Groundwater
Science Corp.

328 Daleview Place,
Waterloo, ON N2L 5M5
Phone: (519) 746-6916
groundwaterscience.ca

Hydrogeologic Assessment
Blueland Farms McCormick Pit
Part Lot 12, Concession 2 EHS,
Town of Caledon
Region of Peel

Prepared For:

Harrington McAvan Ltd.
6882 14th Avenue
Markham, Ontario
L6B 1A8

Prepared By:

Andrew Pentney, P.Geo.
Groundwater Science Corp.

October 2017

TABLE OF CONTENTS

Figures

Tables

Appendices

1.0 INTRODUCTION

This report presents the results of a hydrogeologic assessment completed as part of a Licence application under the Aggregate Resources Act (ARA) for the Blueland Farms proposed McCormick Pit. The proposed pit is located in Part Lot 12, Concession 2 EHS, Town of Caledon, Regional Municipality of Peel, Ontario.

1.1 BACKGROUND

The proposed McCormick Pit is located at 17736 Heart Lake Road, approximately 1.3 kilometers (km) east of the Village of Caledon, as shown in **Figure 1**.

A complete Planning application to rezone the site, including necessary technical assessments, was submitted in February 2013 to the Town of Caledon. Since that time additional hydrogeologic information has been collected at the site.

The original proposal has been revised as a result of an agreement with the adjacent property owner. The updated proposal includes a plan to process and ship aggregate through the existing pit to the west (Caledon Sand and Gravel) thereby eliminating gravel truck traffic from the pit onto Heart Lake Road. The revised proposal also includes a reduction in the proposed maximum annual tonnage limit, from 1,500,000 tonnes to 750,000 tonnes per year. At this time the Planning application is being updated and an Aggregate Resources Act (ARA) Licence application submitted for a Cateogry 1, Class ‘A’ Licence (with below water table extraction) for the site.

This study is intended to address technical requirements associated with the ARA Licence application. The study will also serve to update the findings of the original hydrogeologic assessment (AECOM Canada Ltd., February 2013) submitted as part of the 2013 Planning (rezoning) application.

1.2 SCOPE

The study scope is intended to address the current groundwater related ARA Provincial Standards for the proposed Category 1 Licence (Class A Pit Below Water) to extract aggregate from both above and below the groundwater table at the site.

1.2.1 Summary of Provincial ARA Standards

The ARA provincial Standards for a Category 1 Application (Class A Pit Below Water) indicates that if extraction is to occur below, or within 1.5 m of, the established groundwater table, technical reports accompanying the application must provide information on the following:

> *2.2.1 Hydrogeological Level 1: Preliminary hydrogeologic evaluation to determine the final extraction elevation relative to the groundwater table, and the potential for adverse effects to groundwater and surface water resources and their uses;*
>
> 2.2.2 *Hydrogeological Level 2: Where the results of the Level 1 have identified a potential for adverse effects of the operation on ground water and surface water resources and their uses, an impact assessment is required to determine the significance of the effect and feasibility of mitigation. The assessment should address the potential effects of the operation on the*

> *following features if located within the zone of influence for extraction below the established groundwater table, where applicable;*
>
> *A technical report must be prepared by a person with appropriate training and/or experience in hydrogeology to include the following items:*
> *(a) waterwells;*
> *(b) springs;*
> *(c) groundwater aquifers;*
> *(d) surface water courses and bodies;*
> *(e) discharge to surface water;*
> *(f) proposed water diversion, storage and drainage facilities on site;*
> *(g) methodology;*
> *(h) description of the physical setting including local geology, hydrogeology, and surface water systems;*
> *(i) water budget;*
> *(j) impact assessment;*
> *(k) mitigation measures including trigger mechanisms;*
> *(l) contingency plan;*
> *(m) monitoring plan;*
> *(n) technical support data in the form of tables, graphs and figures, usually appended to the report.*

The Level 1 report provides an assessment of the groundwater table elevation and extraction plan, as well as a general discussion of potential for impact in order to determine the need for a Level 2 report and “scope” the issues to be examined. The Level 2 report examines the type and scale of any potential impacts, and based on that assessment identifies any potential for adverse effects on groundwater and surface water resources (and their uses). In addition, the need for monitoring and/or mitigation is also assessed. If necessary, the Level 2 report also provides recommendations regarding monitoring and/or mitigation.

