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FINAL REPORT

PHASE II ENVIRONMENTAL SITE ASSESSMENT SIXTH LINE CORPORATION, RESIDENTIAL DEVELOPMENT OAKVILLE, ONTARIO

Submitted to:
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REPORT

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Golder Associates

Executive Summary

Golder Associates Ltd. (“Golder”) was retained by Sixth Line Corporation (“Sixth Line”) to conduct a Phase I and Phase II Environmental Site Assessment (ESA) to assess the environmental conditions of an agricultural property that is located northeast of the Dundas Street East and Sixth Line intersection in Oakville, Ontario.

The property is approximately 37 hectares (93 acres) in plan area, and consists mainly of agricultural fields with a gentle undulating topography. Some areas of the existing agricultural fields were separated by lines or stands of mature bushes and/or trees, with post and wire fencing present along some of the property lines. A drainage swale, the West Morrison Creek, meandered through the southern portion of the Site, generally flowing in a southeast direction into a low-lying area of accumulated water located in the southwest corner of the Site. An unpaved driveway existed in the south portion of the Site, off of Dundas Street East which provided access to a residential house and two wood sheds. The Site is intended to re-develop into a residential subdivision that will be municipally serviced.

This report provides the results of the Phase II ESA for the Site. The Phase II ESA meets the requirements of O. Reg. 153/04 for Phase II ESAs intended to support the filing of a Record of Site Condition (RSC). The redevelopment does not require an RSC under the provisions of O. Reg. 153/04, but is understood to be required as part of the municipal planning Approvals Process. This Phase II ESA applies to the property that is legally identified as Part of Lot 15, Concession 1, North of Dundas Street, Geographic Township of Oakville, Regional Municipality of Halton (PIN Number 24929-0117 LT) (hereinafter referred to as the "Site"). The municipal address of a single on-Site residence was observed to be 41 Dundas Street East.

The Phase II ESA investigation was conducted between May 26, 2011 and July 25 2011, and utilized information from twenty four (24) boreholes and eleven (11) monitoring wells at selected locations to sample soil and groundwater.

The subsurface conditions encountered at the borehole locations consisted of surficial topsoil and localized fill materials that were underlain by native silty clay till that extended to depths of approximately 1.0 m to 3.1 m below the existing ground surface, underlain by reddish brown shale bedrock of the Queenston Formation. The bedrock extended to depths of at least 4.6 m to 10.3 m below the inferred top of bedrock where practical refusal to further auger penetration was encountered, or the boreholes were terminated. The measured groundwater level is within three metres of the ground surface and generally mimics the surface topography. The water table elevation ranges from approximately 174 masl in the northwest area of the Site to around 168 masl in the southeast area of the Site. Groundwater flow in the shallow bedrock (or local groundwater flow system) is generally from the northwest to the southeast with some component influenced by the creek, indicating a convergence of groundwater flow towards the lower lying drainage course.

The Phase II ESA has investigated the relevant environmental issues identified in the Phase I ESA. The analytical results indicate that the soil and groundwater quality meets the applicable MOE Table 8 Standards under O. Reg. 153/04, dated April 15, 2011 for the potential contaminants of concern that were identified for the soil and groundwater at the Site in relation to on and off Site agricultural activities, as well as the placement of some fill materials on the Site.

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1.0 INTRODUCTION

Golder Associates Ltd. (“Golder”) was retained by Sixth Line Corporation (“Sixth Line”) to conduct a Phase II Environmental Site Assessment (“Phase II ESA”) for an agricultural property that is located northeast of the Dundas Street East and Sixth Line intersection in Oakville, Ontario, as shown on Figure 1.

The property is currently used for agricultural land use and includes a drainage swale/creek that meanders through the southwest portion of the Site. The existing fields appear to be separated by lines or stands of mature bushes and/or trees, with some areas of post and wire fencing present along the property lines near the adjacent roadways. Small driveway/laneway entrances which connect to the roads along the west and south limits of the property are assumed to have been used to access the agricultural fields.

Based on the Sixth Line Corporation Concept Plan, produced by Freeman Planning Solutions Inc, dated February 28, 2011, the proposed development will primarily consist of residential houses with municipal services located within associated internal roads with a stormwater management pond located along the south-central portion of the Site. A drainage corridor has been allocated along the west side of the Site for realignment of the existing swale, and an “Urban Core” area allocated within the southeast corner of the overall development.

The layout of the property showing the proposed development is provided in Figure 2.

This report provides the findings of the Phase II ESA for the property that will be redeveloped from its current agricultural use into a residential subdivision. The findings of this Phase II ESA are intended to support the filing of a Record of Site Condition (RSC) for the landscaped park area. Separate reports on the environmental (Phase I ESA), geotechnical and hydrogeological conditions of the site have been submitted to Sixth Line Corporation and Arutip Engineering Limited.

The general scope of the environmental work conducted was outlined in Golder’s proposal provided to Arutip Engineering Ltd on behalf of Sixth Line Corporation on April 29, 2011 (revised) to undertake the environmental, hydrogeological and geotechnical investigations in support of residential redevelopment at the Site. The scope of work meets the Schedule D requirements of O. Reg. 511/09, and investigates the potential issues of concern raised in the Phase I ESA conducted for this Site, as shown in the Conceptual Site Model (Appendix C).

1.1 Site Description

This Phase II ESA applies to the property that is legally identified as Part of Lot 15, Concession 1, North of Dundas Street, Geographic Township of Oakville, Regional Municipality of Halton (PIN Number 24929-0117 LT) (hereinafter referred to as the "Site"). The municipal address of a single on-Site residence was observed to be 41 Dundas Street East. The Site is rectangularly shaped and is approximately 37 hectares (93 acres) in size. A Plan of Survey for the Site is included in Appendix A.

1.2 Property Ownership

The property at 41 Dundas Street East and identified as Part of Lot 15, Concession 1, North of Dundas Street, Geographic Township of Oakville, Regional Municipality of Halton (PIN Number 24929-0117 LT) is owned by Sixth Line Corporation. The Phase II ESA work was undertaken for Sixth Line Corporation. The appropriate contact information for Sixth Line Corporation (for the purpose of filing an RSC) is:

Sixth Line Corporation
2500 Appleby Line, Suite 200
Burlington, Ontario L7L 0A2

Contact: Steve Malovic, Chief Operating Officer

1.3 Current and Proposed Future Uses

The Site is currently used for agricultural purposes with a residential development proposed that is to include houses, municipal services located within associated internal roads and a stormwater management pond. As detailed above in Section 1.0, an RSC is required as part of the municipal planning approvals process, however, the change from the former agricultural use to the proposed residential use does not constitute a change to a more sensitive land use requiring a RSC under *O.Reg.153/04*.

1.4 Applicable Site Condition Standards

The analytical results of soil and groundwater samples collected for this Phase II ESA were compared to the Ministry of Environment (MOE) Ontario Regulation 153/04 "Soil, Ground Water and Sediment Standards for Use Under Part XV.1 of the Environmental Protection Act, April 25, 2011. The following issues were considered in selecting the assessment criteria:

- A watercourse meanders through the southwest portion of the Site. Therefore, the generic site condition standards within 30 m of a water body would apply to the Site;
- There are no features either on or surrounding the Site that would meet the conditions of an environmentally sensitive site;
- The Site is currently used for agricultural purposes, and will be re-developed for a less sensitive use as residential development;
- The geotechnical investigation encountered the interpreted top of the bedrock within 2 m of the ground surface over the majority of the Site. However, the bedrock consists of the red shale of the Queenston Formation. The upper portion of the Queenston Formation is characteristically weathered, as indicated in the Record of Borehole sheets, and therefore behaves as a soil as reflected in the hydraulic conductivities of the bedrock. Therefore, the shallow soil conditions are not considered to apply to the subject site conditions.
- Based on 4 grain size analysis results (see Appendix E), the overburden in the subsurface of the Site is predominantly comprised of silty clay till. More than 60% particles (by mass) in the soil were equal to or

smaller than 75 µm in mean diameter. Pursuant to Ontario Regulation 153/04, the soil on the Site is therefore considered to be fine-medium textured.

Based on the above, the following standards were considered suitable for the purpose of assessing the soil and groundwater quality for the Site:

- April 15, 2011 MOE Table 8: Generic Site Condition Standards for use within 30 m of a Water Body in a Potable Groundwater Condition ("2011 MOE Table 8 Standards") for residential property use.

2.0 BACKGROUND

This section presents the background conditions of the Phase II ESA Site including a description of the physical setting and a summary of past investigations conducted.

2.1 Physical Setting

The Site has an approximate total area of 93 acres (37 hectares) and consists mainly of agricultural fields with a gentle undulating topography. A watercourse (tributary of Sixteen Mile Creek) meandered through the southwest portion of the Site into an area of accumulated water (marsh / swamp area) located in the southwest corner of the Site. An unpaved driveway existed in the south portion of the Site, off of Dundas Street East which provided access to a residential house and two wood sheds.

A request for information was made to Conservation Halton ("Conservation") as part of the Phase I ESA dated July, 2011. The response from Conservation dated June 17, 2011 indicated that the Site contains a tributary of the Sixteen Mile Creek (West Morrison Creek) and the hazard lands associated with that watercourse, including floodplain, wetlands and a valley feature. The Conservation's regulation limit in this area is 15 metres from the limit of the greatest hazard associated with Sixteen Mile Creek and 120 metres from the limit of a wetland equal to or greater than 2 hectares (ha.) in size. As a result, a portion of the subject property is regulated pursuant to *O.Reg. 162/06*.

The response also indicated that the Site is included within the North Oakville Secondary Plan as well as the North Oakville Creeks Subwatershed Study. In addition, the response included two maps illustrating the approximate *O.Reg. 162/06* limit within the Site.

2.2 Past Investigations

A Phase I ESA was conducted by Golder in July 2011, and is reported under separate cover. The findings of the Phase I ESA were used to better define the scope of work for the Phase II ESA. Geotechnical and hydrogeological investigations were undertaken concurrently with this Phase II ESA at the Site. The results of these investigations conducted have also been reported under separate cover. A summary of the past investigations is contained below.

2.2.1 Phase I ESA

Golder conducted a Phase I ESA in July 2011 to assess the likelihood of soil or groundwater contamination resulting from historic or present activities at the Site and surrounding area. This included a review of available historical information on the Site and surrounding area, including the previous environmental investigations described below. The Phase I ESA findings are based on evidence of actual and/or potential environmental impact as assessed by the same Qualified Person as conducted this Phase II ESA, and represent those environmental issues that may have a material impact on the Site or operations. The findings of the Phase I ESA and associated recommendations for follow-up investigation through the Phase II ESA are summarized in the table below.

Table 2.1: Areas of Potential Environmental Concern

Ref#	Location of the Area of Potential Environmental Concern	Finding & Justification	Information Sources	Contaminants of Concern
ESA 1	**Fill Material of Unknown Quantity: On-Site, northwest and southwest corners**	Soil material mixed with asphalt was observed on the northwest corner of the Site and fill material was observed in the area northeast of the on-Site house. The source and quality of the fill was unknown. No further information and/or reports were available regarding the quantity or quality of these materials.	Site visit visual observations	Metals and inorganics
ESA 2	**Agricultural activities: On-Site – southeast, central and north portions of Site**	Historical activities on-Site have consisted of agricultural operations since at least the late 1930's. Reportedly, since 1987, herbicides were used on-Site to control weed growth.	Site representative, aerial photographs	Pesticides, herbicides, fertilizers (i.e., nitrate, nitrite)
ESA 3	**Agricultural activities: Off-Site – north and east neighbouring properties**	The properties located north and east of the Site are inferred to be hydrogeologically up-gradient and cross-gradient of the Site; these properties consist of agricultural fields. Based on the up- and cross-gradient location and proximity to the Site, the potential use of pesticides and herbicides on the agricultural land immediately north and east of the Site represents a potential issue of environmental concern for the Site.	Aerial photographs, visual observations	Pesticides, herbicides, fertilizers (i.e., nitrate, nitrite)

Based on the Ministry of the Environment ("MOE") response that was received by Golder on July 21, 2011, it appears that the Site was used for the spreading of biosolids in 2003 and 2008, including the application of lime for soil conditioning. The application of lime to the compost was identified as having a potential impact on the soil pH.

2.2.2 Geotechnical and Hydrogeological Investigations

The geotechnical investigation was carried out by Golder from May 26 to June 3, 2011, at which time twenty-four (24 boreholes (designated as Boreholes 11-1 to 11-21 and Fill #11-1 to Fill #11-3) were advanced to depths of about 0.6 m to 11 m below existing grades. Soil stratigraphic and groundwater level information from the geotechnical and hydrogeological investigations were incorporated into this Phase II ESA.

In general, the subsurface conditions encountered at the borehole locations consisted of surficial topsoil that was underlain by native silty clay till and shallow reddish brown shale bedrock of the Queenston Formation. On June 17, 2011, water levels were measured in the piezometers that were installed in the overburden and bedrock at the Site. In the eight (8) piezometers (Boreholes 11-1, 11-2, 11-7, 11-9, 11-11, 11-15, 11-18 and 11-19), the water levels were measured at depths of between about 0.4 m to 2.6 m below the original ground surface. The results of particle size gradation analyses carried out on four (4) samples and four (4) Atterberg Limits tests carried out on select samples indicate that this soil at the Site typically comprises silty clay of low plasticity.

Findings of the geotechnical investigation were provided to Arutip Engineering Ltd. on behalf of Sixth Line Corporation ("Sixth Line") in a report entitled *Geotechnical Investigation, Sixth Line Corporation, Residential Development, Oakville, Ontario*, dated July 2011.

For the hydrogeological investigation, groundwater elevation monitoring was conducted four times during the period of June 2011 and July 2011. Water level measurements were taken using a standard water level meter, including flow monitoring stations at three different locations on West Morrison Creek from June 3, 2011 to July 7, 2011 to identify base flow conditions (i.e., flow rates not representative of precipitation events).

In-situ hydraulic conductivity testing (bail testing) was undertaken at five wells (11-2, 11-7, 11-9S, 11-15S and 11-19S) to estimate the hydraulic conductivity of the materials at the screened intervals. Details of the single well response tests results are provided in the Golder's Hydrogeological Investigation Report, July 2011.

Baseline groundwater quality sampling was completed by Golder on June 24, 2011 for general analysis. Noteably, two (2) monitoring wells in BH 11-2 (screened 4.5 m to 6.0 m) and BH11-9S (screened 3.4 m to 4.9 m) contained elevated nitrate concentrations of approximately 14 mg/L to 19 mg/L.

Surface water quality samples were taken at the upstream and downstream limits of the Site at SW1 (i.e., located on Sixth Line, approximately 675 metres northwest of the intersection with Dundas Street West, where West Morrison Creek flows under Sixth Line) and SW3 (i.e., located at the southern limit of the Site) during the July 7, 2011 Site visit. Total phosphorus was slightly elevated above PWQO at monitoring station SW1 with a concentration of 0.08 mg/L. The PWQO to eliminate excessive plant growth in rivers and streams is 0.03 mg/L. All other parameters with a corresponding PWQO were found to be below method detection limits or below the PWQO. All parameters measured at SW3 were found to be below the PWQO and as such no water quality issues were observed at this time.

Findings of the hydrogeological investigation were provided to Arutip Engineering Ltd. on behalf of Sixth Line Corporation ("Sixth Line") in a report entitled *Hydrogeological Investigation, Sixth Line Corporation, Residential Development, Oakville, Ontario*, dated August 2011.

3.0 SCOPE OF THE PHASE II ESA INVESTIGATION

The primary objectives of this Phase II ESA were to assess the absence or presence of target contaminants in relation to the potential environmental concerns identified in the Phase I ESA, and to provide support for filing a Record of Site Condition for the Site.

3.1 Overview of Site Investigation

The Phase II ESA was completed to investigate the issues of potential environmental concern identified in Golder's Phase I ESA. The location of the boreholes and monitoring wells were determined to target the identified issues of potential environmental concern, to provide spatial coverage of the Site and to meet the objectives of the geotechnical, hydrogeological and Phase II ESA requirements for the Site and proposed development. The parameters for chemical analysis of soil and groundwater samples were determined based on the potentially contaminating activities identified as part of the Phase I ESA.

The Phase II ESA was conducted in accordance with Ontario Regulation 153/04, as amended by O.Reg. 511/09. The 1996 MOE Guideline on Sampling and Analytical Methods for Use at Contaminated Sites in Ontario was also followed. The requirements of Ontario Regulation 903/128 (water well regulation) were followed for the drilling and installation of the monitoring wells.

The scope of work included the following tasks:

- Preparing a Health and Safety Plan. A Health and Safety Plan for internal and subcontractor use was prepared prior to initiating any fieldwork at the Site.
- Borehole Drilling and Monitoring Well Installation. Boreholes were drilled at 24 locations for soil sampling at the Site, with eleven (11) monitoring wells installed at eight (8) locations for groundwater monitoring and sampling. Due to the shallow overburden at the Site, the monitoring wells targeted water bearing layers and were primarily screened within the bedrock. The locations of boreholes and monitoring wells are shown on Figure 3, and the monitoring well details are presented in Table 1. Boreholes (i.e., BH11-1, BH11-2, BH11-5, BH11-11, BH11-17, BH11-18 and BH11-21) were designated for environmental purposes.
- Soil Sampling. Soil samples collected from 7 borehole locations were submitted for chemical analysis of one or more of the following parameters: pH, organochlorinated pesticides, PCBs, triazine pesticides, metals and inorganics.
- Groundwater Monitoring and Sampling. Groundwater samples collected from two (2) monitoring wells (i.e., BH11-11 and BH11-18) were submitted for chemical analysis of organochlorine pesticides, PCBs, triazine pesticides and nitrate/nitrite. It is noted that for the hydrogeological investigation, groundwater quality samples were collected on June 24, 2011 from three monitoring well locations, 11-2, 11-9S and 11-19S for general chemistry analysis.
- Single-Well Response Test. For the hydrogeological investigation, in-situ hydraulic conductivity testing (bail testing) was undertaken at five wells (11-2, 11-7, 11-9S, 11-15S and 11-19S) to estimate the hydraulic conductivity of the materials at the screened intervals.
- Surveying. An elevation survey of the existing ground surface at the borehole and monitoring well locations at the Site was completed by an Ontario Land Surveyor (Teddy Surveying Inc.) contracted by Golder, and are referenced to a geodetic datum. The ground surface elevation was measured using a GPS Trimble R8.
- Reporting: Golder compiled and assessed the field and laboratory results into this report.

The Sampling and Analysis Plan for this Site has been included in Appendix B.

3.2 Media Investigated

To investigate the potential environmental issues identified in the Phase I ESA, the Phase II ESA field program included sampling of surficial soil, and of groundwater from wells screened within the shallow bedrock at the Site. As part of the Site redevelopment, it is understood that the existing creek will be realigned to a designated block of land next to 6th Line; therefore, no sediment sampling was undertaken.

To investigate potential impacts from pesticide and biosolids application, the soil quality within about 0.3 m of the ground surface was targeted for analyses since the potential contaminants of concern are relatively immobile. Representative samples of the fill were collected from the existing fill piles on the Site to assess the chemical quality of the imported materials. To investigate potential leaching of pesticides, the shallow groundwater conditions (screened 1 m to 5 m below ground surface or Elevation of 171.0 m to Elevation 165.6 m) were assessed.

Details of the parameters sampled in soil and groundwater are presented in Tables 4.2 and 4.3, respectively that are included in Section 4 of this report.

3.3 Phase One Conceptual Site Model

A Conceptual Site Model of the Phase I Study area is presented as a series of figures included in Appendix C, which display the Phase I Study Area and surrounding land use and the areas of on-site and off-Site potential environmental concern. Together these figures outline all the significant features of the Site and surrounding properties included within the Phase I Study Area.

The results of the Phase I ESA indicate the following three issues of Potential Environmental Concern:

- Application of pesticides and/or fertilizers on the on-Site areas used for agricultural activities;
- Migration of pesticides or fertilizers from the off-Site areas used for agricultural activities; and
- The piles of fill of unknown quality located on the northwest and southwest portions of the Site.

Based on the historical document review, the specific contaminants of concern for this property in soil and groundwater include; pesticides, herbicides, fertilizers (i.e., nitrate and nitrite), metals and inorganics.

The results of Golder's concurrent geotechnical investigation indicated that subsurface conditions typically consisted of about 0.15 m to 0.5 m of surficial topsoil that was underlain by native silty clay till that extended to depths of approximately 1.0 m to 3.1 m below the existing ground surface. Beneath the silty clay till, reddish brown shale bedrock of the Queenston Formation was encountered that extended to depths of approximately 4.6 m to 10.3 m below the inferred top of bedrock where practical refusal to further auger penetration was encountered, or the boreholes were terminated.

Therefore, the Phase I ESA Conceptual Site Model as described above and in the attached Figures in Appendix C was used as a basis for developing the scope of work for this Phase II ESA investigation.

3.4 Deviations from Sampling and Analysis Plan

The soil and groundwater sampling was carried out in general accordance with Golder's Sampling and Analysis Plan, which was designed to address the potential areas of concern identified in Golder's Phase I ESA, and in consideration of the requirements of O.Reg. 153/04, as amended by O.Reg. 511/09.

In addition to the scope provided for in the Sampling and Analysis Plan, one of the fill samples that primarily consisted of topsoil was also submitted for analysis of pesticides and herbicides. A groundwater sample that was originally to be collected from BH11-19 was collected from the nearby monitoring well at BH11-18 due to the slow recovery of shallow groundwater in the upper monitoring well at BH11-19. Further, in addition to the two (2) fill samples originally proposed, three (3) surficial topsoil samples near BH11-5 and BH11-17 were submitted for pH to assess the potential impact of lime conditioning of biosolids/compost that was placed on the Site between about 2003 and 2008. This information was disclosed from the MOE Freedom of Information Request that was received by Golder on July 21, 2011.

One borehole (BH11-21) was also drilled on the west side of the existing house for exploratory purposes in order to verify if the soil conditions in the vicinity of the house have been impacted by petroleum hydrocarbons related to a former heating oil tank that reportedly existed in the basement of the on-Site house.

3.5 Impediments

No impediments to the Phase II ESA investigation were encountered.

4.0 INVESTIGATION METHOD

4.1 General

The following sections of this report describe the pre-field work activities and field investigation methods employed during the investigation conducted at the Site. Field methods described below include borehole drilling, soil sampling, field screening, groundwater monitoring well installation, measurement of water quality parameters, and sampling. Details of analytical testing, residue management, elevation surveying and Quality Assurance / Quality Control (QA/QC) measures are also included below. Specific sampling methodologies were as provided in the attached Sampling and Analysis Plan and Standard Operating Procedures.

4.1.1 Site-Specific Health and Safety Plan

Prior to the commencement of field activities, Golder developed a Site-specific health and safety plan. The plan addressed the specific health and safety concerns anticipated for the work to be done at the Site, and established procedures to be followed by Golder staff in the event of an emergency. The document was reviewed and signed on-Site by field personnel prior to commencing work.

No incidents regarding the health and safety took place during the field work activities.

4.2 Drilling and Excavating

A total of 24 boreholes (designated as Boreholes 11-1 to 11-21 and Fill #11-1 to Fill #11-3) were advanced to depths of about 0.6 m to 11 m below existing grades between May 26, 2011 and June 3, 2011. Boreholes 11-1, 11-2, 11-7, 11-9, 11-11, 11-15, 11-18 and 11-19 were equipped with monitoring wells for groundwater level monitoring and sampling throughout the Site. The locations of the completed boreholes are shown on the appended Borehole Location Plan, Figure 2.

Prior to initiating the field work, Golder contacted public and private utility companies to locate and clear existing underground services. As the boreholes advanced within the proposed residential subdivision were located on private property, Golder also retained a private utility locating contractor to scan the borehole locations for buried services prior to drilling.

The boreholes were advanced using a track-mounted drill rig equipped with 150 mm outside diameter solid stem augers, supplied and operated by a specialist drilling contractor (Davis Well Drilling Ltd. (MOE Well Contractor License No. 7472). Standard Penetration Testing (SPT) and sampling was typically carried out at 0.75 m and 1.5 m intervals of depth in the boreholes using conventional 35 mm I.D. split spoon sampling equipment. Composite samples of the fill materials were taken from the augers of the “Fill” boreholes. The field work for this investigation was monitored by members of our engineering staff who logged the subsurface conditions encountered in the boreholes and cared for the samples obtained. All of the recovered soil samples obtained by Golder during this investigation were brought to our Mississauga laboratory for further examination and classification/index testing (i.e. moisture contents and grain size analysis).

The locations of the boreholes were determined by Golder in consultation with Arutip Engineering Limited. The ground surface elevations at the borehole locations were subsequently determined in the field by an Ontario Land Surveyor contracted by Golder, and are referenced to a geodetic datum.

Groundwater observations were carried out in the open boreholes during and upon completion of drilling activities. Groundwater level measurements were also taken periodically in the monitoring wells.

For the boreholes designated for environmental purposes (i.e., BH11-1, BH11-2, BH11-5, BH11-11, BH11-17, BH11-18 and BH11-21), decontamination of split spoons was conducted between each soil sampling interval, by washing with an alconox solution and rinsing with water.

The borehole locations are shown on Figure 2. The Record of Borehole Logs are included in Appendix D.

4.3 Soil: Sampling

Soil samples were retrieved from the boreholes using a split-spoon sampler. In boreholes designated for environmental purposes (i.e., BH11-1, BH11-2, BH11-5, BH11-11, BH11-17, BH11-18 and BH11-21), the retrieved samples were split in the field into two components. One component of each sample was placed into laboratory-supplied labelled glass jars and stored in a cooler with ice for possible subsequent chemical analyses. The second component of the sample was placed inside a labelled plastic bag for subsequent testing and screening using soil headspace vapour measurements.

The subsurface soil conditions within the boreholes drilled were described in terms of their texture, presence of staining, odour and debris, if any.

Field observations made during the borehole drilling activities are summarized in the borehole logs (Appendix D).

4.4 Field Screening Measurements

Soil headspace vapour measurements were conducted on the soil samples collected from "environmental" boreholes (i.e., BH11-1, BH11-2, BH11-5, BH11-11, BH11-17, BH11-18 and BH11-21) for combustible gas vapour concentrations using the equipment described in Table 4.1.

Table 4.1: Field Screening Measurement Equipment

Equipment	Make and Model	Parameters Detected	Detection Limits	Precision	Accuracy	Calibration Standard	Calibration Procedure
Gastech	Gastech 1238	Combustible gas	N/A - Analog Needle	N/A	+/- 5%	Hexane	In office prior to fieldwork

The field screening measurements (Gastech), visual observations (e.g., staining, discolouration and/or free product), and olfactory observations were considered for selection of samples for chemical analyses.

The results of soil headspace measurements are presented on Table 5.1 in Section 5 of this report.

4.5 Ground Water: Monitoring Well Installation

In accordance with the scope of work provided in Golder's Proposal P1-1111-0050, dated April 29, 2011, monitoring wells were installed in Boreholes 11-1, 11-2, 11-7, 11-9, 11-11, 11-15, 11-18 and 11-19 by Davis Drilling Ltd. (an MOE licensed well contractor) for groundwater level monitoring and sampling. No wells were completed entirely within the glacial till deposit due to the shallow nature of the deposit. Borehole 11-18 was constructed with a screen straddling the glacial till and underlying bedrock. Monitoring wells BH11-11 and BH11-18 were designated for environmental sampling. The other monitoring wells were used to obtain groundwater level information across the Site for the geotechnical and hydrogeological investigaitons.

The monitoring wells were constructed using threaded 50-mm diameter, schedule 40, polyvinyl chloride ("PVC") well screens and riser pipe, which were brought to the Site in sealed plastic bags. The annulus around the monitoring well screens was backfilled with silica sand and sealed below ground surface with bentonite and/or concrete to minimize cross-contamination.

Prior to the sampling event, the monitoring wells were developed using dedicated Waterra® pumps (tubing with foot valves). The monitoring wells were developed by purging to dryness.

Figure 2 shows the locations of the groundwater monitoring wells that were sampled for environmental purposes. The monitoring well installation details and groundwater conditions encountered during drilling are shown on the attached Record of Borehole sheets and Table 1.

4.6 Ground Water: Field Measurement of Water Quality Parameters

Groundwater indicator parameters including temperature, pH and electrical conductivity (EC) were measured in groundwater samples collected from each of the monitoring wells sampled during the groundwater sampling event. The results of measurement of temperature, pH and EC for the groundwater samples taken from BH11-11 and BH11-18 are presented on the Monitoring Well Water Work Sheets included in Appendix F.

4.7 Ground Water: Sampling

Golder conducted groundwater level monitoring at the Site on four occasions, and groundwater sampling on one separate occasion during the period of June 2011 and July 2011. Water level measurements were taken using a standard water level meter. The groundwater level monitoring was completed from June 8, 2011 and July 18, 2011, and the sampling event was carried out on June 24, 2011.

During development, qualitative observations were made of water colour, clarity, the presence or absence of any hydrocarbon sheen and any odours present. Golder did not encounter free product in any of the monitoring wells. A hydrogen sulphide odour was noted during backfilling of the monitoring well in BH11-2.

The groundwater samples were collected using using dedicated Waterras® and then subsequently stored on ice and submitted to AGAT Analytical Laboratories for chemistry analysis.

4.8 Sediment: Sampling

No sediment samples were collected as part of this investigation since the creek is to be realigned to a block of land along 6th Line as part of the Site redevelopment, and a stormwater management pond is to be constructed in the southwest corner of the Site where the existing swamp/marsh exists.

4.9 Analytical Testing

Representative soil and groundwater samples were submitted for chemical analysis upon completion of drilling and sampling. For environmental characterization of these media, the samples were submitted for analysis of O. Reg. 153/03 metals and inorganics, organochlorinated (OC) pesticides including polychlorinated biphenyls (PCBs), triazine pesticides, pH, nitrate and nitrite.

Anomalous soil conditions based on visual and olfactory evidence (i.e., staining and/or odour), and combustible gas readings measured on the headspace of soil samples were also considered in the selection of the samples for chemical testing. The groundwater samples were examined in the field for any visual or olfactory indications of environmental impact (i.e, sheen, odour, free-phase liquid product).

For this Site investigation, a total of 10 soil and 2 groundwater samples were submitted for analyses of the above parameters in accordance with Golder's Sampling and Analysis Plan dated May 26, 2011 that is included in Appendix B of this report.

The soil and QA/QC samples submitted for analysis are provided in Table 4.2:

Table 4.2: Soil Sampling Protocol

Location	Sample	Depth (m)	Parameters
BH Fill 11-1	SA1	0- 0.61	O. Reg. 153 metals, pH, EC and SAR
BH Fill 11-3	SA1	0-0.05	O. Reg. 153 metals, pH, EC and SAR, OC Pesticides, PCBs, Triazine Pesticides
BH 11-2	SA1A	0-0.28	OC Pesticides, PCBs, Triazine Pesticides
BH 11-5	SA1A	0-0.20	OC Pesticides, PCBs, Triazine Pesticides
BH 11-5	SAGA1	0.05-0.12	pH
BH 11-5	SA1GA2	0-0.05	pH
BH 11-11	SA1A	0-0.33	OC Pesticides, PCBs, Triazine Pesticides
BH 11-17	SA1A	0-0.30	OC Pesticides, PCBs, Triazine Pesticides, pH
BH 11-17	SAGA1	0-0.05	pH
BH 11-18	SA1A	0-0.28	OC Pesticides, PCBs, Triazine Pesticides
QA/QC Samples			
DUP 1A	BH 11-18 SA1A	0-0.28	OC Pesticides, PCBs, Triazine Pesticides
DUPE 1	BH Fill 11-1 SA1	0-0.61	O. Reg. 153 metals, pH, EC and SAR
Equip. Blank	BH Fill 11-3	0-0.05	O. Reg. 153 metals, pH, EC and SAR
Equip. Blank	BH 11-18 SA1A	0-0.28	OC Pesticides, Triazine Pesticides

The groundwater and QA/QC samples submitted for analysis are provided in Table 4.3:

Table 4.3: Groundwater Sampling Protocol

Location	Parameters
BH 11-11	OC Pesticides, PCBs, Triazine Pesticides, nitrate, nitrite
BH 11-18	OC Pesticides, PCBs, Triazine Pesticides, nitrate, nitrite
QA/QC Samples	
DUP #1 (BH 11-11)	OC Pesticides and PCBs, Triazine Pesticides, nitrate, nitrite

Analytical soil and groundwater testing was conducted by AGAT Analytical Laboratories ("AGAT"). The contact information for the laboratory used is included below.

AGAT Analytical Laboratories

5835 Coppers Avenue
Mississauga, ON L4Z 1Y2

Laboratory Contact:
Nihila Anthonypillai B.Sc.
Senior Client Project Manager
AGAT Environmental Division, Mississauga
Office: 905 712 5123
Cell: 416-471-9605

4.10 Residue Management Procedures

With analytical results indicating that the application of generic Site Condition Standards were not exceeded, soil and bedrock cuttings from the drilling program remained on the ground surface at the respective borehole locations. Purge water generated during the development of monitoring wells, and from equipment cleaning was disposed of on the ground surface in the area where the water was generated.

4.11 Elevation Surveying

Teddy Surveying Inc. conducted an elevation survey in June 2011 after the boreholes and monitoring wells were completed. The elevation survey was conducted geodetically using a GPS Trimble R8, and included measurement of the elevation of the ground surface of the monitoring wells and boreholes. The elevations of the borehole locations as determined from this survey are presented on the respective Record of Borehole sheets.

4.12 Single-Well Hydraulic Response Testing

Golder conducted single-well hydraulic response testing (bail testing) at five wells (11-2, 11-7, 11-9S, 11-15S and 11-19S) to estimate the hydraulic conductivity of the materials at the screened intervals. The results were used to interpret the hydraulic conductivity of the aquifer in the bedrock with the interval screened and tested. Details of the hydraulic testing are provided in Golder's *Hydrogeological Investigation, Sixth Line Corporation, Residential Development, Oakville, Ontario*, dated August 2011.

