2K 2A9

Contact: Nicole Soucy

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
F2-F4-511-WT	Soil							
Batch	R4954369							
WG3246895-4 MS		WG3246895-5						
F3 (C16-C34)			114.2		%		60-140	23-DEC-19
F4 (C34-C50)			117.2		%		60-140	23-DEC-19
F4G-ADD-511-WT	Soil							
Batch	R4955000							
WG3249598-2 LCS								
F4G-SG (GHH-Silica)			75.3		%		60-140	20-DEC-19
WG3249598-1 MB								
F4G-SG (GHH-Silica)			<250		ug/g		250	20-DEC-19
HG-200.2-CVAA-WT	Soil							
Batch	R4957031							
WG3250496-2 CRM		WT-CANMET-TILL2						
Mercury (Hg)			115.9		%		70-130	30-DEC-19
WG3250496-6 DUP		WG3250496-5						
Mercury (Hg)		0.0184	0.0173		ug/g	6.4	40	30-DEC-19
WG3250496-3 LCS								
Mercury (Hg)			113.5		%		80-120	30-DEC-19
WG3250496-1 MB								
Mercury (Hg)			<0.0050		mg/kg		0.005	30-DEC-19
MET-200.2-CCMS-WT	Soil							
Batch	R4954079							
WG3248651-9 CRM		WT-CANMET-TILL2						
Antimony (Sb)			112.9		%		70-130	24-DEC-19
Arsenic (As)			111.7		%		70-130	24-DEC-19
Barium (Ba)			118.4		%		70-130	24-DEC-19
Beryllium (Be)			99.0		%		70-130	24-DEC-19
Boron (B)			3.2		mg/kg		0-8.6	24-DEC-19
Cadmium (Cd)			111.6		%		70-130	24-DEC-19
Chromium (Cr)			110.1		%		70-130	24-DEC-19
Cobalt (Co)			109.2		%		70-130	24-DEC-19
Copper (Cu)			113.0		%		70-130	24-DEC-19
Lead (Pb)			103.0		%		70-130	24-DEC-19
Molybdenum (Mo)			107.9		%		70-130	24-DEC-19
Nickel (Ni)			110.9		%		70-130	24-DEC-19
Selenium (Se)			0.39		mg/kg		0.15-0.55	24-DEC-19
Silver (Ag)			0.29		mg/kg		0.16-0.36	24-DEC-19

Quality Control Report

Workorder: L2398556

Report Date: 02-JAN-20

Page 4 of 7

Client: GEMTEC Consulting Engineers & Scientists Limited
32 Steacie Drive
Ottawa ON K2K 2A9

Contact: Nicole Soucy

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-200.2-CCMS-WT		Soil						
Batch	R4954079							
WG3248651-9	CRM	WT-CANMET-TILL2						
Thallium (Tl)			103.5		%		70-130	24-DEC-19
Uranium (U)			88.9		%		70-130	24-DEC-19
Vanadium (V)			111.0		%		70-130	24-DEC-19
Zinc (Zn)			105.2		%		70-130	24-DEC-19
WG3248651-13	DUP	WG3248651-12						
Antimony (Sb)		0.18	0.16		ug/g	11	30	24-DEC-19
Arsenic (As)		6.60	6.74		ug/g	2.0	30	24-DEC-19
Barium (Ba)		84.3	78.9		ug/g	6.6	40	24-DEC-19
Beryllium (Be)		0.71	0.65		ug/g	9.5	30	24-DEC-19
Boron (B)		14.6	12.4		ug/g	17	30	24-DEC-19
Cadmium (Cd)		0.086	0.073		ug/g	17	30	24-DEC-19
Chromium (Cr)		21.9	21.4		ug/g	2.4	30	24-DEC-19
Cobalt (Co)		12.1	12.1		ug/g	0.1	30	24-DEC-19
Copper (Cu)		35.0	34.4		ug/g	1.7	30	24-DEC-19
Lead (Pb)		9.48	8.70		ug/g	8.6	40	24-DEC-19
Molybdenum (Mo)		0.53	0.44		ug/g	18	40	24-DEC-19
Nickel (Ni)		25.9	25.8		ug/g	0.7	30	24-DEC-19
Selenium (Se)		<0.20	<0.20	RPD-NA	ug/g	N/A	30	24-DEC-19
Silver (Ag)		<0.10	<0.10	RPD-NA	ug/g	N/A	40	24-DEC-19
Thallium (Tl)		0.110	0.097		ug/g	12	30	24-DEC-19
Uranium (U)		0.496	0.444		ug/g	11	30	24-DEC-19
Vanadium (V)		30.5	29.2		ug/g	4.1	30	24-DEC-19
Zinc (Zn)		60.7	59.1		ug/g	2.7	30	24-DEC-19
WG3248651-11	LCS							
Antimony (Sb)			108.3		%		80-120	24-DEC-19
Arsenic (As)			102.9		%		80-120	24-DEC-19
Barium (Ba)			108.2		%		80-120	24-DEC-19
Beryllium (Be)			96.2		%		80-120	24-DEC-19
Boron (B)			95.7		%		80-120	24-DEC-19
Cadmium (Cd)			97.3		%		80-120	24-DEC-19
Chromium (Cr)			102.2		%		80-120	24-DEC-19
Cobalt (Co)			99.9		%		80-120	24-DEC-19
Copper (Cu)			98.1		%		80-120	24-DEC-19

Quality Control Report

Workorder: L2398556

Report Date: 02-JAN-20

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Client: GEMTEC Consulting Engineers & Scientists Limited
32 Steacie Drive
Ottawa ON K2K 2A9