1.2.2 Municipal Planning Requirements

Planning requirements associated with the application were discussed in the February 2013 AECOM Canada Ltd. report titled: *Hydrogeological Assessment for Below-Water Extraction, Blueland McCormick Property, Town of Caledon, Peel Region*, and which accompanied the planning application.

The AECOM report outlined the following planning requirements:

> *The hydrogeological requirements associated with new aggregate operations in the Town of Caledon Official Plan are:*
>
> *5.11.2.4.2 (g)*
>
> *the Applicant, for operations which propose below groundwater table extraction, has completed a Water Resources Study as described in Section 5.11.2.4.15 and has demonstrated water resources will be protected, maintained and, where applicable, enhanced and that there will be no unacceptable impacts;*
>
> *5.11.2.4.15*

> *The Water Resources Study required by Section 5.11.2.4.2(g) shall identify all sources of water and their functions and analyses and assess the impact of the application on each of those water resources and shall satisfactorily demonstrate that there will be no unacceptable impacts and shall address the following:*
>
> *a) the quantity and quality of mineral aggregate resource located below the groundwater table;*
>
> *b) that the removal of the mineral aggregate resource and the subsequent rehabilitation of the lands will satisfy the applicable performance measures in Sections 3.1.5.12 and 5.11.2.2.6 of this Plan;*
>
> *c) that measures to protect water resources will be implemented in the design and operation of fuel storage and handling systems, machinery storage and servicing and the use and storage of potential contaminants on the site. The storage of fuel and other potential contaminants on site may be restricted if necessary to protect water resources; and*
>
> *d) that an appropriate monitoring program will be implemented and that the results of this monitoring program will be provided to the Town of Caledon, the Region of Peel, the Niagara Escarpment Commission where applicable and the applicable Conservation Authorities.*

The planning application requirements were addressed in the February 2013 AECOM report (Sections 4, 5 and 10) using the information available at that time.

This current study will summarize and update the overall hydrogeologic assessment, water resources characterization and impact assessment as related to the above referenced planning requirements.

1.2.3 Niagara Escarpment Plan Requirements

The site is located within the Niagara Escarpment Plan (NEP) planning area. The most recent NEP revisions came into effect June 1, 2017. The revised polies include development criteria related to water resources (Section 2.6), Natural Heritage (Section 2.7) and Mineral Aggregate Resources (Section 2.9).

The above referenced NEP development criteria related to hydrogeologic conditions at the McCormick site are assessed through the site characterization and impact assessment in this report, consistent with the ARA study requirements. A summary of the study findings related to relevant NEP development criteria is provided in **Section 8.1.4** of this report.

2.0 METHODOLOGY

This assessment included a background information review to characterize the site setting, review of detailed site-specific fieldwork completed to characterize local conditions, and, the use of specific analysis methods for the water budget and impact assessment.

Standard hydrogeologic field and analysis methods are used for this study. The specific methodologies used for each step of the characterization and analysis are outlined in the respective Sections of this report.