4.13 Quality Assurance and Quality Control Measures

Field instruments were calibrated prior to each use. Soil and groundwater samples were collected in pre-cleaned, labelled, laboratory-supplied bottles and handled with dedicated nitrile gloves, and were put in ice-filled coolers following collection and prior to submission to the laboratory. The samples were submitted under standard chain-of-custody protocols to AGAT for chemical analysis within the sample holding times specified in the MOE's *"Guidance on Sampling and Analytical Methods for Use at Contaminated Sites in Ontario, dated December, 1996".*

Soil samples were collected directly from the split spoon sampling equipment, which was washed between each sampling run with an alconox solution, then rinsed with water. Groundwater samples were collected using dedicated Waterra® pumps at each well location. Sampling personnel wore nitrile gloves while sampling and changed the gloves between each sample collected.

Two (2) duplicate soil samples and one duplicate groundwater sample were collected during the field program for this Phase II ESA. Two (2) equipment blanks from the soil sampling operations were submitted for the contaminants of concern. Details of the parameters analysed for each duplicate sample are presented in Tables 4.2 and 4.3. Considering that volatile organic compounds were not identified as a potential contaminant of concern, trip blanks were not prepared.

5.0 REVIEW AND EVALUATION

This section of the report presents a review and evaluation of the results of the drilling, monitoring and sampling activities conducted as part of the Phase II ESA described herein.

5.1 Geology

The investigation was designed to investigate the full depth of the saturated and unsaturated portions of the overburden and upper bedrock underlying the Site; and to evaluate the environmental condition and hydraulic properties of the overburden and upper portion of the bedrock aquifer.

Regionally the topography generally slopes to the southeast towards Lake Ontario. Local topography on the Site is gently undulating and ranges from approximately 169 to 176 metres above sea level. There is a minor influence on local topography from the surface water features in the area.

The surficial geology in the vicinity of the Site was mapped by the Canadian Geologic Survey of Canada (GSC) in 1997. The main geologic units in the vicinity of the Site consist of glaciolacustrine-derived silty to clayey till deposits overlying Paleozoic bedrock. The glacial till covers a large area surrounding the Site. The bedrock outcrop appears to follow the West Morrison Creek.

The field investigation identified near surface deposits (e.g., above bedrock) as predominantly comprised of relatively fine grained (silty clay) glacial till. Underlying the glacial till is bedrock comprised mainly of shale.

The soil conditions encountered during borehole drilling are presented in the Record of Borehole Logs (Appendix D) as well as in the cross-section presented in Figure 4, with the cross-section location shown on Figure 3. It should be noted that the boundaries between the strata on the borehole logs have been inferred from drilling observations and non-continuous sampling. The boundaries generally represent a transition from one soil type to another and should not be inferred to represent an exact plane of geological change. Further, conditions will vary between and beyond the boreholes.

The following is a summary of the subsurface soil conditions.

5.1.1 Stratigraphy

In general, the subsurface conditions encountered at the borehole locations consisted of about 0.15 m to 0.5 m of surficial topsoil (Elevation 174.5 m to Elevation 169.4 m) that was underlain by native silty clay till that extended to depths of approximately 1.0 m to 3.1 m below the existing ground surface (or Elevation 173.4 m to Elevation 168.3 m) where the inferred top of bedrock was encountered. The results of particle size gradation analyses carried out on four (4) samples and four (4) Atterberg Limits tests carried out on select samples indicate that this soil at the Site typically comprises silty clay of low plasticity.

Beneath the silty clay till, reddish brown shale bedrock of the Queenston Formation was encountered that extended to depths of approximately 4.6 m to 10.7 m (Elevation 168.6 m to Elevation 160.9 m) below the ground surface where practical refusal to further auger penetration was encountered, or the boreholes were terminated. Based on the rate of advancement and observations made during the advancement of the augers through the bedrock, grey limestone interbeds were occasionally encountered, which resulted in slower advancement of the augers with depth. These observations generally indicate that the upper portion of the shale bedrock is moderately weathered and becomes slightly weathered to fresh at depth.

5.1.2 Hydrogeology

The West Morrison Creek is a drainage swale meandering through the southern portion of the Site generally flowing in a southeast direction. The West Morrison Creek is a perennial creek. Drainage on the Site is to two watersheds; the West Morrison Creek watershed comprising the southern portion of the Site and the East Morrison Creek (Main Tributary) watershed comprising the northern portion of the Site.

Two confining units (i.e., groundwater aquitards) were observed during the Site investigation program; the overburden unit, of approximately 1 to 3 m thick (Elevation 173.4 m to Elevation 168.3 m), which is underlain by the bedrock aquitard unit, extending from approximately 1 mbgs to beyond the maximum depth investigated (10.3 mbgs) or Elevation 168.6 m to at least Elevation 160.9 m.

As part of the geotechnical investigation conducted by Golder (and reported under separate cover), particle size distribution analyses were carried out on 4 samples of the silty clay till. Based on the laboratory results, the estimated hydraulic conductivity of the silty clay till overburden at the Site is in the order of $1x10^{-5}$ cm/s.

Hydraulic conductivity of the upper bedrock was interpreted according to Hvorslev method. Applying the Hvorslev analysis to in-situ hydraulic conductivity test results, the horizontal hydraulic conductivity of the shallow bedrock is relatively low and is calculated to range from 1×10^{-6} cm/s to 3×10^{-4} cm/s, with a geometric mean of 3×10^{-5} cm/s. The higher values of hydraulic conductivity may be reflective of more weathered horizons in the upper bedrock. The hydraulic conductivity of the underlying shale limits both vertical and horizontal groundwater seepage in the bedrock.

5.2 Ground Water: Elevations and Flow Direction

On four occasions in 2011 (June 8, June 17, July 7 and July 18), groundwater levels were measured in the monitoring wells that were generally installed in the bedrock at the Site. At the eight (8) monitoring well locations

(Boreholes 11-1, 11-2, 11-7, 11-9S,D, 11-11, 11-15S,D, 11-18 and 11-19S,D), groundwater levels measured in monitoring wells screened within the upper bedrock ranged from about 0.2 m to 3.6 mbgs (from Elevation 168.0 m and Elevation 174.1 m) during these monitoring events. The presence of free product was not noted on the groundwater samples during the sampling event. A summary of the measured groundwater levels is presented in Table 2. Groundwater level contours are presented on Figure 5.

The water table elevation is within three metres below ground surface and generally mimics the surface topography. The water table elevation ranges from approximately 174 masl in the northwest area of the Site to around 168 masl in the southeast area of the Site. Groundwater monitoring of shallow overburden locations throughout June and July 2011 indicate that groundwater levels do not rise above ground surface.

Groundwater levels are below ground surface indicating the Site is within a recharge area. The small upward gradients that were observed in the bedrock on some of the monitoring occasions indicates that groundwater may be moving upward within the weathered bedrock and possibly discharging to the creek.

Groundwater flow in the shallow bedrock (or local groundwater flow system) is generally from the northwest to the southeast with some component influenced by the creek, indicating a convergence of groundwater flow towards the lower lying drainage course.

It should be noted that the groundwater levels at the Site are anticipated to fluctuate with seasonal variations in precipitation and runoff. Perched groundwater conditions are expected to develop within and above fine-grained materials especially during and following periods of sustained precipitation.

5.3 Ground Water: Hydraulic Gradients

Based on the groundwater contours presented in Figure 5, the horizontal hydraulic gradient at this Site was evaluated. In the June 8 to July 18, 2011 water level monitoring events, the hydraulic gradient within the shallow bedrock is relatively low and ranges from approximately 0.004 m/m in the northern part of the Site to 0.008 m/m in the southern part of the Site.

Nested or multi-level wells are present at three locations (BH11-9, BH11-15 and BH11-19). Groundwater elevation data from multi-level monitoring locations indicates relatively low vertical gradients. The vertical gradients appear to change direction during the year from a downward gradient to an upward gradient (ranging from approximately 0.01 to 0.1 m/m).

5.4 Soil Texture

Four (4) soil samples from on-Site (BH11-5 SA3, BH11-10 SA2B, BH11-13 SA3 and BH11-19 SA3) were collected and submitted to Golder's geotechnical laboratory in Mississauga, Ontario for grain size distribution analysis (sieve and hydrometer).

Based on fieldwork observations and grain size analysis results, the majority of the overburden material at the Site is predominantly comprised of silty clay, indicating that more than 50% particles (by mass) in the soil were equal to or smaller than 75 µm in mean diameter. The grain size distribution curves for the analyzed samples are

presented in Appendix E. Pursuant to Ontario Regulation 153/04, the soil on the Site is therefore considered to be medium-fine textured.

5.5 Soil: Field Screening

The soil vapour concentrations provide a measurement of undifferentiated organic compounds and do not discriminate among the various organic parameters such as those from solvents, petroleum products, or other potential chemicals. Therefore, the soil vapour concentrations do not provide a quantitative assessment of soil quality, but are taken to guide the selection of soil samples for chemical analysis of organic compounds such as volatile constituents and/or petroleum hydrocarbons.

The results of the soil gas headspace testing using the Gastech 1238 (with methane elimination) indicate that the measurable soil gas concentrations in the samples from boreholes designated for environmental purposes (i.e., BH11-1, BH11-2, BH11-5, BH11-11, BH11-17, BH11-18 and BH11-21), were less than 20 parts per million (ppm). These combustible gas readings are low and not considered of significance.

The results of the Gastech readings are presented in Table 5.1:

Table 5.1: Combustible Gas Soil Headspace Readings

SAMPLE LOCATION	HEADSPACE GAS HEADSPACE READINGS (GASTECHTOR 1238) ppm, unless otherwise noted						
	BH 11-1	BH 11-2	BH 11-5	BH 11-11	BH 11-17	BH 11-18	BH 11-21
SA 1A	ND	ND	5	ND	ND	ND	ND
SA 1B	ND	ND	ND	ND	ND	ND	ND
SA 2A	ND	ND	ND	ND	ND	ND	ND
SA 2B	ND	-	-	ND	-	10	-
SA 3	ND	ND	ND	ND	ND	ND	ND
SA 4	ND	ND	10	ND	ND	ND	ND
SA 5	ND	ND	20	ND	ND	ND	ND
SA 6	ND	-	ND	ND	ND	ND	ND
SA 7	ND	ND	ND	ND	ND	ND	ND

Note: ND – Not Detected (i.e. 0 ppm);
- No sample

5.6 Soil Quality

A total of ten (10) soil samples and two (2) duplicate samples were selected and submitted for analysis of the parameters listed in Table 4.2 of Section 4.9 of this report.

The analytical results of soil samples are presented in Tables 3 and 4. Copies of the laboratory certificates of analysis for the soil samples are included in Appendix G.

A comparison of the analytical results to MOE's Table 8 standards indicates that there are no soil exceedances of the 2011 MOE Standards for O. Reg. 153/03 metals and inorganics, organochlorinated (OC) pesticides and triazine pesticides. The pH values in 3 topsoil samples and in 2 samples of the fill materials ranged from 6.18 to 7.41 and therefore are within the pH range of 5 - 9.

It is noted that the concentrations of OC pesticides, PCBs and triazine pesticides in six (6) original soil samples were below both the reportable detection limit (i.e., not detected) and the available Table 8 standards.

5.7 Ground Water Quality

Monitoring well construction details are summarized in Table 1 and a list of groundwater samples submitted for laboratory analysis is provided in Table 4.3 in Section 4.9. Laboratory Certificates of Analysis for groundwater have been included in Appendix H.

Groundwater indicator parameters including temperature, pH and electrical conductivity (EC) were measured at the two (2) monitoring well locations during the single groundwater sampling event. The results of measurement of temperature, pH and EC are provided on the Monitoring Well Water Work Sheets included in Appendix F. The pH values of groundwater samples measured in the field were approximately 7.2 and 7.4. EC values were approximately 1 mS/cm, and the temperature was measured to be 11.2 and 11.8 ^{0}C in the June sampling event.

The analytical results for groundwater samples are summarized in Table 5. Based on the chemical test results, the concentrations of OC pesticides, PCBs and triazine pesticides in the two (2) groundwater samples were below the reportable detection limit (i.e., not detected) and the available Table 8 standards, with the exception of measurable concentrations of heptachlor in both samples.

Heptachlor concentrations of 0.03 ug/L were measured in the original groundwater samples from these two monitoring wells, which are below the MOE Table 8 standard of 0.038 ug/L. It is noted that in the duplicate sample (DUP #1) for the groundwater sample from BH11-11, the heptachlor concentration was 0.04 ug/L, which is above the MOE Table 8 Standard. However, the average of the 2 samples is 0.035 ug/L which is below the Table 8 Standard of 0.038 ug/L, and therefore meets the O. Reg. 153/04 standards.

Nitrate levels in the groundwater ranged from 16.5 mg/L to 19.8 mg/L. Nitrate is no longer included in the O. Reg. 153/04 standards, dated April 15, 2011.

5.8 Sediment Quality

No sediment samples were collected as part of this investigation since the creek is to be realigned to a block of land along 6th Line as part of the Site redevelopment, and a stormwater management pond is to be constructed in the southwest corner of the Site where the existing swamp/marsh exists.

5.9 Quality Assurance and Quality Control Results

A certificate of analysis was received for each sample submitted for analysis. The results for QA/QC samples are presented in full in the laboratory certificates of analysis (Appendix H). A summary of calculated RPDs and a further assessment of the field duplicate sample results according to the Protocol document entitled *Protocol for*

Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act, March 9, 2004 (effective as of July 1, 2011) is provided below.

For QA/QC purposes, relative percent difference (RPD) calculations were performed for the soil and groundwater duplicate samples when analytical results for a particular parameter were greater than the method detection limit in the original and duplicate samples collected at the borehole location. The RPD values were calculated by dividing the difference between the duplicate and original samples by the average of the two values.

For the original (BH Fill 11-11 SA1) and duplicate (DUPE 1) soil samples, the concentrations of OC Pesticides and triazine herbicides are below the reportable detection limits in both samples. Where concentrations of metals and inorganic parameters were detected in the soil samples, and one pesticide parameter in the groundwater samples, the RPD values for the soil and groundwater original and duplicate samples are outlined in Table 5.2.

Table 5.2: Acceptable QA/QC Performance Standards

Parameter	Calculated RPD	Acceptable Performance Standard	Result
Soil			
Metals	0 -18%, except for lead at 30%	</= 30%	Ok
Mercury	25%	</= 30%	Ok
Electrical Conductivity	9%	</= 10%	Ok
pH	Difference of 0.03 units	Within 0.3 units	Ok
Groundwater			
Heptachlor	29%	</= 30%	Ok

The RPD value for nitrate was 18% which is below a Lower Acceptable Performance Standard of 20% for other parameters. Nitrate is no longer a parameter under O.Reg. 153/04 and therefore, the RPD value should be considered acceptable.

The analytical results of the primary and duplicate soil samples and groundwater samples indicated a satisfactory correlation between the primary and duplicate samples in accordance with the Protocol for Analytical Methods used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act, March 9, 2004 amended as of July 1, 2011.

Two (2) equipment blanks from the soil sampling operations were submitted for the contaminants of concern that included O. Reg. 153/03 metals and inorganics, organochlorinated (OC) pesticides, triazine pesticides and pH. Detections of zinc, cyanide free, and a pH of 6.14 were encountered in the water. The detections of zinc and cyanide free are well below the Table 8 standards and the pH value is within the acceptable range of 5 to 9. Therefore, it is concluded that the sampling equipment did not substantially impact the analytical data of the soil samples collected during this investigation, and therefore the conclusions of this report.

The quality of the analytical results is further supported by an internal QA/QC program using blanks, spikes, surrogates and duplicate samples carried out by AGAT. Golder received analytical results for all samples submitted and the analytical testing complied with O. Reg. 153/04 requirements.. The required data quality objectives were met. All analytical results are included in Appendices G and H.

5.10 Phase Two Conceptual Site Model

The Golder Phase I ESA, conducted in July 2011, identified three areas of potential environmental concern related to the Site including: unknown fill quality in mounds of material that were observed on the northwest and south portions of the Site; the application of pesticides, herbicides and fertilizers from On-Site agricultural activities; and, the application of pesticides, herbicides and fertilizers from Off-Site agricultural activities. It was also indicated that the soil pH should be verified based on the use of lime with compost as part of the application of biosolids on the Site in the 2000s. The Phase II ESA Sampling and Analysis Program was designed to assess whether soil or groundwater contamination was present on-Site relating to the above-identified areas of potential environmental concerns.

In general, the subsurface conditions encountered at the borehole locations consisted of about 0.15 m to 0.5 m of surficial topsoil and localized fill that were underlain by native silty clay till that extended to depths of approximately 1.0 m to 3.1 m below the existing ground surface. Beneath the silty clay till, reddish brown shale bedrock of the Queenston Formation was encountered that extended to depths of approximately 4.6 m to 10.3 m below the inferred top of bedrock where practical refusal to further auger penetration was encountered, or the boreholes were terminated.

The measured groundwater level is within three metres of the ground surface and generally mimics the surface topography. The water table elevation ranges from approximately 174 masl in the northwest area of the Site to around 168 masl in the southeast area of the Site. Groundwater flow in the shallow bedrock (or local groundwater flow system) is generally from the northwest to the southeast with some component influenced by the creek, indicating a convergence of groundwater flow towards the lower lying drainage course.

Figure 3 shows the location of a schematic cross-section (Cross Section A – A'), which provides an interpretation of local geology based on the borehole drilling results and groundwater levels. Cross Section A – A' (shown on Figure 4) extends from the northwest part of the Site to the southeast part of the Site. It should be noted that the boundaries between the strata on the borehole logs have been inferred from drilling observations and non-continuous sampling. The boundaries generally represent a transition from one soil type to another and should not be inferred to represent an exact plane of geological change. Further, conditions will vary between and beyond the boreholes.

The Phase II ESA findings indicate that soil and groundwater quality on-Site complies with the applicable MOE Table 8 standards provided under O. Reg 153/04 for the contaminants investigated. The potential issues raised in the Phase I ESA have been investigated in accordance with the Phase II ESA Sampling and Analysis Program (Appendix B).

6.0 CONCLUSIONS

In conclusion, the Phase II ESA has addressed the relevant environmental issues identified in the Phase I ESA.

The pH values in the tested topsoil and fill/topsoil samples ranged from 6.18 to 7.41 which are within the acceptable pH range of 5 – 9. Therefore, the potential soil conditioning of the biosolids with lime does not appear to have adversely impacted the soil pH at the Site.

The nitrate levels that were encountered in the groundwater appear to be elevated in comparison to the 2004 potable Table 2 groundwater standard of 10 mg/L. These nitrate levels are consistent with the analytical testing from two other on-Site wells located across the Site that were sampled as part of the hydrogeologic investigation. Considering that one of the monitoring wells (BH11-2) is located in a hydraulically upgradient location (i.e., near the northern property boundary), the elevated nitrate levels may be attributable in part to the historical application of biosolids, however, it appears to be a regional issue. For the proposed municipally serviced residential subdivision, the nitrate levels should not be an issue of environmental concern for the Site as local groundwater is not intended for use as a potable water supply.

BH11-21 was advanced to the west side of the existing house and in the inferred downgradient groundwater flow direction to assess if the soil conditions in the vicinity of the house have been impacted by petroleum hydrocarbons related to a former heating oil tank that reportedly existed in the basement of the house at the Site. There was no visual or olfactory evidence of environmental impact, or measureable soil gas concentrations, in the soil samples that were collected from this borehole.

The hydrogen sulphide type odour that was noted during installation of the monitoring well in BH11-2 may be related to the decomposition of saturated organic matter under anaerobic conditions as this monitoring well is located near the northeast portion of the Site and East Morrison Creek. This is not considered an issue of potential environmental concern, rather it may be a health and safety issue that should be further investigated and considered as part of the future land development activities.

Based on the results of the Phase II ESA completed, there were no exceedances of the 2011 MOE Table 8 Standards for the potential contaminants of concern that were identified for the soil and groundwater at the Site in relation to on and off Site agricultural activities, as well as for the placement of some fill materials on the Site.

7.0 REFERENCES

Golder Associates Ltd., July 2011. Phase I Environmental Site Assessment, Sixth Line Corporation, Sixth Line and Dundas Street East, Oakville, Ontario.

Golder Associates Ltd., July 2011. Geotechnical Investigation, Sixth Line Corporation, Residential Development, Oakville, Ontario.

Golder Associates Ltd., August 2011. Hydrogeological Investigation, Sixth Line Corporation, Residential Development, Oakville, Ontario.

Ministry of Environment (MOE) Ontario Regulation 153/04 “Soil, Ground Water and Sediment Standards for Use Under Part XV.1 of the Environmental Protection Act, April 25, 2011.

Ministry of Environment (MOE) Guideline on Sampling and Analytical Methods for Use at Contaminated Sites in Ontario, 1996.

8.0 LIMITATIONS

This report was prepared for the exclusive use of Sixth Line Corporation ("Sixth Line"), its consultants, and any third parties with whom Sixth Line contracts for this project. The report, which specifically includes all tables, figures and appendices, is based on data and information collected during conducting the Phase II ESA, and is based solely on the conditions of the property at the time of conducting investigations, supplemented by historical information and data obtained by Golder Associates Ltd. as described in this report.

The assessment of environmental conditions at this site has been made using the results of field screening techniques and chemical analysis of soil, groundwater and surface water samples at a limited number of locations. The site conditions between sampling locations have been inferred based on conditions observed at the sampling locations. Conditions may vary from these sample locations. Additional study, including further investigation, can reduce the inherent uncertainties associated with this type of study. However, it is never possible, even with exhaustive sampling and testing, to dismiss the possibility that part of a site may be contaminated and remain undetected.

The services performed as described in this report were conducted in a manner consistent with that level of care and skill normally exercised by other members of the engineering and science professions currently practicing under similar conditions, subject to the time limits and financial and physical constraints applicable to the services.

Any use which a third party (except Sixth Line, its consultants, and any third parties with whom Sixth Line contracts for this project) makes of this report, or any reliance on, or decisions to be made based on it, are the responsibilities of such third parties. Golder accepts no responsibility for damages, if any, suffered by any third party (other than as noted above) as a result of decisions made or actions based on this report.

The content of this report is based on information collected during the drilling, soil, and groundwater sampling activities, our present understanding of the site conditions, and our professional judgement in light of such information at the time of this report. This report provides a professional opinion and therefore no warranty is expressed, implied, or made as to the conclusions, advice and recommendations offered in this report. This report does not provide a legal opinion regarding compliance with applicable laws. With respect to regulatory compliance issues, it should be noted that regulatory statutes and the interpretation of regulatory statues are subject to change.

The findings and conclusions of this report are valid only as of the date of this report. If new information is discovered in future work, including excavations, borings, or other studies, Golder Associates Ltd. should be requested to re-evaluate the conclusions of this report, and to provide amendments as required.

The monitoring wells installed as part of this project have been constructed using licensed drilling/well contractors employing licensed well technicians. It is the owner's responsibility to have a licensed well technician properly abandon all monitoring wells if required.

9.0 CLOSURE

We trust that you will find the contents of this report satisfactory for your current needs. Should you require clarification of the information provided, please do not hesitate to contact the undersigned.

GOLDER ASSOCIATES LTD.

Steven Desrocher, M. Sc., P. Geo.
Senior Contaminant Hydrogeologist

Peter Mann, P. Eng.
Associate

PM/SD/sa

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TABLES

Table 1
Monitoring Well Details

Well ID	Northing	Easting	Ground Elevation Prior to Installation (masl)	Stickup (m)	Screen Depth		Sandpack Depth	
					Top (mbgs)	Bottom (mbgs)	Top (mbgs)	Bottom (mbgs)
BH11-1	4815663.1	602132.6	174.51	0.84	3.2	6.3	2.9	6.3
BH11-2	4815821.1	602253.6	174.44	0.80	4.6	6.1	4.1	6.1
BH11-7	4815751.8	602378.7	173.27	0.90	4.6	6.2	4.3	6.2
BH11-9-D	4815428.9	602365.9	174.66	0.55	8.5	10.1	7.6	10.1
BH11-9-S	4815428.9	602365.9	174.66	0.84	3.4	4.9	2.8	4.9
BH11-11	4815479.5	602524.4	173.12	0.91	2.1	5.2	1.8	5.2
BH11-15-D	4814216.1	602584.5	171.75	0.77	8.4	9.9	8.1	9.9
BH11-15-S	4814216.1	602584.5	171.75	0.76	3.4	4.9	3.1	4.9
BH11-18	4815048.8	602742.5	169.62	0.86	0.9	4.0	0.8	4.0
BH11-19-D	4814994	602808.3	171.58	0.93	9.1	10.7	8.8	10.7
BH11-19-S	4814994	602808.3	171.58	0.66	4.4	5.9	4.1	5.9

Table 2
Groundwater Levels

Well ID	Top of Pipe (TOP) Elevation (masl)	Groundwater Levels							
		8-Jun-11		17-Jun-11		7-Jul-11		18-Jul-11	
		Depth (mbTOP)	Elevation (masl)	Depth (mbTOP)	Elevation (masl)	Depth (mbTOP)	Elevation (masl)	Depth (mbTOP)	Elevation (masl)
BH11-1	175.35	1.29	174.06	1.83	173.53	2.28	173.07	2.45	172.90
BH11-2	175.24	1.21	174.03	1.72	173.53	2.22	173.03	2.41	172.83
BH11-7	174.17	1.39	172.78	1.87	172.30	2.32	171.85	2.53	171.65
BH11-9-D	175.21	2.53	172.69	3.20	172.01	3.78	171.44	4.07	171.15
BH11-9-S	175.50	2.82	172.69	3.47	172.04	4.09*	171.41	4.40	171.11
BH11-11	174.03	1.57	172.47	2.19	171.85	2.76	171.27	3.03	171.00
BH11-15-D	172.52	1.63	170.90	1.62	170.90	1.89	170.63	2.18	170.34
BH11-15-S	172.51	1.23	171.29	1.57	170.94	1.96	170.55	2.22	170.29
BH11-18	170.48	1.01	169.47	1.27	169.21	1.56	168.93	1.79	168.69
BH11-19-D	172.51	3.63	168.88	3.54	168.97	3.92	168.59	3.98	168.54
BH11-19-S	172.24	3.29	168.95	3.80	168.44	3.96	168.28	4.23	168.01

* groundwater level measured on July 8, 2011

Table 3
Soil Analytical Results
OC and Triazine Pesticides, PCBs
Sixth Line Corporation, Oakville, Ontario

		Borehole Location	**BH 11-18**	**Dup 1A**	**BH 11-2**	**BH 11-5**	**BH 11-11**	**BH 11-17**	**Fill 11-3**
		Sample ID	**SA1A**	**Dup 1A**	**SA1A**	**SA1A**	**SA1A**	**SA1A**	**SA1**
		Sampling Date	2-Jun-11	2-Jun-11	2-Jun-11	3-Jun-11	3-Jun-11	3-Jun-11	3-Jun-11
		Sample Depth (mbgs)	0.0 - 0.28	0.0 - 0.28	0.0 - 0.28	0.0 - 0.2	0.0 - 0.33	0.0 - 0.3	0.0 - 0.05
Parameter	**Units**	***MOE Table 8 (2011)*** [1]							
gamma-BHC (Lindane)	*µg/g*	*nv*	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Heptachlor	*µg/g*	*0.05*	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Aldrin	*µg/g*	*0.05*	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Heptachlor Epoxide	*µg/g*	*0.05*	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Total Endosulfan	*µg/g*	*0.04*	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Chlordane	*µg/g*	*0.05*	<0.007	<0.007	<0.007	<0.007	<0.007	<0.007	<0.007
DDE	*µg/g*	*0.05*	<0.007	<0.007	<0.007	<0.007	<0.007	<0.007	<0.007
DDD	*µg/g*	*0.05*	<0.007	<0.007	<0.007	<0.007	<0.007	<0.007	<0.007
DDT	*µg/g*	*1.4*	<0.007	<0.007	<0.007	<0.007	<0.007	<0.007	<0.007
Dieldrin	*µg/g*	*0.05*	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Endrin	*µg/g*	*0.04*	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Methoxychlor	*µg/g*	*0.05*	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Hexachlorobenzene	*µg/g*	*0.02*	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Hexachlorobutadiene	*µg/g*	*0.01*	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Hexachloroethane	*µg/g*	*0.01*	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Trifluralin	*µg/g*	*nv*	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Simazine	*µg/g*	*nv*	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Atrazine	*µg/g*	*nv*	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Metribuzin	*µg/g*	*nv*	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Alachlor	*µg/g*	*nv*	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Prometryne	*µg/g*	*nv*	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Metolachlor	*µg/g*	*nv*	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Cyanazine	*µg/g*	*nv*	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Aroclor 1242	*µg/g*	*nv*	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1248	*µg/g*	*nv*	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1254	*µg/g*	*nv*	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1260	*µg/g*	*nv*	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
PCBs (total)	*µg/g*	*0.3*	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1

Notes:

nv = No value

µg/g = Microgram per gram

1 = Ministry of Environment (MOE) "Soil, Groundwater, and Sediment Standards, Part XV.1 Environmental Protection Act, April 15, 2011" Table 8: Generic Site Condition Standards for use within 30 m of a Water Body in a Potable Groundwater Condition, Res/Park/Institutional/Ind/Com/Community Property Use

0.04 = Exceeds MOE Table 8 (2011) Standards

Prepared By: SM
Checked By: PM

Table 4
Soil Analytical Results
Metals and Inorganics
Sixth Line Corporation, Oakville, Ontario

			Borehole Location	Fill 11-3	DUPE 1	Fill 11-1	BH 11-5*	BH 11-5*	BH 11-17*
			Sample ID	SA1	DUPE 1	SA1	11-5 GA1(0-2)	11-5 GA1(2-5)	11-17 GA1 (0-2)
			Sampling Date	2-Jun-11	2-Jun-11	2-Jun-11	25-Jul-11	25-Jul-11	25-Jul-11
			Sample Depth (mbgs)	0.0 - 0.05	0.0 - 0.61	0.0 - 0.61	0.0 - 0.05	0.05 - 0.12	0.0 - 0.05
Parameter	**Units**	***MOE Table 8 (2011)[1]***							
pH	-	*5-9*		7.23	7.38	7.41	7.33	7.41	6.18
EC	*mS/cm*	*0.7*		0.22	0.192	0.209	-	-	-
SAR	na	*5*		0.176	0.043	0.046	-	-	-
Antimony	*µg/g*	*1.3*		<0.8	<0.8	<0.8	-	-	-
Arsenic	*µg/g*	*18*		6	5	5	-	-	-
Barium	*µg/g*	*220*		96	71	70	-	-	-
Beryllium	*µg/g*	*2.5*		0.9	0.8	0.7	-	-	-
Boron	*µg/g*	*36*		7	9	8	-	-	-
Boron (Hot Water Ext)	*µg/g*	*1.5*		0.47	0.49	0.52	-	-	-
Cadmium	*µg/g*	*1.2*		<0.5	<0.5	<0.5	-	-	-
Chromium	*µg/g*	*70*		24	23	22	-	-	-
Cobalt	*µg/g*	*22*		12.9	12.1	11.6	-	-	-
Copper	*µg/g*	*92*		29	45	38	-	-	-
Lead	*µg/g*	*120*		22	27	20	-	-	-
Molybdenum	*µg/g*	*2*		0.5	0.5	0.5	-	-	-
Nickel	*µg/g*	*82*		26	42	38	-	-	-
Selenium	*µg/g*	*1.5*		<0.4	0.5	<0.4	-	-	-
Silver	*µg/g*	*0.5*		<0.2	0.2	0.2	-	-	-
Thallium	*µg/g*	*1*		<0.4	<0.4	<0.4	-	-	-
Uranium	*µg/g*	*2.5*		0.6	0.6	0.5	-	-	-
Vanadium	*µg/g*	*86*		33	30	29	-	-	-
Zinc	*µg/g*	*290*		81	82	83	-	-	-
Chromium, Hexavalent	*µg/g*	*0.66*		<0.2	<0.2	<0.2	-	-	-
Cyanide, Free	*µg/g*	*0.051*		<0.05	<0.05	<0.05	-	-	-
Mercury	*µg/g*	*0.27*		0.06	0.09	0.07	-	-	-

Notes:

nv	= No value
na	= Not applicable
µg/g	= Microgram per gram
-	= Not tested
1	= Ministry of Environment (MOE) "Soil, Groundwater, and Sediment Standards, Part XV.1 Environmental Protection Act, April 15, 2011" Table 8: Generic Site Condition Standards for use within 30 m of a Water Body in a Potable Groundwater Condition, Res/Park/Institutional/Ind/Com/Community Property Use
0.04	= Exceeds MOE Table 8 (2011) Standards
*	= Surface soil samples taken in the vicinity of BH11-5 and BH11-7

Prepared By: SM
Checked By: PM

Table 5
Groundwater Analytical Results
OC and Trianzine Pesticides, PCBs, Nitrate and Nitrite
Sixth Line Corporation, Oakville, Ontario