Contact: Nicole Soucy

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-200.2-CCMS-WT		Soil						
Batch R4954079								
WG3248651-11 LCS								
Lead (Pb)			97.1		%		80-120	24-DEC-19
Molybdenum (Mo)			102.2		%		80-120	24-DEC-19
Nickel (Ni)			99.2		%		80-120	24-DEC-19
Selenium (Se)			102.7		%		80-120	24-DEC-19
Silver (Ag)			98.6		%		80-120	24-DEC-19
Thallium (Tl)			98.7		%		80-120	24-DEC-19
Uranium (U)			85.9		%		80-120	24-DEC-19
Vanadium (V)			104.5		%		80-120	24-DEC-19
Zinc (Zn)			97.3		%		80-120	24-DEC-19
WG3248651-8 MB								
Antimony (Sb)			<0.10		mg/kg		0.1	24-DEC-19
Arsenic (As)			<0.10		mg/kg		0.1	24-DEC-19
Barium (Ba)			<0.50		mg/kg		0.5	24-DEC-19
Beryllium (Be)			<0.10		mg/kg		0.1	24-DEC-19
Boron (B)			<5.0		mg/kg		5	24-DEC-19
Cadmium (Cd)			<0.020		mg/kg		0.02	24-DEC-19
Chromium (Cr)			<0.50		mg/kg		0.5	24-DEC-19
Cobalt (Co)			<0.10		mg/kg		0.1	24-DEC-19
Copper (Cu)			<0.50		mg/kg		0.5	24-DEC-19
Lead (Pb)			<0.50		mg/kg		0.5	24-DEC-19
Molybdenum (Mo)			<0.10		mg/kg		0.1	24-DEC-19
Nickel (Ni)			<0.50		mg/kg		0.5	24-DEC-19
Selenium (Se)			<0.20		mg/kg		0.2	24-DEC-19
Silver (Ag)			<0.10		mg/kg		0.1	24-DEC-19
Thallium (Tl)			<0.050		mg/kg		0.05	24-DEC-19
Uranium (U)			<0.050		mg/kg		0.05	24-DEC-19
Vanadium (V)			<0.20		mg/kg		0.2	24-DEC-19
Zinc (Zn)			<2.0		mg/kg		2	24-DEC-19
MOISTURE-WT		Soil						
Batch R4948024								
WG3246817-3 DUP		L2398753-1						
% Moisture		10.5	10.7		%	2.3	20	20-DEC-19
WG3246817-2 LCS								
% Moisture			100.5		%		90-110	20-DEC-19



Quality Control Report

Workorder: L2398556

Report Date: 02-JAN-20

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Client: GEMTEC Consulting Engineers & Scientists Limited
32 Steacie Drive
Ottawa ON K2K 2A9

Contact: Nicole Soucy

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MOISTURE-WT	Soil							
Batch	R4948024							
WG3246817-1 MB								
% Moisture			<0.25		%		0.25	20-DEC-19

Quality Control Report

Workorder: L2398556

Report Date: 02-JAN-20

Client: GEMTEC Consulting Engineers & Scientists Limited
32 Steacie Drive
Ottawa ON K2K 2A9

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Contact: Nicole Soucy

Legend:

Limit	ALS Control Limit (Data Quality Objectives)
DUP	Duplicate
RPD	Relative Percent Difference
N/A	Not Available
LCS	Laboratory Control Sample
SRM	Standard Reference Material
MS	Matrix Spike
MSD	Matrix Spike Duplicate
ADE	Average Desorption Efficiency
MB	Method Blank
IRM	Internal Reference Material
CRM	Certified Reference Material
CCV	Continuing Calibration Verification
CVS	Calibration Verification Standard
LCSD	Laboratory Control Sample Duplicate

Sample Parameter Qualifier Definitions:

Qualifier	Description
RPD-NA	Relative Percent Difference Not Available due to result(s) being less than detection limit.

Hold Time Exceedances:

All test results reported with this submission were conducted within ALS recommended hold times.

ALS recommended hold times may vary by province. They are assigned to meet known provincial and/or federal government requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by the US EPA, APHA Standard Methods, or Environment Canada (where available). For more information, please contact ALS.

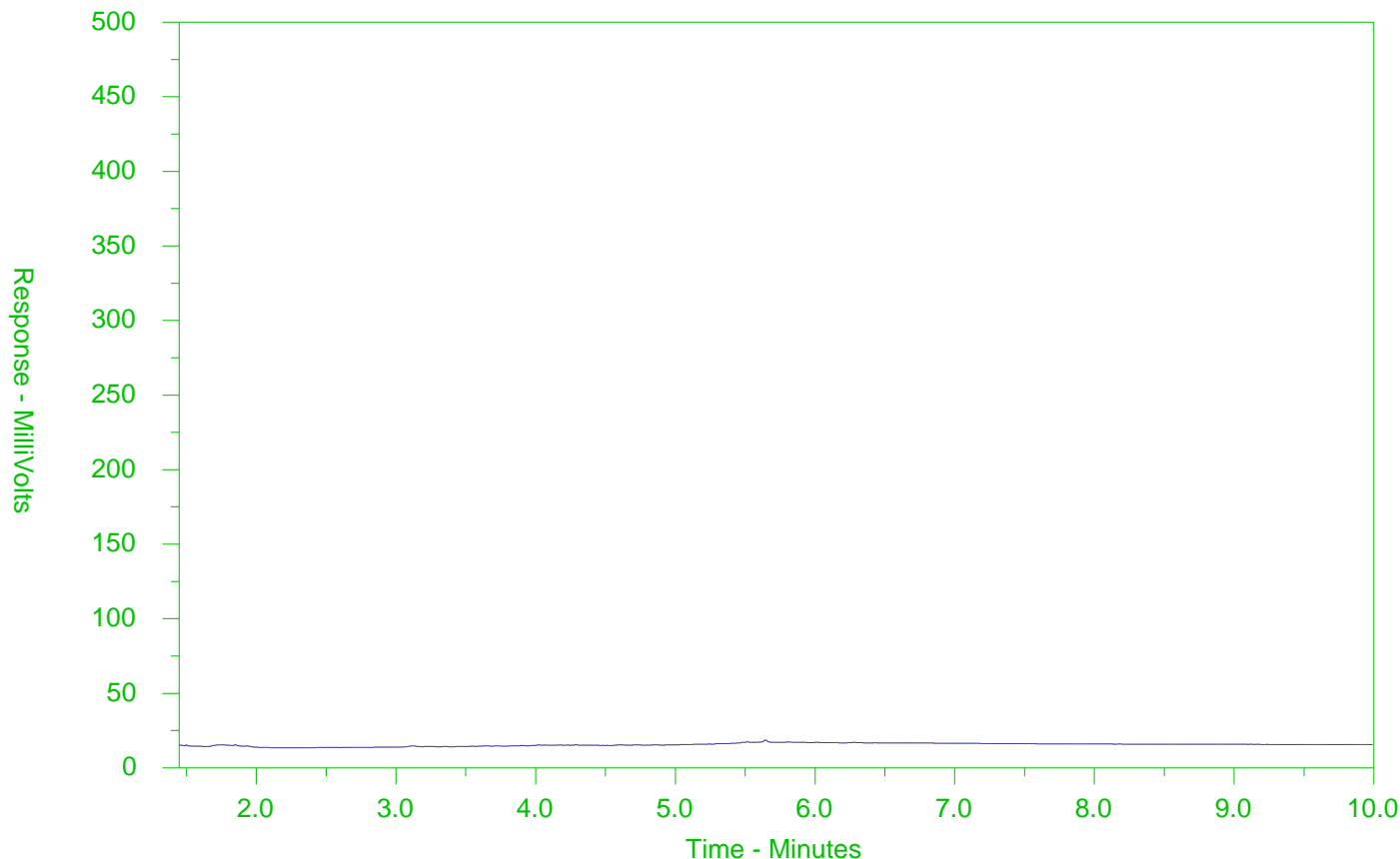
The ALS Quality Control Report is provided to ALS clients upon request. ALS includes comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against pre-determined data quality objectives to provide confidence in the accuracy of associated test results.