2.1 INFORMATION REVIEW

As part of this study the following primary information sources were used:

1) Harrington McAvan Ltd, *McCormick Pit Site Plans*.
2) Harrington McAvan Ltd., February 2013; *Geotechnical Report, McCormick Pit, Part of Lot 12, Concession 2 EHS, Town of Caledon, Region of Peel, For Blueland Farms Limited.*
3) AECOM Canada Ltd., February 2013; *Hydrogeological Assessment for Below-Water Extraction, Blueland McCormick Property, Town of Caledon, Peel Region.*
4) AECOM Canada Ltd., various dates; monitoring data summaries (2013 to 2016), historical borehole logs at the Caledon Sand and Gravel Pit Expansion Area, and, Borehole Log 2R.
5) Savanta Inc., September 2017, *Natural Environment Technical Report, McCormick Pit, Part Lot 12, Conc. 2 Town of Caledon, Peel Region*.
6) Aquatic and Wildlife Services in association with Savanta Inc., December 2012, *Natural Environment Technical Report Level I & II, Blueland Farms McCormick Pit, Part Lot 12, Concession 2 EHS, Town of Caledon, Peel Region*.
7) Harden Environmental Services Ltd., January 19, 2016 letter: *Re: Caledon Sand and Gravel. 2015 Annual Monitoring Report* and subsequent 2016 data summaries.
8) Harden Environmental Services Ltd., January 31, 1995; *Hydrology and Hydrogeology Report For The Caledon Sand and Gravel Inc. Expansion Area, Final Draft*.
9) Excerpts from (as provided by AECOM Canada Ltd.): Harden Environmental Services Ltd., June 12 1996; *Response to Interrogatory from Dames and Moore Canada*.
10) Conestoga-Rovers & Associates, August 1996; *Warnock Lake Evaluation, Proposed Caledon Sand and Gravel Inc. Pit Expansion*.
11) Harden Environmental Services Ltd., February 2001; *Evaluation of Three Hydraulic Barriers in Southern Ontario*.

12) Credit Valley Conservation Authority, July 27, 2015: *CTC Source Protection Region, Approved Updated Assessment Report: Credit Valley Source Protection Area*.

13) CTC Source Protection Region; July 28, 2015: *Approved Source Protection Plan, CTC Source Protection Region*.

14) CTC Source Protection Region, Aqua Resources Inc. for Credit Valley Conservation; April 2009: *SPC Accepted Integrated Water Budget Report - Tier 2, Credit Valley Source Protection Area*.

15) Credit Valley Conservation Authority, November 1988: *Caledon Creek and Credit River Subwatershed Study (Subwatersheds 16 & 18) Phase I: Characterization Report*.

16) Credit Valley Conservation Authority, December 2001: *Caledon Creek and Credit River Subwatershed Study (Subwatersheds 16 & 18) Phase III: Implementation Report*.

17) Credit Valley Conservation Authority, July 2007: *East Credit Subwatershed Study, Phase I Report: Subwatershed Characterization*.

18) Ministry of the Environment and Climate Change (MOECC) online water well records, available at: https://www.ontario.ca/environment-and-energy/map-well-records.

19) Ministry of Natural Resources and Forestry (MNRF) online natural heritage mapping, available at: https://www.ontario.ca/page/make-natural-heritage-area-map.

20) Ontario Geological Survey OGSEarth (KML files viewed on Google Earth®); available online at: http://www.mndm.gov.on.ca/en/mines-and-minerals/applications/ogsearth

21) Ontario Base Map (OBM) 1:10,000 series topographic mapping.

Additional general references used are noted in the text of this report.

3.0 BACKGROUND REVIEW AND SITE SPECIFIC WORK

The local site setting is shown in **Figure 2**. The proposed Licence area (as shown on **Figure 2**) consists of the northern portion of the ownership parcel at 17736 Heart Lake Road and is 25.97 hectares (ha) in size. Consistent with the Natural Environment Technical Report (NETR), the proposed Licence is referenced as the Subject Lands. The proposed extraction area within the Licence is 20.75 ha in size. Additional background mapping is included in **Appendix A**. Detailed property and proposed Licence boundary information is shown on the Site Plan, (Harington McAvan Ltd.) please refer to the plan for specific details.

The ownership parcel, designated the full Subject Property (see NETR), consists of a “diamond” shaped lot with a north-south orientation. Portions of the property are in agricultural (field crop or passive) use, some of the land consists of forested area and one farm residence is located at the site. One residence, occupying parcel formerly severed from the Subject Property, occurs along Heart Lake Road, just south of the proposed Licence boundary.