		Monitoring Well Location	BH11-11	BH11-18	DUP #1
		Sample ID	BH11-11	BH11-18	DUP #1
		Sampling Date	24-Jun-11	24-Jun-11	24-Jun-11
Parameter	**Units**	***MOE Table 8 (2011)*** [1]			
gamma-BHC (Lindane)	*µg/L*	*nv*	<0.01	<0.01	<0.01
Heptachlor	*µg/L*	*0.038*	0.03	0.03	**0.04**
Aldrin	*µg/L*	*0.35*	<0.01	<0.01	<0.01
Heptachlor Epoxide	*µg/L*	*0.038*	<0.01	<0.01	<0.01
Total Endosulfan	*µg/L*	*0.56*	<0.05	<0.05	<0.05
Chlordane	*µg/L*	*0.06*	<0.04	<0.04	<0.04
DDE	*µg/L*	*10*	<0.01	<0.01	<0.01
DDD	*µg/L*	*1.8*	<0.05	<0.05	<0.05
DDT	*µg/L*	*0.05*	<0.04	<0.04	<0.04
Dieldrin	*µg/L*	*0.35*	<0.02	<0.02	<0.02
Endrin	*µg/L*	*0.36*	<0.05	<0.05	<0.05
Methoxychlor	*µg/L*	*0.3*	<0.04	<0.04	<0.04
Hexachlorobenzene	*µg/L*	*1*	<0.01	<0.01	<0.01
Hexachlorobutadiene	*µg/L*	*0.44*	<0.01	<0.01	<0.01
Hexachloroethane	*µg/L*	*2.1*	<0.01	<0.01	<0.01
PCB's (total)	*µg/L*	*0.2*	<0.2	<0.2	<0.2
Trifluralin	*µg/L*	*nv*	<1.0	<1.0	<1.0
Simazine	*µg/L*	*nv*	<1.0	<1.0	<1.0
Atrazine	*µg/L*	*nv*	<0.5	<0.5	<0.5
Metribuzin	*µg/L*	*nv*	<0.25	<0.25	<0.25
Prometryne	*µg/L*	*nv*	<0.25	<0.25	<0.25
Metolachlor	*µg/L*	*nv*	<0.11	<0.11	<0.11
Alachlor	*µg/L*	*nv*	<0.5	<0.5	<0.5
Cyanazine	*µg/L*	*nv*	<1.0	<1.0	<1.0
Nitrate as N	*µg/L*	*nv*	19800	16500	16600
Nitrite as N	*µg/L*	*nv*	<50	<50	<50

Notes:

nv = No value derived

µg/L = Microgram per litre

1 = Ministry of Environment (MOE) "Soil, Groundwater, and Sediment Standards, Part XV.1 Environmental Protection Act, April 15, 2011" Table 8: Generic Site Condition Standards for use within 30 m of a Water Body in a Potable Groundwater Condition, Res/Park/Institutional/Ind/Com/Community Property Use

0.04 = Exceeds MOE Table 8 (2011) Standards

Prepared By: SM
Checked By: PM

FIGURES

LEGEND

Site Boundary

REFERENCE

Base Data - MNR NRVIS, obtained 2004, CANMAP v2006.4
Produced by Golder Associates Ltd under licence from
Ontario Ministry of Natural Resources, © Queens Printer 2008
Imagery - Bing Maps © 2009 Microsoft Corporation and its data suppliers
Projection: Transverse Mercator Datum: NAD 83 Coordinate System: UTM Zone 17

200 100 0 200 400 600
SCALE 1:15,000 METRES

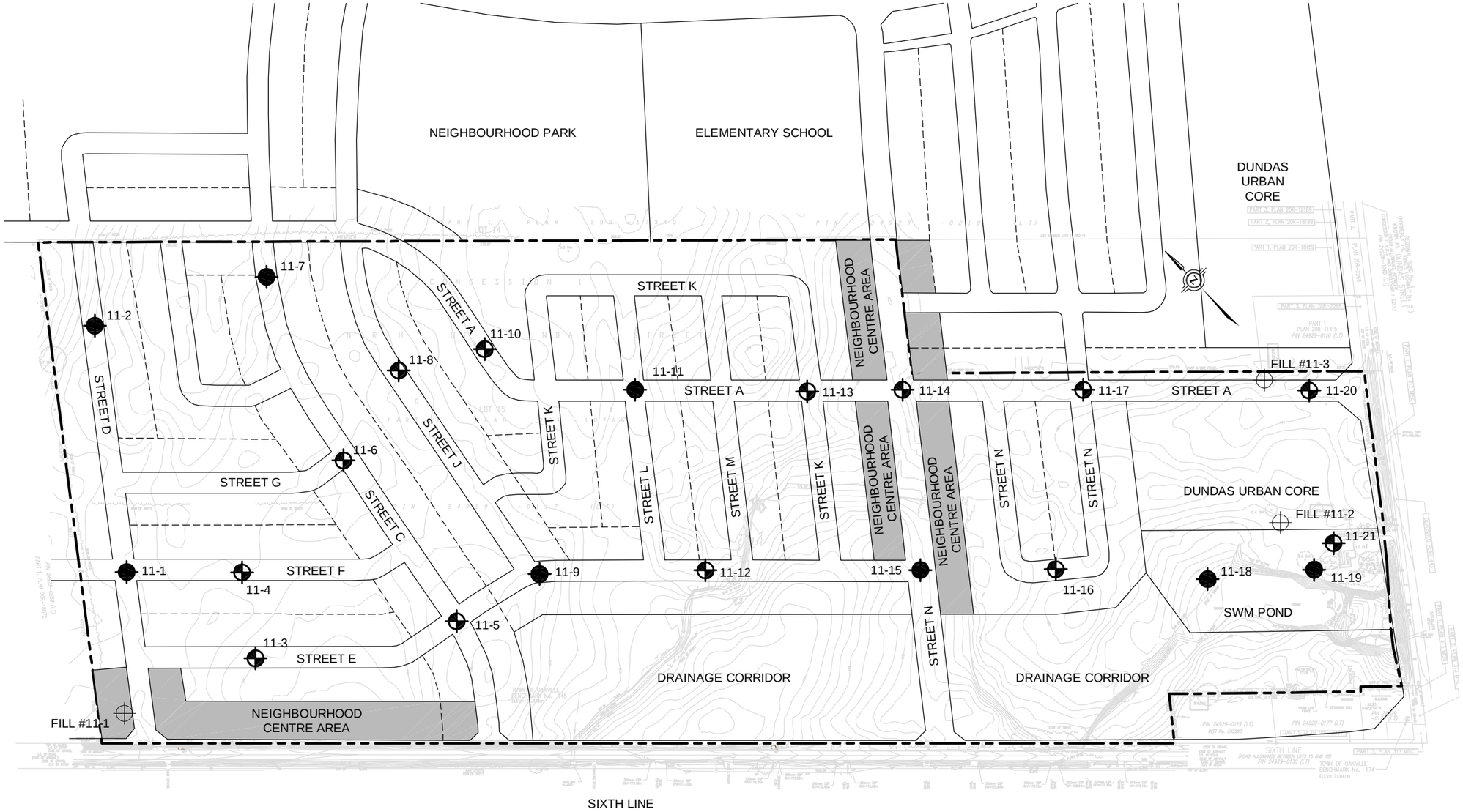
PROJECT
SIXTH LINE CORPORATION
OAKVILLE, ONTARIO

TITLE
SITE LOCATION

Golder Associates
Mississauga, Ontario

PROJECT NO. 11-1186-0103			SCALE AS SHOWN	REV. 0.0
DESIGN	ME	13 Jul. 2011	FIGURE: 1	
GIS	ME	13 Jul. 2011		
CHECK				
REVIEW				

G:\Projects\2011\11-1186-0103_Antlp_Engineering_Sixth_Line\GIS\MXDs\Reporting\PhaseII_ESA\Fig1_SiteLocation.mxd



BOREHOLE CO-ORDINATES			
No.	ELEVATION	NORTHING	EASTING
11-1	174.51	4815663.1	602132.6
11-2	174.44	4815821.1	602253.6
11-3	174.01	4815541.3	602157.0
11-4	174.26	4815597.8	602197.9
11-5	174.65	4815448.8	602292.2
11-6	174.81	4815604.0	602318.7
11-7	173.27	4815751.8	602378.7
11-8	173.95	4815624.0	602400.9
11-9	174.66	4815428.9	602365.9
11-10	173.02	4815587.6	602461.8
11-11	173.12	4815479.5	602524.4
11-12	173.16	4815337.3	602462.3
11-13	173.19	4815381.5	602621.1
11-14	171.94	4815328.6	602676.1
11-15	171.75	4815216.1	602584.5
11-16	171.73	4815140.1	602661.8
11-17	172.64	4815226.5	602778.7
11-18	169.62	4815048.8	602742.5
11-19	171.58	4814994.0	602808.3
11-20	171.32	4815098.6	602906.7
11-21	171.31	4814998.1	602834.3

LEGEND:

- APPROXIMATE BOREHOLE- LOCATIONS
- APPROXIMATE BOREHOLE AND WELL LOCATIONS
- APPROXIMATE FILL PILE LOCATION
- PROPERTY LINE

REFERENCES:

1. BASE PLAN PROVIDED IN DIGITAL FORMAT BY ARUTIP, FILE NO. 03001101-2D(11JAN12).DWG, RECEIVED MAY 6, 2011.
2. BOREHOLE LOCATIONS BASED ON PDF FILE RECEIVED BY CLIENT.

70 0 70 140

SCALE 1:3500 METRES

PROJECT

SIXTH LINE CORPORATION
OAKVILLE, ONTARIO

TITLE

PROPOSED DEVELOPMENT AND BOREHOLE/MONITORING WELL LOCATION PLAN

Golder Associates
Mississauga, Ontario, Canada

PROJECT No.		11-1186-0103	FILE No.	1111860103CA002.dwg
DESIGN			SCALE	AS SHOWN REV. A
CAD	DD	July 6, 2011	FIGURE	
CHECK	DA	July 6, 2011		2
REVIEW	JET	July 6, 2011		

PLOT DATE: July 29, 2011
FILENAME: T:\Projects\2011\11-1186-0103 (AEI, Oakville)\-CA- Phase II ESA\1111860103CA002.dwg

602000 602500 603000

4816000 4815500 4815000

N

A A'

11-1 11-2 11-3 11-4 11-5 11-6 11-7 11-8 11-9 11-10 11-11 11-12 11-13 11-14 11-15 11-16 11-17 11-18 11-19 11-20 11-21

SW1 SW2 SW3

SIXTH LINE

DUNDAS STREET

LEGEND

- Monitoring Well Location
- Borehole Location
- Surface Water Stations
- Cross Section Location
- Site Boundary
- Watercourse, Permanent
- Watercourse, Intermittent
- Waterbody

REFERENCE

Base Data - MNR NRVIS, obtained 2004, CANMAP v2006.4
Produced by Golder Associates Ltd under licence from
Ontario Ministry of Natural Resources, © Queens Printer 2008
Imagery - Bing Maps © 2009 Microsoft Corporation and its data suppliers
Projection: Transverse Mercator Datum: NAD 83 Coordinate System: UTM Zone 17

50 25 0 50 100 150
SCALE 1:5,000 METRES

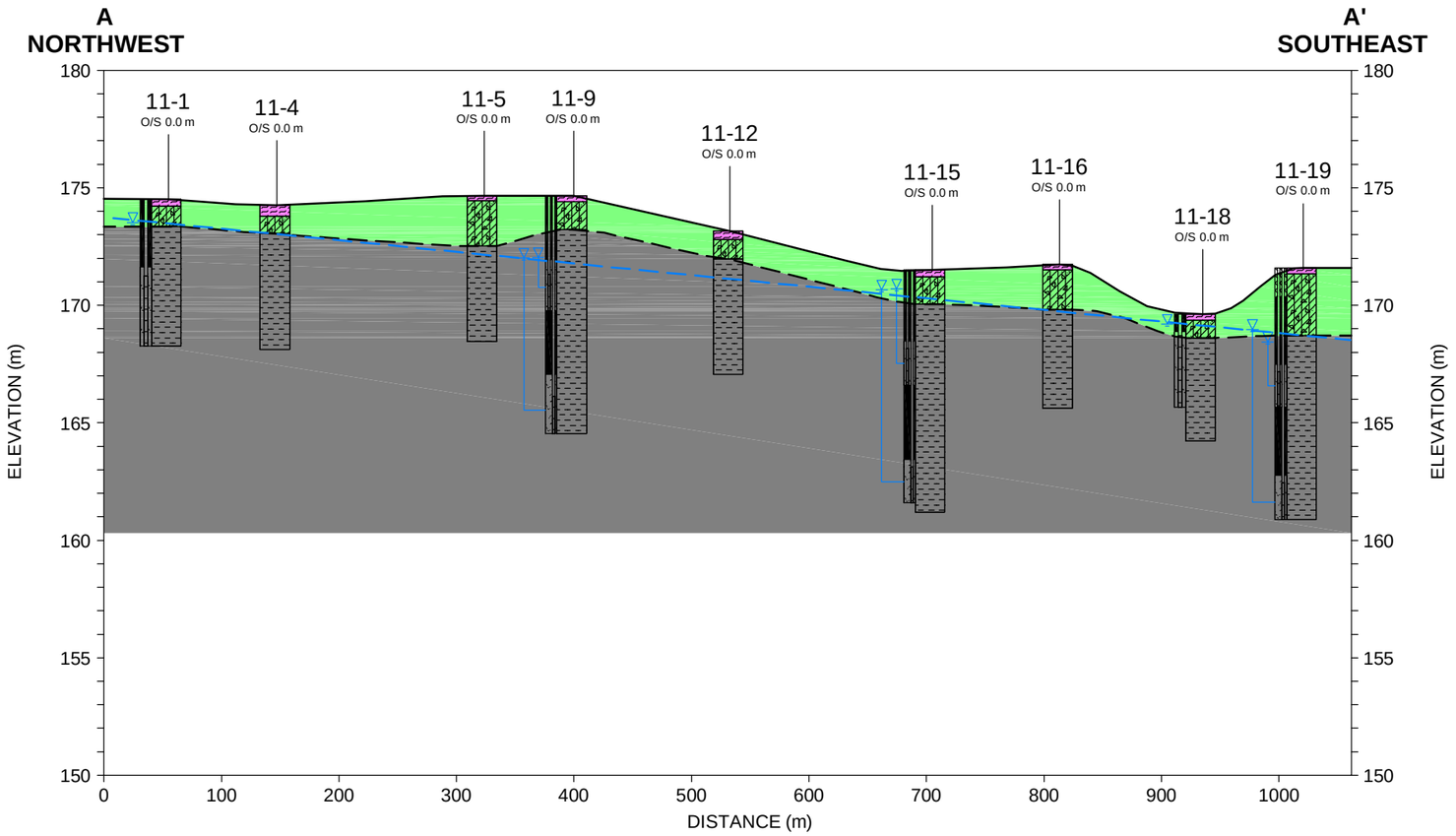
PROJECT
SIXTH LINE CORPORATION
OAKVILLE, ONTARIO

TITLE
CROSS SECTION LOCATION

Golder Associates
Mississauga, Ontario

PROJECT NO. 11-1186-0103			SCALE AS SHOWN	REV. 0.0
DESIGN	ME	13 Jul. 2011	FIGURE: 3
GIS	ME	13 Jul. 2011	
CHECK			
REVIEW			

G:\Projects\2011\11-1186-0103_Arup_Engineering_Sixth_Line\GIS\MXDs\Reporting\PhaseII_ESA\Fig3_CrossSectionLocation.mxd



LITHOLOGIC DESCRIPTION:

- TOPSOIL
- SILTY CLAY TILL
- SHALE

STRATIGRAPHIC LAYERS:

- OVERBURDEN GLACIAL TILL
- BEDROCK SHALE

LEGEND:

- WATER LEVEL MEASURED ON JUNE 17, 2011
- INFERRED WATER LEVEL ELEVATION

NOTES:

1. THE VERTICAL EXAGGERATION IS 20:1.
2. GROUNDWATER ELEVATION S ARE APPROXIMATE BASED ON GROUND ELEVATION.

100 0 100 200
SCALE HORIZONTAL 1:5000 METRES

5 0 5 10
SCALE VERTICAL 1:250 METRES

PROJECT
SIXTH LINE CORPORATION
OAKVILLE, ONTARIO

TITLE
CROSS SECTION A - A'

Golder Associates
Mississauga, Ontario, Canada

PROJECT No.		11-1186-0103	FILE No. 1111860103CA004.dwg
DESIGN			SCALE AS SHOWN REV. A
CAD	DD	July 22, 2011	FIGURE
CHECK	GP	July 22, 2011	4
REVIEW			

PLOT DATE: July 29, 2011
FILENAME: T:\Projects\2011\11-1186-0103 (AE), Oakville)\-CA- Phase II ESA\1111860103CA004.dwg

LEGEND

- Monitoring Well Location
- Site Boundary
- Interpreted Groundwater Elevation Contour (masl)
- Inferred Groundwater Flow Direction
- Watercourse, Permanent
- Watercourse, Intermittent
- Waterbody
- 171.85 Approximate Groundwater Elevation

NOTES:

1. Groundwater elevations measured June 17, 2011.
2. Groundwater elevations are approximate based on ground elevation.

REFERENCE

Base Data - MNR NRVIS, obtained 2004, CANMAP v2006.4
Produced by Golder Associates Ltd under licence from
Ontario Ministry of Natural Resources, © Queens Printer 2008
Imagery - Bing Maps © 2009 Microsoft Corporation and its data suppliers
Projection: Transverse Mercator Datum: NAD 83 Coordinate System: UTM Zone 17

50 25 0 50 100 150
SCALE 1:5,000 METRES

PROJECT
SIXTH LINE CORPORATION
OAKVILLE, ONTARIO

TITLE
GROUNDWATER ELEVATION CONTOURS - BEDROCK
JUNE 17, 2011

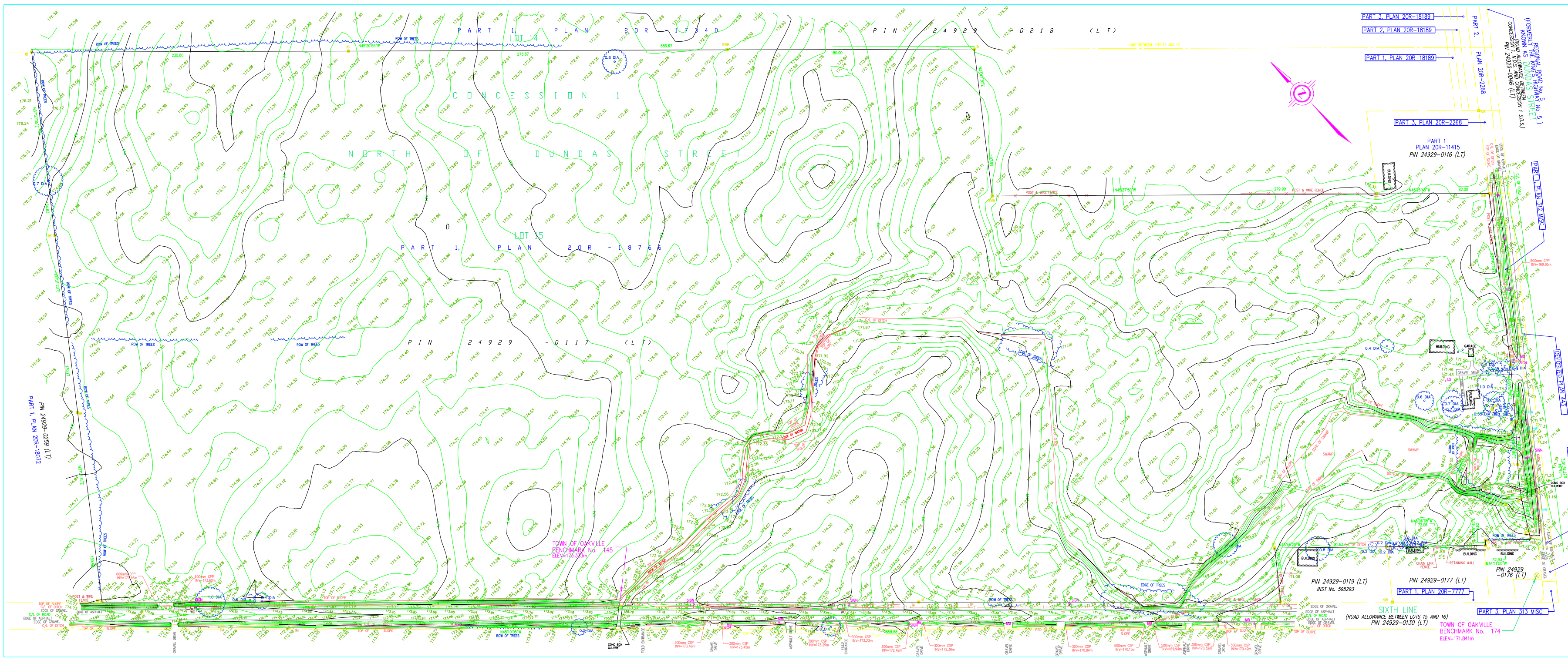
Golder Associates
Mississauga, Ontario

PROJECT NO. 11-1186-0103			SCALE AS SHOWN	REV. 0.0
DESIGN	ME	21 Jul. 2011	FIGURE: 5	
GIS	ME	21 Jul. 2011		
CHECK				
REVIEW				

G:\Projects\2011\11-1186-0103_Arutip_Engineering_Sixth_Line\GIS\MXDs\Reporting\PhaseII_ESA\Fig5_GroundwaterElevationContours.mxd

APPENDIX A

Plan of Survey



TOPOGRAPHIC SKETCH OF

PART OF LOT 15
CONCESSION 1
NORTH OF DUNDAS STREET

GEOGRAPHIC TOWNSHIP OF TRAFALGAR

IN THE

TOWN OF OAKVILLE

REGIONAL MUNICIPALITY OF HALTON

SCALE 1 : 1000

20 0 20 40 60 metres

J. D. BARNES LIMITED

METRIC DISTANCES AND/OR COORDINATES SHOWN ON THIS PLAN ARE IN METRES AND CAN BE CONVERTED TO FEET BY DIVIDING BY 0.3048.

LEGEND

- WC DENOTES WATER CHAMBER
- HW DENOTES HANDWELL
- TMH DENOTES TELEPHONE MANHOLE
- WMH DENOTES WATER MANHOLE
- MB DENOTES MAIL BOX
- HP DENOTES HYDRO POLE
- LS DENOTES LIGHT STANDARD
- TP DENOTES TELEPHONE POLE
- SIGN DENOTES SIGN
- TM DENOTES TELEPHONE CABLE MARKER
- PED DENOTES TELEPHONE PEDESTAL
- H DENOTES FIRE HYDRANT
- DENOTES BENCHMARK
- —T— DENOTES OVERHEAD TELEPHONE WIRE
- —TE— DENOTES OVERHEAD TELEPHONE AND ELECTRICAL WIRES
- —E— DENOTES OVERHEAD ELECTRICAL WIRE
- 0.4 DIA DENOTES CONIFEROUS TREE WITH TRUNK DIAMETER
- 0.4 DIA DENOTES DECIDUOUS TREE WITH TRUNK DIAMETER

ELEVATION NOTES

ELEVATIONS HEREON ARE DERIVED FROM THE TOWN OF OAKVILLE BENCHMARK No. 174 PUBLISHED ELEVATION = 171.841 METRES. AND TOWN OF OAKVILLE BENCHMARK No. 145 PUBLISHED ELEVATION = 173.333 METRES.

IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO VERIFY THAT THE LOCAL BENCHMARKS HAVE NOT BEEN ALTERED OR DISTURBED AND THAT THE RELATIVE ELEVATIONS AND DESCRIPTIONS AGREE WITH THE INFORMATION SHOWN ON THIS PLAN.

BEFORE DIGGING, UNDERGROUND SERVICES SHOULD BE LOCATED ON SITE BY THE RESPECTIVE AGENCIES.

INDEX CONTOURS ARE AT 1.0m INTERVALS.
INTERMEDIATE CONTOURS ARE AT 0.25m INTERVALS.

FIELDWORK WAS COMPLETED ON THE 20th OF DECEMBER, 2010.

J.D.BARNES LIMITED
SURVEYING PLANNING MAPPING GIS
LAND INFORMATION SPECIALISTS
401 WHEELABRATOR WAY, SUITE A MILTON, ON L9T 3C1
T: (905) 875-9955 F: (905) 875-9956 www.jdbarnes.com

DRAWN BY: RPA	CHECKED BY:	REFERENCE NO.: 10-30-011-01-2D
FILE: $FILE$		DATED: January 12, 2011
		PLOTTED: $DATE$

APPENDIX B

Sampling and Analysis Plan

TECHNICAL MEMORANDUM

DATE May 27, 2011 **PROJECT No.** 11-1186-0103

FROM Peter Mann, P.Eng. **EMAIL** pmann@golder.com

SAMPLING AND ANALYSIS PLAN
ENVIRONMENTAL INVESTIGATION
6TH LINE AND DUNDAS STREET WEST,
OAKVILLE, ONTARIO

1.0 INTRODUCTION

This sampling and analysis plan is intended to fulfill the requirements of Part II of Ontario Regulation 153/04 Schedule E for a Phase Two Environmental Site Assessment ("ESA") being conducted on the Sixth Line Corporation's development project on a partially undeveloped parcel of land located near the northeast corner of the intersection of the Dundas Street and Sixth Line in the Town of Oakville, Ontario. The site is approximately 37 hectare (93 acres) in size. These lands are intended to undergo redevelopment from current agricultural and residential purposes into a residential development. It is understood that a filing of a *Record of Site Condition (RSC)* is required as part of the approvals process.

2.0 SAMPLING AND ANALYSIS PLAN

The sampling and analysis plan is based on review of existing information for a concurrent Phase I Environmental Site Assessment (ESA) that is being conducted by Golder. The sampling and analysis plan has been designed to assess the entire Sixth Line Corporation Site.

This sampling and analysis plan provides information on the issues of actual and potential environmental concern pertaining to the Sixth Line Corporation Site, a rationale for proposed scope of investigation, the proposed investigation locations (i.e. boreholes and monitoring wells) intended to investigate the actual and potential issues of environmental concern, the proposed number and depth of sampling locations, the proposed screening methods and intervals to be sampled, and the parameters to be analyzed (Table 1).

The selection of soil and groundwater samples for contaminants of concern related to agricultural activities is based on judgement to provide sufficient areal coverage of areas of potential former pesticide or herbicide application. Two (2) fill piles of unknown quality that exist on the Site will be targeted for analysis.

2.1 Borehole Drilling and Soil Sampling

Twenty-one (21) boreholes (designated as BH11-1 through BH11-21) are proposed to be advanced and are intended to investigate soil conditions across the Sixth Line Corporation Site. Chemical parameters for analysis were based on potentially contaminating activities (i.e., use of pesticides and herbicides) associated with the issues of actual or potential environmental concern to be investigated. Table 1 provides a summary of the locations and depths of investigation. The boreholes will be advanced to depths of about 5 to 10 metres below ground surface (mbgs) for geotechnical and hydrogeological study purposes. Sampling for pesticides and herbicides will be limited to surface soils.

Soil samples at Boreholes 11-2, 11-5, 11-11, 11-17 and 11-18 will be utilized for environmental purposes, and groundwater samples will be obtained from two (2) monitoring wells (BH11-1 and 11-19) that will be installed for hydrogeological purposes.

Two (2) holes (designated as Fill 11-1 and Fill 11-3) will be advanced through two (2) fill stockpiles that exist on Site in order to obtain samples of the imported materials for chemical analysis. The holes will penetrate the full thickness of the stockpiles which have been estimated at about 1.5 m deep.

2.1.1 Drilling Methodology

The boreholes will be advanced using track-mounted drilling equipment operated by an MOE-licensed well driller contracted by Golder. The field work will be monitored on a full-time basis by a member of our technical staff, who will direct the drilling and sampling operations and log the boreholes. The boreholes will be advanced using solid stem augers. Soil samples will be obtained in the boreholes using 35 mm I.D. split-spoon sampling equipment as part of the Standard Penetration Test (SPT) at 0.75 metre intervals to the termination depth of the borehole.

The methodology for borehole drilling is described in Standard Operating Procedure No. 3, attached hereto in Appendix A.

2.1.2 Equipment Decontamination

Split spoon samplers will be decontaminated between uses by washing with a solution of Alconox detergent in potable water, and rinsing with deionized water.

Considering that previous land uses at the Site, surface samples are being targeted, and the split spoon sampler is advanced ahead of the augers, decontamination of the augers is not deemed necessary for this Site.

2.1.3 Sample Collection

Golder will retrieve soil samples from each borehole for physical testing and chemical analyses. For the boreholes that are designated for environmental purposes, the soil samples will be screened in the field in terms of colour, odours and soil headspace combustible gas concentrations using a Gastech Model 1238ME (Gastech) set in the methane on/methane elimination modes.

The Gastech will be calibrated at the start of each working day to a 100 ppm and 40% LEL of hexane standard. Calibration records will be maintained in written form. Standard Operating Procedures for the calibration and operation of the Gastech are attached in Appendix A.

Recovered soil and bedrock samples will also be transported to Golder's laboratory for visual examination.

2.2 Groundwater Monitoring Well Installation and Sampling

2.2.1 Groundwater Monitoring and Sampling Methodology

Eight (8) boreholes will be instrumented with 25 mm and 50 mm diameter PVC pipes to allow monitoring of potential gases and the underlying groundwater conditions. Materials used in well construction will be transported to the Sixth Line Corporation Site in factory-sealed packaging.

The shallow monitoring wells (i.e. those with depths of approximately 5 mbgs) are intended to straddle the water table to assess the potential presence of LNAPL in the groundwater, and will be extended through the vadose zone to monitor soil gas vapours. Nested monitoring wells will be constructed at three (3) locations for hydrogeological purposes to investigate vertical gradients of the groundwater quality at these locations. Shallow groundwater (well installed to 5 m depth) will be sampled at one of the nested well locations.

Wells will be surveyed to a geodetic benchmark to provide elevation information to allow for assessment of groundwater flow directions. The wells will be backfilled and tagged (as a "well cluster") as per the requirements of Ontario Regulation 903 (RRO 1990, Regulation 903 "Wells").

The monitoring event will be completed at least one (1) week after the groundwater monitoring wells are installed to allow the static water conditions to stabilize. Before sampling, Golder will develop the groundwater monitoring wells through the removal of groundwater and suspended fines. Prior to sampling, Golder will measure the water level and NAPL thickness (if any) in the newly-installed monitoring wells. Well headspace combustible gas concentrations (including methane) will be conducted as well at this time.

Dedicated Waterra pumps/tubing will be used for developing and sampling the monitoring wells.

Wells will be purged prior to sampling by removing at least three times the standing volume of water in the well casing. Measurements of electrical conductivity (EC), pH and temperature will be taken following the removal of each standing well volume. Measurements will be taken using pH pens (Hanna Instruments Inc., Model HI 98128) calibrated daily using a solution of pH 4 and 7, and EC pens (Hanna Instruments Inc., Model HI 98312) calibrated daily using solution at 1288 µS/cm.

The methodology for sample collection is provided in Standard Operating Procedure No. 9 attached hereto in Appendix A.

2.2.2 Decontamination Procedures

Any sampling equipment requiring usage between monitoring wells will be decontaminated with Alconox detergent solution and rinsed with methanol, and then rinsed with deionized water between locations. Groundwater samples will be collected in pre-cleaned/labelled, laboratory-supplied bottles and handled with dedicated nitrile gloves, and put in ice-filled coolers following collection. The methodology for equipment decontamination is provided in Standard Operating Procedure No. 11 attached hereto in Appendix A.

2.3 Analytical

Samples will be submitted to Agat Laboratories (Agat) of Mississauga, Ontario for the parameters of concern as outlined in Table 1. Agat is accredited with the Standards Council of Canada in accordance with the requirements of O. Reg. 153/04 Section 47.

2.3.1 Soil

Soil samples from each borehole will be analyzed per the schedule attached hereto in Table 1 for one or more of the following parameters: organochlorinated pesticides and triazine herbicides, and metals and inorganics.

2.3.2 Groundwater

Groundwater samples will be submitted to Agat per the schedule provided in the attached Table 1. Samples will be analyzed for the following chemical parameters: organochlorinated pesticides and triazine herbicides, nitrate and nitrite as outlined in Table 1.

2.4 Assessment Criteria and Data Quality Objectives

The analytical results of soil and groundwater samples will be compared to the MOE O. Reg. 153/04 "Soil, Ground Water and Sediment Standards for Use Under Part XV.1 of the Environmental Protection Act, March 9, 2004" (hereafter referred to as the "MOE Standards"), amended by O.Reg. 511/09 (July 27, 2009). Golder envisions the use of the following assessment criteria:

- Soil samples will be analyzed for soil pH at the laboratory.
- MOE Table 8 Generic Site Condition Standards for Use within 30 m of a Water Body in a Potable Groundwater Condition will be used for assessment of soil and groundwater quality.
- The proposed redevelopment of the Site represents a change in land use category from predominantly agricultural land use to residential land use. Therefore, MOE Standards appropriate to the proposed land use of the RSC Site will be applied.
- Grain size will be determined based on the field observations of the split-spoon samples from the proposed boreholes and grain size analysis results. Grain size criteria will be evaluated and appropriate MOE Standards for coarse grain or medium to fine grain soil will be applied.

2.5 Quality Assurance and Quality Control (QA/QC) Samples

2.5.1 Field Duplicates

Golder will further collect and submit duplicate soil samples at a frequency of ten percent (10%) for analysis of pesticides and herbicides, and metals and inorganics as part of the quality assurance and quality control (QA/QC) measures. The analytical laboratory will also be instructed to target a method detection limit for each analysed parameter below the MOE Table 8 Standards.

Golder will submit duplicate groundwater samples at a frequency of ten percent (10%) as part of QA/QC measures and to meet the requirements specified in O.Reg. 153/04, as amended. The analytical laboratory will also be instructed to target a method detection limit for each analysed parameter below the MOE Table 8 Standards.

2.5.2 Blanks

Split spoon samplers will be subjected to the collection of an equipment blank following decontamination as indicated above. Equipment blanks will be collected by running laboratory-supplied deionized water across the surface of the sampler, and collecting the runoff into laboratory-supplied containers for analysis.

A minimum of one equipment blank will be collected and will be analyzed for all of the contaminants of concern specified in Table 1 for soils.

The contaminants of concern at the Site do not include volatile organic compounds, and therefore, trip blanks are not required.