Please note that this report may contain QC results from anonymous Sample Duplicates and Matrix Spikes that do not originate from this Work Order.

CCME F2-F4 HYDROCARBON DISTRIBUTION REPORT



ALS Sample ID: L2398556-1
Client Sample ID: BH19-3 SA1



← F2 →		← F3 →		← F4 →	
nC10	nC16		nC34		nC50
174°C	287°C		481°C		575°C
346°F	549°F		898°F		1067°F
Gasoline →			← Motor Oils/Lube Oils/Grease		
← Diesel/Jet Fuels →					

The CCME F2-F4 Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and four n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

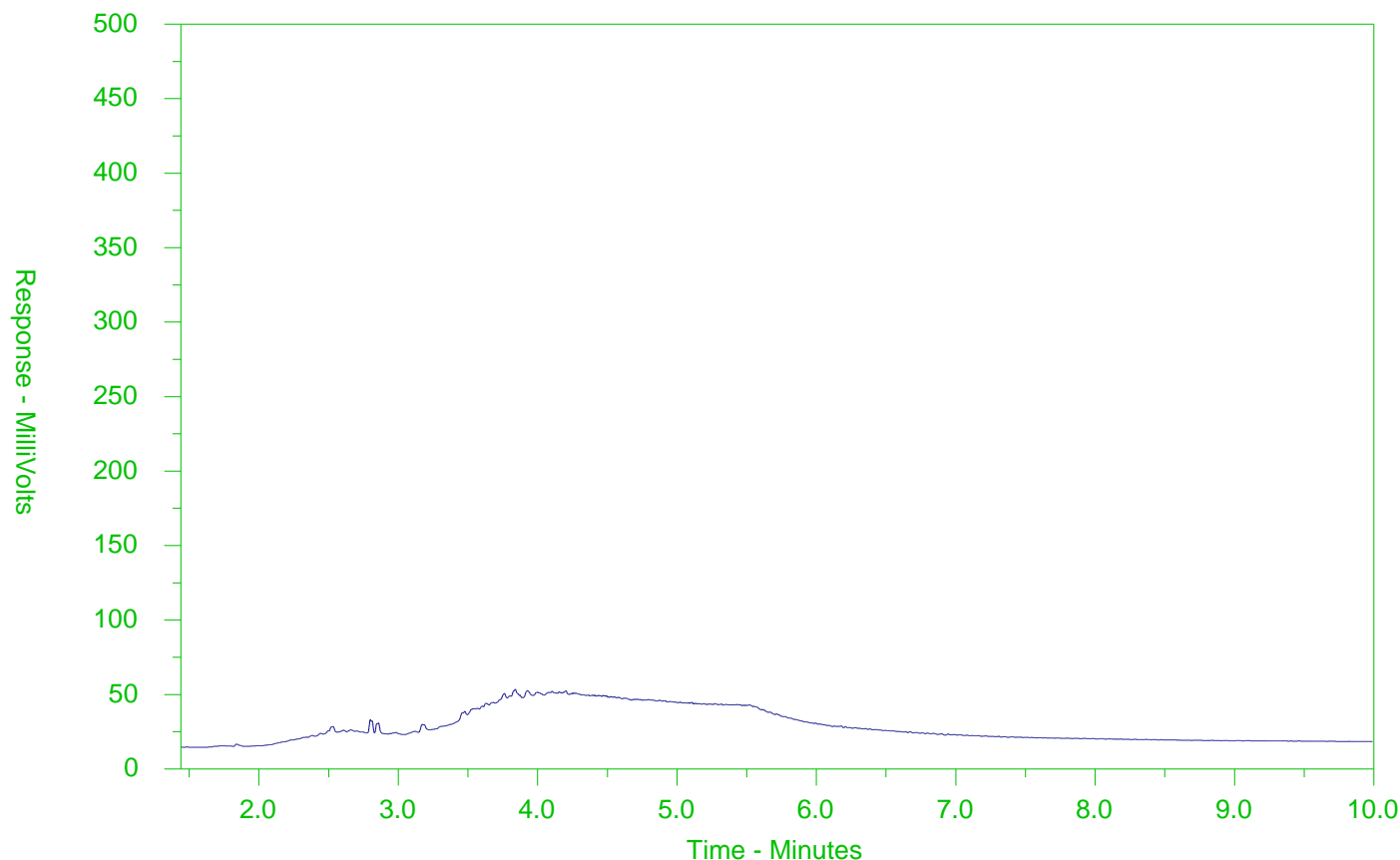
Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor and the scale at the left.