The Subject Property is bounded by Heart Lake Road along the northeast edge. Lands to the northeast consist of rural residences, with associated meadows and woodlots. The adjacent property to the northwest includes a residence, agricultural fields, a portion of Caledon Creek, and, a surface water feature known as Warnock Lake. The existing James Dick Construction Ltd. Caledon Sand and Gravel (active below water extraction) pit borders the Subject Property on the southwest, and extends both north and south of the proposed Licence. Aggregate extraction on the adjacent pit is visible on the air photo (**Appendix A**). The adjacent property to the southeast, extending to the Escarpment Side Road, is unoccupied and is largely in pasture or meadow and shrubs.

The February 2013 AECOM Hydrogeologic Assessment report was submitted as part of the original Planning Applications (Town File Number: POPA 13-02) for the proposed McCormick Pit and is part of the public record associated with the overall application (available at: http://www.caledon.ca/en/townhall/Blueland-Farms.asp). Data collection at the site began in September 2003 and has continued on a regular basis to date. In addition, monitoring at the site is ongoing. This current hydrogeologic assessment references the data collected at the site by AECOM, both as reported in the February 2013 report and as subsequently made available to Blueland Farms.

3.1 ON-SITE TEST PIT, DRILLING AND MONITORING

A total of 41 test Pits (TP1 to TP41) were completed within the Subject Property by Harrington McAvan Ltd. in November 2002. In addition, 6 boreholes (BH1 to BH6) were drilled at the site and 5 monitoring wells (BH1, BH3, BH4, BH5 and BH6) were installed by Gartner Lee Ltd. (now AECOM) in September 2003. Subsequently, in December 2013 a monitoring well was installed at the original BH2 location (well referenced as BH2R) in order to provide additional water level elevation data at the site. Test Pit, borehole and monitoring well locations are shown on **Figure 3**. Copies of the test pit and borehole logs are included in **Appendix B**. This information is summarized and discussed in **Section 4.0**.

In order to asses water level conditions as specific features and locations, a drive-point piezometer, MP-1, was installed in Wetland 4 (see **Section 3.6.2**) and a surface water level monitoring station, SG1, established at the culvert where Caledon Creek crosses Heart Lake Road. These two monitoring stations were updated and surveyed relative to the closest monitoring wells in April 2017. Locations are shown on **Figure 3**.

The original drive-point piezometer MP-1 consists of a 1.9 cm (0.75 inch) steel pipe and 0.3 m long stainless steel screen, allowing for occasional manual measurement of groundwater and surface water levels. In April 2017 a new drive-point piezometer, referenced as MP-1b, was installed adjacent to MP-1. MP-1b consists of a 3.8 cm (1.5 inch) galvanized steel pipe and 0.3 m long stainless steel screen. In addition a stilling well, consisting of 3.8 cm PVC geotextile wrapped perforated pipe (above surface) and 0.6 m sump (below surface) was installed. Both the new piezometer and stilling well were equipped with dataloggers (Van Essen Diver®). At that time it was determined by hand coring that the organic soil depth at MP-1 was approximately 0.6 m deep.

The original Caledon Creek monitoring location consisted of the upstream (east) end of the concrete box culvert, depth to water was measured from the top of the culvert when water was present, allowing for occasional manual measurement of groundwater and surface water levels. In April 2017 a new location was established at the downstream (west) end of the box culvert and a 3.8 cm diameter stilling well was attached to a pre-existing T-bar (fence) post to allow for a datalogger (Van Essen Diver®) to be installed to monitor surface water levels in the creek.