Attachments: Table 1: Sampling and analysis plan for field investigations at Sixth Line Corporation Site, Oakville, Ontario

Figure 1: Borehole Location Plan

Appendix A: Standard Operating Procedure No. 1: Monitoring Well Installation
Standard Operating Procedure No. 2: Water Level Measurement
Standard Operating Procedure No. 3: Borehole Drilling
Standard Operating Procedure No. 4: Soil Headspace Vapour Screening
Standard Operating Procedure No. 5: Monitoring Well Development
Standard Operating Procedure No. 6: Soil Logging
Standard Operating Procedure No. 9: Conventional Groundwater Sample Collection
Standard Operating Procedure No. 11: Equipment Decontamination
Standard Operating Procedure No. 12: Measurement of Field Parameters

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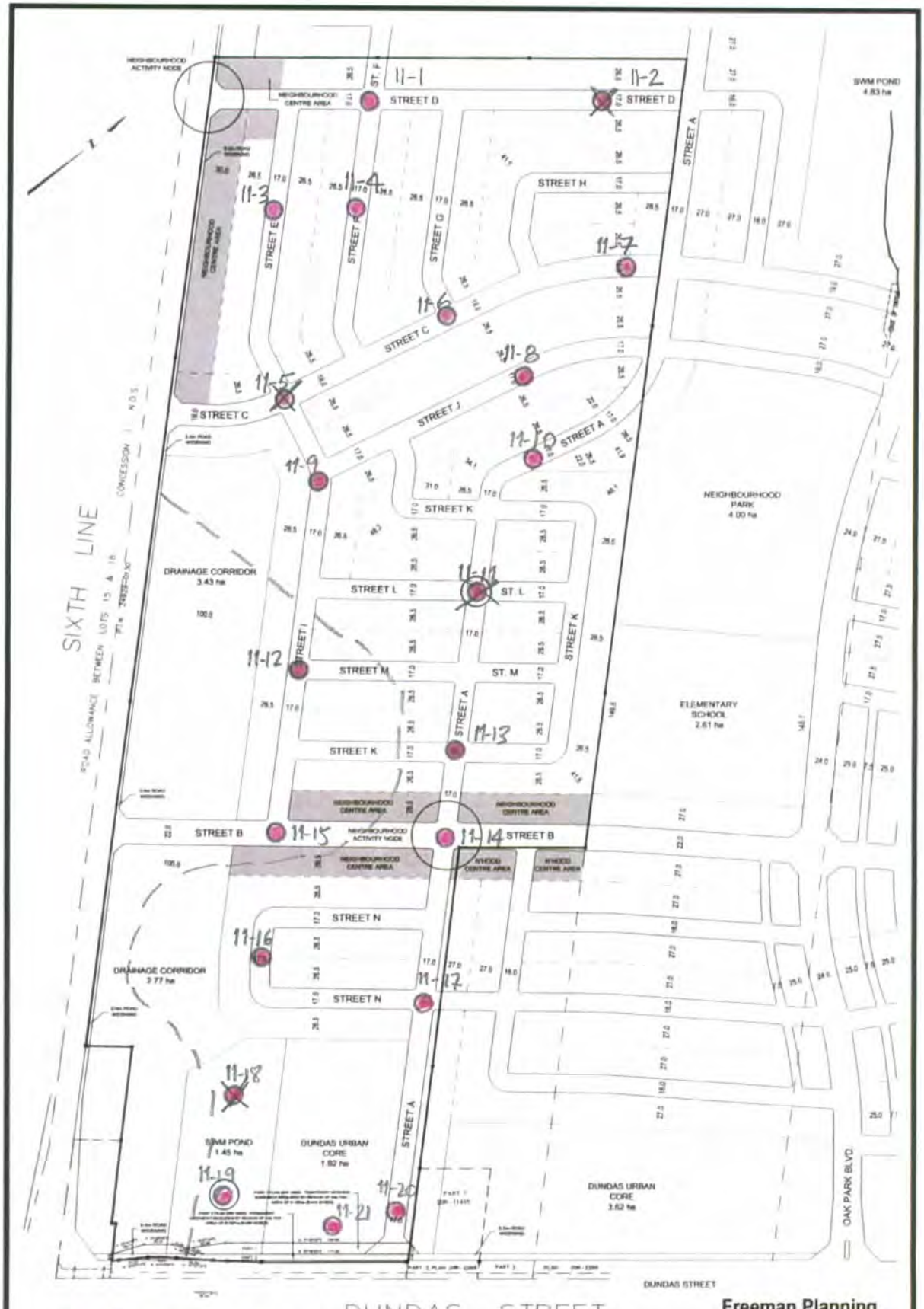
TABLE 1

Table 1
Sampling and Analysis Plan for Field Investigation
6th Line and Dundas Street West
Oakville, Ontario

									Soil analyses				Groundwater analyses			
ID	Rationale/objective	APEC	BH	MW	BH Depth	Nested MW	Screen length	Screen depth	OC Pest, PCBs	Tri Herb	Metals	Inorganics	OC Pest, PCBs	Tri Herb	Nitrate	Nitrite
BH11-2	confirm on-site pesticide/herbicide impact	2	✓	✓	6		1.5	6	1	1						
BH11-5	confirm on-site pesticide/herbicide impact	2	✓		6				1	1						
BH11-11	confirm on-site pesticide/herbicide impact	2,3	✓	✓	5		3	5	1	1			1	1	1	1
BH11-17	confirm on-site pesticide/herbicide impact	2	✓		6				1	1						
BH11-18	confirm on-site pesticide/herbicide impact	2,3	✓	✓	6				1	1			1	1	1	1
BH11-19	confirm on-site pesticide/herbicide impact	2	✓	✓	10	✓	3, 1.5	5, 10								
Fill 11-1	confirm metal and inorganic impact, fill quality	1	✓		1.5						1	1				
Fill 11-3	confirm metal and inorganic impact, fill quality	1	✓		1.5						1	1				
								Duplicates	1	1	1	1	1	1	1	1
								Equipment Blank	1	1	1	1				
Total			8	4		1			7	7	4	4	3	3	3	3

FIGURE

11-1186-0103



● - PROPOSED BOREHOLE LOCATION PLAN.

SCALE 1:3000
FEB. 28, 2011

MW selected for ENV. Testing (see Table 1)

X - BH selected for ENV SOIL Testing (see Table 1)

SIXTH LINE CORPORATION
CONCEPT PLAN

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BOREHOLE LOCATION PLAN
FIGURE 1

APPENDIX A

SUMMARY OF TYPICAL PROCEDURE

Monitoring wells will be constructed of 2 inch inner diameter (ID) Schedule 40 polyvinyl chloride (PVC) casing and 2 inch ID Schedule 40 PVC well screens (1.5 m in length, 0.01 inch slot size). The sand pack surrounding each screen will consist of silica sand extending at least 0.3 metres above the top of the well screen. A bentonite seal composed of bentonite chips or bentonite slurry will be placed above the sand pack (minimum 0.6 m length). The remainder of the borehole will be filled with bentonite ground and completed at ground surface with a flush-mount lockable protective casing set in concrete.

PURPOSE

Monitoring wells are used for measuring water levels or free product thickness and for collecting groundwater samples. Free product may be either light non-aqueous-phase liquids or dense non-aqueous-phase liquids.

LIMITATIONS

This Standard Operating Procedure (SOP) applies to the installation of groundwater monitoring wells in boreholes. Requirements for monitoring well installations are site-specific and will depend on the soil, rock, and groundwater conditions encountered in the field, the goals of the investigation program, and the availability and limitations of drilling equipment and installation materials. This SOP does not apply to vapour headspace measurement in the monitoring well.

EQUIPMENT AND MATERIAL SPECIFICATIONS

In general, monitoring wells consist of a monitoring well string (riser pipe and monitoring well screen), a filter pack, a bentonite seal, and possibly bentonite or cement grout.

Riser pipe will meet the following requirements:

- Riser pipe will be new, pre-cleaned, and wrapped in protective plastic wrap at the factory;
- Riser pipe will consist of either Schedule 40 (for total depths <30 m) or Schedule 80 (for total depths > 30 m) polyvinyl chloride (PVC) pipe with threaded joints and O-ring seals; and
- Metal riser pipe will be new, clean, and free of contaminants (e.g., oil and grease), have water-tight joints and seams, and conform with ASTM A252 or ASTM A500.

Monitoring well screens will meet the following requirements:

- Screens will be factory-slotted and will be new, pre-cleaned, and wrapped in protective plastic wrap at the factory;
- The saturated length of the monitoring-well screen length will not exceed 3.1 metres (O. Reg. 153/04);
- Screen slots should be sized to prevent 90 percent of the filter pack from entering the monitoring well. For monitoring wells where no filter pack is used, the screen slot size should be selected to retain 60 to 70 percent of the formation materials opposite the screen; and
- The bottom of the screen will be completed with a threaded or slip-fit cap. A small slot or hole may be cut or drilled into the cap to allow water to drain from the bottom of the monitoring well.

The filter pack surrounding the monitoring well screen will consist of uniformly graded silica sand composed of clean, inert, well-rounded particles with less than 2 percent flat particles and will be certified free of contaminants by the supplier.

High-solids bentonite grout will contain >30% bentonite that is hydrated with either distilled or potable water.

FIELD PROCEDURE

Monitoring well installation will consider the following (O. Reg. 153/04):

- The requirements of the Sampling and Analysis Plan;
- Access constraints;
- The position of the water table to ensure that monitoring wells at petroleum hydrocarbon and other LNAPL sites intersect the water table; and
- The depth of permeable geologic materials.

Sampling depth intervals, including the screened intervals of monitoring wells, will be positioned (O. Reg. 153/04):

- Within the geologic formation in which a contaminant may be present;
- So as to isolate the zones where contaminants may be present; and
- So as to delineate both dissolved and separate phase contaminants.

Where petroleum hydrocarbons or light non-aqueous-phase liquids may be present on, in, or under the investigated property, sampling depth intervals, including screened intervals of monitoring wells, shall be positioned to intersect the water table (O. Reg. 153/04).

Any uncertainty in the conditions encountered should be discussed with the Qualified Person and his/her advice sought about how to proceed.

The monitoring well string will be centered and suspended in the borehole such that it does not rest on the bottom of the borehole. The filter pack surrounding the well screen will extend from at least 0.15 m below the monitoring well screen to at least 0.3 m above the top of the monitoring well screen. The top of the sand pack will be sounded to verify its depth during placement and additional silica sand will be placed as required.

Once placement of the filter pack is complete, a bentonite seal consisting of bentonite solids (e.g., Holeplug™) will be placed above the filter pack to a minimum thickness of 0.6 m. Bentonite solids will be placed slowly to prevent bridging in the standing water column. If the borehole is dry, bentonite solids will be hydrated with either distilled or potable water. If the monitoring well is shallow (<9 m), this form of bentonite seal may be extended to ground surface (i.e., used as casing grout). For deeper monitoring wells, it may be more cost effective to use a high-solids bentonite grout as casing grout. The casing grout will extend from the top of the bentonite seal to ground surface. Casing grout will be placed using tremie methods with a tremie pipe set 0.3 m above the solid bentonite (e.g., Holeplug) seal. Grout pumping will continue until the consistency of grout returning to the surface is constant, indicating that grout has fully displaced water in the annular space.

For flush-mounted completions, the monitoring-well riser pipe will be cut about 10 cm below ground surface. The top of the riser pipe will be cut level and a notch cut as a reference point for depth-to-water measurements. The monitoring well will be capped with a watertight, lockable, vermin-proof cap (e.g., a J-plug). A freely draining protective casing set in concrete will be placed over the riser pipe to prevent surface water from entering the monitoring well. The top of the riser pipe will extend above the bottom of the protective casing box.

For above-ground completion, monitoring wells and protective casing will extend a minimum of 0.4 m above ground surface.

The identity of the monitoring well will be permanently marked on the protective casing lid and the monitoring well cap using, as a minimum, a permanent marker. For multiple monitoring wells within a borehole, at least one monitoring well (usually the deepest) will be marked with an MOE well tag by the driller (O. Reg. 903). Where protective casing may be subject to traffic loads, the protective casing must be constructed to match the strength of the surrounding surfaces.

REQUIRED DOCUMENTATION

All monitoring well construction details will be documented on the Golder field borehole record provided in Appendix C.

REFERENCES

ASTM A252. Standard Specification for Welded and Seamless Steel Pipe Piles.

ASTM A500. Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.

Golder Associates Ltd. Procedure No. 23: Installation of Groundwater Monitoring Wells (In Overburden)

Ontario Regulation 153/04 (Records of Site Condition) (as amended) under the Environmental Protection Act (Ontario).

Ontario Regulation 903 (Wells Regulation) under the Ontario Water Resources Act.

DOCUMENT CONTROL

Version 2.	**Author:** S. Bonneville	**Reviewer**
	Date	Date
Edit 1	Editor : Margaret Shaw	Edit Date: November 5, 2010

SOP1-Monitoring Well Installation-MS-5Nov10

SUMMARY OF TYPICAL PROCEDURE

At least 24 hours after monitoring well development, the water level in the monitoring well will be measured with a water level probe or an oil-water interface probe. The water depth and, if applicable, free product depth, will be recorded. The probe and tape will be decontaminated prior to moving to the next monitoring well.

PURPOSE

Water levels are measured to determine the depth of the water table below ground surface or the pressure head in a confined aquifer. This information can be used to estimate hydraulic gradients, groundwater flow direction, and changes in flow conditions over time. Free product levels are measured to aid in estimating free product quantities present at the site and because they influence groundwater levels.

LIMITATIONS

This Standard Operating Procedure (SOP) is applicable to all groundwater monitoring wells, including those installed primarily for groundwater sampling. Water levels must be measured at least 24 hours after monitoring-well development (O. Reg. 153/04).

In fractured rock, purging and sampling can cause significant drawdown in adjacent or nearby monitoring wells. Therefore, in fractured rock geologic settings, consideration should be given to measuring water levels in all monitoring wells prior to purging or sampling.

EQUIPMENT AND MATERIAL SPECIFICATIONS

Water level measurement requires a water level probe or an oil-water interface probe with a graduated tape marked in millimetres.

FIELD PROCEDURE

To measure groundwater and/or free product levels:

1) Open the monitoring well.

2) Establish or locate the reference point from which measurements will be taken (e.g., notch cut into the top of the monitoring well standpipe).

3) Take measurements using one of the following methods:

- **Method 1.** Measure depth to water using a clean electric water-level probe:

    a. Lower the probe into the monitoring well until you hear a steady tone.

    b. When the expected depth to water is reached, measure the depth to water to the nearest 0.003 m (3 mm).

    c. Take a second confirmatory reading and check that is within 0.003 m (3 mm) of the first reading. If not, take additional reading(s) until you are satisfied that the static depth to water has been found.

Note: Repeatability of the measurement ensures an accurate water-level record and that the probe is not up against a wet wall, etc.

d. Record the water levels on the form titled Static Water Level Measurement.

e. Calculate the water-level elevation by subtracting the measured depth to water from the elevation of the reference point (e.g., notch cut into the top of the pipe). Record the elevation on the form

f. Remove the probe from the monitoring well and decontaminate it in accordance with Golder SOP No. 8 (Decontamination).

- **Method 2.** Measure water and free product levels using a clean oil-water interface probe:

a. Lower the probe into the monitoring well.

Note: A steady tone will be emitted when the probe is fully immersed in the free product.

b. Slowly raise the probe until the sound stops, and then lower the probe until sound is just heard again to define the air-product interface.

c. Repeat and ensure that both readings are within 0.003 m (3 mm). If not, take additional measurements until two consecutive readings are within 0.003 m (3 mm) of each other.

d. Read the tape marking and record the depth to free product on the Static Water Level Measurement form.

e. Slowly lower the probe through the free product.

Note: An intermittent tone will be emitted when the probe reaches the base of the floating free product (oil-water interface).

f. Repeat and ensure that both readings are within 0.003 m (3 mm). If not, take additional measurements until two consecutive readings are within 0.003 m (3 mm) of each other.

g. Calculate the free product elevation by subtracting the measured depth to free product from the elevation of the reference point (notch cut into the top of the pipe), and record the free product elevation on the form.

h. Calculate the free product thickness by subtracting the measured depth to base of product from the measured depth to the air-product interface and record the free-product thickness.

i. Remove the probe from the monitoring well and decontaminate the probe and tape in accordance with Golder SOP No. 11 (Equipment Decontamination) prior to proceeding to the next monitoring well.

REQUIRED DOCUMENTATION

The static water level measurement and/or free-product level measurement(s) will be recorded on a field form (see form titled Static Water Level Measurement, Appendix C) at the time of the measurements.

REFERENCES

Golder Associates Ltd. Procedure No. 24: Water-Level Monitoring in Wells

Golder Associates Ltd. Procedure No. 23: Installation of Groundwater Monitoring Wells (In Overburden)

ASTM D 4750-87 (Reapproved 2001). Standard Test Method for Determining Subsurface Liquid Levels in a Borehole or Monitoring Well (Observation Well).

Ontario Regulation 153/04 (Records of Site Condition) (as amended) under the Environmental Protection Act (Ontario).

DOCUMENT CONTROL

Version 2. **Author** B. G. Sullivan

Edit 1 Editor : Margaret Shaw Edit Date: November 2, 2010

SOP2-Water Level Measurements-MS-5Nov10

SUMMARY OF TYPICAL PROCEDURE

Boreholes will be drilled by a specialist drilling contractor under the direct supervision of Golder Associates staff. The boreholes will be drilled using a drilling and soil sampling system compatible with the project objectives and the anticipated subsurface conditions, subject to any access limitations or other special requirements.

In most cases, soil samples will obtained from the boreholes at regular depth intervals. The samples will be examined in the field, and details regarding drilling methodology as well as observations of subsurface stratigraphy, hydrogeology, evidence of contamination, etc. will be recorded on a field borehole log. Subsamples for potential chemical analysis or other further characterization will be obtained from the retrieved soil samples, following appropriate sampling protocol. Upon completion of drilling, the borehole will be either completed as a groundwater monitoring well, or backfilled in accordance with applicable regulations and generally accepted good practices. Excess soil cuttings will be managed in accordance with the project objectives and client requirements.

PURPOSE

Boreholes are generally drilled when information on soil quality is required for depths greater than about 4 or 5 metres (i.e., depths greater than those easily accessible by a backhoe or excavator), and/or where information on bedrock quality is needed. A borehole may also be drilled for the purpose of installing a groundwater monitoring well. Borehole drilling provides a one-dimensional and often discontinuous view of subsurface conditions, but over a depth range greater than can be achieved by excavating test pits. Advantages of drilling over test pitting include minimal disruption of the ground surface (e.g., paving or concrete) and subsurface soils and the ability to penetrate and sample (core) bedrock. Disadvantages include potentially greater inaccuracies when interpolating soil conditions between testing locations due to the one-dimensional perspective, potentially poor soil sample recovery (particularly in very coarse soils), and cost.

LIMITATIONS

This Standard Operating Procedure (SOP) is applicable to the drilling and sampling of all boreholes in overburden and/or in bedrock. Portions of this SOP (concerning sample collection) may not be applicable or required in situations where a borehole is being drilled solely to facilitate monitoring well installation in an area where the subsurface geologic conditions are already well known. Portions of this SOP (concerning sample collection methods) may also not be applicable where the borehole is being drilled for purely geotechnical purposes and where the presence of environmental contamination is not suspected.

EQUIPMENT AND MATERIAL SPECIFICATIONS

Boreholes may be drilled using a wide variety of drilling rigs, including sonic, hollow or solid stem auger, direct push (e.g. Geoprobe), air or mud rotary, Becker Hammer, or cable tool. Depending on the drill rig used, soil samples may be collected using a split spoon sampler or a continuous corer, or they may be carried to the surface using air or drilling mud. Each of these techniques has its distinct advantages and disadvantages and ideal situations for application. The selection of the drilling method will depend on project objectives, expected subsurface conditions, project-specific constraints such as access limitations, contractor availability, schedule, and cost.

FIELD PROCEDURE

1) Prior to starting field activities, review reasonably available documentation pertinent to the proposed borehole investigation. Such documentation should generally include:

   - Project Health & Safety Plan;
   - The Conceptual Site Model, where one exists;
   - Site plan and plan showing proposed borehole locations;.
   - Project-specific sampling and analysis plan;
   - Information regarding local subsurface conditions (geology, hydrogeology, and (where applicable) contaminant presence), such as regional mapping or specific project data previously obtained from the work site or from other local projects; and
   - Existing information regarding the presence of subsurface or overhead utilities or other structures.

2) Mark out borehole locations at the work site.

3) Identify logistical issues with proposed locations, e.g. access restrictions, overhead clearance issues, workspace control requirements (e.g. traffic control), etc. Modify proposed borehole locations if necessary.

4) Ensure utility clearances are up to date and/or arrange for new clearances if necessary.

   Note: Public utility clearances are required. The use of private utility locators is recommended where appropriate.

5) Modify borehole locations if necessary based on utility clearances.

6) Conduct a tailgate meeting with drilling contractor as required by Golder Health & Safety protocols.

   Note: This should include review of utility clearances, as well as verification that down-hole drilling equipment is clean (decontaminated).

7) Where information regarding degree and location of subsurface contamination is available, and where doing so is practical subject to other logistical considerations, stage the investigation such that areas of least contamination are drilled first, and areas of heaviest contamination are drilled last.

8) Prepare each drilling location. This may include, as appropriate:

   - Restricting public access to work area and/or providing a safe work area for workers (e.g., providing traffic control);
   - Mitigating potential contamination of ground surface during drilling (e.g., using a plastic and/or plywood sheet to receive drill cuttings);
   - Setting up monitoring equipment for health and safety and/or environmental management purposes;

- Removing asphalt or concrete surface pavements.

9) Start drilling the borehole. As the borehole is advanced, collect representative soil and/or rock samples using soil sampling equipment appropriate to the type of drilling rig (e.g., split spoon sampler, dual-tube sampler, core barrel, or other).

10) Examine samples in the field for stratigraphic information and evidence of contamination.

11) Collect sub-samples from retrieved soil and/or rock samples for possible further characterization ,Conduct all sampling and sub-sampling as determined in the sampling and analysis plan, subject to any practical limitations encountered (e.g., limited soil recovery in sampling device) or modifications made in the field based on observed conditions:

    - As a general guide, collect soil samples at least every 1.5 m in depth.In general, use smaller vertical sampling intervals where conditions are highly variable, where the presence and/or depth of contamination is unknown, or where specific zones of limited thickness are to be targeted.
    - In bedrock, collect continuous samples (cores) unless directed otherwise.

12) Decontaminate non-dedicated sampling equipment between uses.

13) Upon completion of the borehole, do one or more of the following:

    - Install a monitoring well, if called for in the sampling and analysis plan. Refer to Golder Associates SOP 1 (Monitoring Well Installation).
    - If the borehole is not considered a "well" under the provisions of O. Reg. 903, and if no evidence of contamination was identified during drilling, backfill the borehole with the auger or drill cuttings. Replace cuttings generated from the bottom of the borehole in first, followed by soils from subsequently higher zones.
    - If the borehole could be considered a "well" under the provisions of O. Reg. 903 and/or if evidence of contamination was identified during drilling, backfill the borehole with bentonite (e.g., Holeplug) and/or grout.
    - Reinstate surface pavements or other ground treatments where appropriate.

14) For each subsequent borehole, ensure that clean down-hole drilling equipment is used.

15) Prepare a field sketch documenting actual, final borehole locations, with measurements referenced to fixed local landmarks or through the use of GPS coordinates, as appropriate.

    Note: The required level of accuracy for such measurements will depend upon the specific investigation objectives.

16) Where required based upon investigation objectives, measure the elevation of ground surface at each borehole location, referenced to a fixed local benchmark or to a geodetic benchmark, as appropriate.

    Note: The required level of accuracy for elevations will depend upon the specific investigation objectives.

REQUIRED DOCUMENTATION

Details regarding drilling methodology, subsurface conditions observed during drilling, soil/rock sample intervals, and other pertinent observations as appropriate shall be recorded on a field borehole log or field corehole log, as appropriate (see field forms titled Record of Borehole and Record of Corehole, Appendix C) at the time of drilling.

The field log must include the following:

- file identification
- site identification
- date and time
- a unique (per site) borehole/corehole number
- information regarding drilling method
- information regarding subsurface conditions encountered
- information regarding samples collected

DOCUMENT CONTROL

Version 1.	**Author**	R. Smith	**Reviewer**	Reviewer
Edit 1	Editor : Margaret Shaw		Edit Date: November 3, 2010	

SOP3-BH Drilling and Sampling-MS-5Nov10

SUMMARY OF TYPICAL PROCEDURE

During soil sampling events including borehole drilling, test pitting, stockpile sampling, and confirmatory sampling, field measurements of vapour concentrations in the headspaces of soil samples may be completed for the purpose of comparing the relative concentrations of volatile organic contaminants in soil samples.

PURPOSE

Soil-headspace vapour screening (headspace screening) measures relative concentrations of volatile organic compounds in the headspaces of soil sample jars as an indicator of volatile contaminants in the soil sample. Headspace screening is carried out on any environmental project where soil samples are collected. After the headspace screening is done, the relative concentrations are evaluated for indications of possible impacts and to provide guidance on which soil samples are to be submitted to an analytical laboratory.

LIMITATIONS

It is important to note that the headspace concentrations measured are relative rather than absolute. The actual concentrations of volatile compounds in soil are determined through laboratory testing. Also, the headspace measurement does not identify the compound(s) that may be in the soil but represents an aggregate of all volatile compounds.

Note that some combustible gas detectors can operation in a "methane elimination" mode that excludes methane from the measurement. Methane is typically associated with buried organic wastes (e.g., municipal refuse, wood) and naturally-occurring subsurface deposits of organic matter.

EQUIPMENT AND MATERIAL SPECIFICATIONS

Soil headspace vapour can be measured using different instruments depending on the nature of the suspected contamination. A summary of typical instruments and the contaminants detected is provided in Table 1. If petroleum hydrocarbons are suspected, a combustible gas detector can be used. If volatile organic compounds are suspected, a photoionization detector can be used. Other instruments can also be considered, and the instrument used should be selected taking into account the best available information about site history and uses. Field instruments must be calibrated in accordance with the requirements of the Quality Assurance Program and Golder SOP No. 12 (Measurement of Field Parameters).

FIELD PROCEDURE

To screen soil headspace for volatile compounds:

1) Collect the soil sample and place it in a secure container so as to minimize losses of volatile components during headspace screening.

2) Immediately place the soil sample in a plastic bag (0.5 L to 1 L), filling the bag about one-quarter full.

3) Seal the bag tightly leaving a minimal headspace.

4) While the sample is secure in the bag, knead any lumps of soil by hand within the closed bag to break them up.

5) Allow the soil sample to equilibrate for a minimum of 15 minutes and until it reaches a minimum temperature of 10°C, but complete all headspace measurements within two hours of sample collection.

6) To measure the headspace vapours, insert the analyser(s) probe of choice into the headspace above the soil sample, taking care to minimize potential vapour loss.

7) Agitate/manipulate the sample by hand as the measurement is taken.

8) Record on the field form or log the peak reading registered by the analyser(s) during the first 15 seconds of measurement.

REQUIRED DOCUMENTATION

Soil headspace readings should be recorded on the field form or log on which the soil sample is otherwise described, so that each headspace reading is clearly identified with the sample to which the results apply. There must be a notation on the field form or log that identifies the type of instrument used. Units of measurement must also appear with the reading.

REFERENCES

MOEE *Guidance on Sampling and Analytical Methods for Use at Contaminated Sites in Ontario,* dated May 1996. Version 1

DOCUMENT CONTROL

Version 1 Author: K E Salt

Edit 1 Editor: Margaret Shaw Edit Date: November 5, 2010

SOP4-Headspace Screening-MS-5Nov10

SUMMARY OF TYPICAL PROCEDURE

Following installation, each monitoring well will be developed to remove fine-grained material from the monitoring well and filter pack and to stabilize the filter pack around the monitoring well screen. Development will be achieved by surging the monitoring well screen with a solid 2-inch OD Waterra™ surge block and pumping groundwater using a Waterra™ inertial pump. During monitoring-well development, periodic field measurements of turbidity will be made using a field turbidimeter. Development will continue until the turbidity of the groundwater produced stabilizes or, if that does not happen, until a minimum of three and a maximum of ten well volumes have been removed.

PURPOSE

Monitoring wells are developed to remove fine particles from the filter pack and to remove any fluids introduced to the monitoring well during drilling. Proper monitoring-well development ensures that samples collected are representative of surrounding aquifer conditions and reduces the amount of sediment produced during sample collection.

LIMITATIONS

This Standard Operating Procedure (SOP) generally applies to all groundwater monitoring wells except those installed for the sole purpose of water level measurement. However, if free product is present in the monitoring well, avoiding well development is recommended to eliminate the potential for smearing free product in the filter pack and the surrounding formation.

EQUIPMENT AND MATERIAL SPECIFICATIONS

Monitoring well development requires a pump, a water level meter, and a turbidity meter. Other water quality meters (e.g., pH meter, specific conductivity meter) may be used as required by the Qualified Person.

The pump selected will vary depending upon the depth of the monitoring well and the transmissivity of the formation. Inertial pumps equipped with a surge block are widely applicable. However, other pumping methods may be preferred, or may be required for deep and/or high-yield monitoring wells (e.g., air-lift pumping using either compressed air or nitrogen). The selection of the pumping method is the responsibility of the Qualified Person.

FIELD PROCEDURE

To develop a monitoring well:

1) Measure the initial depth to water.

2) Use the measured depth to water and the monitoring well completion details to determine the monitoring well volume (i.e., the standing volume of groundwater inside the monitoring well screen and pipe).

   Note: monitoring well volume = $\pi r^2 h$

   Set the pump intake at the top of the monitoring well screen. Direct the pump discharge to a container for volume measurement.

3) Start pumping at the maximum rate possible without exceeding the monitoring well yield.

4) Measure the initial turbidity.

5) Progressively lower the pump intake down the monitoring well screen while measuring the turbidity of the produced water after every well volume of water pumped. Complete at least two minutes of pumping for each 0.3 m of monitoring well screen.

6) Where possible, lower the pump to the bottom of the monitoring well to remove any accumulated fine-grained materials.

7) Continue until you have pumped at least three well volumes from the monitoring well and the turbidity of the produced groundwater stabilizes (i.e., the measured turbidity is within ±10 percent for three successive well volumes), up to a maximum of ten well volumes.

8) For low-yield monitoring wells (i.e., monitoring wells with a maximum yield that is less than 0.5 L/min and that go dry during development), purge at least one monitoring well volume.

   Note: It is not necessary for turbidity to stabilize during the development of low-yield monitoring wells.

9) Contain produced groundwater appropriately and characterize it for disposal in accordance with the requirements of the Quality Assurance Program.

REQUIRED DOCUMENTATION

Monitoring well development and the rationale for its conclusion (e.g., turbidity stabilized, ten well volumes purged, or low-yield monitoring well) will be recorded on the field form titled Monitoring Well Development (Appendix C) at the time of well development (O. Reg. 153/04).

REFERENCES

Ontario Regulation 153/04 (Records of Site Condition) (as amended) under the Environmental Protection Act (Ontario).

DOCUMENT CONTROL

Version 1. **Author** E. Hood **Reviewer** Reviewer

Edit 1 Editor : Margaret Shaw Edit Date: November 5, 2010

SOP5-Monitoring Well Development-5Nov10

SUMMARY OF TYPICAL PROCEDURE

Soil encountered, exposed, and/or sampled will be logged in the field to record the stratigraphy, groundwater conditions encountered, visual and olfactory observations of environmental significance, sampling method, and location and depth from which the samples were obtained.

PURPOSE

Soil logging is conducted while drilling boreholes or excavating test pits whenever information on subsurface conditions is required or when soil samples are to be collected. Soil logging assists in developing a good understanding of the soil, groundwater, and environmental conditions at a site.

LIMITATIONS

This Standard Operating Procedure (SOP) is applicable to the collection of all soil samples. However, site-specific environmental factors and health and safety protocols may preclude the collection of some information.

EQUIPMENT AND MATERIAL SPECIFICATIONS

The sub-contractor may supply various specific soil sampling equipment (e.g., split spoon sampler, liners, augers, etc.).

Any or all of the following equipment may also be required:

- Various field screening instruments to test for specific requirements (e.g., headspace screening, in situ density, etc.);
- Measuring tape;
- Various sampling tools (e.g., putty knife, trowel, shovel, dredge samplers, or other specific sampling tools);
- Various sampling containers (e.g., plastic bags, glass or plastic jars, or other specific sampling containers);
- Various labels, markers, pens, and/or pencils for labelling the sample containers; and
- Camera to document the site and/or soil conditions.

Equipment and materials required for standard decontamination procedures of all sampling tools will also be required at sites with known or potential contamination.

FIELD PROCEDURE

When logging soil and/or collecting soil samples, record the following types of information on the standardized, task-specific log appropriate to the job (e.g., borehole log or test pit log).

Record information needed to identify the job, site, and sample location:

- Project number and site identification (e.g., street address, name of site, etc,);
- Date, time and weather conditions;
- Name of person conducting soil logging/ sampling;
- Name of contractor (if used), including type and size of equipment and methodology (e.g., type of drill rig and type and size of sampling equipment, trowel or shovel);
- Sample identification number;
- Location of sample (i.e., the horizontal distance of the testing location from a fixed feature on the site, or relative to a sampling grid, or a cell number, or GPS coordinates, etc.); and
- Measured depth of the sample below ground surface, including the top and bottom of the sample interval.

Record the characteristics of the geologic material encountered or sampled:

- Describe the consistency or compactness, moisture content, colour, grain size, indicators of contamination, and structure (optional). Refer to Golder SOP No. 14 for guidance;
- Record each stratigraphic unit and each zone of inferred contamination;
- Note the characteristics, depth, thickness, and extent of any staining, odours and/or debris.
- Describe any evidence of free phase product/sheen.
- Identify any naturally occurring organic matter (e.g., topsoil, peat).
- Identify fill materials.
- Note the type of bedrock (e.g., shale, limestone, etc.) if bedrock is encountered or inferred.

Record the following information related to field measurements and samples:

- Soil-vapour headspace screening results (see Golder Associates Ltd. SOP No. 4);
- Soil moisture content (e.g., dry, damp, wet);
- Wetness on the sampling device, groundwater seepage or accumulation in a borehole or test pit, or any zone of sloughing/collapse in a trench or test pit;

- Recovery of samples (if using split spoon, coring, etc.) as a proportion of the maximum possible (e.g., 22/24 inches);
- Sampling progress and/or difficulties (e.g., drilling refusal, collapsing test pit, etc.)
- Samples submitted for analysis and chemical parameters to be analyzed; and
- Factors that may affect the sample's chemical integrity.