Note: This chromatogram was produced using GC conditions that are specific to ALS Canada CCME F2-F4 method. Refer to the ALS Canada CCME F2-F4 Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR Library can be found at www.alsglobal.com.

CCME F2-F4 HYDROCARBON DISTRIBUTION REPORT



ALS Sample ID: L2398556-2
Client Sample ID: BH19-3 SA3



← F2 →		← F3 →		← F4 →	
nC10	nC16		nC34		nC50
174°C	287°C		481°C		575°C
346°F	549°F		898°F		1067°F
Gasoline →			← Motor Oils/Lube Oils/Grease		
← Diesel/Jet Fuels →					

The CCME F2-F4 Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and four n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

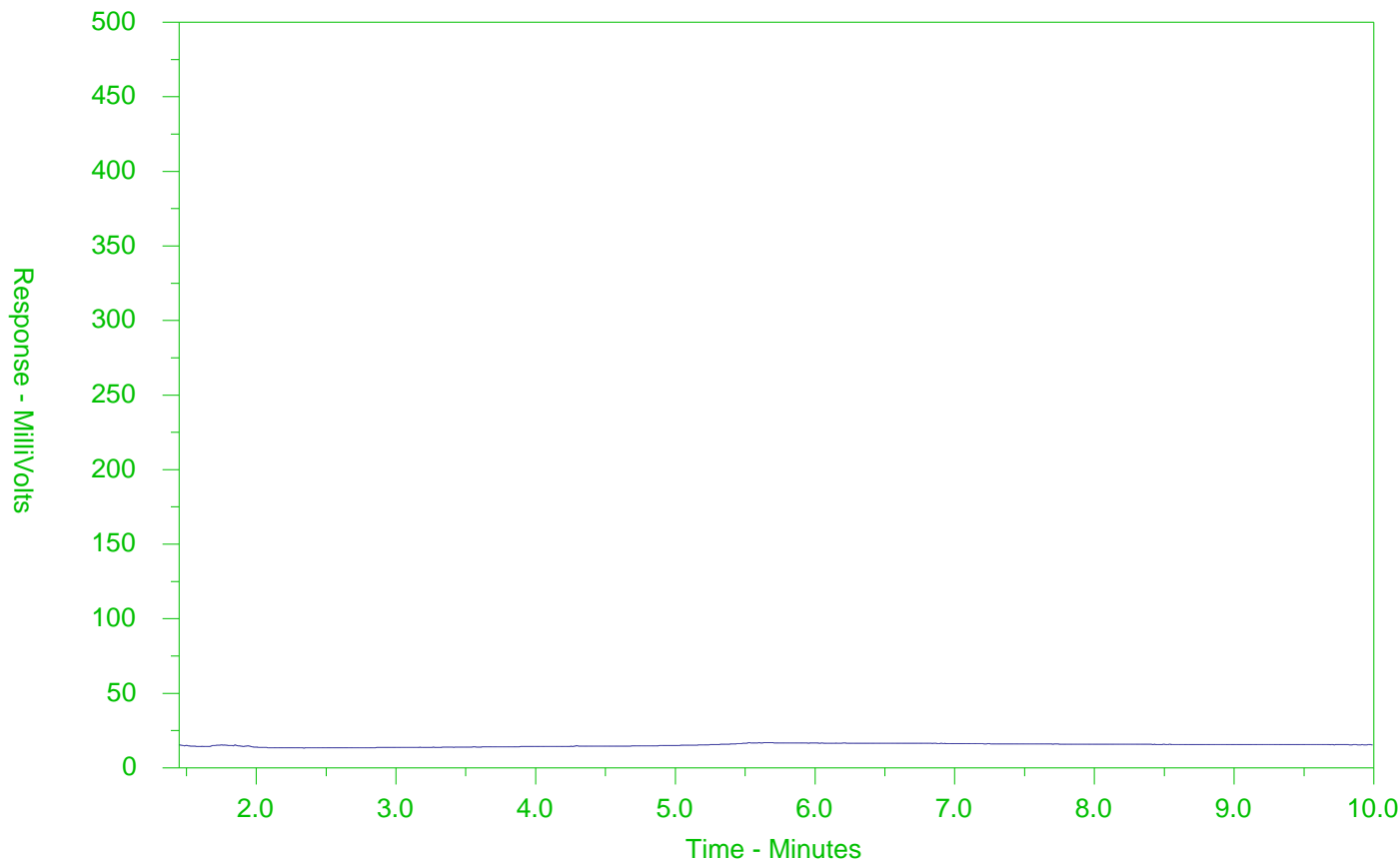
Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor and the scale at the left.

Note: This chromatogram was produced using GC conditions that are specific to ALS Canada CCME F2-F4 method. Refer to the ALS Canada CCME F2-F4 Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR Library can be found at www.alsglobal.com.

CCME F2-F4 HYDROCARBON DISTRIBUTION REPORT



ALS Sample ID: L2398556-3
Client Sample ID: BH19-3 SA103



← F2 →		← F3 →		← F4 →	
nC10	nC16		nC34		nC50
174°C	287°C		481°C		575°C
346°F	549°F		898°F		1067°F
Gasoline →			← Motor Oils/Lube Oils/Grease		
← Diesel/Jet Fuels →					

The CCME F2-F4 Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and four n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor and the scale at the left.

Note: This chromatogram was produced using GC conditions that are specific to ALS Canada CCME F2-F4 method. Refer to the ALS Canada CCME F2-F4 Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR Library can be found at www.alsglobal.com.