Manual water level monitoring was initiated by AECOM at the site in September 2003 and has continued to date, generally on a quarterly basis. A summary of reported manual water level measurements are included in **Appendix C**. In October 2013 water level dataloggers (Solinst Leveloggers®) were installed in BH1, BH3, BH4, BH5 and BH6. In February 2014 a datalogger was also installed in BH2R. The original dataloggers were programed to obtain measurements at a 6 hour interval. In April 2017 all dataloggers at the site were replaced (Van Essen Diver® series) and programmed to record at 1 hour intervals. Graphs of the data collected to date are included in **Appendix C**.

Water level monitoring results and interpreted groundwater table mapping is further discussed in **Section 4.0** of this report.

3.2 CALEDON SAND AND GRAVEL PIT MONITORING

Historical drilling locations and borehole logs at the Caledon Sand and Gravel (CSG) Pit are reported in the Harden Environmental Services Ltd. (1995 and 1996) and Conestoga-Rovers & Associates (1996) assessment reports. Select information from the historical reporting is referenced in this assessment (copies of relevant borehole logs are included in **Appendix B**).

Monitoring records for the CSG Pit site, dating back to 1994, have been made available through Harden Environmental Services (Harden). CSG Pit monitoring locations in the vicinity of the McCormick Pit site are shown on figures in **Appendix D**. Water level monitoring summaries, based on Harden reporting, for nearby monitors are also included in **Appendix D**.

3.3 QUATERNARY GEOLOGY

Excerpts from the February 2013 Geotechnical Report (Harrington McAvan Ltd.) illustrating the quaternary geology in the area are included in **Appendix A**. The proposed McCormick Pit is situated along the southern edge of a northeast to southwest trending Glacial Spillway set within a Kame Moraine (Paris Moraine / Wentworth Till) to the south and buried escarpment overlain by a Drumlinized Till Plain or Till Moraine (Singhampton Moraine / Northern Till) to the north. The Paris Moraine, Till Plain and Till Moraine are all described by OGS as consisting of a "*stone poor sandy silt to silty sand textured till*".

The spillway is known as the Caledon Meltwater Channel (or Outwash Deposit) and is a result of the retreat and end of glacial activity in this area. The outwash is described as "*Glaciofluvial deposits, river deposits and delta topset facies*" (i.e. includes sand and gravel). The northern edge of the proposed McCormick Pit, Caledon Creek, Warnock Lake and associated wetlands are all mapped as within the outwash deposit. The deposit widens to the southwest, and most of the adjacent gravel pit operations are set within this geologic feature.

The majority of the Subject Property is mapped as within the Paris Moraine Wentworth Till deposit. However, test pit and drilling results at the site indicate that the till is discontinuous at surface. Where the till was encountered it has varying thickness, and is underlain by a thick sequence of sand and gravel. The Paris Moraine is also reported to include sand and gravel deposits, as lenses or pockets of glaciofluvial material, or as stratified sand and gravel within the Wentworth Till.

Based on drilling and test pit results, the on-site geology can be characterized as a thick sequence of sand and gravel deposits overlying both a discontinuous basal till layer and/or shale bedrock. The sand and gravel deposit, considered the "aggregate resource" on-site, varies from sand or silty sand to coarse sand and gravel. Discontinuous or localized till deposits also occur at surface or within the sand and gravel.

The Till deposits identified at the site include a large percentage of silt, and at times some clay. The till layers encountered at drilling and test pit locations is generally described as silt till to silty sandy till; typically, with a trace to some gravel, clay or boulders.

3.4 BEDROCK GEOLOGY

The bedrock at the site consists of Silurian Shale of the Clinton and Cataract Group. Red shale was reported at BH1, BH2 and BH3 at the site, at depths of 38.4 m, 25.9 m and 31.4 m respectively, corresponding to elevations between 380.7 and 389.6 mASL. An overall bedrock slope to the southeast is reported.

3.5 SITE TOPOGRAPHY AND DRAINAGE

Please refer to the Site Plan for specific topographic information at the property. Local topography is also shown on **Figure 2**.