REQUIRED DOCUMENTATION

Soil logging requires that a field record be documented on a standardized task-specific log (e.g., borehole log, test pit log), that can be incorporated into the field file.

Refer to Appendix C for standardized field forms.

REFERENCES

Golder Associates Ltd. Procedure No. 4: Decontamination of Equipment.

Golder Associates Ltd. Procedure No. 11: Soil Classification.

Golder Associates Ltd. Procedure No. 4: Soil-Headspace Vapour Screening.

DOCUMENT CONTROL

Version 1.	**Author**	Tim Mullings	**Reviewer**
Edit 1	Editor : Margaret Shaw		Edit Date: November 5, 2010

SOP6-Soil Logging-MS-5Nov10

STANDARD OPERATING PROCEDURE NO. 9: CONVENTIONAL GROUNDWATER SAMPLE COLLECTION

SUMMARY OF TYPICAL PROCEDURE

At each monitoring well location, the initial depth to water, reflecting static conditions, will be measured using an electric water level meter. Prior to groundwater sample collection, each monitoring well will be purged to remove stagnant groundwater so that groundwater samples are representative of the physical and geochemical conditions in the aquifer.

Three monitoring well volumes (i.e., standing volume of water in the monitoring well screen and casing) will be purged, except less at low-yield monitoring wells. Following purging, field measurements of water quality parameters (temperature, pH, and specific conductivity) will be made and groundwater samples will be carefully dispensed into the appropriate sample containers.

PURPOSE

Groundwater samples are collected to provide information about the chemical composition of the groundwater. Conventional groundwater collection may be used for a wide range of analytes. Prior to collecting groundwater samples, monitoring wells are purged to remove stagnant water in the monitoring well so that representative groundwater samples may be obtained.

LIMITATIONS

This Standard Operating Procedure (SOP) applies to all groundwater monitoring wells except those containing free product (i.e., either LNAPL or DNAPL). This SOP applies to collection of groundwater for a wide range of analytes. Groundwater sample collection must take place at least 24 hours after monitoring-well development (refer to Golder Associates SOP No. 5).

EQUIPMENT AND MATERIAL SPECIFICATIONS

Conventional monitoring-well purging and groundwater sampling requires the following equipment:

- Pump (dedicated inertial, bladder, centrifugal, or peristaltic) and tubing

  Notes:

  For conventional groundwater parameters, the pump is typically a dedicated inertial pump consisting of tubing and a foot valve.

  If a dedicated inertial pump is not used, the pump selected (bladder, centrifugal, or peristaltic) will vary depending upon the depth of the monitoring well and the transmissivity of the formation.

  For a peristaltic pump, silicone or tygon tubing should be used in the drive head, while high density polyethylene (HDPE) tubing or similar material should be used for sample collection.

- Electric water-level meter

- Graduated container (e.g., a bucket) for measuring volume of water removed
- Water quality meter(s) (as a minimum, temperature, pH, and specific conductivity; possibly also dissolved oxygen, redox potential (ORP), and turbidity)

  Note: Water quality meters capable of simultaneously reading multiple water quality parameters, such as Horiba U-22 or YSI 556, and the use of manufactured flow-through cells are recommended.
- 250-mL plastic beaker or a flow-through cell (preferred) for measurement of field indicator parameters
- Detailed descriptions of the equipment and material required for most common purging and sampling methods are provided in ASTM 6634-01.

FIELD PROCEDURE

1) Measure and record the depth to water. (O. Reg. 153/04).

   Note: The monitoring well should have been properly developed at least one week prior to sampling. Refer to Golder Associates SOP No. 5.

2) Calculate the monitoring well volume (i.e., standing volume of water in the monitoring well screen and casing).

3) Set up pump apparatus at monitoring well.

4) If a fuel-powered generator is used, set up generator downwind of monitoring well.

5) Carefully set the pump intake in the screened interval of the monitoring well, at whichever of the following is lower:

- the midpoint of the monitoring well screen
- the midpoint of the water column

  Note: Avoid stirring up any accumulated sediment at the base of the monitoring well. An intake that is too low could disturb sediment in the monitoring well, biasing results for analytes that preferentially accumulate in the sediment (e.g., polyaromatic hydrocarbons, metals). The intake depth should be consistent between sampling events for each monitoring well.

6) Secure the pump intake at the required depth.

7) Attach the pump discharge to the flow-through cell and the calibrated field probe(s) to the water quality meter.

8) Re-measure and record the depth to water.

9) Purge three monitoring well volumes from the monitoring well at a constant flow rate that is less than 2 litres per minute (L/min), except at low-yield monitoring wells (see Note, following).

Note: Avoid excessive agitation of the water column by pumping at a flow rate that does not cause drawdown of the water level below the pump intake. Large drawdown can cause aeration of groundwater, dislodge sediment, and alter the geochemical conditions. If such drawdown occurs, reduce the purging flow rate or use the following alternate procedure for low-yield monitoring wells:

a. Purge the water level down to the midpoint of the monitoring well screen or the midpoint of the water column (whichever is lower), using a constant flow rate that is less than 2 L/min. To the extent possible, minimize agitation of the water column.

   Note: Low-yield monitoring wells typically yield groundwater at maximum rates that are less than 0.5 L/min. They produce so little water that purging three complete monitoring well volumes prior to sample collection is impractical.

b. Allow the water level to recover to the extent practical (e.g., until later in the work day).

c. Purge the water level in the monitoring well down to the top of the monitoring well screen or the midpoint of the water column (whichever is lower) a second time.

10) Perform field measurements of water quality parameters (including, at minimum, temperature, pH, and specific conductivity) as specified in Golder Associates SOP No. 12.

11) Minimizing any unnecessary agitation of the groundwater, collect the groundwater samples specified in the work plan (not necessarily the entire list shown here) into pre-cleaned, preserved sample containers in the following order:

   a. Unfiltered analytes, including volatile organic compounds, fixed hydrocarbon gases, petroleum hydrocarbon compounds, semi-volatiles and other organic contaminants, mercury, methyl mercury, total organic carbon, and anions; and

   b. Field-filtered analytes, including dissolved metals (except mercury or methyl mercury), dissolved organic carbon, and alkalinity.

   Notes: Samples should be collected in progression beginning with the least contaminated well and ending with the most contaminated wells (if known). For wells where multiple analytes are required, volatile and oxygen-sensitive (e.g., ferrous iron, methane, sulphide) analytes are generally collected first. The sequence in which inorganic analytes are collected is not important, unless field filtration is required (unfiltered analytes collected first, then filtered analytes).

12) Carefully pack the samples into a cooler. A trip blank must be placed in each container containing samples for volatile organic compound analysis.

13) Maintain the sample temperature at less than 10°C using ice or cold packs, even if samples are to be submitted the same day as collected (O. Reg. 153/04).

REQUIRED DOCUMENTATION

The methods and results of groundwater sample collection will be recorded on a field form at the time of sample collection (see form titled Groundwater Sample Collection, Appendix C).

REFERENCES

ASTM 6643-01. Standard Guide for the Selection of Purging and Sampling Devices for Groundwater Monitoring Wells.

Golder Associates Ltd. Standard Operating Procedure No. 12: Measurement of Field Parameters

Golder Associates Ltd. Standard Operating Procedure No. 5: Monitoring Well Development.

Ontario Regulation 153/04 (Records of Site Condition) (as amended) under the Environmental Protection Act (Ontario).

DOCUMENT CONTROL

Version 1.	**Author**	Eric Hood	**Reviewer**	Reviewer
	Date	May 27, 2010	Date	_____
Edit 1	Editor : Margaret Shaw	Edit Date: November 19, 2010		
Edit 2	Editor : Margaret Shaw	Edit Date: December 5, 2010		

SOP9-Conventional Groundwater Sample Collection-MS-5Dec10

SUMMARY OF TYPICAL PROCEDURE

Prior to sampling soil, water, or sediment, equipment will be decontaminated to remove traces of previously sampled material that could otherwise interfere with sample analysis. Any equipment that comes in contact with soil, groundwater, or sediment will first be cleaned by mechanical means; washed with a laboratory-grade detergent (e.g., non-phosphate LiquiNox or AlcoNox) and, if necessary, an appropriate desorbing wash solution; and thoroughly rinsed with analyte-free water.

PURPOSE

Where dedicated field sampling equipment cannot be used, sampling equipment must be decontaminated prior to retrieving samples of soil, water or sediment (O. Reg. 153/04). Decontamination is used to reduce the likelihood of cross-contamination between sampling locations.

LIMITATIONS

This Standard Operating Procedure (SOP) applies to field equipment constructed of metallic and synthetic materials that comes in contact with samples that will be submitted for laboratory analysis. It is not intended for use at sites where PCBs, biohazards, or radioactive substances are present.

EQUIPMENT AND MATERIAL SPECIFICATIONS

Equipment decontamination requires the following materials as appropriate to the task:

- Sample containers for the laboratory analysis of rinse water.
- Mechanical cleaning device(s) (e.g., paper towels, bottle brush, broom, pressure washer) to dislodge and remove gross contamination. The cleaning device should be appropriate to the equipment being decontaminated.
- Detergent Solution - Laboratory-grade non-phosphate detergent solution (e.g., AlcoNox or LiquiNox) prepared using analyte-free water as per the detergent instructions (typically 1 part detergent to 100 parts water).
- Acid Rinse Solution - 10% nitric or hydrochloric acid solution-made from reagent grade nitric or hydrochloric acid and deionized water (1% is to be applied to low-carbon steel equipment).
- Solvent Rinse Solution - isopropanol, acetone, or methanol; pesticide grade.
- Analyte-free Rinse Water - typically distilled water. To demonstrate that the rinse water is analyte free, a sample of the source water can be submitted for laboratory analysis.

- Labelled squeeze bottles containing prepared decontamination solutiona (note: decontamination solutions will be prepared for each sample event and will not be reused at more than one site to avoid cross-contamination). For the decontamination of larger equipment, larger solution containers may be necessary.
- Waste-water collection containers (barrels or pails with sealable lids).

FIELD PROCEDURE

1) At a minimum, sample contacting equipment should be washed with a detergent solution and rinsed with analyte-free water.
2) Wash with detergent solution, using a brush made of inert material to remove any particles or surface film. For equipment that, because of internal mechanism or tubing cannot be adequately cleaned with a brush, the decontamination solutions should be circulated through the equipment.
3) Rinse thoroughly with analyte-free water.
4) Rinse with an acid rinse solution (note that this step may be deleted if samples will not undergo inorganic chemical analysis). This rinse is effective only on non-metal surfaces.
5) Rinse with analyte-free water.
6) Rinse with a solvent solution (only required if a non-aqueous phase is present and may be deleted if samples will not undergo organic chemical analyses).
7) Thoroughly rinse with analyte-free water.
8) Allow equipment to air dry prior to next use.
9) Contain waste decontamination solutions and dispose of them using the same procedure as for other investigation-derived wastes.
10) Collect a rinsate blank for laboratory analysis (O.Reg. 153/04)

The probes of water level meters can be decontaminated using only a detergent wash and a thorough rinse using analyte-free water. If a non-aqueous phase liquid is present, a solvent rinse is required.

REQUIRED DOCUMENTATION

In addition to the documentation requirements of the Golder Quality Assurance Program, the Field Team will document the decontamination procedures, the source and types of solution(s) used for decontamination, and the handling of rinse fluids and accumulated solids, if any.

REFERENCES

ASTM D5088-02 (Reapproved 2008). Standard Practice for Decontamination of Field Equipment Used at Waste Sites.

Ontario Regulation 153/04 (Records of Site Condition) (as amended) under the Environmental Protection Act (Ontario).

DOCUMENT CONTROL

Version 1.	**Author**	BRG___	**Reviewer**	Reviewer
	Date	May 26/10	Date	_____
Edit 1	Editor : Margaret Shaw		Edit Date: November 19, 2010	

SOP11-Equipment Decontamination-MS-19Nov10

STANDARD OPERATING PROCEDURE NO. 12: MEASUREMENT OF FIELD PARAMETERS

SUMMARY OF TYPICAL PROCEDURE

Water quality parameters will be measured during monitoring well development and groundwater sample collection. In the case of monitoring-well development, the measurement of turbidity is required (as a minimum). In the case of groundwater sample collection, the measurement of temperature, pH, and specific conductivity is required (as a minimum). Field parameters will be measured in accordance with the requirements of the instrument manufacturer(s).

PURPOSE

Field measurements of water quality parameters provides information about the basic geochemistry of the groundwater and may be used to assess the representativeness of groundwater samples submitted for laboratory analysis.

LIMITATIONS

This procedure applies to the measurement of groundwater quality parameters in the field. This procedure applies to groundwater samples from monitoring wells that have been properly developed and purged (see Golder Associates SOP No. 4, Golder Associates SOP No. 9, and Golder Associates SOP No. 10).

EQUIPMENT AND MATERIAL SPECIFICATIONS

Field measurement of water quality parameters requires the following:

- Appropriate water quality field instrument(s), which can include meters, field spectrophotometers, field titration apparatus and other. The use of widely-available multiparameter water quality meters for the measurement of temperature, pH and specific conductivity is recommended.
- Any necessary calibration materials.

FIELD PROCEDURE

1) Set up the water quality instrument(s) in accordance with the manufacturer's instructions.
2) Calibrate the instrument(s) in accordance with the manufacturer's instructions and the requirements of the Golder Quality Assurance Program.
3) Collect a water sample and measure water quality parameters in accordance with the manufacturer's instructions.

REQUIRED DOCUMENTATION

Record the results at the time of measurement on an appropriate field form (e.g., a monitoring well development field form, a groundwater sample collection field form, or other).

REFERENCES

Golder Associates Ltd. Standard Operating Procedure No. 5: Monitoring Well Development.

Golder Associates Ltd. Standard Operating Procedure No. 9: Conventional Groundwater Sample Collection.

Golder Associates Ltd. Standard Operating Procedure No. 10: Low-Flow Groundwater Sample Collection.

DOCUMENT CONTROL

Version 1.	**Author**	Eric Hood	**Reviewer**	Reviewer
	Date	November 4, 2010	Date	_____
Edit 1	Editor : Margaret Shaw		Edit Date: November 19, 2010	

SOP12-Measurement of Field Parameters-MS-19Nov10

APPENDIX C

Phase I ESA Conceptual Site Model - Figures

LEGEND

Approximate Site Limit

1. 3380 6th Line – Residential
2. 3369 6th Line – Residential
3. 3270 6th Line – Communication Tower
4. 3042 to 3158 6th Line – Residential
5. 3043 & 3051 6th Line – Residential
6. 5 Dundas Street East – Munn's United Church
7. 87 Dundas Street East – Residential
8. Southeast corner of 6th Line and Dundas Street East – Munn's Cementary
9. 32 Dundas Street East – Presentation Centre: Waterlilies Townhomes.
10. 95 Oak Walk Drive – Halton Regional Police Service #2 District
11. No number – Vacant land
12. No number – Under construction
13. 2545 6th Line – Wellspring Halton-Peel
14. 11-43 Red Maple Lane, 2448 -2624 Andover Road and 92-136 Westfield Trail - Residential

REFERENCE

Base Data - MNR NRVIS, obtained 2004
Produced by Golder Associates Ltd under licence from
Ontario Ministry of Natural Resources, © Queens Printer 2008
Imagery - Bing Maps © 2009 Microsoft Corporation and its data suppliers
Projection: Transverse Mercator Datum: NAD 83 Coordinate System: UTM Zone 17

100 50 0 100 200 300
SCALE 1:10,000 METRES

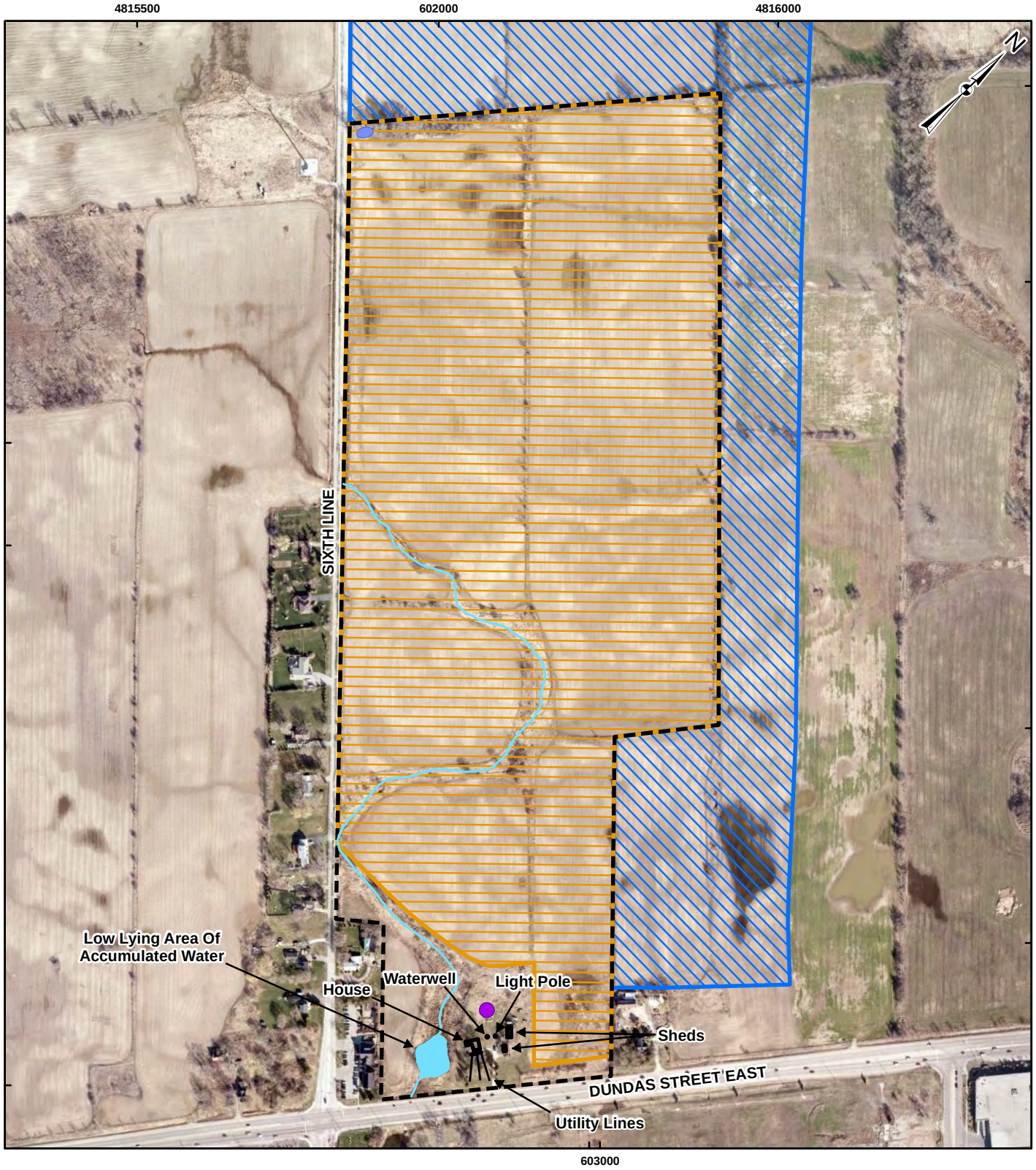
PROJECT
PHASE I ESA
SIXTH LINE CORPORATION
SIXTH LINE AND DUNDAS STREET EAST
OAKVILLE, ONTARIO

TITLE
SITE AND SURROUNDING LAND USE

Golder Associates

PROJECT NO. 11-1186-0103 (3010)			SCALE AS SHOWN	REV. 0.0
DESIGN	ME	19 May. 2011	FIGURE: 2	
GIS	ME	19 May. 2011		
CHECK	VU	19 May. 2011		
REVIEW	PM	25 Jul. 2011		

G:\Projects\2011\11-1186-0103_Arutip_Engineering_Sixth_Line\GIS\MXDs\Reporting\Fig2_SiteAndSurroundingLandUse.mxd



LEGEND

- Approximate Site Limit
- ESA 1 - Material Mixed With Asphalt
- ESA 1 - Fill Material
- ESA 2 - Agricultual Activities On-Site
- ESA 3 - Agricultual Activities Off-Site
- Watercourse
- Utility Lines (Suspected To Be Telephone, Hydro and Water)

REFERENCE

Base Data - MNR NRVIS, obtained 2004
Produced by Golder Associates Ltd under licence from
Ontario Ministry of Natural Resources, © Queens Printer 2008
Imagery - Bing Maps © 2009 Microsoft Corporation and its data suppliers
Projection: Transverse Mercator Datum: NAD 83 Coordinate System: UTM Zone 17

50 25 0 50 100 150
SCALE 1:6,000 METRES

PROJECT
PHASE I ESA
SIXTH LINE CORPORATION
SIXTH LINE AND DUNDAS STREET EAST
OAKVILLE, ONTARIO

TITLE
AREAS OF POTENTIAL ENVIRONMENTAL CONCERN

Golder Associates

PROJECT NO. 11-1186-0103 (3010)		SCALE AS SHOWN	REV. 0.0
DESIGN	ME	19 May. 2011	FIGURE: 3
GIS	ME	13 Jun. 2011	
CHECK	VU	13 Jun. 2011	
REVIEW	PM	25 Jul. 2011	

G:\Projects\2011\11-1186-0103_Arutip_Engineering_Sixth_Line\GIS\MXDs\Reporting\Fig3_AreasOfPotentialEnvironmentalConcern.mxd

APPENDIX D

Record of Borehole Logs

PROJECT: 11-1186-0103

RECORD OF BOREHOLE: 11-1

SHEET 1 OF 1

LOCATION: N 4815663.10 ;E 602132.60

BORING DATE: June 2, 2011

DATUM: Geodetic

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	HEADSPACE COMBUSTIBLE VAPOUR CONCENTRATIONS [PPM] ⊕ (ND = Not Detected; 100 200 300 400) / HEADSPACE COMBUSTIBLE VAPOUR CONCENTRATIONS [%LEL] □ (ND = Not Detected; 20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp W Wl; 10 20 30 40)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		174.51						
0	Power Auger 150 mm O.D. Solid Stem Augers	TOPSOIL		0.00	1A			ND		
				174.21		50 DO	5			
		Firm to hard, moist, mottled reddish brown, SILTY CLAY, trace sand and gravel, with organics (TILL)		0.30	1B			ND		
1					2A	50 DO	72	ND		June 17, 2011
		Highly weathered, thinly bedded, fine grained, reddish brown to grey, SHALE, with limestone interbeds (BEDROCK)		173.34 1.17	2B			ND		Hole Plug
					3	50 DO		ND		
2					4	50 DO	50/ 0.10	ND		
3					5	50 DO	50/ 0.05	ND		Sand
4										
					6	50 DO	50/ 0.05	ND		Screen
5										
6				168.26	7	50 DO	50/ 0.05			June 2, 2011
		END OF BOREHOLE		6.25						
7		NOTES: 1. Water level at 6.1 m below ground surface at completion of drilling. 2. No visual or olfactory evidence of environmental impact observed during drilling. 3. On June 17, 2011 water level measured at 0.99 m below ground surface.								
8										
9										
10										

DEPTH SCALE

1 : 50

Golder Associates

LOGGED: CL

CHECKED: JET

MIS-BHS 001 11-1186-0103.GPJ GAL-MIS.GDT 7/8/11 DD

PROJECT: 11-1186-0103

RECORD OF BOREHOLE: 11-2

SHEET 1 OF 1

LOCATION: N 4815821.10 ;E 602253.60

BORING DATE: June 2, 2011

DATUM: Geodetic

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	HEADSPACE COMBUSTIBLE VAPOUR CONCENTRATIONS [PPM] ⊕ *ND = Not Detected* (100 200 300 400) / HEADSPACE COMBUSTIBLE VAPOUR CONCENTRATIONS [%LEL] □ *ND = Not Detected* (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT Wp W Wl (10 20 30 40)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
0		GROUND SURFACE		174.44						
	Power Auger; 150 mm O.D. Solid Stem Augers	TOPSOIL		0.00 / 174.21	1A	50 DO	2	⊕ ND		
		Soft to hard, moist, mottled reddish brown, SILTY CLAY, some to trace sand and gravel, with shale fragments (TILL)		0.23	1B	50 DO		⊕ ND		
1					2	50 DO	59	⊕ ND		June 17, 2011
					3	50 DO	50/ 0.15	⊕ ND		
				172.61						
2		Highly weathered, thinly bedded, fine grained, reddish brown to grey, SHALE, with limestone interbeds (BEDROCK)		1.83						Hole Plug
					4	50 DO	50/ 0.08	⊕ ND		
3					5	50 DO	50/ 0.05	⊕ ND		
4										June 2, 2011
					6	50 DO	50/ 0.01			Sand
5										
										Screen
6				168.27	7	50 DO	50/ 0.07	⊕ ND		
		END OF BOREHOLE		6.17						
7		NOTES:								
		1. Water level at 4.07 m below ground surface at completion of drilling.								
		2. No visual or olfactory evidence of environmental impact observed during drilling.								
		3. On June 17, 2011 water level measured at 0.92 m below ground surface.								
8										
9										
10										

DEPTH SCALE

1 : 50

Golder Associates

LOGGED: CL

CHECKED: JET

MIS-BHS 001 11-1186-0103.GPJ GAL-MIS.GDT 7/8/11 DD

PROJECT: 11-1186-0103

RECORD OF BOREHOLE: 11-3

SHEET 1 OF 1

LOCATION: N 4815541.30 ;E 602157.00

BORING DATE: May 27, 2011

DATUM: Geodetic

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80)	SHEAR STRENGTH Cu, kPa (nat V. +, rem V. ⊕; Q - ●, U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3})	WATER CONTENT PERCENT (Wp, W, Wl) (10 20 30 40)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		174.01									
0	Power Auger 150 mm O.D. Solid Stem Augers	TOPSOIL		0.00 / 173.76	1A	50 DO	4						
		Firm to hard, moist, reddish brown, SILTY CLAY, some sand and gravel, with shale fragments (TILL)		0.25	1B								
					1C								
1					2	50 DO	45						
				172.56									
		Highly weathered, thinly bedded, fine grained, reddish brown, SHALE, with limestone interbeds (BEDROCK)		1.45	3	50 DO	50/ 0.05						
2					4	50 DO	50/ 0.02						
3					5	50 DO	50/ 0.02						
4													
					6	50 DO	50/ 0.10						
5													
													May 27, 2011
6				167.89	7	50 DO	50/ 0.02						
		END OF BOREHOLE		6.12									
7		NOTES: 1. Water level at 5.70 m below ground surface at completion of drilling. 2. No visual or olfactory evidence of environmental impact observed during drilling.											
8													
9													
10													

DEPTH SCALE

1 : 50

Golder Associates

LOGGED: CL

CHECKED: JET

MIS-BHS 001 11-1186-0103.GPJ GAL-MIS.GDT 7/8/11 DD

PROJECT: 11-1186-0103

RECORD OF BOREHOLE: 11-4

SHEET 1 OF 1

LOCATION: N 4815597.80 ;E 602197.90

BORING DATE: May 26, 2011

DATUM: Geodetic

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80)	SHEAR STRENGTH Cu, kPa (nat V. +, rem V. ⊕, Q - ●, U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3})	WATER CONTENT PERCENT (Wp, W, Wl) (10 20 30 40)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		174.26									
0	Power Auger 150 mm O.D. Solid Stem Augers	TOPSOIL		0.00	1A	50 DO	3						
				173.80									
		Hard, moist, mottled brown to reddish brown, SILTY CLAY, some sand, trace gravel (TILL)		0.46	1B								
1					2	50 DO	44						
				173.04									
		Highly weathered, thinly bedded, fine grained, reddish brown, SHALE with limestone interbeds (BEDROCK)		1.22	3	50 DO	50/ 0.15						
2					4	50 DO	50/ 0.01						
3					5	50 DO	50/ 0.02						
4													
					6	50 DO	50/ 0.13						
5													
6				168.11	7	50 DO	50/ 0.05						
		END OF BOREHOLE		6.15									
		NOTES:											
		1. Borehole open and dry at completion of drilling.											
7		2. No visual or olfactory evidence of environmental impact observed during drilling.											
8													
9													
10													

DEPTH SCALE

1 : 50

Golder Associates

LOGGED: CL

CHECKED: JET

MIS-BHS 001 11-1186-0103.GPJ GAL-MIS.GDT 7/8/11 DD

PROJECT: 11-1186-0103

RECORD OF BOREHOLE: 11-5

SHEET 1 OF 1

LOCATION: N 4815448.80 ;E 602292.20

BORING DATE: June 3, 2011

DATUM: Geodetic

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m	HEADSPACE COMBUSTIBLE VAPOUR CONCENTRATIONS [PPM] ⊕ *ND = Not Detected* (100 200 300 400) / HEADSPACE COMBUSTIBLE VAPOUR CONCENTRATIONS [%LEL] □ *ND = Not Detected* (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT Wp W Wl (10 20 30 40)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		174.65							
0	Power Auger; 150 mm O.D. Solid Stem Augers	TOPSOIL		0.00 / 174.45	1A						
		Firm to hard, moist, brown to reddish brown to mottled reddish brown, SILTY CLAY, trace to some sand and gravel (TILL)		0.20	1B	50 DO	4	ND			
1					2	50 DO	39	ND			
					3	50 DO	61	ND			MH
2				172.52							
		Highly weathered, thinly bedded, fine grained, reddish brown, SHALE, with limestone interbeds (BEDROCK)		2.13	4	50 DO	50/ 0.13				
3					5	50 DO	50/ 0.05				
4											
					6	50 DO	50/ 0.05	ND			
5											
6				168.45	7	50 DO	50/ 0.10	ND			
		END OF BOREHOLE		6.20							
7		NOTES:									
		1. Borehole open and dry at completion of drilling.									
		2. No visual or olfactory evidence of environmental impact observed during drilling.									
8											
9											
10											

DEPTH SCALE

1 : 50

Golder Associates

LOGGED: CL

CHECKED: JET

MIS-BHS 001 11-1186-0103.GPJ GAL-MIS.GDT 7/8/11 DD

PROJECT: 11-1186-0103

RECORD OF BOREHOLE: 11-6

SHEET 1 OF 1

LOCATION: N 4815604.00 ;E 602318.70

BORING DATE: May 26, 2011

DATUM: Geodetic

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. + Q - ● / rem V. ⊕ U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp W Wl) (10 20 30 40)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		174.81							
0	Power Auger 150 mm O.D. Solid Stem Augers	TOPSOIL		0.00	1A						
				174.51		50 DO	6				
		Firm to very stiff, moist, mottled reddish brown, SILTY CLAY, some sand, some to trace gravel, with sand seam and oxidation (TILL)		0.30	1B						
1					2	50 DO	26				
				173.36							
		Highly weathered, thinly bedded, fine grained, reddish brown, SHALE, with limestone interbeds (BEDROCK)		1.45	3	50 DO	50/ 0.15				
2					4	50 DO	50/ 0.07				
3					5	50 DO	50/ 0.02				
					6	50 DO	50/ 0.05				
4					7	50 DO	50/ 0.10				
5											
6					8	50 DO	50/ 0.15				
				168.56							
		END OF BOREHOLE		6.25							
7		NOTES:									
		1. Borehole open and dry at completion of drilling.									
		2. No visual or olfactory evidence of environmental impact observed during drilling.									
8											
9											
10											

DEPTH SCALE

1 : 50

Golder Associates

LOGGED: CL

CHECKED: JET

MIS-BHS 001 11-1186-0103.GPJ GAL-MIS.GDT 7/8/11 DD

PROJECT: 11-1186-0103

RECORD OF BOREHOLE: 11-7

SHEET 1 OF 1

LOCATION: N 4815751.80 ;E 602378.70

BORING DATE: May 27, 2011

DATUM: Geodetic

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. + Q - ● / rem V. ⊕ U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp W Wl; 10 20 30 40)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
0		GROUND SURFACE		173.27							
	Power Auger 150 mm O.D. Solid Stem Augers	TOPSOIL		0.00 / 173.02	1A	50 DO	4				
		Firm to very stiff, moist, reddish brown, SILTY CLAY to CLAYEY SILT, trace sand and gravel (TILL)		0.25	1B						
1					2A	50 DO	29				June 17, 2011
				171.82	2B						
		Highly weathered, thinly bedded, fine grained, reddish brown, SHALE, with limestone interbeds (BEDROCK)		1.45	3	50 DO	87/ 0.25				
2					4	50 DO	50/ 0.07				Hole Plug
3					5	50 DO	50/ 0.05				
					6	50 DO	50/ 0.02				
4					7	50 DO	50/ 0.05				Sand
5											Screen
6				167.12	8	50 DO	50/ 0.05				
		END OF BOREHOLE		6.15							
7		NOTES: 1. Borehole open and dry at completion of drilling. 2. No visual or olfactory evidence of environmental impact observed during drilling. 3. On June 17, 2011 water level measured at 0.97 m below ground surface.									
8											
9											
10											

DEPTH SCALE

1 : 50

Golder Associates

LOGGED: CL

CHECKED: JET

MIS-BHS 001 11-1186-0103.GPJ GAL-MIS.GDT 7/8/11 DD

PROJECT: 11-1186-0103

RECORD OF BOREHOLE: 11-8

SHEET 1 OF 1

LOCATION: N 4815624.00 ;E 602400.90

BORING DATE: May 26, 2011

DATUM: Geodetic

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. + Q - ● / rem V. ⊕ U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp W Wl) (10 20 30 40)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		173.95							
0	Power Auger, 150 mm O.D. Solid Stem Augers	TOPSOIL		0.00	1A						
		Stiff to very stiff, moist, reddish brown, SILTY CLAY, some sand and gravel, with oxidation and shale fragments (TILL)		0.15	1B	50 DO	4				
1					2A	50 DO	24				
					2B						
					3	50 DO	16				▽ May 26, 2011
2				171.74							
		Highly weathered, thinly bedded, fine grained, reddish brown, SHALE, with limestone interbeds (BEDROCK)		2.21	4	50 DO	50/ 0.15				
3					5	50 DO	50/ 0.08				
		Auger grinding at 3.3 m									
					6	50 DO	50/ 0.01				
4											
					7	50 DO	50/ 0.05				
5											
6				167.84	8	50 DO	50/ 0.01				
		END OF BOREHOLE		6.11							
7		NOTES: 1. Water level at 1.70 m below ground surface at completion of drilling. 2. No visual or olfactory evidence of environmental impact observed during drilling.									
8											
9											
10											