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REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

WHITE - LABORATORY COPY

YELLOW - CLIENT COPY

NOV 2018 FROM

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

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



GEMTEC Consulting Engineers & Scientists
Limited
ATTN: Nicole Soucy
32 Steacie Drive
Ottawa ON K2K 2A9

Date Received: 08-JAN-20
Report Date: 10-JAN-20 15:40 (MT)
Version: FINAL

Client Phone: 613-836-1422

Certificate of Analysis

Lab Work Order #: L2403756

Project P.O. #: 65032.03

Job Reference: 65032.03

C of C Numbers:

Legal Site Desc:

Emily Smith
Account Manager

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ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters		Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2403756-1	MW19-01							
Sampled By: CLIENT on 07-JAN-20 @ 12:50								
Matrix: WATER								
Volatile Organic Compounds								
Acetone		<30		30	ug/L		10-JAN-20	R4966140
Benzene		<0.50		0.50	ug/L		10-JAN-20	R4966140
Bromodichloromethane		<2.0		2.0	ug/L		10-JAN-20	R4966140
Bromoform		<5.0		5.0	ug/L		10-JAN-20	R4966140
Bromomethane		<0.50		0.50	ug/L		10-JAN-20	R4966140
Carbon tetrachloride		<0.20		0.20	ug/L		10-JAN-20	R4966140
Chlorobenzene		<0.50		0.50	ug/L		10-JAN-20	R4966140
Dibromochloromethane		<2.0		2.0	ug/L		10-JAN-20	R4966140
Chloroform		<1.0		1.0	ug/L		10-JAN-20	R4966140
1,2-Dibromoethane		<0.20		0.20	ug/L		10-JAN-20	R4966140
1,2-Dichlorobenzene		<0.50		0.50	ug/L		10-JAN-20	R4966140
1,3-Dichlorobenzene		<0.50		0.50	ug/L		10-JAN-20	R4966140
1,4-Dichlorobenzene		<0.50		0.50	ug/L		10-JAN-20	R4966140
Dichlorodifluoromethane		<2.0		2.0	ug/L		10-JAN-20	R4966140
1,1-Dichloroethane		<0.50		0.50	ug/L		10-JAN-20	R4966140
1,2-Dichloroethane		<0.50		0.50	ug/L		10-JAN-20	R4966140
1,1-Dichloroethylene		<0.50		0.50	ug/L		10-JAN-20	R4966140
cis-1,2-Dichloroethylene		<0.50		0.50	ug/L		10-JAN-20	R4966140
trans-1,2-Dichloroethylene		<0.50		0.50	ug/L		10-JAN-20	R4966140
Methylene Chloride		<5.0		5.0	ug/L		10-JAN-20	R4966140
1,2-Dichloropropane		<0.50		0.50	ug/L		10-JAN-20	R4966140
cis-1,3-Dichloropropene		<0.30		0.30	ug/L		10-JAN-20	R4966140
trans-1,3-Dichloropropene		<0.30		0.30	ug/L		10-JAN-20	R4966140
1,3-Dichloropropene (cis & trans)		<0.50		0.50	ug/L		10-JAN-20	
Ethylbenzene		<0.50		0.50	ug/L		10-JAN-20	R4966140
n-Hexane		<0.50		0.50	ug/L		10-JAN-20	R4966140
Methyl Ethyl Ketone		<20		20	ug/L		10-JAN-20	R4966140
Methyl Isobutyl Ketone		<20		20	ug/L		10-JAN-20	R4966140
MTBE		<2.0		2.0	ug/L		10-JAN-20	R4966140
Styrene		<0.50		0.50	ug/L		10-JAN-20	R4966140
1,1,1,2-Tetrachloroethane		<0.50		0.50	ug/L		10-JAN-20	R4966140
1,1,2,2-Tetrachloroethane		<0.50		0.50	ug/L		10-JAN-20	R4966140
Tetrachloroethylene		<0.50		0.50	ug/L		10-JAN-20	R4966140
Toluene		<0.50		0.50	ug/L		10-JAN-20	R4966140
1,1,1-Trichloroethane		<0.50		0.50	ug/L		10-JAN-20	R4966140
1,1,2-Trichloroethane		<0.50		0.50	ug/L		10-JAN-20	R4966140
Trichloroethylene		<0.50		0.50	ug/L		10-JAN-20	R4966140
Trichlorofluoromethane		<5.0		5.0	ug/L		10-JAN-20	R4966140
Vinyl chloride		<0.50		0.50	ug/L		10-JAN-20	R4966140
o-Xylene		<0.30		0.30	ug/L		10-JAN-20	R4966140
m+p-Xylenes		<0.40		0.40	ug/L		10-JAN-20	R4966140

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
F1-F4-511-CALC-WT	Water	F1-F4 Hydrocarbon Calculated Parameters	CCME CWS-PHC, Pub #1310, Dec 2001-L

Analytical methods used for analysis of CCME Petroleum Hydrocarbons have been validated and comply with the Reference Method for the CWS PHC.

In cases where results for both F4 and F4G are reported, the greater of the two results must be used in any application of the CWS PHC guidelines and the gravimetric heavy hydrocarbons cannot be added to the C6 to C50 hydrocarbons.

In samples where BTEX and F1 were analyzed , F1-BTEX represents a value where the sum of Benzene, Toluene, Ethylbenzene and total Xylenes has been subtracted from F1.

In samples where PAHs, F2 and F3 were analyzed, F2-Naphth represents the result where Naphthalene has been subtracted from F2. F3-PAH represents a result where the sum of Benzo(a)anthracene, Benzo(a)pyrene, Benzo(b)fluoranthene, Benzo(k)fluoranthene, Dibenzo(a,h)anthracene, Fluoranthene, Indeno(1,2,3-cd)pyrene, Phenanthrene, and Pyrene has been subtracted from F3.

- Unless otherwise qualified, the following quality control criteria have been met for the F1 hydrocarbon range:
- 1. All extraction and analysis holding times were met.
 - 2. Instrument performance showing response factors for C6 and C10 within 30% of the response factor for toluene.
 - 3. Linearity of gasoline response within 15% throughout the calibration range.

- Unless otherwise qualified, the following quality control criteria have been met for the F2-F4 hydrocarbon ranges:
- 1. All extraction and analysis holding times were met.
 - 2. Instrument performance showing C10, C16 and C34 response factors within 10% of their average.
 - 3. Instrument performance showing the C50 response factor within 30% of the average of the C10, C16 and C34 response factors.
 - 4. Linearity of diesel or motor oil response within 15% throughout the calibration range.

F1-HS-511-WT	Water	F1-O.Reg 153/04 (July 2011)	E3398/CCME TIER 1-HS
--------------	-------	-----------------------------	----------------------

Fraction F1 is determined by analyzing by headspace-GC/FID.

Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011), unless a subset of the Analytical Test Group (ATG) has been requested (the Protocol states that all analytes in an ATG must be reported).

VOC-1,3-DCP-CALC-WT	Water	Regulation 153 VOCs	SW8260B/SW8270C
---------------------	-------	---------------------	-----------------

VOC-511-HS-WT	Water	VOC by GCMS HS O.Reg 153/04 (July 2011)	SW846 8260
---------------	-------	---	------------

Liquid samples are analyzed by headspace GC/MSD.

Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011), unless a subset of the Analytical Test Group (ATG) has been requested (the Protocol states that all analytes in an ATG must be reported).

XYLENES-SUM-CALC-WT	Water	Sum of Xylene Isomer Concentrations	CALCULATION
---------------------	-------	-------------------------------------	-------------

Total xylenes represents the sum of o-xylene and m&p-xylene.

** ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
WT	ALS ENVIRONMENTAL - WATERLOO, ONTARIO, CANADA

Chain of Custody Numbers:

Reference Information

GLOSSARY OF REPORT TERMS

Surrogates are compounds that are similar in behaviour to target analyte(s), but that do not normally occur in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery. In reports that display the D.L. column, laboratory objectives for surrogates are listed there.

- mg/kg - milligrams per kilogram based on dry weight of sample*
- mg/kg ww_t - milligrams per kilogram based on wet weight of sample*
- mg/kg l_wt - milligrams per kilogram based on lipid weight of sample*
- mg/L - unit of concentration based on volume, parts per million.*
- < - Less than.*
- D.L. - The reporting limit.*
- N/A - Result not available. Refer to qualifier code and definition for explanation.*

Test results reported relate only to the samples as received by the laboratory.
UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.
Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

Quality Control Report

Workorder: L2403756

Report Date: 10-JAN-20

Page 1 of 6

Client: GEMTEC Consulting Engineers & Scientists Limited
32 Steacie Drive
Ottawa ON K2K 2A9

Contact: Nicole Soucy

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
VOC-511-HS-WT		Water						
Batch	R4966140							
WG3254231-4	DUP	WG3254231-3						
1,1,1,2-Tetrachloroethane		<0.50	<0.50	RPD-NA	ug/L	N/A	30	10-JAN-20
1,1,2,2-Tetrachloroethane		<0.50	<0.50	RPD-NA	ug/L	N/A	30	10-JAN-20
1,1,1-Trichloroethane		<0.50	<0.50	RPD-NA	ug/L	N/A	30	10-JAN-20
1,1,2-Trichloroethane		<0.50	<0.50	RPD-NA	ug/L	N/A	30	10-JAN-20
1,1-Dichloroethane		<0.50	<0.50	RPD-NA	ug/L	N/A	30	10-JAN-20
1,1-Dichloroethylene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	10-JAN-20
1,2-Dibromoethane		<0.20	<0.20	RPD-NA	ug/L	N/A	30	10-JAN-20
1,2-Dichlorobenzene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	10-JAN-20
1,2-Dichloroethane		<0.50	<0.50	RPD-NA	ug/L	N/A	30	10-JAN-20
1,2-Dichloropropane		<0.50	<0.50	RPD-NA	ug/L	N/A	30	10-JAN-20
1,3-Dichlorobenzene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	10-JAN-20
1,4-Dichlorobenzene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	10-JAN-20
Acetone		<30	<30	RPD-NA	ug/L	N/A	30	10-JAN-20
Benzene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	10-JAN-20
Bromodichloromethane		<2.0	<2.0	RPD-NA	ug/L	N/A	30	10-JAN-20
Bromoform		<5.0	<5.0	RPD-NA	ug/L	N/A	30	10-JAN-20
Bromomethane		<0.50	<0.50	RPD-NA	ug/L	N/A	30	10-JAN-20
Carbon tetrachloride		<0.20	<0.20	RPD-NA	ug/L	N/A	30	10-JAN-20
Chlorobenzene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	10-JAN-20
Chloroform		<1.0	<1.0	RPD-NA	ug/L	N/A	30	10-JAN-20
cis-1,2-Dichloroethylene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	10-JAN-20
cis-1,3-Dichloropropene		<0.30	<0.30	RPD-NA	ug/L	N/A	30	10-JAN-20
Dibromochloromethane		<2.0	<2.0	RPD-NA	ug/L	N/A	30	10-JAN-20
Dichlorodifluoromethane		<2.0	<2.0	RPD-NA	ug/L	N/A	30	10-JAN-20
Ethylbenzene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	10-JAN-20
n-Hexane		<0.50	<0.50	RPD-NA	ug/L	N/A	30	10-JAN-20
m+p-Xylenes		<0.40	<0.40	RPD-NA	ug/L	N/A	30	10-JAN-20
Methyl Ethyl Ketone		<20	<20	RPD-NA	ug/L	N/A	30	10-JAN-20
Methyl Isobutyl Ketone		<20	<20	RPD-NA	ug/L	N/A	30	10-JAN-20
Methylene Chloride		<5.0	<5.0	RPD-NA	ug/L	N/A	30	10-JAN-20
MTBE		<2.0	<2.0	RPD-NA	ug/L	N/A	30	10-JAN-20
o-Xylene		<0.30	<0.30	RPD-NA	ug/L	N/A	30	10-JAN-20
Styrene		<0.50	<0.50		ug/L			10-JAN-20

Quality Control Report

Workorder: L2403756

Report Date: 10-JAN-20

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Client: GEMTEC Consulting Engineers & Scientists Limited
32 Steacie Drive
Ottawa ON K2K 2A9