Topography within the Subject Property and adjacent properties to the northeast, southeast and southwest, is rolling and hummocky (with enclosed drainage). Numerous depressions (often having a "Kettle" like form) occur in the overall landscape. Within the proposed Licence, ground surface elevations vary from a local maximum of approximately 431.7 metres above sea level (mASL) to a minimum of approximately 412.5 mASL. Local topographic variation of 8 to 10 m is common from a hill top to bottom of the adjacent depression. The row crop fields at the northern corner of the site, and adjacent agricultural fields to the north and northwest, have less topographic variation and can be described as undulating. Ground surface elevations within the on-site row cropped fields vary from approximately 412.5 to 417 mASL.

Within the proposed Licenced area all drainage is internal and focused within "dry" depressions. There are no springs, other surface water bodies or wetlands, or surface water courses within the proposed Licenced area on-site.

Within the remainder of the land Subject Property, and adjacent lands to the northeast and southeast, drainage is also primarily internal, focused on isolated dry depressions and wetland areas (**Figure 2**) with isolated catchments. Local individual wetlands are discussed further in **Section 3.6** of this report.

An interconnected drainage system, consisting of Caledon Creek, Warnock Lake and associated wetland areas, is located north and northwest of the site and within 120 m of the proposed Licence boundary (**Figure 2**). This system of features is further described in **Section 3.6**.

Catchment areas, related to both dry depressions and wetlands on and near the site, have been delineated as shown on **Figure 4**. The catchment area delineation represents existing conditions based on both available topographic mapping and field observations, specifically with regard to Wetland 4. The field observations include site inspections to examine small scale topographic features that can control local surface water flows, such as depressions and ridges, not represented within the 1 m Site Plan contour mapping. For example, in several areas of the site field edges, access laneways or small depressions alter local surface water flow direction and/or act to retain water. The wetland catchment areas are discussed further in **Section 3.6** and as part of the impact analysis.

The adjacent CSG Pit site aggregate extraction pond/lake, referenced as the Concession II Pond, is located within 120 m of the proposed Licence boundary (**Figure 2**). The extraction pond receives some input from the Caledon Creek drainage system. Under high streamflow conditions Caledon Creek flows into Warnock Lake. Under very high surface water level conditions in Warnock Lake water can flow through an elevated culvert and directly into the Concession II Pond. Water present in the creek or pond also infiltrates rapidly and can move through surrounding groundwater system to the Concession II Pond. However there is no surface outflow from the extraction pond. From the available information, including annual monitoring reports prepared by Harden Environmental, it appears that below water extraction at the Concession II Pond began in 1998. Since that time the reported range in water level elevation at the pond varies from 405.1 to 409.3 mASL, with the greatest fluctuation occurring early in the pond development, between February 1999 and June 2000. Since late 2003, when the McCormick Pit site monitoring began, the Concession II Pond is reported to have varied between 405.3 and 408.3 mASL. Seasonal inputs of surface water and groundwater associated with the Caledon Creek system likely accounts for much of the significant seasonal fluctuation in the Concession II Pond.

3.6 NATURAL ENVIRONMENT FEATURES

The proposed McCormick Pit is located within the Caledon Creek subwatershed (Subwatershed 16) of the Credit River. As noted previously, Caledon Creek is located northwest of the site. There are no natural environment features such as water bodies or wetlands within the proposed Licence area (Subject Lands). There are several surface water based natural environment features within 120 m of the Subject Lands, and several features within the wider landscape (including within the full Subject Property).

Local natural environment features are shown on **Figure 5**. As shown, the wetlands in the area of the full Subject Property have been numbered (Wetland 1 to 12, consistent with previous assessments) for reference. For the purposes of this assessment features have been grouped together based on hydrologic connection and distance from the proposed Licenced area (Subject Lands), as detailed in **Section 3.6.1** and **Section 3.6.2**. A summary of wetland characteristics is provided in **Table 1**.