DEPTH SCALE

1 : 50

Golder Associates

LOGGED: CL

CHECKED: JET

MIS-BHS 001 11-1186-0103.GPJ GAL-MIS.GDT 7/8/11 DD

PROJECT: 11-1186-0103

RECORD OF BOREHOLE: 11-9

SHEET 1 OF 2

LOCATION: N 4815428.90 ;E 602365.90

BORING DATE: May 26, 2011

DATUM: Geodetic

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. +, rem V. ⊕, Q - ●, U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp, W, Wl) (10 20 30 40)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		174.66							
0	Power Auger; 150 mm O.D. Solid Stem Augers	TOPSOIL		0.00 / 174.41	1A	50 DO	7				
		Firm to very stiff, moist, reddish brown, SILTY CLAY, trace to some sand and gravel, with shale fragments (TILL)		0.25	1B						
1					2	50 DO	22				Hole Plug
				173.21							
		Highly weathered, thinly bedded, fine grained, reddish brown, SHALE, with limestone interbeds (BEDROCK)		1.45	3	50 DO	50/ 0.15				
2					4	50 DO	55/ 0.07				May 26, 2011
3					5	50 DO	50/ 0.07				Sand
					6	50 DO	50/ 0.07				
4											Screen
					7	50 DO	53/ 0.10				
5											
6					8	50 DO	50/ 0.03				Hole Plug
7											
8											Sand
9					9	50 DO	50/ 0.05				Screen
10		*CONTINUED NEXT PAGE*									

DEPTH SCALE

1 : 50

Golder Associates

LOGGED: CL

CHECKED: JET

MIS-BHS 001 11-1186-0103.GPJ GAL-MIS.GDT 7/8/11 DD

PROJECT: 11-1186-0103

RECORD OF BOREHOLE: 11-9

SHEET 2 OF 2

LOCATION: N 4815428.90 ;E 602365.90

BORING DATE: May 26, 2011

DATUM: Geodetic

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. + Q - ● / rem V. ⊕ U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp — W — Wl) (10 20 30 40)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
10		*--- CONTINUED FROM PREVIOUS PAGE ---*									
		END OF BOREHOLE		164.54 / 10.12	10	50 DO	50/ 0.01				Screen
11		NOTES: 1. Water level in open borehole at 2.4 m below ground surface at completion of drilling. 2. No visual or olfactory evidence of environmental impact observed during drilling. 3. On June 17, 2011 water level in the shallow well measured at 2.63 m below ground surface. 4. On June 17, 2011 water level in the deep well measured at 2.65 m below ground surface.									
12											
13											
14											
15											
16											
17											
18											
19											
20											

DEPTH SCALE

1 : 50

Golder Associates

LOGGED: CL

CHECKED: JET

MIS-BHS 001 11-1186-0103.GPJ GAL-MIS.GDT 7/8/11 DD

PROJECT: 11-1186-0103

RECORD OF BOREHOLE: 11-10

SHEET 1 OF 1

LOCATION: N 4815587.60 ;E 602461.80

BORING DATE: May 26, 2011

DATUM: Geodetic

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80)	SHEAR STRENGTH Cu, kPa (nat V. +, rem V. ⊕, Q - ●, U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3})	WATER CONTENT PERCENT (Wp, W, Wl) (10 20 30 40)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		173.02									
0	Power Auger 150 mm O.D. Solid Stem Augers	TOPSOIL		0.00 / 172.82	1A								
		Stiff to hard, moist, mottled brown to reddish brown, SILTY CLAY, trace to some sand and gravel (TILL) Sand seam at 0.56 m		0.20	1B	50 DO	9						▽ May 26, 2011
1					2A	50 DO	41						
		Highly weathered, thinly bedded, fine grained, reddish brown, SHALE, with limestone interbeds (BEDROCK)		171.72 / 1.30	2B							MH	
					3	50 DO	50/ 0.10						
2					4	50 DO	50/ 0.15						
3					5	50 DO	50/ 0.10						
					6	50 DO	50/ 0.02						
4					7	50 DO	50/ 0.10						
5													
6				166.91	8	50 DO	50/ 0.01						
		END OF BOREHOLE		6.11									
7		NOTES: 1. Water level at 0.5 m below ground surface at completion of drilling. 2. No visual or olfactory evidence of environmental impact observed during drilling.											
8													
9													
10													

DEPTH SCALE

1 : 50

Golder Associates

LOGGED: CL

CHECKED: JET

MIS-BHS 001 11-1186-0103.GPJ GAL-MIS.GDT 7/8/11 DD

PROJECT: 11-1186-0103

RECORD OF BOREHOLE: 11-11

SHEET 1 OF 1

LOCATION: N 4815479.50 ;E 602524.40

BORING DATE: June 3, 2011

DATUM: Geodetic

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	HEADSPACE COMBUSTIBLE VAPOUR CONCENTRATIONS [PPM] ⊕ *ND = Not Detected* (100 200 300 400) / HEADSPACE COMBUSTIBLE VAPOUR CONCENTRATIONS [%LEL] □ *ND = Not Detected* (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp W Wl; 10 20 30 40)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		173.12						
0	Power Auger, 150 mm O.D. Solid Stem Augers	TOPSOIL		0.00	1A	50 DO	3	⊕ ND		Concrete
				172.80						
		Soft to hard, moist, reddish brown, SILTY CLAY, trace to some sand and gravel (TILL)		0.32	1B	50 DO		⊕ ND		
					2A			⊕ ND		
1				172.11						
		Highly weathered, thinly bedded, fine grained, reddish brown to grey, SHALE (BEDROCK)		1.01	2B	50 DO	82/ 0.18	⊕ ND		Hole Plug
										▽ June 17, 2011
					3	50 DO	50/ 0.15	⊕ ND		▽ June 3, 2011
2										Sand
					4	50 DO	50/ 0.01	⊕ ND		
3					5	50 DO	50/ 0.01	⊕ ND		
										Screen
4										
						50 DO	50/ 0	⊕ ND		
5										
6				167.01						
		END OF BOREHOLE		6.11	6	50 DO	50/ 0.01	⊕ ND		

NOTES:

1. Water level at 1.80 m below ground surface at completion of drilling.

2. No visual or olfactory evidence of environmental impact observed during drilling.

3. On June 17, 2011 water level measured at 1.28 m below ground surface.

7
8
9
10

DEPTH SCALE

1 : 50

Golder Associates

LOGGED: CL

CHECKED: JET

MIS-BHS 001 11-1186-0103.GPJ GAL-MIS.GDT 7/8/11 DD

PROJECT: 11-1186-0103

RECORD OF BOREHOLE: 11-12

SHEET 1 OF 1

LOCATION: N 4815337.30 ;E 602462.30

BORING DATE: June 3, 2011

DATUM: Geodetic

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80)	SHEAR STRENGTH Cu, kPa (nat V. +, rem V. ⊕; Q - ●, U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3})	WATER CONTENT PERCENT (Wp, W, Wl) (10 20 30 40)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		173.16									
0	Power Auger 150 mm O.D. Solid Stem Augers	TOPSOIL		0.00	1A	50 DO	3						
				172.80									
		Soft to hard, moist, greyish brown to reddish brown, SILTY CLAY, some gravel, trace sand (TILL)		0.36	1B								
1					2	50 DO	57						
				171.97									
		Highly weathered, thinly bedded, fine grained, reddish brown, SHALE, with limestone interbeds (BEDROCK)		1.19	3	50 DO	50/ 0.15						
2					4	50 DO	50/ 0.08						▽ June 3, 2011
3					5	50 DO	50/ 0.07						
					6	50 DO	50/ 0.01						
4													
					7	50 DO	50/ 0.05						
5													
				167.06									
6		END OF BOREHOLE		6.10									
		NOTES:											
		1. Water level at 2.07 m below ground surface at completion of drilling.											
7		2. No visual or olfactory evidence of environmental impact observed during drilling.											
8													
9													
10													

DEPTH SCALE

1 : 50

Golder Associates

LOGGED: CL

CHECKED: JET

MIS-BHS 001 11-1186-0103.GPJ GAL-MIS.GDT 7/8/11 DD

PROJECT: 11-1186-0103

RECORD OF BOREHOLE: 11-13

SHEET 1 OF 1

LOCATION: N 4815381.50 ;E 602621.10

BORING DATE: May 27, 2011

DATUM: Geodetic

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. + Q - ●, rem V. ⊕ U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp, W, Wl) (10 20 30 40)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		173.19							
0	Power Auger, 150 mm O.D. Solid Stem Augers	TOPSOIL		0.00 / 172.96	1A						
		Soft to hard, moist, mottled brown grey to reddish brown, SILTY CLAY, some sand and gravel, with oxidation seams (TILL)		0.23	1B	50 DO	5				
1					2	50 DO	36				
					3	50 DO	42			MH	
2				170.98							
		Highly weathered, thinly bedded, fine grained, reddish brown, SHALE, with limestone interbeds (BEDROCK)		2.21	4	50 DO	50/ 0.13				
3					5	50 DO	50/ 0.05				
4		Difficult drilling through limestone layer at 4.2 m			6	50 DO	50/ 0.01				
5											
6				167.08	7	50 DO	50/ 0.01				
		END OF BOREHOLE		6.11							
7		NOTES: 1. Borehole open and dry at completion of drilling. 2. No visual or olfactory evidence of environmental impact observed during drilling.									
8											
9											
10											

MIS-BHS 001 11-1186-0103.GPJ GAL-MIS.GDT 7/8/11 DD

DEPTH SCALE

1 : 50

Golder Associates

LOGGED: CL

CHECKED: JET

PROJECT: 11-1186-0103

RECORD OF BOREHOLE: 11-14

SHEET 1 OF 1

LOCATION: N 4815328.60 ;E 602676.10

BORING DATE: May 27, 2011

DATUM: Geodetic

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80)	SHEAR STRENGTH Cu, kPa (nat V. +, rem V. ⊕; Q - ●, U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3})	WATER CONTENT PERCENT (Wp, W, Wl) (10 20 30 40)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		171.94									
0	Power Auger 150 mm O.D. Solid Stem Augers	TOPSOIL		0.00	1A								
				171.62		50 DO	4						
		Firm to hard, moist, mottled brown to reddish brown, SILTY CLAY, some to trace sand and gravel (TILL)		0.32	1B								
1					2	50 DO	30						▽ May 27, 2011
				170.21	3A	50 DO	88/ 0.08						
		Highly weathered, thinly bedded, fine grained, reddish brown, SHALE, with limestone interbeds (BEDROCK)		1.73	3B								
2					4	50 DO	50/ 0.02						
3					5	50 DO	50/ 0.02						
4					6	50 DO	50/ 0.01						
					7	50 DO	50/ 0.02						
5													
6				165.84	8	50 DO	50/ 0						
		END OF BOREHOLE		6.10									
7		NOTES: 1. Water level at 0.66 m below ground surface at completion of drilling. 2. No visual or olfactory evidence of environmental impact observed during drilling.											
8													
9													
10													

DEPTH SCALE

1 : 50

Golder Associates

LOGGED: CL

CHECKED: JET

MIS-BHS 001 11-1186-0103.GPJ GAL-MIS.GDT 7/8/11 DD

PROJECT: 11-1186-0103

RECORD OF BOREHOLE: 11-15

SHEET 1 OF 2

LOCATION: N 4815216.10 ;E 602584.50

BORING DATE: June 2, 2011

DATUM: Geodetic

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80)	SHEAR STRENGTH Cu, kPa (nat V. +, rem V. ⊕, Q - ●, U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3})	WATER CONTENT PERCENT (Wp, W, Wl) (10 20 30 40)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		171.50									
0	Power Auger 150 mm O.D. Solid Stem Augers	TOPSOIL		0.00	1A	50 DO	9						
				171.20									
		Stiff to hard, moist, reddish brown, SILTY CLAY, trace to some sand and gravel (TILL)		0.30	2A								
1					2	50 DO	33						June 17, 2011
				170.05									June 17, 2011
		Highly weathered, thinly bedded, fine grained, reddish brown, SHALE, with limestone interbeds (BEDROCK)		1.45	3	50 DO	50/ 0.13						Hole Plug
2					4	50 DO	50/ 0.13						
3					5	50 DO	50/ 0.02						Sand
					6	50 DO	50/ 0.07						June 2, 2011
4		Difficult drilling trough limestone layer at 4.2 m											Screen
					7	50 DO	50/ 0.01						
5													
6					8	50 DO	50/ 0.13						Hole Plug
7													
8													Sand
9					9	50 DO	50/ 0.01						Screen
10		*CONTINUED NEXT PAGE*											

DEPTH SCALE

1 : 50

Golder Associates

LOGGED: CL

CHECKED: JET

MIS-BHS 001 11-1186-0103.GPJ GAL-MIS.GDT 7/8/11 DD

PROJECT: 11-1186-0103

RECORD OF BOREHOLE: 11-15

SHEET 2 OF 2

LOCATION: N 4815216.10 ;E 602584.50

BORING DATE: June 2, 2011

DATUM: Geodetic

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80)	SHEAR STRENGTH Cu, kPa (nat V. +, rem V. ⊕, Q - ●, U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3})	WATER CONTENT PERCENT (Wp, W, Wl) (10 20 30 40)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
10		*--- CONTINUED FROM PREVIOUS PAGE ---*											
				161.20	10	50 DO	50/ 0.13						
		END OF BOREHOLE		10.30									
11		NOTES: 1. Water level in open borehole at 3.88 m below ground surface at completion of drilling. 2. No visual or olfactory evidence of environmental impact observed during drilling. 3. On June 17, 2011 water level in the shallow well measured at 0.85 m below ground surface. 4. On June 17, 2011 water level in the deep well measured at 0.99 m below ground surface.											
12													
13													
14													
15													
16													
17													
18													
19													
20													

DEPTH SCALE

1 : 50

Golder Associates

LOGGED: CL

CHECKED: JET

MIS-BHS 001 11-1186-0103.GPJ GAL-MIS.GDT 7/8/11 DD

PROJECT: 11-1186-0103

RECORD OF BOREHOLE: 11-16

SHEET 1 OF 1

LOCATION: N 4815140.10 ;E 602661.80

BORING DATE: May 27, 2011

DATUM: Geodetic

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. + Q - ● / rem V. ⊕ U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp W Wl) (10 20 30 40)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		171.73							
0	Power Auger, 150 mm O.D. Solid Stem Augers	TOPSOIL		0.00							
				171.50	1A	50 DO	3				
		Soft to hard, moist, mottled brown grey to reddish brown, SILTY CLAY, trace to some sand and gravel, with shale fragments (TILL)		0.23	1B						
1					2	50 DO	28				
					3A	50 DO	42				
				169.82							
2		Highly weathered, thinly bedded, fine grained, reddish brown, SHALE, with limestone interbeds (BEDROCK)		1.91	3B						
					4	50 DO	50/ 0.07				
3					5	50 DO	50/ 0.07				
4											▽ May 27, 2011
					6	50 DO	50/ 0.01				
5											
6				165.62	7	50 DO	50/ 0.01				
		END OF BOREHOLE		6.11							
7		NOTES: 1. Water level at 4.40 m below ground surface at completion of drilling. 2. No visual or olfactory evidence of environmental impact observed during drilling.									
8											
9											
10											

DEPTH SCALE

1 : 50

Golder Associates

LOGGED: CL

CHECKED: JET

MIS-BHS 001 11-1186-0103.GPJ GAL-MIS.GDT 7/8/11 DD

PROJECT: 11-1186-0103

RECORD OF BOREHOLE: 11-17

SHEET 1 OF 1

LOCATION: N 4815226.50 ;E 602778.70

BORING DATE: June 3, 2011

DATUM: Geodetic

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m	HEADSPACE COMBUSTIBLE VAPOUR CONCENTRATIONS [PPM] ⊕ *ND = Not Detected* (100 200 300 400) / HEADSPACE COMBUSTIBLE VAPOUR CONCENTRATIONS [%LEL] □ *ND = Not Detected* (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT Wp W Wl (10 20 30 40)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		172.64						
0	Power Auger 150 mm O.D. Solid Stem Augers	TOPSOIL		0.00	1A	50 DO	4	⊕ 4 ND		
				172.34						
		Firm to hard, moist, mottled brown to brown grey, SILTY CLAY, trace to some sand and gravel (TILL)		0.30	1B	50 DO		⊕ ND		
1					2	50 DO	19	⊕ ND		
2					3	50 DO	20	⊕ ND		
					4	50 DO	53	⊕ ND		
3				169.54	5	50 DO	50/0.07	⊕ ND		▽ June 3, 2011
		Highly weathered, thinly bedded, fine grained, reddish brown, SHALE, with limestone interbeds (BEDROCK)		3.10						
4					6	50 DO	50/0.05	⊕ ND		
					7	50 DO	50/0.05			
5										
6				166.52	8	50 DO	50/0.02	⊕ ND		
		END OF BOREHOLE		6.12						
7		NOTES: 1. Water level at 3.08 m below ground surface at completion of drilling. 2. No visual or olfactory evidence of environmental impact observed during drilling.								
8										
9										
10										

DEPTH SCALE

1 : 50

Golder Associates

LOGGED: CL

CHECKED: JET

MIS-BHS 001 11-1186-0103.GPJ GAL-MIS.GDT 7/8/11 DD

PROJECT: 11-1186-0103

RECORD OF BOREHOLE: 11-18

SHEET 1 OF 1

LOCATION: N 4815048.80 ;E 602742.50

BORING DATE: June 2, 2011

DATUM: Geodetic

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	HEADSPACE COMBUSTIBLE VAPOUR CONCENTRATIONS [PPM] ⊕ *ND = Not Detected* (100 200 300 400) / HEADSPACE COMBUSTIBLE VAPOUR CONCENTRATIONS [%LEL] □ *ND = Not Detected* (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp W Wl; 10 20 30 40)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		169.62						
0	Power Auger, 150 mm O.D. Solid Stem Augers	TOPSOIL		0.00 / 169.37	1A	50 DO	11	⊕ ND		Hole Plug, June 17, 2011
		Stiff to very stiff, moist, reddish brown, SILTY CLAY, trace sand and gravel (TILL)		0.25 / 168.61	1B			⊕ ND		Sand
1					2A	50 DO	68	⊕ ND		
		Highly weathered, thinly bedded, fine grained, reddish brown, SHALE, with limestone interbeds (BEDROCK)		1.01	2B			⊕		
					3	50 DO	50/0.10	⊕ ND		
2					4	50 DO	50/0.02	⊕ ND		Screen
3					5	50 DO	50/0.07	⊕ ND		June 2, 2011
4										
5										
				164.23	6	50 DO	50/0.05	⊕ ND		
		END OF BOREHOLE		5.39						
6		NOTES: 1. Water level at 3.18 m below ground surface at completion of drilling. 2. No visual or olfactory evidence of environmental impact observed during drilling. 3. On June 17, 2011 water level measured at 0.42 m below ground surface.								
7										
8										
9										
10										

DEPTH SCALE

1 : 50

Golder Associates

LOGGED: CL

CHECKED: JET

MIS-BHS 001 11-1186-0103.GPJ GAL-MIS.GDT 7/8/11 DD

PROJECT: 11-1186-0103

RECORD OF BOREHOLE: 11-19

SHEET 1 OF 2

LOCATION: N 4814994.00 ;E 602808.30

BORING DATE: June 2, 2011

DATUM: Geodetic

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. + Q - ● / rem V. ⊕ U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp W Wl) (10 20 30 40)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		171.58							
0	Power Auger; 150 mm O.D. Solid Stem Augers	TOPSOIL		0.00 / 171.33	1A						
		Stiff to hard, moist, reddish brown, SILTY CLAY, trace to some sand and gravel (TILL)		0.25	1B	50 DO	10				Cuttings
1					2	50 DO	9				
2					3	50 DO	24			MH	
					4	50 DO					Hole Plug June 17, 2011
				168.71							
3		Highly weathered, thinly bedded, fine grained, reddish brown, SHALE, with limestone interbeds (BEDROCK)		2.87	5	50 DO	50/ 0.10				June 17, 2011
4											Sand
					6	50 DO	50/ 0.02				
5											Screen
											June 2, 2011
6					7	50 DO	50/ 0.05				
7											Hole Plug
8											
9					8	50 DO	50/ 0.02				Sand
											Screen
10		*CONTINUED NEXT PAGE*									

DEPTH SCALE

1 : 50

Golder Associates

LOGGED: CL

CHECKED: JET

MIS-BHS 001 11-1186-0103.GPJ GAL-MIS.GDT 7/8/11 DD

PROJECT: 11-1186-0103

RECORD OF BOREHOLE: 11-19

SHEET 2 OF 2

LOCATION: N 4814994.00 ;E 602808.30

BORING DATE: June 2, 2011

DATUM: Geodetic

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. + Q - ● / rem V. ⊕ U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp, W, Wl) (10 20 30 40)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
10		*--- CONTINUED FROM PREVIOUS PAGE ---*									
	Power Auger	Highly weathered, thinly bedded, fine grained, reddish brown, SHALE, with limestone interbeds (BEDROCK)		160.88	9	50 DO	50/.02		W ○		Screen
		END OF BOREHOLE		10.70							
11		NOTES:									
		1. Water level in open borehole at 5.45 m below ground surface at completion of drilling.									
12		2. No visual or olfactory evidence of environmental impact observed during drilling.									
		3. On June 17, 2011 water level in the shallow well measured at 2.61 m below ground surface.									
13		4. On June 17, 2011 water level in the deep well measured at 3.14 m below ground surface.									
14											
15											
16											
17											
18											
19											
20											

DEPTH SCALE

1 : 50

Golder Associates

LOGGED: CL

CHECKED: JET

MIS-BHS 001 11-1186-0103.GPJ GAL-MIS.GDT 7/8/11 DD

PROJECT: 11-1186-0103

RECORD OF BOREHOLE: 11-20

SHEET 1 OF 1

LOCATION: N 4815098.60 ;E 602906.70

BORING DATE: May 27, 2011

DATUM: Geodetic

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80)	SHEAR STRENGTH Cu, kPa (nat V. + Q - ● / rem V. ⊕ U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3})	WATER CONTENT PERCENT (Wp — W — Wl) (10 20 30 40)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		171.32									
0	Power Auger 150 mm O.D. Solid Stem Augers	TOPSOIL		0.00	1A	50 DO	5						
				170.81									
		Firm to hard, moist to wet, mottled brown grey to reddish brown, SILTY CLAY, some to trace sand and gravel (TILL)		0.51	1B								
1					2	50 DO	10						▽ May 27, 2011
					3	50 DO	50/ 0.12						
				169.52									
2		Highly weathered, thinly bedded, fine grained, reddish brown, SHALE, with limestone interbeds (BEDROCK)		1.80	4	50 DO	50/ 0.2						
3					5	50 DO	50/ 0.10						
4													
					6	50 DO	50/ 0.07						
5													
6				165.22									
		END OF BOREHOLE		6.10									
7		NOTES: 1. Water level at 1.24 m below ground surface at completion of drilling. 2. No visual or olfactory evidence of environmental impact observed during drilling.											
8													
9													
10													

DEPTH SCALE

1 : 50

Golder Associates

LOGGED: CL

CHECKED: JET

MIS-BHS 001 11-1186-0103.GPJ GAL-MIS.GDT 7/8/11 DD

PROJECT: 11-1186-0103

RECORD OF BOREHOLE: 11-21

SHEET 1 OF 1

LOCATION: N 4814998.10 ;E 602834.30

BORING DATE: June 3, 2011

DATUM: Geodetic

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES BLOWS/0.3m	HEADSPACE COMBUSTIBLE VAPOUR CONCENTRATIONS [PPM] ⊕ *ND = Not Detected* (100 200 300 400) / HEADSPACE COMBUSTIBLE VAPOUR CONCENTRATIONS [%LEL] □ *ND = Not Detected* (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT Wp W Wl (10 20 30 40)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		171.31							
0	Power Auger 150 mm O.D. Solid Stem Augers	TOPSOIL		0.00 / 171.06	1A	50 DO	3	⊕ ND			
		Soft to hard, moist, brown to reddish brown, SILTY CLAY, trace to some sand and gravel, with shale fragments (TILL)		0.25	1B	50 DO		⊕ ND			
1					2	50 DO	16	⊕ ND			
2					3	50 DO	32	⊕ ND			
					4	50 DO	24	⊕ ND			
3				168.34							
		Highly weathered, thinly bedded, fine grained, reddish brown, SHALE, with limestone interbeds (BEDROCK)		2.97	5	50 DO	50/0.07	⊕ ND			
4					6	50 DO	50/0.02	⊕ ND			
				166.74	7	50 DO	50/0				
		END OF BOREHOLE		4.57							
5		NOTES:									
		1. Borehole open and dry at completion of drilling.									
		2. No visual or olfactory evidence of environmental impact observed during drilling.									
6											
7											
8											
9											
10											

DEPTH SCALE

1 : 50

Golder Associates

LOGGED: CL

CHECKED: JET

MIS-BHS 001 11-1186-0103.GPJ GAL-MIS.GDT 7/8/11 DD

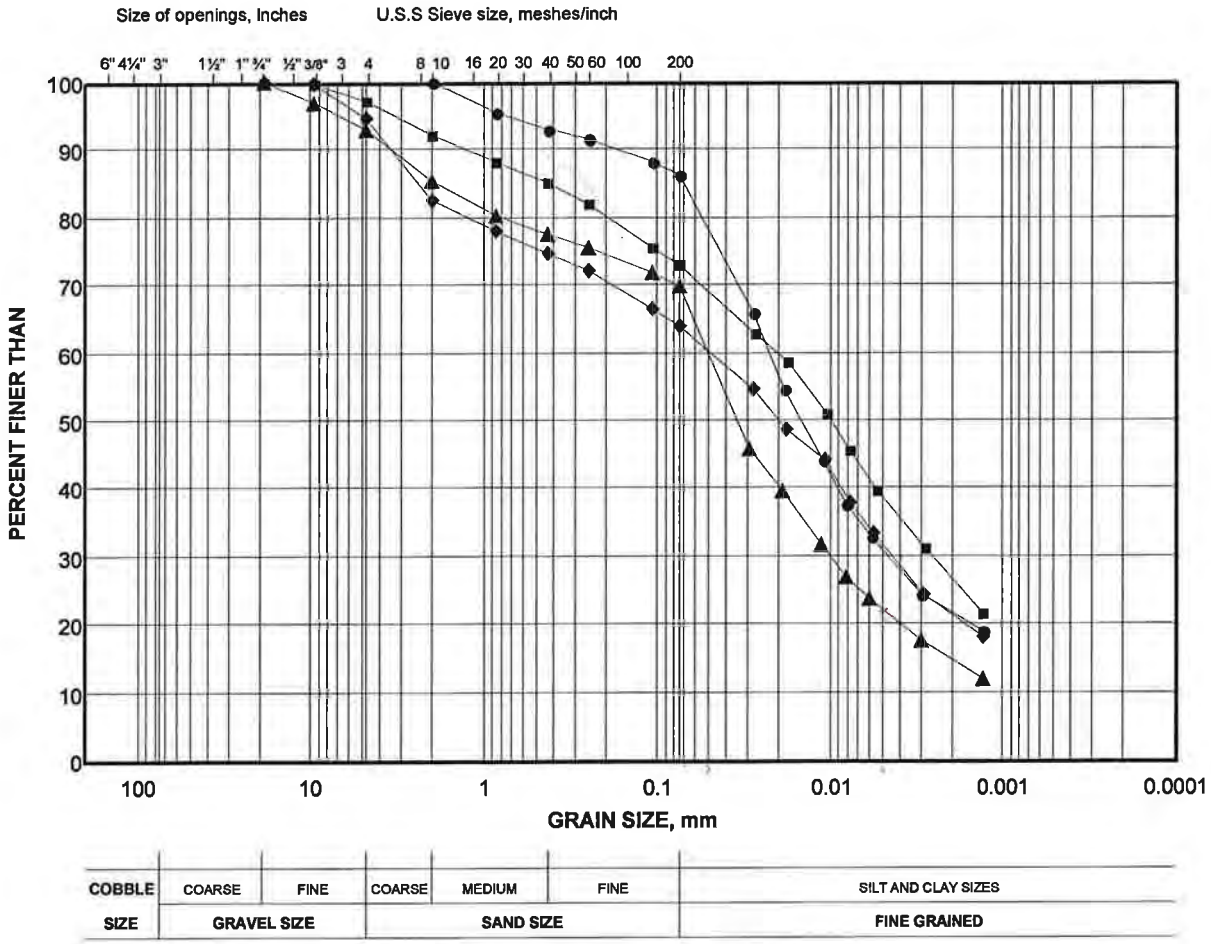
APPENDIX E

Grain Size Distribution Curves

GRAIN SIZE DISTRIBUTION

Silty Clay Till

FIGURE 3



LEGEND

SYMBOL	BOREHOLE	SAMPLE	DEPTH(m)
●	11-10	2B	1.20 - 1.40
■	11-19	3	
◆	11-13	3	1.50 - 2.10
▲	11-5	3	

Project Number: 11-1186-0103

Checked By: JL

Golder Associates

Date: 05-Jul-11

APPENDIX F

Monitoring Well Water Work Sheets, BH11-11, BH11-18

MONITORING WELL WATER WORK SHEET

Project No. 11-1186-0103 Well Identification BH11-11 Date June 8/11

Short Title 6th Line DEVELOPMENT

WATER LEVEL INFORMATION

Depth to water from top of casing	1.565 m.	Depth to bottom of well	5.91 m.
Stick-Up	0.91 m.	Stick-Up	0.91 m.
Water Level below ground surface	0.655 m.	Bottom below ground surface	5 m.
Done By	LAURA ELMHURST	Date	June 8/11
		Time	14:50

WELL DEVELOPMENT NOTES

FIRST DEVELOPMENT

Water Level below stick-up	2.185 m	Date	June 17/11	Time	14.00
Volume of Water pumped	7 l	Date	June 17/11	Time	1555
Comments Odours	Y / (N)	pH	7.16	Colour	Lt. BROWN
Sheen	Y / (N)	Temp	11.2.	Clarity	CLOUDY
Staining	Y / (N)	Conductivity	0.72 mS	Other	

Done By KYLE SCHEPANOW PURGED DRY

SECOND DEVELOPMENT

Water Level below stick-up	m.	Date		Time	
Volume of Water pumped	l	Date		Time	
Comments Odours	Y / N	pH		Colour	
Sheen	Y / N	Temp		Clarity	
Staining	Y / N	Conductivity		Other	

Done By

THIRD DEVELOPMENT

Water Level below stick-up	m	Date		Time	
Volume of Water pumped	l	Date		Time	
Comments Odours	Y / N	pH		Colour	
Sheen	Y / N	Temp		Clarity	
Staining	Y / N	Conductivity		Other	

Done By

SAMPLE INFORMATION

Water Level below stick-up	2.375 m	Date	June 24/11	Time	14 00
Comments		Sample Date	June 24/11	Time	14:20
		Sample Identification	BH11-11		
		Methane Gas Reading	/	% LEL / % GAS	

Done By KYLE SCHEPANOW

Duplicate taken from this well called DUP1

MONITORING WELL WATER WORK SHEET

Project No. 11-1186-0103 Well Identification BH11-18 Date JUNE 8 / 11

Short Title 6th LINE DEVELOPMENT

WATER LEVEL INFORMATION

Depth to water from top of casing	1.225 m.	Depth to bottom of well	4.8 m.
Stick-Up	0.855 m.	Stick-Up	0.855 m.
Water Level below ground surface	0.77 m	Bottom below ground surface	4.43 m.
Done By	LAURA ELMHURST	Date	June 8/11
		Time	15:00

WELL DEVELOPMENT NOTES

FIRST DEVELOPMENT

Water Level below stick-up	1.27 m.	Date	June 17/11	Time	13:56
Volume of Water pumped	8 l.	Date	June 17/11	Time	1400
Comments Odours	Y / (N)	pH	7.36	Colour	LT BROWN
Sheen	Y / (N)	Temp	11.8°C	Clarity	SLIGHTLY CLOUDY
Staining	Y / (N)	Conductivity	0.85 mS	Other	

Done By KYLE SCHEPANOW WELL PURGED DRY

SECOND DEVELOPMENT

Water Level below stick-up	m.	Date		Time	
Volume of Water pumped	l.	Date		Time	
Comments Odours	Y / N	pH		Colour	
Sheen	Y / N	Temp		Clarity	
Staining	Y / N	Conductivity		Other	

Done By

THIRD DEVELOPMENT

Water Level below stick-up	m.	Date		Time	
Volume of Water pumped	l.	Date		Time	
Comments Odours	Y / N	pH		Colour	
Sheen	Y / N	Temp		Clarity	
Staining	Y / N	Conductivity		Other	

Done By

SAMPLE INFORMATION

Water Level below stick-up	m	Date		Time	
Comments		Sample Date	June 24/11	Time	13:50
WATER LEVEL NOT MEASURED PRIOR TO SAMPLE COLLECTION		Sample Identification	BH11-18		
		Methane Gas Reading	/	% LEL / % GAS	

Done By KYLE SCHEPANOW

APPENDIX G

Laboratory Certificates of Analysis (Soil)

AGAT Laboratories

5835 COOPERS AVENUE
MISSISSAUGA, ONTARIO
CANADA L4Z 1Y2
TEL (905)712-5100
FAX (905)712-5122
http://www.agatlabs.com

CLIENT NAME: GOLDER ASSOCIATES LTD.
2390 ARGENTIA ROAD
MISSISSAUGA, ON L5N5Z7

ATTENTION TO: Peter Mann

PROJECT NO: 11-1186-0103

AGAT WORK ORDER: 11T499778

SOIL ANALYSIS REVIEWED BY: Anthony Dapaah, PhD (Chem), Inorganic Lab Manager

TRACE ORGANICS REVIEWED BY: Jacky Takeuchi, BScH (Chem Eng), BSc (Bio), C.Chem, Laboratory Manager

WATER ANALYSIS REVIEWED BY: Anthony Dapaah, PhD (Chem), Inorganic Lab Manager

DATE REPORTED: Jun 16, 2011

PAGES (INCLUDING COVER): 17

VERSION*: 1

Should you require any information regarding this analysis please contact your client services representative at (905) 712 5100, or at 1-800-856-6261

*NOTES

VERSION 1:June 27, 2011: This a revision a previous report issued on June 16, 2011.