Contact: Nicole Soucy

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
VOC-511-HS-WT		Water						
Batch	R4966140							
WG3254231-4 DUP		WG3254231-3						
Styrene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	10-JAN-20
Tetrachloroethylene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	10-JAN-20
Toluene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	10-JAN-20
trans-1,2-Dichloroethylene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	10-JAN-20
trans-1,3-Dichloropropene		<0.30	<0.30	RPD-NA	ug/L	N/A	30	10-JAN-20
Trichloroethylene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	10-JAN-20
Trichlorofluoromethane		<5.0	<5.0	RPD-NA	ug/L	N/A	30	10-JAN-20
Vinyl chloride		<0.50	<0.50	RPD-NA	ug/L	N/A	30	10-JAN-20
WG3254231-1 LCS								
1,1,1,2-Tetrachloroethane			83.5		%		70-130	10-JAN-20
1,1,2,2-Tetrachloroethane			81.7		%		70-130	10-JAN-20
1,1,1-Trichloroethane			96.9		%		70-130	10-JAN-20
1,1,2-Trichloroethane			82.6		%		70-130	10-JAN-20
1,1-Dichloroethane			95.1		%		70-130	10-JAN-20
1,1-Dichloroethylene			97.4		%		70-130	10-JAN-20
1,2-Dibromoethane			80.4		%		70-130	10-JAN-20
1,2-Dichlorobenzene			89.6		%		70-130	10-JAN-20
1,2-Dichloroethane			87.6		%		70-130	10-JAN-20
1,2-Dichloropropane			89.5		%		70-130	10-JAN-20
1,3-Dichlorobenzene			94.2		%		70-130	10-JAN-20
1,4-Dichlorobenzene			93.7		%		70-130	10-JAN-20
Acetone			81.6		%		60-140	10-JAN-20
Benzene			94.0		%		70-130	10-JAN-20
Bromodichloromethane			91.7		%		70-130	10-JAN-20
Bromoform			70.3		%		70-130	10-JAN-20
Bromomethane			88.7		%		60-140	10-JAN-20
Carbon tetrachloride			93.7		%		70-130	10-JAN-20
Chlorobenzene			87.1		%		70-130	10-JAN-20
Chloroform			95.3		%		70-130	10-JAN-20
cis-1,2-Dichloroethylene			91.5		%		70-130	10-JAN-20
cis-1,3-Dichloropropene			86.2		%		70-130	10-JAN-20
Dibromochloromethane			77.9		%		70-130	10-JAN-20
Dichlorodifluoromethane			135.5		%		50-140	10-JAN-20

Quality Control Report

Workorder: L2403756

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Client: GEMTEC Consulting Engineers & Scientists Limited
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Ottawa ON K2K 2A9

Contact: Nicole Soucy

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
VOC-511-HS-WT		Water						
Batch	R4966140							
WG3254231-1	LCS							
Ethylbenzene			88.5		%		70-130	10-JAN-20
n-Hexane			93.0		%		70-130	10-JAN-20
m+p-Xylenes			92.4		%		70-130	10-JAN-20
Methyl Ethyl Ketone			74.1		%		60-140	10-JAN-20
Methyl Isobutyl Ketone			69.3		%		60-140	10-JAN-20
Methylene Chloride			91.9		%		70-130	10-JAN-20
MTBE			89.6		%		70-130	10-JAN-20
o-Xylene			85.7		%		70-130	10-JAN-20
Styrene			81.5		%		70-130	10-JAN-20
Tetrachloroethylene			86.1		%		70-130	10-JAN-20
Toluene			89.7		%		70-130	10-JAN-20
trans-1,2-Dichloroethylene			97.3		%		70-130	10-JAN-20
trans-1,3-Dichloropropene			80.7		%		70-130	10-JAN-20
Trichloroethylene			91.7		%		70-130	10-JAN-20
Trichlorofluoromethane			101.1		%		60-140	10-JAN-20
Vinyl chloride			114.1		%		60-140	10-JAN-20
WG3254231-2	MB							
1,1,1,2-Tetrachloroethane			<0.50		ug/L		0.5	10-JAN-20
1,1,2,2-Tetrachloroethane			<0.50		ug/L		0.5	10-JAN-20
1,1,1-Trichloroethane			<0.50		ug/L		0.5	10-JAN-20
1,1,2-Trichloroethane			<0.50		ug/L		0.5	10-JAN-20
1,1-Dichloroethane			<0.50		ug/L		0.5	10-JAN-20
1,1-Dichloroethylene			<0.50		ug/L		0.5	10-JAN-20
1,2-Dibromoethane			<0.20		ug/L		0.2	10-JAN-20
1,2-Dichlorobenzene			<0.50		ug/L		0.5	10-JAN-20
1,2-Dichloroethane			<0.50		ug/L		0.5	10-JAN-20
1,2-Dichloropropane			<0.50		ug/L		0.5	10-JAN-20
1,3-Dichlorobenzene			<0.50		ug/L		0.5	10-JAN-20
1,4-Dichlorobenzene			<0.50		ug/L		0.5	10-JAN-20
Acetone			<30		ug/L		30	10-JAN-20
Benzene			<0.50		ug/L		0.5	10-JAN-20
Bromodichloromethane			<2.0		ug/L		2	10-JAN-20
Bromoform			<5.0		ug/L		5	10-JAN-20
Bromomethane			<0.50		ug/L		0.5	10-JAN-20

Quality Control Report

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Client: GEMTEC Consulting Engineers & Scientists Limited
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Ottawa ON K2K 2A9