All samples will be disposed of within 30 days following analysis. Please contact the lab if you require additional sample storage time.

AGAT Laboratories

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http://www.agatlabs.com

Certificate of Analysis

AGAT WORK ORDER: 11T499778
PROJECT NO: 11-1186-0103

CLIENT NAME: GOLDER ASSOCIATES LTD.

ATTENTION TO: Peter Mann

O. Reg. 153 Metals & Inorganics in Soil

DATE SAMPLED: Jun 02, 2011 | DATE RECEIVED: Jun 08, 2011 | DATE REPORTED: Jun 16, 2011 | SAMPLE TYPE: Soil

Parameter	Unit	G / S	RDL	Fill 11-3 SA1 2458665	DUPE 1 2458666
Antimony	µg/g	1.3	0.8	<0.8	<0.8
Arsenic	µg/g	18	1	6	5
Barium	µg/g	220	2	96	71
Beryllium	µg/g	2.5	0.5	0.9	0.8
Boron	µg/g	36	5	7	9
Boron (Hot Water Extractable)	µg/g	1.5	0.10	0.47	0.49
Cadmium	µg/g	1.2	0.5	<0.5	<0.5
Chromium	µg/g	70	2	24	23
Cobalt	µg/g	22	0.5	12.9	12.1
Copper	µg/g	92	1	29	45
Lead	µg/g	120	1	22	27
Molybdenum	µg/g	2	0.5	0.5	0.5
Nickel	µg/g	82	1	26	42
Selenium	µg/g	1.5	0.4	<0.4	0.5
Silver	µg/g	0.5	0.2	<0.2	0.2
Thallium	µg/g	1	0.4	<0.4	<0.4
Uranium	ug/g	2.5	0.5	0.6	0.6
Vanadium	µg/g	86	1	33	30
Zinc	µg/g	290	5	81	82
Chromium, Hexavalent	µg/g	0.66	0.2	<0.2	<0.2
Cyanide, Free	µg/g	0.051	0.05	<0.05	<0.05
Mercury	µg/g	0.27	0.01	0.06	0.09
Electrical Conductivity (2:1)	mS/cm	0.7	0.002	0.220	0.192
Sodium Adsorption Ratio (2:1)	N/A	5	N/A	0.176	0.043
pH, 2:1 CaCl2 Extraction	pH Units			7.23	7.38

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard: Refers to T8 (ALL) - New

2458665-2458666 EC & SAR were determined on the DI water extract obtained from the 2:1 leaching procedure (2 parts DI water:1 part soil). pH was determined on the 0.01M CaCl2 extract prepared at 2:1 ratio.

Certified By:

AGAT Laboratories

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Certificate of Analysis

AGAT WORK ORDER: 11T499778
PROJECT NO: 11-1186-0103

CLIENT NAME: GOLDER ASSOCIATES LTD.

ATTENTION TO: Peter Mann

O. Reg. 153 Metals & Inorganics in Soil (Revised)

DATE SAMPLED: Jun 02, 2011 | DATE RECEIVED: Jun 08, 2011 | DATE REPORTED: Jun 16, 2011 | SAMPLE TYPE: Soil

Parameter	Unit	G / S	RDL	Fill 11-1 SA1 2458663
Antimony	µg/g	1.3	0.8	<0.8
Arsenic	µg/g	18	1	5
Barium	µg/g	220	2	70
Beryllium	µg/g	2.5	0.5	0.7
Boron	µg/g	36	5	8
Boron (Hot Water Extractable)	µg/g	1.5	0.10	0.52
Cadmium	µg/g	1.2	0.5	<0.5
Chromium	µg/g	70	2	22
Cobalt	µg/g	22	0.5	11.6
Copper	µg/g	92	1	38
Lead	µg/g	120	1	20
Molybdenum	µg/g	2	0.5	0.5
Nickel	µg/g	82	1	38
Selenium	µg/g	1.5	0.4	<0.4
Silver	µg/g	0.5	0.2	0.2
Thallium	µg/g	1	0.4	<0.4
Uranium	ug/g	2.5	0.5	0.5
Vanadium	µg/g	86	1	29
Zinc	µg/g	290	5	83
Chromium, Hexavalent	µg/g	0.66	0.2	<0.2
Cyanide, Free	µg/g	0.051	0.05	<0.05
Mercury	µg/g	0.27	0.01	0.07
Electrical Conductivity (2:1)	mS/cm	0.7	0.002	0.209
Sodium Adsorption Ratio (2:1)	N/A	5	N/A	0.046
pH, 2:1 CaCl2 Extraction	pH Units			7.41

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard: Refers to T8 (ALL) - New

2458663 EC & SAR were determined on the DI water extract obtained from the 2:1 leaching procedure (2 parts DI water:1 part soil). pH was determined on the 0.01M CaCl2 extract prepared at 2:1 ratio.

ISQ: Insufficient Sample Quantity.

Cr(VI) Analysis: Due to insufficient sample 1.0 g aliquot was used for the analysis. The RDL has been adjusted accordingly.

June 27, 2011: This is a revision of a previous report issued on June 16, 2011. pH and CrVI Analysis: Client submitted extra sample for the analysis of pH and CrVI.

Certified By: Tony Yaash

AGAT Laboratories

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Certificate of Analysis

AGAT WORK ORDER: 11T499778
PROJECT NO: 11-1186-0103

CLIENT NAME: GOLDER ASSOCIATES LTD.

ATTENTION TO: Peter Mann

O. Reg. 153(511) - OC Pesticides (Soil)

DATE SAMPLED: Jun 02, 2011 | DATE RECEIVED: Jun 08, 2011 | DATE REPORTED: Jun 16, 2011 | SAMPLE TYPE: Soil

Parameter	Unit	G / S	RDL	BH 11-18 SA1A 2458646	Dup 1A 2458658	BH 11-2 SA1A 2458659	BH 11-5 SA1A 2458660	BH 11-11 SA1A 2458661	BH 11-17 SA1A 2458662	Fill 11-3 SA1 2458665
gamma-BHC (Lindane)	µg/g	0.01	0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Heptachlor	µg/g	0.05	0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Aldrin	µg/g	0.05	0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Heptachlor Epoxide	µg/g	0.05	0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Total Endosulfan (I + II)	µg/g	0.04	0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Chlordane (alpha + gamma)	µg/g	0.05	0.007	<0.007	<0.007	<0.007	<0.007	<0.007	<0.007	<0.007
DDE (op' + pp')	µg/g	0.05	0.007	<0.007	<0.007	<0.007	<0.007	<0.007	<0.007	<0.007
DDD (op' + pp')	µg/g	0.05	0.007	<0.007	<0.007	<0.007	<0.007	<0.007	<0.007	<0.007
DDT (op' + pp')	µg/g		0.007	<0.007	<0.007	<0.007	<0.007	<0.007	<0.007	<0.007
Dieldrin	µg/g	0.05	0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Endrin	µg/g	0.04	0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Methoxychlor	µg/g	0.05	0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Hexachlorobenzene	µg/g	0.02	0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Hexachlorobutadiene	µg/g	0.01	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Hexachloroethane	µg/g	0.01	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Moisture Content	%		0.1	19.6	23.1	23.8	18.5	21.4	21.2	14.0
Surrogate	Unit	Acceptable Limits								
TCMX	%	50-140		99	60	81	60	62	102	62
Decachlorobiphenyl	%	60-130		94	77	90	80	79	109	85

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard: Refers to T8 (ALL) - New
2458646-2458665 Results are based on the dry weight of the soil.

Certified By: Jordy Takewaki

AGAT Laboratories

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Certificate of Analysis

AGAT WORK ORDER: 11T499778
PROJECT NO: 11-1186-0103

CLIENT NAME: GOLDER ASSOCIATES LTD.

ATTENTION TO: Peter Mann

O. Reg. 153(511) - OC Pesticides (Water)

DATE SAMPLED: Jun 02, 2011 | DATE RECEIVED: Jun 08, 2011 | DATE REPORTED: Jun 16, 2011 | SAMPLE TYPE: Water

Parameter	Unit	G / S	RDL	Equip. Blank 2458673
gamma-BHC (Lindane)	µg/L		0.01	<0.01
Heptachlor	µg/L	0.038	0.01	<0.01
Aldrin	µg/L	0.35	0.01	<0.01
Heptachlor Epoxide	µg/L	0.038	0.01	<0.01
Total Endosulfan (I + II)	µg/L	0.56	0.05	<0.05
Chlordane (alpha + gamma)	µg/L	0.06	0.04	<0.04
DDE (op' + pp')	µg/L		0.01	<0.01
DDD (op' + pp')	µg/L	1.8	0.05	<0.05
DDT (op' + pp')	µg/L		0.04	<0.04
Dieldrin	µg/L	0.35	0.02	<0.02
Endrin	µg/L	0.36	0.05	<0.05
Methoxychlor	µg/L	0.3	0.04	<0.04
Hexachlorobenzene	ug/L	1	0.01	<0.01
Hexachlorobutadiene	ug/L	0.44	0.01	<0.01
Hexachloroethane	ug/L	2.1	0.01	<0.01
Surrogate	**Unit**	**Acceptable Limits**		
TCMX	%	50-140		90
Decachlorobiphenyl	%	60-140		95

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard: Refers to T8 (ALL-GW) - NEW

Certified By: Jordy Takewaki

AGAT Laboratories

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Certificate of Analysis

AGAT WORK ORDER: 11T499778
PROJECT NO: 11-1186-0103

CLIENT NAME: GOLDER ASSOCIATES LTD.

ATTENTION TO: Peter Mann

O. Reg. 153(511) - PCBs (Soil)

DATE SAMPLED: Jun 02, 2011 | DATE RECEIVED: Jun 08, 2011 | DATE REPORTED: Jun 16, 2011 | SAMPLE TYPE: Soil

Parameter	Unit	G / S	RDL	BH 11-18 SA1A 2458646	Dup 1A 2458658	BH 11-2 SA1A 2458659	BH 11-5 SA1A 2458660	BH 11-11 SA1A 2458661	BH 11-17 SA1A 2458662	Fill 11-3 SA1 2458665
Aroclor 1242	µg/g		0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1248	µg/g		0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1254	µg/g		0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1260	µg/g		0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
PCBs (total)	µg/g	0.3	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Surrogate	Unit	Acceptable Limits								
Decachlorobiphenyl	%	60-140		112	110	90	80	79	109	85

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard: Refers to T8 (ALL) - New
2458646-2458665 Results are based on the dry weight of soil extracted.

Certified By: Jordy Takewaki

AGAT Laboratories

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TEL (905)712-5100
FAX (905)712-5122
http://www.agatlabs.com

Certificate of Analysis

AGAT WORK ORDER: 11T499778

PROJECT NO: 11-1186-0103

CLIENT NAME: GOLDER ASSOCIATES LTD.

ATTENTION TO: Peter Mann

Triazine Pesticides [soil]

DATE SAMPLED: Jun 02, 2011 | DATE RECEIVED: Jun 08, 2011 | DATE REPORTED: Jun 16, 2011 | SAMPLE TYPE: Soil

Parameter	Unit	G / S	RDL	BH 11-18 SA1A 2458646	Dup 1A 2458658	BH 11-2 SA1A 2458659	BH 11-5 SA1A 2458660	BH 11-11 SA1A 2458661	BH 11-17 SA1A 2458662	Fill 11-3 SA1 2458665
Trifluralin	µg/g		0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Simazine	µg/g		0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Atrazine	µg/g		0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Metribuzin	µg/g		0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Alachlor	µg/g		0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Prometryne	µg/g		0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Metolachlor	µg/g		0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Cyanazine	µg/g		0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard

2458646-2458665 Results are based on the dry weight of the soil.
Results relate only to the items tested.

Certified By: Jordy Takewaki

AGAT Laboratories

Certificate of Analysis

AGAT WORK ORDER: 11T499778

PROJECT NO: 11-1186-0103

5835 COOPERS AVENUE
MISSISSAUGA, ONTARIO
CANADA L4Z 1Y2
TEL (905)712-5100
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http://www.agatlabs.com

CLIENT NAME: GOLDER ASSOCIATES LTD.

ATTENTION TO: Peter Mann

Triazine Pesticides [water]

DATE SAMPLED: Jun 02, 2011 | DATE RECEIVED: Jun 08, 2011 | DATE REPORTED: Jun 16, 2011 | SAMPLE TYPE: Water

Parameter	Unit	G / S	RDL	Equip. Blank 2458673
Trifluralin	µg/L		1.0	<1.0
Simazine	µg/L		1.0	<1.0
Atrazine	µg/L		0.5	<0.5
Metribuzin	µg/L		0.25	<0.25
Prometryne	µg/L		0.25	<0.25
Metolachlor	µg/L		0.11	<0.11
Alachlor	µg/L		0.5	<0.5
Cyanazine	µg/L		1.0	<1.0

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard

2458673 Results relate only to the items tested.

Certified By: Jordy Takewaki

AGAT Laboratories

5835 COOPERS AVENUE
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CANADA L4Z 1Y2
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FAX (905)712-5122
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Certificate of Analysis

AGAT WORK ORDER: 11T499778
PROJECT NO: 11-1186-0103

CLIENT NAME: GOLDER ASSOCIATES LTD.

ATTENTION TO: Peter Mann

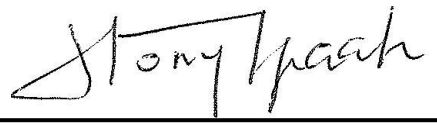
O. Reg. 153 - Metals & Inorganics in Water

DATE SAMPLED: Jun 02, 2011 | DATE RECEIVED: Jun 08, 2011 | DATE REPORTED: Jun 16, 2011 | SAMPLE TYPE: Water

Parameter	Unit	G / S	RDL	Equip. Blank 2458673
Antimony	µg/L	6	0.5	<0.5
Arsenic	µg/L	25	1.0	<1.0
Barium	µg/L	1000	2.0	<2.0
Beryllium	µg/L	4	0.5	<0.5
Boron	µg/L	5000	10.0	<10.0
Cadmium	µg/L	2.1	0.2	<0.2
Chromium	µg/L	50	2.0	<2.0
Cobalt	µg/L	3.8	0.5	<0.5
Copper	µg/L	69	1.0	<1.0
Lead	µg/L	10	0.5	<0.5
Molybdenum	µg/L	70	0.5	<0.5
Nickel	µg/L	100	1.0	<1.0
Selenium	µg/L	10	1.0	<1.0
Silver	µg/L	1.2	0.2	<0.2
Thallium	µg/L	2	0.3	<0.3
Uranium	µg/L	20	0.5	<0.5
Vanadium	µg/L	6.2	0.4	<0.4
Zinc	µg/L	890	5.0	101
Mercury	µg/L	0.29	0.02	<0.02
Chromium VI	µg/L	25	5	<5
Cyanide, Free	µg/L	52	2	3
Sodium	µg/L	490000	500	<500
Chloride	µg/L	790000	100	<100
Nitrate as N	µg/L		50	<50
Nitrite as N	µg/L		50	<50
Electrical Conductivity	uS/cm		2	<2
pH	pH Units		NA	6.14

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard: Refers to T8 (ALL-GW) - NEW

Certified By:



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Quality Assurance

CLIENT NAME: GOLDER ASSOCIATES LTD.

AGAT WORK ORDER: 11T499778

PROJECT NO: 11-1186-0103

ATTENTION TO: Peter Mann

Soil Analysis

RPT Date: Jun 16, 2011			DUPLICATE				REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD	Method Blank	Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
O. Reg. 153 Metals & Inorganics in Soil (Revised)															
Antimony	1		< 0.8	< 0.8	0.0%	< 0.8	116%	80%	120%	97%	90%	110%	91%	70%	130%
Arsenic	1		5	4	22.2%	< 1	103%	90%	110%	103%	90%	110%	107%	70%	130%
Barium	1		58	54	7.1%	< 2	101%	90%	110%	109%	90%	110%	104%	70%	130%
Beryllium	1		0.5	0.5	0.0%	< 0.5	103%	90%	110%	109%	90%	110%	107%	70%	130%
Boron	1		6	5	18.2%	< 5	83%	80%	120%	106%	90%	110%	96%	70%	130%
Boron (Hot Water Extractable)	1	2458665	0.47	0.49	4.2%	< 0.10	110%	80%	120%	109%	90%	110%	107%	70%	130%
Cadmium	1		< 0.5	< 0.5	0.0%	< 0.5	92%	90%	110%	106%	90%	110%	91%	70%	130%
Chromium	1		16	15	6.5%	< 2	96%	90%	110%	112%	80%	120%	117%	70%	130%
Cobalt	1		6.7	6.2	7.8%	< 0.5	96%	90%	110%	104%	90%	110%	101%	70%	130%
Copper	1		24	22	8.7%	< 1	95%	90%	110%	109%	90%	110%	108%	70%	130%
Lead	1		26	25	3.9%	< 1	108%	90%	110%	104%	90%	110%	105%	70%	130%
Molybdenum	1		< 0.5	< 0.5	0.0%	< 0.5	96%	90%	110%	101%	90%	110%	95%	70%	130%
Nickel	1		14	12	15.4%	< 1	94%	90%	110%	101%	90%	110%	96%	70%	130%
Selenium	1		0.5	0.5	0.0%	< 0.4	95%	90%	110%	99%	90%	110%	97%	70%	130%
Silver	1		< 0.2	< 0.2	0.0%	< 0.2	96%	90%	110%	104%	90%	110%	96%	70%	130%
Thallium	1		< 0.4	< 0.4	0.0%	< 0.4	112%	80%	120%	100%	90%	110%	102%	70%	130%
Uranium	1		0.8	0.8	0.0%	< 0.5	111%	80%	120%	105%	90%	110%	112%	70%	130%
Vanadium	1		24	23	4.3%	< 1	98%	90%	110%	104%	90%	110%	103%	70%	130%
Zinc	1		90	94	4.3%	< 5	100%	90%	110%	107%	90%	110%	116%	70%	130%
Chromium, Hexavalent	1		< 0.2	< 0.2	0.0%	< 0.2	100%	80%	120%	101%	90%	110%	104%	70%	130%
Cyanide, Free	1		< 0.05	< 0.05	0.0%	< 0.05	100%	80%	120%	110%	90%	110%	93%	70%	130%
Mercury	1		< 0.01	< 0.01	0.0%	< 0.01	92%	80%	120%	117%	80%	120%	113%	70%	130%
Electrical Conductivity (2:1)	1		0.456	0.474	3.9%	< 0.002	86%	80%	120%						
Sodium Adsorption Ratio (2:1)	1		0.907	0.915	0.9%	N/A									
pH, 2:1 CaCl2 Extraction	1		7.18	7.16	0.3%	<	104%	90%	110%						

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Quality Assurance

CLIENT NAME: GOLDER ASSOCIATES LTD.

AGAT WORK ORDER: 11T499778

PROJECT NO: 11-1186-0103

ATTENTION TO: Peter Mann

Trace Organics Analysis

RPT Date: Jun 16, 2011			DUPLICATE				REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD	Method Blank	Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
Triazine Pesticides [soil]															
Trifluralin	1	2458658	< 0.2	< 0.2	0.0%	< 0.2	92%	50%	130%	108%	50%	130%	102%	50%	130%
Simazine	1	2458658	< 0.2	< 0.2	0.0%	< 0.2	91%	50%	130%	91%	50%	130%	89%	50%	130%
Atrazine	1	2458658	< 0.1	< 0.1	0.0%	< 0.1	97%	50%	130%	99%	50%	130%	98%	50%	130%
Metribuzin	1	2458658	< 0.5	< 0.5	0.0%	< 0.5	78%	50%	130%	113%	50%	130%	98%	50%	130%
Alachlor	1	2458658	< 0.1	< 0.1	0.0%	< 0.1	101%	50%	130%	98%	50%	130%	102%	50%	130%
Prometryne	1	2458658	< 0.5	< 0.5	0.0%	< 0.5	96%	50%	130%	103%	50%	130%	95%	50%	130%
Metolachlor	1	2458658	< 0.2	< 0.2	0.0%	< 0.2	105%	50%	130%	99%	50%	130%	105%	50%	130%
Cyanazine	1	2458658	< 0.2	< 0.2	0.0%	< 0.2	91%	50%	130%	102%	50%	130%	103%	50%	130%
Triazine Pesticides [water]															
Trifluralin	1					< 1.0	101%	50%	130%	119%	50%	130%		50%	130%
Simazine	1					< 1.0	91%	50%	130%	91%	50%	130%		50%	130%
Atrazine	1					< 0.5	91%	50%	130%	103%	50%	130%		50%	130%
Metribuzin	1					< 0.25	85%	50%	130%	105%	50%	130%		50%	130%
Prometryne	1					< 0.25	96%	50%	130%	102%	50%	130%		50%	130%
Metolachlor	1					< 0.11	81%	50%	130%	107%	50%	130%		50%	130%
Alachlor	1					< 0.5	93%	50%	130%	102%	50%	130%		50%	130%
Cyanazine	1					< 1.0	102%	50%	130%	88%	50%	130%		50%	130%
O. Reg. 153(511) - OC Pesticides (Soil)															
gamma-BHC (Lindane)	1	2458658	< 0.005	< 0.005	0.0%	< 0.005	93%	60%	140%	98%	60%	140%	112%	60%	140%
Heptachlor	1	2458658	< 0.005	< 0.005	0.0%	< 0.005	101%	50%	140%	101%	50%	140%	110%	50%	140%
Aldrin	1	2458658	< 0.005	< 0.005	0.0%	< 0.005	105%	50%	140%	92%	50%	140%	112%	50%	140%
Heptachlor Epoxide	1	2458658	< 0.005	< 0.005	0.0%	< 0.005	103%	50%	140%	111%	50%	140%	111%	50%	140%
Total Endosulfan (I + II)	1	2458658	< 0.005	< 0.005	0.0%	< 0.005	93%	60%	140%	97%	60%	140%	90%	60%	140%
Chlordane (alpha + gamma)	1	2458658	< 0.007	< 0.007	0.0%	< 0.007	98%	60%	140%	98%	60%	140%	107%	60%	140%
DDE (op' + pp')	1	2458658	< 0.007	< 0.007	0.0%	< 0.007	112%	50%	140%	96%	50%	140%	112%	50%	140%
DDD (op' + pp')	1	2458658	< 0.007	< 0.007	0.0%	< 0.007	114%	50%	140%	97%	50%	140%	102%	50%	140%
DDT (op' + pp')	1	2458658	< 0.007	< 0.007	0.0%	< 0.007	116%	50%	140%	95%	50%	140%	111%	50%	140%
Dieldrin	1	2458658	< 0.005	< 0.005	0.0%	< 0.005	106%	50%	140%	97%	50%	140%	97%	50%	140%
Endrin	1	2458658	< 0.005	< 0.005	0.0%	< 0.005	102%	50%	140%	96%	50%	140%	92%	50%	140%
Methoxychlor	1	2458658	< 0.005	< 0.005	0.0%	< 0.005	102%	50%	140%	97%	50%	140%	120%	50%	140%
Hexachlorobenzene	1	2458658	< 0.005	< 0.005	0.0%	< 0.005	112%	50%	140%	120%	50%	140%	110%	50%	140%
Hexachlorobutadiene	1	2458658	< 0.01	< 0.01	0.0%	< 0.01	114%	50%	140%	111%	50%	140%	111%	50%	140%
Hexachloroethane	1	2458658	< 0.01	< 0.01	0.0%	< 0.01	115%	50%	140%	97%	50%	140%	103%	50%	140%
O. Reg. 153(511) - OC Pesticides (Water)															
gamma-BHC (Lindane)	1					< 0.01	105%	50%	140%	90%	50%	140%		50%	140%
Heptachlor	1					< 0.01	101%	50%	140%	91%	50%	140%		50%	140%
Aldrin	1					< 0.01	105%	50%	140%	92%	50%	140%		50%	140%
Heptachlor Epoxide	1					< 0.01	103%	50%	140%	101%	50%	140%		50%	140%

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Quality Assurance

CLIENT NAME: GOLDER ASSOCIATES LTD.

AGAT WORK ORDER: 11T499778

PROJECT NO: 11-1186-0103

ATTENTION TO: Peter Mann

Trace Organics Analysis (Continued)

RPT Date: Jun 16, 2011			DUPLICATE				REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD	Method Blank	Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
Total Endosulfan (I + II)	1					< 0.05	99%	50%	140%	102%	50%	140%		50%	140%
Chlordane (alpha + gamma)	1					< 0.04	111%	50%	140%	98%	50%	140%		50%	140%
DDE (op' + pp')	1					< 0.01	109%	50%	140%	90%	50%	140%		50%	140%
DDD (op' + pp')	1					< 0.05	107%	50%	140%	90%	50%	140%		50%	140%
DDT (op' + pp')	1					< 0.04	106%	50%	140%	91%	50%	140%		50%	140%
Dieldrin	1					< 0.02	106%	50%	140%	101%	50%	140%		50%	140%
Endrin	1					< 0.05	102%	50%	140%	110%	50%	140%		50%	140%
Methoxychlor	1					< 0.04	102%	50%	140%	96%	50%	140%		50%	140%
Hexachlorobenzene	1					< 0.01	98%	50%	140%	104%	50%	140%		50%	140%
Hexachlorobutadiene	1					< 0.01	95%	50%	140%	98%	50%	140%		50%	140%
Hexachloroethane	1					< 0.01	96%	50%	140%	90%	50%	140%		50%	140%
O. Reg. 153(511) - PCBs (Soil)															
PCBs (total)	1		< 0.1	< 0.1	0.0%	< 0.1	117%	60%	140%	96%	60%	140%	90%	60%	140%

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Quality Assurance

CLIENT NAME: GOLDER ASSOCIATES LTD.

AGAT WORK ORDER: 11T499778

PROJECT NO: 11-1186-0103

ATTENTION TO: Peter Mann

Water Analysis

RPT Date: Jun 16, 2011			DUPLICATE				REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD	Method Blank	Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
O. Reg. 153 - Metals & Inorganics in Water															
Antimony	1		< 0.5	< 0.5	0.0%	< 0.5	97%	90%	110%	96%	90%	110%	99%	70%	130%
Arsenic	1		< 1.0	< 1.0	0.0%	< 1.0	95%	90%	110%	99%	90%	110%	100%	70%	130%
Barium	1		17.1	16.8	1.8%	< 2.0	97%	90%	110%	102%	90%	110%	101%	70%	130%
Beryllium	1		< 0.5	< 0.5	0.0%	< 0.5	85%	80%	120%	86%	80%	120%	90%	70%	130%
Boron	1		9.2	10.1	9.3%	< 10.0	96%	90%	110%	93%	90%	110%	99%	70%	130%
Cadmium	1		< 0.2	< 0.2	0.0%	< 0.2	100%	90%	110%	111%	80%	120%	116%	70%	130%
Chromium	1		< 2.0	< 2.0	0.0%	< 2.0	106%	90%	110%	99%	90%	110%	100%	70%	130%
Cobalt	1		< 0.5	< 0.5	0.0%	< 0.5	100%	90%	110%	105%	90%	110%	99%	70%	130%
Copper	1		5.3	5.3	0.0%	< 1.0	107%	90%	110%	114%	80%	120%	107%	70%	130%
Lead	1		0.7	0.7	0.0%	< 0.5	101%	90%	110%	108%	90%	110%	104%	70%	130%
Molybdenum	1		0.5	0.5	0.0%	< 0.5	98%	90%	110%	100%	90%	110%	103%	70%	130%
Nickel	1		< 1.0	< 1.0	0.0%	< 1.0	102%	90%	110%	108%	90%	110%	99%	70%	130%
Selenium	1		< 1.0	< 1.0	0.0%	< 1.0	101%	90%	110%	97%	90%	110%	112%	70%	130%
Silver	1		< 0.2	< 0.2	0.0%	< 0.2	96%	90%	110%	111%	80%	120%	113%	70%	130%
Thallium	1		< 0.3	< 0.3	0.0%	< 0.3	96%	90%	110%	99%	90%	110%	95%	70%	130%
Uranium	1		< 0.5	< 0.5	0.0%	< 0.5	96%	90%	110%	100%	90%	110%	101%	70%	130%
Vanadium	1		< 0.4	< 0.4	0.0%	< 0.4	101%	90%	110%	104%	90%	110%	106%	70%	130%
Zinc	1		47.5	47.6	0.2%	< 5.0	100%	90%	110%	116%	80%	120%	103%	70%	130%
Mercury	1		< 0.02	< 0.02	0.0%	< 0.02	100%	80%	120%	97%	90%	110%	94%	70%	130%
Chromium VI	1		< 5	< 5	0.0%	< 5	98%	80%	120%	98%	90%	110%	100%	70%	130%
Cyanide, Free	1		< 2	< 2	0.0%	< 2	107%	80%	120%	100%	90%	110%	95%	70%	130%
Sodium	1		94200	95800	1.7%	< 500	101%	80%	120%	100%	90%	110%	98%	70%	130%
Chloride	1		155	147	5.3%	< 100	97%	80%	120%	94%	90%	110%	82%	70%	130%
Nitrate as N	1		< 50	< 50	0.0%	< 50	99%	80%	120%	105%	90%	110%	101%	70%	130%
Nitrite as N	1		< 50	< 50	0.0%	< 50	NA	80%	120%	99%	90%	110%	117%	70%	130%
Electrical Conductivity	1		631	615	2.6%	< 2	100%	80%	120%						
pH	1		8.00	8.08	1.0%	NA	96%	90%	110%						

Certified By:

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Method Summary

CLIENT NAME: GOLDER ASSOCIATES LTD.

AGAT WORK ORDER: 11T499778

PROJECT NO: 11-1186-0103

ATTENTION TO: Peter Mann

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Soil Analysis			
Antimony	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Arsenic	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Barium	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Beryllium	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Boron	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Boron (Hot Water Extractable)	MET-93-6104	EPA SW 846 6010C; MSA, Part 3, Ch.21	ICP/OES
Cadmium	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Chromium	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Cobalt	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Copper	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Lead	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Molybdenum	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Nickel	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Selenium	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Silver	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Thallium	MET-93-1003	EPA SW 846 3050B & 6020A	ICP-MS
Uranium	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Vanadium	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Zinc	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Chromium, Hexavalent	INOR-93-6029	SM 3500 B; MSA Part 3, Ch. 25	SPECTROPHOTOMETER
Cyanide, Free	INOR-93-6052	MOE CN-3015 & E 3009 A;SM 4500 CN	TECHNICON AUTO ANALYZER
Mercury	MET-93-6101	EPA SW 846 7471A 245.5	CVAAS
Electrical Conductivity (2:1)	INOR-93-6036	McKeague 4.12, SM 2510 B	EC METER
Sodium Adsorption Ratio (2:1)	INOR-93-6007	McKeague 4.12 & 3.26 & EPA SW-846 6010C	ICP/OES
pH, 2:1 CaCl2 Extraction	INOR-93-6031	MSA part 3 & SM 4500-H+ B	PH METER
Antimony	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Arsenic	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Barium	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Beryllium	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Boron	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Boron (Hot Water Extractable)	MET-93-6104	EPA SW 846 6010C; MSA, Part 3, Ch.21	ICP/OES
Cadmium	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Chromium	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Cobalt	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Copper	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Lead	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Molybdenum	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Nickel	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Selenium	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Silver	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Thallium	MET-93-1003	EPA SW 846 3050B & 6020A	ICP-MS
Uranium	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Vanadium	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Zinc	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Chromium, Hexavalent	INOR-93-6029	SM 3500 B; MSA Part 3, Ch. 25	SPECTROPHOTOMETER

5835 COOPERS AVENUE
MISSISSAUGA, ONTARIO
CANADA L4Z 1Y2
TEL (905)712-5100
FAX (905)712-5122
http://www.agatlabs.com

Method Summary

CLIENT NAME: GOLDER ASSOCIATES LTD.

AGAT WORK ORDER: 11T499778

PROJECT NO: 11-1186-0103

ATTENTION TO: Peter Mann

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Cyanide, Free	INOR-93-6052	MOE CN-3015 & E 3009 A;SM 4500 CN	TECHNICON AUTO ANALYZER
Mercury	MET-93-6101	EPA SW 846 7471A 245.5	CVAAS
Electrical Conductivity (2:1)	INOR-93-6036	McKeague 4.12, SM 2510 B	EC METER
Sodium Adsorption Ratio (2:1)	INOR-93-6007	McKeague 4.12 & 3.26 & EPA SW-846 6010C	ICP/OES
pH, 2:1 CaCl2 Extraction	INOR-93-6031	MSA part 3 & SM 4500-H+ B	PH METER

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http://www.agatlabs.com

Method Summary

CLIENT NAME: GOLDER ASSOCIATES LTD.

AGAT WORK ORDER: 11T499778

PROJECT NO: 11-1186-0103

ATTENTION TO: Peter Mann

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Trace Organics Analysis			
gamma-BHC (Lindane)	ORG-91-5113	EPA SW-846 3541,3620 & 8081	GC/ECD
Heptachlor	ORG-91-5113	EPA SW-846 3541,3620 & 8081	GC/ECD
Aldrin	ORG-91-5113	EPA SW-846 3541,3620 & 8081	GC/ECD
Heptachlor Epoxide	ORG-91-5113	EPA SW-846 3541,3620 & 8081	GC/ECD
Total Endosulfan (I + II)	ORG-91-5113	EPA SW-846 3541,3620 & 8081	GC/ECD
Chlordane (alpha + gamma)	ORG-91-5113	EPA SW-846 3541,3620 & 8081	GC/ECD
DDE (op' + pp')	ORG-91-5113	EPA SW-846 3541,3620 & 8081	GC/ECD
DDD (op' + pp')	ORG-91-5113	EPA SW-846 3541,3620 & 8081	GC/ECD
DDT (op' + pp')	ORG-91-5113	EPA SW-846 3541,3620 & 8081	GC/ECD
Dieldrin	ORG-91-5113	EPA SW-846 3541,3620 & 8081	GC/ECD
Endrin	ORG-91-5113	EPA SW-846 3541,3620 & 8081	GC/ECD
Methoxychlor	ORG-91-5113	EPA SW-846 3541,3620 & 8081	GC/ECD
Hexachlorobenzene	ORG-91-5113	EPA SW-846 3541,3620 & 8081	GC/ECD
Hexachlorobutadiene	ORG-91-5113	EPA SW-846 3541,3620 & 8081	GC/ECD
Hexachloroethane	ORG-91-5113	EPA SW-846 3541,3620 & 8081	GC/ECD
TCMX	ORG-91-5112	EPA SW-846 3541,3620 & 8081	GC/ECD
Decachlorobiphenyl	ORG-91-5113	EPA SW-846 3541,3620 & 8081	GC/ECD
Moisture Content		MOE E3139	BALANCE
gamma-BHC (Lindane)	ORG-91-5112	EPA SW-846 3510 & 8081	GC/ECD
Heptachlor	ORG-91-5112	EPA SW-846 3510 & 8081	GC/ECD
Aldrin	ORG-91-5112	EPA SW-846 3510 & 8081	GC/ECD
Heptachlor Epoxide	ORG-91-5112	EPA SW-846 3510 & 8081	GC/ECD
Total Endosulfan (I + II)	ORG-91-5112	EPA SW-846 3510 & 8081	GC/ECD
Chlordane (alpha + gamma)	ORG-91-5112	EPA SW-846 3510 & 8081	GC/ECD
DDE (op' + pp')	ORG-91-5112	EPA SW-846 3510 & 8081	GC/ECD
DDD (op' + pp')	ORG-91-5112	EPA SW-846 3510 & 8081	GC/ECD
DDT (op' + pp')	ORG-91-5112	EPA SW-846 3510 & 8081	GC/ECD
Dieldrin	ORG-91-5112	EPA SW-846 3510 & 8081	GC/ECD
Endrin	ORG-91-5112	EPA SW-846 3510 & 8081	GC/ECD
Methoxychlor	ORG-91-5112	EPA SW-846 3510 & 8081	GC/ECD
Hexachlorobenzene	ORG-91-5112	EPA SW-846 3510 & 8081	GC/ECD
Hexachlorobutadiene	ORG-91-5112	EPA SW-846 3510 & 8081	GC/ECD
Hexachloroethane	ORG-91-5112	EPA SW-846 3510 & 8081	GC/ECD
TCMX	ORG-91-5112	EPA SW-846 3510 & 8081	GC/ECD
Decachlorobiphenyl	ORG-91-5112	EPA SW-846 3510 & 8081	GC/ECD
Aroclor 1242	ORG-91-5113	EPA SW-846 3541 & 8082	GC/ECD
Aroclor 1248	ORG-91-5113	EPA SW-846 3541 & 8082	GC/ECD
Aroclor 1254	ORG-91-5113	EPA SW-846 3541 & 8082	GC/ECD
Aroclor 1260	ORG-91-5113	EPA SW-846 3541 & 8082	GC/ECD
PCBs (total)	ORG-91-5113	EPA SW-846 3541 & 8082	GC/ECD
Decachlorobiphenyl	ORG-91-5113	EPA SW-846 3541 & 8082	GC/ECD
Trifluralin	ORG 5504	EPA SW-846 8270C & MOE E3121	GC/MS
Simazine	ORG 5504	EPA SW-846 3510c & 8270 & MOE E3121	GC/MS
Atrazine	ORG 5504	EPA SW-846 3510C & 8270 & MOE E3121	GC/MS
Metribuzin	ORG 5504	EPA SW-846 3510c & 8270 & MOE E3121	GC/MS
Alachlor	ORG 5007	EPA SW-846 8081A & 8082	GC/MS

AGAT Laboratories

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Method Summary

CLIENT NAME: GOLDER ASSOCIATES LTD.

AGAT WORK ORDER: 11T499778

PROJECT NO: 11-1186-0103

ATTENTION TO: Peter Mann

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Prometryne	ORG 5504	EPA SW-846 3510c & 8270 & MOE E3121	GC/MS
Metolachlor	ORG 5504	EPA SW-846 3510c & 8270 & MOE E3121	GC/MS
Cyanazine	ORG 5504	EPA SW-846 3510C & 8270 & MOE E3121	GC/MS
Trifluralin	ORG 5504	EPA SW-846 3510C & 8270 & MOE E3121	GC/MS
Simazine	ORG 5504	EPA SW-846 3510c & 8270 & MOE E3121	GC/MS
Atrazine	ORG 5504	EPA SW-846 3510C & 8270 & MOE E3121	GC/MS
Metribuzin	ORG 5504	EPA SW-846 3510c & 8270 & MOE E3121	GC/MS
Prometryne		EPA 0525.2	GC/MS
Metolachlor	ORG 5504	EPA SW-846 3510c & 8270 & MOE E3121	GC/MS
Alachlor	ORG 5007	EPA SW-846 8081A & 8082	GC/MS
Cyanazine	ORG 5504	EPA SW-846 3510C & 8270 & MOE E3121	GC/MS
Water Analysis			
Antimony	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Arsenic	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Barium	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Beryllium	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Boron	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Cadmium	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Chromium	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Cobalt	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Copper	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Lead	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Molybdenum	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Nickel	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Selenium	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Silver	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Thallium	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Uranium	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Vanadium	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Zinc	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Mercury	MET-93-6100	EPA SW-846 7470 & 245.1	CVAAS
Chromium VI	INOR-93-6034	SM 3500-Cr B	SPECTROPHOTOMETER
Cyanide, Free	INOR-93-6052	MOE METHOD CN- 3015 & SM 4500 CN- I	TECHNICON AUTO ANALYZER
Sodium	MET-93-6105	EPA SW-846 6010C & 200.7	ICP/OES
Chloride	INOR-93-6004	SM 4110 B	ION CHROMATOGRAPH
Nitrate as N	INOR-93-6004	SM 4110 B	ION CHROMATOGRAPH
Nitrite as N	INOR-93-6004	SM 4110 B	ION CHROMATOGRAPH
Electrical Conductivity	INOR-93-6000	SM 2510 B	PC TITRATE
pH	INOR-93-6000	SM 4500-H+ B	PC TITRATE

1 med blue

AGAT Laboratories

5835 Coopers Avenue
Mississauga, Ontario; L4Z 1Y2
Phone: 905-712-5100; Fax: 905-712-5122
Toll free: 800-856-6261
www.agatlabs.com
http://webearth.agatlabs.com

CHAIN OF CUSTODY RECORD

LABORATORY USE ONLY
Arrival Condition: ☑ Good ☐ Poor (complete "notes")
Arrival Temperature: 7-3 AGAT WO #: 11T499778
Notes:

Client Information
Company: GOLDER ASSOC
Contact: PETER MANN
Address: 2390 ARGENTIA Rd
MISSISSAUGA, ON L5N 5Z7
Phone: 905-567-4444 Fax: 905-567-6561
Project: PO:
AGAT Quotation #:
Please note, if quotation number is not provided, client will be billed full price for analysis.

Invoice To Same as Above? (Yes) No (circle)
Company:
Contact:
Address:
Phone: Fax:

Report Information - reports to be sent to:
1. Name: PMANN@GOLDER.COM
Email:
2. Name:
Email:

Regulatory Requirements
☑ Regulation 153 Table B (Indicate one) ☐ Ind/Com ☐ Res/Park ☑ Agriculture
Soil Texture (check one) ☐ Coarse ☑ Med/Fine
☐ Sewer Use Region (Indicate one) ☐ Sanitary ☐ Storm
☐ Regulation 558 ☐ CCME ☐ Other (Indicate)
☐ Prov. Water Quality Objectives (PWQO)
☐ Nutrient Management Act (NMA)

Is this a drinking water sample (potable water intended for human consumption)? ☐ Yes ☐ No (If "Yes" please use the Drinking Water Chain of Custody Record)

Report Format
☐ Single Sample per page
☑ Multiple Samples per page
☐ Results by fax

Turnaround Time (TAT) Required*
Regular TAT: ☑ 5 to 7 Working Days
Rush TAT: (please provide prior notification)
Rush Surcharges Apply
☐ 3 to 5 Working Days
☐ 2 Working Days
☐ 1 Working Day
OR
DATE REQUIRED (Rush surcharges may apply):
*TAT is exclusive of weekends and statutory holidays

Sample Identification	Date Sampled	Time Sampled	Sample Matrix	# of Containers	Comments Site/ Sample Information	Metals and Inorganics	Metal Scan (exclud. Hg, B, Cr6)	CCME Fractions 1 to 4	VOCs	PAHs	PCBs	TCLP Metals/Inorganics	TCLP	Storm Sewer Use	Sanitary Sewer Use	OC PESTICIDES / TRIAZINE HERBICIDES	LABORATORY USE ONLY LAB SAMPLE ID
BH 11-18 SA 1A	JUNE 2/11	1345	SOIL	1												✓	
DUP 1A	JUNE 2/11		SOIL	1												✓	
BH 11-2 SA 1A	JUNE 2/11	1700	SOIL	1												✓	
BH 11-5 SA 1A	JUNE 3/11	1605	SOIL	1												✓	
BH 11-11 SA 1A	JUNE 3/11	1326	SOIL	1												✓	
BH 11-17 SA 1A	JUNE 3/11	930	SOIL	1												✓	
FILL 11-1 SA 1	JUNE 3/11	1230	SOIL	1	HOLD											✓	
FILL 11-2 SA 1	JUNE 3/11	1240	SOIL	1	HOLD											✓	
FILL 11-3 SA 1	JUNE 3/11	1615	SOIL	1		✓										✓	
DUPE 1	JUNE 3/11	1235	SOIL	1												✓	
EQUIP. BLANK	JUNE 2/11	1350	WATER	2	OC PESTICIDES / TRIAZINE HERBICIDES											✓	
EQUIP. BLANK	JUNE 3/11	1630	WATER	5	METALS & INORGANICS	✓											

Samples Relinquished By (print name & sign)	Date/Time	Samples Received By (print name & sign)	Date/Time
Juan Jimenez	8/ 10:25		June 8/11 10:25
Samples Relinquished By (print name & sign)	Date/Time	Samples Received By (print name & sign)	Date/Time

Pink Copy – Client
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White Copy - AGAT

PAGE ____ of ____
NO: 156035

AGAT Laboratories

5835 COOPERS AVENUE
MISSISSAUGA, ONTARIO
CANADA L4Z 1Y2
TEL (905)712-5100
FAX (905)712-5122
http://www.agatlabs.com

CLIENT NAME: GOLDER ASSOCIATES LTD.
2390 ARGENTIA ROAD
MISSISSAUGA, ON L5N5Z7

ATTENTION TO: Peter Mann

PROJECT NO: 11-1186-0103-3000

AGAT WORK ORDER: 11T513339

SOIL ANALYSIS REVIEWED BY: Anthony Dapaah, PhD (Chem), Inorganic Lab Manager

DATE REPORTED: Jul 27, 2011

PAGES (INCLUDING COVER): 4

VERSION*: 1

Should you require any information regarding this analysis please contact your client services representative at (905) 712 5100, or at 1-800-856-6261

*NOTES

All samples will be disposed of within 30 days following analysis. Please contact the lab if you require additional sample storage time.

AGAT Laboratories

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Certificate of Analysis

AGAT WORK ORDER: 11T513339

PROJECT NO: 11-1186-0103-3000

CLIENT NAME: GOLDER ASSOCIATES LTD.

ATTENTION TO: Peter Mann

pH (Soil)

DATE SAMPLED: Jul 25, 2011 | DATE RECEIVED: Jul 26, 2011 | DATE REPORTED: Jul 27, 2011 | SAMPLE TYPE: Soil

Parameter	Unit	G / S	RDL	11-5 GA1 (2-5) 2568438	11-5 GA2 (0-2) 2568439	11-17 GA1 (0-2) 2568440
pH, 2:1 CaCl2 Extraction	pH Units			7.41	7.33	6.18

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard

2568438-2568440 pH was determined on the 0.01M CaCl2 extract prepared at 2:1 ratio.

Certified By:

AGAT Laboratories

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Quality Assurance

CLIENT NAME: GOLDER ASSOCIATES LTD.

AGAT WORK ORDER: 11T513339

PROJECT NO: 11-1186-0103-3000

ATTENTION TO: Peter Mann

Soil Analysis

RPT Date: Jul 27, 2011			DUPLICATE				REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD	Method Blank	Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
pH (Soil)															
pH, 2:1 CaCl2 Extraction	1		7.42	7.42	0.0%	<	102%	90%	110%						

Certified By:

5835 COOPERS AVENUE
MISSISSAUGA, ONTARIO
CANADA L4Z 1Y2
TEL (905)712-5100
FAX (905)712-5122
http://www.agatlabs.com

Method Summary

CLIENT NAME: GOLDER ASSOCIATES LTD.

AGAT WORK ORDER: 11T513339

PROJECT NO: 11-1186-0103-3000

ATTENTION TO: Peter Mann

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Soil Analysis			
pH, 2:1 CaCl2 Extraction	INOR-93-6031	MSA part 3 & SM 4500-H+ B	PH METER

AGAT Laboratories

CHAIN OF CUSTODY RECORD

5835 Coopers Avenue
Mississauga, Ontario; L4Z 1Y2
Phone: 905-712-5100; Fax: 905-712-5122
Toll free: 800-856-6261
www.agatlabs.com
http://webearth.agatlabs.com

LABORATORY USE ONLY
Arrival Condition: ☑ Good ☐ Poor (complete "notes")
Arrival Temperature: 20.1 AGAT WO #: 11T513339
Notes:

Client Information

Company: Golder Associates
Contact: Peter Mann
Address: 210 Sheldon Dr. Cambridge Ontario N1T 1A8
Phone: 519 620 1222 Fax:
Project: 11-1186-0003-3000 PO:
AGAT Quotation #:
Please note, if quotation number is not provided, client will be billed full price for analysis.

Invoice To Same as Above? Yes/No (circle)
Company:
Contact:
Address:
Phone: Fax:

Report Information - reports to be sent to:

1. Name: Peter Mann
Email: Peter_Mann@golder.com
2. Name:
Email:

Regulatory Requirements

☑ Regulation 153 Table 3 (Indicate one) ☐ Ind/Com ☑ Res/Park ☐ Agriculture
☐ Sewer Use Region (Indicate one) ☐ Sanitary ☐ Storm
☐ Regulation 558 ☐ CCME ☐ Other (indicate)
Soil Texture (check one) ☐ Coarse ☑ Med/Fine
☐ Prov. Water Quality Objectives (PWQO)
☐ Nutrient Management Act (NMA)

Is this a drinking water sample (potable water intended for human consumption)? ☐ Yes ☐ No (If "Yes" please use the Drinking Water Chain of Custody Record)

Report Format

☐ Single Sample per page
☑ Multiple Samples per page
☐ Results by fax

Turnaround Time (TAT) Required*

Regular TAT:
☐ 5 to 7 Working Days
Rush TAT: (please provide prior notification)
Rush Surcharges Apply
☐ 3 to 5 Working Days
☐ 2 Working Days
☑ 1 Working Day
OR
DATE REQUIRED (Rush surcharges may apply):

*TAT is exclusive of weekends and statutory holidays

Sample Identification	Date Sampled	Time Sampled	Sample Matrix	# of Containers	Comments Site/ Sample Information	Metals and Inorganics	Metal Scan (excl. Hg, B, Cr6)	CCME Fractions 1 to 4	VOCs	PAHs	PCBs	TCLP Metals/Inorganics	TCLP	Storm Sewer Use	Sanitary Sewer Use	1 day				LABORATORY USE ONLY LAB SAMPLE ID
11-5GA1 (0-2)	July 25			1												✓				
11-5GA2 (2-5)	July 25			1												✓				
11-17GA1	July 25			1												✓				
11-5GA1 (2-5)	July 25	9 PM	Soil	1												✓				
11-5GA2 (0-2)	July 25	9 PM	Soil	1												✓				
11-17GA1 (0-2)	July 25	9 PM	Soil	1												✓				

Samples Relinquished By (print name & sign)	Date/Time	Samples Received By (print name & sign)	Date/Time
Stephen Missiuna Stephen Missiuna	July 26	Shannon	July 26/2011 9:40
Samples Relinquished By (print name & sign)	Date/Time	Samples Received By (print name & sign)	Date/Time

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PAGE 1 of 1
NO: 150564

APPENDIX H

Laboratory Certificates of Analysis (Groundwater)

AGAT Laboratories

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TEL (905)712-5100
FAX (905)712-5122
http://www.agatlabs.com

CLIENT NAME: GOLDER ASSOCIATES LTD.
2390 ARGENTIA ROAD
MISSISSAUGA, ON L5N5Z7

ATTENTION TO: Peter Mann

PROJECT NO: 11-1186-0103

AGAT WORK ORDER: 11T504755

TRACE ORGANICS REVIEWED BY: Jacky Takeuchi, BScH (Chem Eng), BSc (Bio), C.Chem, Laboratory Manager

WATER ANALYSIS REVIEWED BY: Mike Muneswar, BSc (Chem), Senior Inorganic Analyst

DATE REPORTED: Jul 06, 2011

PAGES (INCLUDING COVER): 8

VERSION*: 1

Should you require any information regarding this analysis please contact your client services representative at (905) 712 5100, or at 1-800-856-6261

*NOTES

All samples will be disposed of within 30 days following analysis. Please contact the lab if you require additional sample storage time.

AGAT Laboratories

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MISSISSAUGA, ONTARIO
CANADA L4Z 1Y2
TEL (905)712-5100
FAX (905)712-5122
http://www.agatlabs.com

Certificate of Analysis

AGAT WORK ORDER: 11T504755
PROJECT NO: 11-1186-0103

CLIENT NAME: GOLDER ASSOCIATES LTD.

ATTENTION TO: Peter Mann

O. Reg. 153(511) - OC Pesticides + PCBs (Water)

DATE SAMPLED: Jun 24, 2011 | DATE RECEIVED: Jun 27, 2011 | DATE REPORTED: Jul 06, 2011 | SAMPLE TYPE: Water

Parameter	Unit	G / S	RDL	BH11-11 2499878	BH11-18 2499886	DUP #1 2499891
gamma-BHC (Lindane)	µg/L		0.01	<0.01	<0.01	<0.01
Heptachlor	µg/L	0.038	0.01	0.03	0.03	0.04
Aldrin	µg/L	0.35	0.01	<0.01	<0.01	<0.01
Heptachlor Epoxide	µg/L	0.038	0.01	<0.01	<0.01	<0.01
Total Endosulfan (I + II)	µg/L	0.56	0.05	<0.05	<0.05	<0.05
Chlordane (alpha + gamma)	µg/L	0.06	0.04	<0.04	<0.04	<0.04
DDE (op' + pp')	µg/L		0.01	<0.01	<0.01	<0.01
DDD (op' + pp')	µg/L	1.8	0.05	<0.05	<0.05	<0.05
DDT (op' & pp')	µg/L		0.04	<0.04	<0.04	<0.04
Dieldrin	µg/L	0.35	0.02	<0.02	<0.02	<0.02
Endrin	µg/L	0.36	0.05	<0.05	<0.05	<0.05
Methoxychlor	µg/L	0.3	0.04	<0.04	<0.04	<0.04
Hexachlorobenzene	ug/L	1	0.01	<0.01	<0.01	<0.01
Hexachlorobutadiene	ug/L	0.44	0.01	<0.01	<0.01	<0.01
Hexachloroethane	ug/L	2.1	0.01	<0.01	<0.01	<0.01
Aroclor 1242	µg/L		0.2	<0.2	<0.2	<0.2
Aroclor 1248	µg/L		0.2	<0.2	<0.2	<0.2
Aroclor 1254	µg/L		0.2	<0.2	<0.2	<0.2
Aroclor 1260	µg/L		0.2	<0.2	<0.2	<0.2
PCB's (total)	µg/L	0.2	0.2	<0.2	<0.2	<0.2
Surrogate	Unit	Acceptable Limits				
TCMX	%	50-140		81	91	89
Decachlorobiphenyl	%	60-140		102	109	107

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard: Refers to T8 (ALL-GW) - NEW

Certified By: Jordy Takewaki

AGAT Laboratories

5835 COOPERS AVENUE
MISSISSAUGA, ONTARIO
CANADA L4Z 1Y2
TEL (905)712-5100
FAX (905)712-5122
http://www.agatlabs.com

Certificate of Analysis

AGAT WORK ORDER: 11T504755

PROJECT NO: 11-1186-0103

CLIENT NAME: GOLDER ASSOCIATES LTD.

ATTENTION TO: Peter Mann

Triazine Pesticides [water]

DATE SAMPLED: Jun 24, 2011 | DATE RECEIVED: Jun 27, 2011 | DATE REPORTED: Jul 06, 2011 | SAMPLE TYPE: Water

Parameter	Unit	G / S	RDL	BH11-11 2499878	BH11-18 2499886	DUP #1 2499891
Trifluralin	µg/L		1.0	<1.0	<1.0	<1.0
Simazine	µg/L		1.0	<1.0	<1.0	<1.0
Atrazine	µg/L		0.5	<0.5	<0.5	<0.5
Metribuzin	µg/L		0.25	<0.25	<0.25	<0.25
Prometryne	µg/L		0.25	<0.25	<0.25	<0.25
Metolachlor	µg/L		0.11	<0.11	<0.11	<0.11
Alachlor	µg/L		0.5	<0.5	<0.5	<0.5
Cyanazine	µg/L		1.0	<1.0	<1.0	<1.0

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard: Refers to ODWS - Table D

2499878-2499891 Results relate only to the items tested.

Certified By: Jordy Takewaki

AGAT Laboratories

5835 COOPERS AVENUE
MISSISSAUGA, ONTARIO
CANADA L4Z 1Y2
TEL (905)712-5100
FAX (905)712-5122
http://www.agatlabs.com

Certificate of Analysis

AGAT WORK ORDER: 11T504755

PROJECT NO: 11-1186-0103

CLIENT NAME: GOLDER ASSOCIATES LTD.

ATTENTION TO: Peter Mann

NO2/NO3 (water)

DATE SAMPLED: Jun 24, 2011 | DATE RECEIVED: Jun 27, 2011 | DATE REPORTED: Jul 06, 2011 | SAMPLE TYPE: Water

Parameter	Unit	G / S	RDL	BH11-11 2499878	BH11-18 2499886	DUP #1 2499891
Nitrate as N	µg/L		50	19800	16500	16600
Nitrite as N	µg/L		50	<50	<50	<50

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard

Certified By:

AGAT Laboratories

Guideline Violation

AGAT WORK ORDER: 11T504755

PROJECT NO: 11-1186-0103

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SAMPLEID	SAMPLE TITLE	GUIDELINE	ANALYSIS PACKAGE	PARAMETER	GUIDEVALUE	RESULT
2499891	DUP #1	T8 (ALL-GW) - NEW	O. Reg. 153(511) - OC Pesticides + PCBs (Water)	Heptachlor	0.038	0.04

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Quality Assurance

CLIENT NAME: GOLDER ASSOCIATES LTD.

AGAT WORK ORDER: 11T504755

PROJECT NO: 11-1186-0103

ATTENTION TO: Peter Mann

Trace Organics Analysis

RPT Date: Jul 06, 2011			DUPLICATE				REFERENCE MATERIAL				METHOD BLANK SPIKE				MATRIX SPIKE			
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD	Method Blank	Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits				
								Lower	Upper		Lower	Upper		Lower	Upper		Lower	Upper
O. Reg. 153(511) - OC Pesticides + PCBs (Water)																		
gamma-BHC (Lindane)	1					< 0.01	81%	50%	140%	87%	50%	140%				50%	140%	
Heptachlor	1					< 0.01	102%	50%	140%	113%	50%	140%				50%	140%	
Aldrin	1					< 0.01	90%	50%	140%	106%	50%	140%				50%	140%	
Heptachlor Epoxide	1					< 0.01	91%	50%	140%	87%	50%	140%				50%	140%	
Total Endosulfan (I + II)	1					< 0.05	102%	50%	140%	120%	50%	140%				50%	140%	
Chlordane (alpha + gamma)	1					< 0.04	98%	50%	140%	120%	50%	140%				50%	140%	
DDE (op' + pp')	1					< 0.01	96%	50%	140%	89%	50%	140%				50%	140%	
DDD (op' + pp')	1					< 0.05	98%	50%	140%	96%	50%	140%				50%	140%	
DDT (op' & pp')	1					< 0.04	95%	50%	140%	95%	50%	140%				50%	140%	
Dieldrin	1					< 0.02	104%	50%	140%	120%	50%	140%				50%	140%	
Endrin	1					< 0.05	106%	50%	140%	89%	50%	140%				50%	140%	
Methoxychlor	1					< 0.04	104%	50%	140%	103%	50%	140%				50%	140%	
Hexachlorobenzene	1					< 0.01	97%	50%	140%	80%	50%	140%				50%	140%	
Hexachlorobutadiene	1					< 0.01	92%	50%	140%	80%	50%	140%				50%	140%	
Hexachloroethane	1					< 0.01	104%	50%	140%	80%	50%	140%				50%	140%	
PCB's (total)	1					< 0.2	112%	60%	140%	120%	60%	140%				60%	140%	
Triazine Pesticides [water]																		
Trifluralin	1					< 1.0	94%	50%	130%	102%	50%	130%				50%	130%	
Simazine	1					< 1.0	87%	50%	130%	96%	50%	130%				50%	130%	
Atrazine	1					< 0.5	96%	50%	130%	104%	50%	130%				50%	130%	
Metribuzin	1					< 0.25	98%	50%	130%	103%	50%	130%				50%	130%	
Prometryne	1					< 0.25	104%	50%	130%	121%	50%	130%				50%	130%	
Metolachlor	1					< 0.11	96%	50%	130%	120%	50%	130%				50%	130%	
Alachlor	1					< 0.5	100%	50%	130%	116%	50%	130%				50%	130%	
Cyanazine	1					< 1.0	91%	50%	130%	112%	50%	130%				50%	130%	

Certified By: Jordy Takeuchi

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Quality Assurance

CLIENT NAME: GOLDER ASSOCIATES LTD.

AGAT WORK ORDER: 11T504755

PROJECT NO: 11-1186-0103

ATTENTION TO: Peter Mann

Water Analysis

RPT Date: Jul 06, 2011			DUPLICATE				REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD	Method Blank	Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
NO2/NO3 (water)															
Nitrate as N	1		< 50	< 50	0.0%	< 50	106%	90%	110%	106%	90%	110%	112%	70%	130%
Nitrite as N	1		< 50	< 50	0.0%	< 50	NA	90%	110%	90%	90%	110%	88%	70%	130%

Certified By:

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Method Summary

CLIENT NAME: GOLDER ASSOCIATES LTD.

AGAT WORK ORDER: 11T504755

PROJECT NO: 11-1186-0103

ATTENTION TO: Peter Mann

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Trace Organics Analysis			
gamma-BHC (Lindane)	ORG-91-5112	EPA SW-846 3510 & 8081	GC/ECD
Heptachlor	ORG-91-5112	EPA SW-846 3510 & 8081	GC/ECD
Aldrin	ORG-91-5112	EPA SW-846 3510 & 8081	GC/ECD
Heptachlor Epoxide	ORG-91-5112	EPA SW-846 3510 & 8081	GC/ECD
Total Endosulfan (I + II)	ORG-91-5112	EPA SW-846 3510 & 8081	GC/ECD
Chlordane (alpha + gamma)	ORG-91-5112	EPA SW-846 3510 & 8081	GC/ECD
DDE (op' + pp')	ORG-91-5112	EPA SW-846 3510 & 8081	GC/ECD
DDD (op' + pp')	ORG-91-5112	EPA SW-846 3510 & 8081	GC/ECD
DDT (op' & pp')	ORG-91-5112	EPA SW-846 3510 & 8081	GC/ECD
Dieldrin	ORG-91-5112	EPA SW-846 3510 & 8081	GC/ECD
Endrin	ORG-91-5112	EPA SW-846 3510 & 8081	GC/ECD
Methoxychlor	ORG-91-5112	EPA SW-846 3510 & 8081	GC/ECD
Hexachlorobenzene	ORG-91-5112	EPA SW-846 3510 & 8081	GC/ECD
Hexachlorobutadiene	ORG-91-5112	EPA SW-846 3510 & 8081	GC/ECD
Hexachloroethane	ORG-91-5112	EPA SW-846 3510 & 8081	GC/ECD
Aroclor 1242	ORG-91-5112	EPA SW-846 3510 & 8082	GC/ECD
Aroclor 1248	ORG-91-5112	EPA SW-846 3510 & 8082	GC/ECD
Aroclor 1254	ORG-91-5112	EPA SW-846 3510 & 8082	GC/ECD
Aroclor 1260	ORG-91-5112	EPA SW-846 3510 & 8082	GC/ECD
PCB's (total)	ORG-91-5112	EPA SW-846 3510 & 8082	GC/ECD
TCMX	ORG-91-5112	EPA SW-846 3510 & 8081	GC/ECD
Decachlorobiphenyl	ORG-91-5112	EPA SW-846 3510 & 8081	GC/ECD
Trifluralin	ORG 5504	EPA SW-846 3510C & 8270 & MOE E3121	GC/MS
Simazine	ORG 5504	EPA SW-846 3510c & 8270 & MOE E3121	GC/MS
Atrazine	ORG 5504	EPA SW-846 3510C & 8270 & MOE E3121	GC/MS
Metribuzin	ORG 5504	EPA SW-846 3510c & 8270 & MOE E3121	GC/MS
Prometryne		EPA 0525.2	GC/MS
Metolachlor	ORG 5504	EPA SW-846 3510c & 8270 & MOE E3121	GC/MS
Alachlor	ORG 5007	EPA SW-846 8081A & 8082	GC/MS
Cyanazine	ORG 5504	EPA SW-846 3510C & 8270 & MOE E3121	GC/MS
Water Analysis			
Nitrate as N	INOR-93-6004	SM 4110 B	ION CHROMATOGRAPH
Nitrite as N	INOR-93-6004	SM 4110 B	ION CHROMATOGRAPH

AGAT Laboratories

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CHAIN OF CUSTODY RECORD

LABORATORY USE ONLY
Arrival Condition: ☑ Good ☐ Poor (complete "notes")
Arrival Temperature: 8°C AGAT WO #: 11T504755
Notes:

Client Information
Company: GOLDER ASS.
Contact: KYLE SCHEPANOW
Address: 2390 ARGENTIA
MISS. ON L5N 5Z1
Phone: 905 567 4444 Fax: 567-6561
Project: 11-1186-0103 PO:
AGAT Quotation #:
Please note, if quotation number is not provided, client will be billed full price for analysis.

Invoice To Same as Above? Yes/No (circle)
Company: GOLDER
Contact: PETER MANN
Address: 2390 ARGENTIA Rd.
MISS ON
Phone: Fax:

Report Information - reports to be sent to:
1. Name: PETER MANN
Email:
2. Name: KYLE SCHEPANOW
Email:

Report Format
☐ Single Sample per page
☐ Multiple Samples per page
☐ Results by fax

Turnaround Time (TAT) Required*
Regular TAT:
☒ 5 to 7 Working Days
Rush TAT: (please provide prior notification)
Rush Surcharges Apply
☐ 3 to 5 Working Days
☐ 2 Working Days
☐ 1 Working Day
OR
DATE REQUIRED (Rush surcharges may apply):
*TAT is exclusive of weekends and statutory holidays

Regulatory Requirements
☐ Regulation 153 Table ____ (Indicate one) ☐ Ind/Com ☐ Res/Park ☐ Agriculture
☐ Sewer Use Region ____ (Indicate one) ☐ Sanitary ☐ Storm
☐ Regulation 558 ☐ CCME ☐ Other (indicate) ____
Soil Texture (check one) ☐ Coarse ☒ Med/Fine
☐ Prov. Water Quality Objectives (PWQO)
☐ Nutrient Management Act (NMA)

Is this a drinking water sample (potable water intended for human consumption)? ☐ Yes ☐ No (If "Yes" please use the Drinking Water Chain of Custody Record)

Sample Identification	Date Sampled	Time Sampled	Sample Matrix	# of Containers	Comments Site/ Sample Information	Metals and Inorganics	Metal Scan (exclud. Hg, B, Cr6)	CCME Fractions 1 to 4	VOCs	PAHs	PCBs	TCLP Metals/Inorganics	TCLP	Storm Sewer Use	Sanitary Sewer Use	TRIAZINE HOLD	PESTICIDES	PCBs			LABORATORY USE ONLY LAB SAMPLE ID
BH 11-11	June 24/11	PM	GW	3	LOTS OF SEDIMENT IN SAMPLE											X	X	X			
BH 11-18	11	PM	GW	3												X	X	X			
DUP #1	11	PM	GW	3												X	X	X			

HOLD SAMPLES
HAVE NITRIA
CALL KYLE

Samples Relinquished By (print name & sign)	Date/Time	Samples Received By (print name & sign)	Date/Time
KYLE SCHEPANOW	June 24 2011		June 27 8:30
Samples Relinquished By (print name & sign)	Date/Time 832pm	Samples Received By (print name & sign)	Date/Time

Pink Copy - Client
Yellow + Golden Copy - AGAT
White Copy - AGAT

PAGE 1 of 1
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