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
VOC-511-HS-WT		Water						
Batch	R4966140							
WG3254231-2 MB								
Carbon tetrachloride			<0.20		ug/L		0.2	10-JAN-20
Chlorobenzene			<0.50		ug/L		0.5	10-JAN-20
Chloroform			<1.0		ug/L		1	10-JAN-20
cis-1,2-Dichloroethylene			<0.50		ug/L		0.5	10-JAN-20
cis-1,3-Dichloropropene			<0.30		ug/L		0.3	10-JAN-20
Dibromochloromethane			<2.0		ug/L		2	10-JAN-20
Dichlorodifluoromethane			<2.0		ug/L		2	10-JAN-20
Ethylbenzene			<0.50		ug/L		0.5	10-JAN-20
n-Hexane			<0.50		ug/L		0.5	10-JAN-20
m+p-Xylenes			<0.40		ug/L		0.4	10-JAN-20
Methyl Ethyl Ketone			<20		ug/L		20	10-JAN-20
Methyl Isobutyl Ketone			<20		ug/L		20	10-JAN-20
Methylene Chloride			<5.0		ug/L		5	10-JAN-20
MTBE			<2.0		ug/L		2	10-JAN-20
o-Xylene			<0.30		ug/L		0.3	10-JAN-20
Styrene			<0.50		ug/L		0.5	10-JAN-20
Tetrachloroethylene			<0.50		ug/L		0.5	10-JAN-20
Toluene			<0.50		ug/L		0.5	10-JAN-20
trans-1,2-Dichloroethylene			<0.50		ug/L		0.5	10-JAN-20
trans-1,3-Dichloropropene			<0.30		ug/L		0.3	10-JAN-20
Trichloroethylene			<0.50		ug/L		0.5	10-JAN-20
Trichlorofluoromethane			<5.0		ug/L		5	10-JAN-20
Vinyl chloride			<0.50		ug/L		0.5	10-JAN-20
Surrogate: 1,4-Difluorobenzene			92.1		%		70-130	10-JAN-20
Surrogate: 4-Bromofluorobenzene			88.9		%		70-130	10-JAN-20
WG3254231-5 MS		WG3254231-3						
1,1,1,2-Tetrachloroethane			83.5		%		50-140	10-JAN-20
1,1,2,2-Tetrachloroethane			86.5		%		50-140	10-JAN-20
1,1,1-Trichloroethane			96.7		%		50-140	10-JAN-20
1,1,2-Trichloroethane			84.9		%		50-140	10-JAN-20
1,1-Dichloroethane			96.2		%		50-140	10-JAN-20
1,1-Dichloroethylene			96.0		%		50-140	10-JAN-20
1,2-Dibromoethane			83.0		%		50-140	10-JAN-20
1,2-Dichlorobenzene			88.1		%		50-140	10-JAN-20

Quality Control Report

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Client: GEMTEC Consulting Engineers & Scientists Limited
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Ottawa ON K2K 2A9

Contact: Nicole Soucy

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
VOC-511-HS-WT		Water						
Batch	R4966140							
WG3254231-5 MS		WG3254231-3						
1,2-Dichloroethane			91.3		%		50-140	10-JAN-20
1,2-Dichloropropane			91.9		%		50-140	10-JAN-20
1,3-Dichlorobenzene			90.9		%		50-140	10-JAN-20
1,4-Dichlorobenzene			91.1		%		50-140	10-JAN-20
Acetone			84.0		%		50-140	10-JAN-20
Benzene			94.8		%		50-140	10-JAN-20
Bromodichloromethane			94.5		%		50-140	10-JAN-20
Bromoform			71.8		%		50-140	10-JAN-20
Bromomethane			88.8		%		50-140	10-JAN-20
Carbon tetrachloride			92.7		%		50-140	10-JAN-20
Chlorobenzene			86.4		%		50-140	10-JAN-20
Chloroform			97.0		%		50-140	10-JAN-20
cis-1,2-Dichloroethylene			92.5		%		50-140	10-JAN-20
cis-1,3-Dichloropropene			90.4		%		50-140	10-JAN-20
Dibromochloromethane			79.2		%		50-140	10-JAN-20
Dichlorodifluoromethane			126.6		%		50-140	10-JAN-20
Ethylbenzene			85.7		%		50-140	10-JAN-20
n-Hexane			89.9		%		50-140	10-JAN-20
m+p-Xylenes			90.1		%		50-140	10-JAN-20
Methyl Ethyl Ketone			72.8		%		50-140	10-JAN-20
Methyl Isobutyl Ketone			73.2		%		50-140	10-JAN-20
Methylene Chloride			93.9		%		50-140	10-JAN-20
MTBE			89.4		%		50-140	10-JAN-20
o-Xylene			83.8		%		50-140	10-JAN-20
Styrene			80.2		%		50-140	10-JAN-20
Tetrachloroethylene			82.4		%		50-140	10-JAN-20
Toluene			87.3		%		50-140	10-JAN-20
trans-1,2-Dichloroethylene			97.0		%		50-140	10-JAN-20
trans-1,3-Dichloropropene			84.0		%		50-140	10-JAN-20
Trichloroethylene			91.0		%		50-140	10-JAN-20
Trichlorofluoromethane			98.8		%		50-140	10-JAN-20
Vinyl chloride			110.3		%		50-140	10-JAN-20

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Contact: Nicole Soucy

Legend:

Limit	ALS Control Limit (Data Quality Objectives)
DUP	Duplicate
RPD	Relative Percent Difference
N/A	Not Available
LCS	Laboratory Control Sample
SRM	Standard Reference Material
MS	Matrix Spike
MSD	Matrix Spike Duplicate
ADE	Average Desorption Efficiency
MB	Method Blank
IRM	Internal Reference Material
CRM	Certified Reference Material
CCV	Continuing Calibration Verification
CVS	Calibration Verification Standard
LCSD	Laboratory Control Sample Duplicate

Sample Parameter Qualifier Definitions:

Qualifier	Description
RPD-NA	Relative Percent Difference Not Available due to result(s) being less than detection limit.

Hold Time Exceedances:

All test results reported with this submission were conducted within ALS recommended hold times.

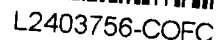
ALS recommended hold times may vary by province. They are assigned to meet known provincial and/or federal government requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by the US EPA, APHA Standard Methods, or Environment Canada (where available). For more information, please contact ALS.

The ALS Quality Control Report is provided to ALS clients upon request. ALS includes comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against pre-determined data quality objectives to provide confidence in the accuracy of associated test results.

Please note that this report may contain QC results from anonymous Sample Duplicates and Matrix Spikes that do not originate from this Work Order.



Canada Toll Free: 1 800 668 9878



COC Number: 17 -

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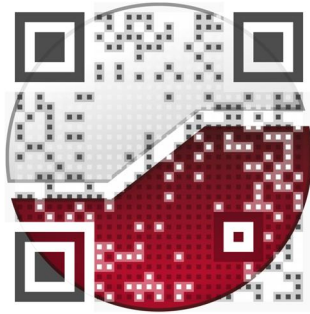
REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

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

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

NOV 2018 FRONT

experience • knowledge • integrity



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

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