Wetland	Location Relative To Site	Association	Designation ELC Classification (Savanta)
Warnock Lake	extends within 120 m of Licence	includes Wetland 1, connected to Caledon Creek (intermittently)	Provincially Significant Wetland (PSW) Open Water, Wetland
Wetland 1	within 120 m of Licence	located at southeast edge of Warnock Lake	PSW Willow Mineral Thicket Swamp
Wetland 2	beyond 120 m of Subject Property	isolated feature	Unevaluated (not identified as PSW) not classified
Wetland 3	within 120 m of Licence	isolated feature	Unevaluated (not identified as PSW) Narrow-leaved Sedge Organic Shallow Marsh
Wetland 4	within 120 m of Licence	isolated feature	PSW central portion: Bur-reed Organic Shallow Marsh perimeter: Red-osier Organic Thicket Swamp
Wetland 5	within 120 m of Subject Property	isolated feature	PSW Winterberry Organic Thicket Swamp
Wetland 6	within 120 m of Subject Property	isolated feature	PSW Narrow-leaved Sedge Organic Shallow Marsh
Wetland 7	within 120 m of Subject Property	isolated feature	Unevaluated (not identified as PSW) Shallow Marsh
Wetland 8	within 120 m of Subject Property	isolated feature	Unevaluated (not identified as PSW) Shallow Marsh
Wetland 9	within 120 m of Subject Property	isolated feature	Unevaluated (not identified as PSW) Shallow Marsh
Wetland 10	within 120 m of Subject Property	isolated feature	Unevaluated (not identified as PSW) Shallow Marsh
Wetland 11	extends within 120 m of Licence	part of Caledon Creek drainage system	PSW southwest of Heart Lake Road: Narrow-leaved Sedge Organic Shallow Marsh northeast of Heart Lake Road: Mineral Meadow Marsh
Wetland 12	within 120 m of Subject Property	isolated feature	Unevaluated (not identified as PSW) Shallow Marsh

Table 1: Identified Wetlands

Caledon Creek, Wetland 11, Warnock Lake and Wetland 1 are part of an interconnected drainage system that receives water from the Caledon Creek catchment northeast of Heart

Lake Road. The remainder of the water dependent natural environment features, Wetlands 2, 3, 4, 5, 6, 7, 8, 9, 10 and 12 (see Figure 5) are isolated and do not receive water from a surface water course. The isolated features are supported by an associated surface water runoff catchment.

3.6.1 Caledon Creek and Warnock Lake System

The most significant natural environment system near the site consists of an interconnected drainage network that includes Caledon Creek and associated online "Wetland 11", and, Warnock Lake with associated "Wetland 1" located at the lake margin. Warnock Lake, Wetland 1 and Wetland 11 are part of the Provincially Significant Star Wetland Complex. This creek and wetland system is located off-site, and within 120 m of, the proposed Licenced area.

Caledon Creek flows generally northeast to southwest and is approximately 50 m from the northwest property boundary at its closest point near Heart Lake Road. The creek is described as having *a warm-water thermal regime and primarily supports Cyprinidae species (minnows and carp)* (Savanta, 2017), however is also observed to seasonally intermittent. The creek flows "through" Wetland 11, then northward, "around" Warnock Lake and toward the adjacent Concession II Pond. As the creek flows northward the separation distance increases to approximately 400 m from the site. As described below, water from Caledon Creek can enter Warnock Lake under certain conditions (when creek levels rise above 411 mASL). Based on Site Plan topographic mapping, historical assessments and reported monitoring results the creek invert varies from approximately 412.5 mASL at Heart Lake Road, to 409 mASL immediately north of Warnock Lake (at the inflow point).

Wetland 11 is an elongated feature approximately 45 m from the Subject Lands at its closest point, extending both east and west. The wetland pond is shown at relatively high (spring) water level stage on the Site Plan, at an elevation of approximately 412.2 mASL. No access is available to Wetland 11 for regular monitoring purposes, however based on observations from the road and a simple air photo review (e.g. Google Earth®), by late spring or early summer Wetland 11 is typically "dry" (with no surface water visible). Agricultural activities currently occur to the edge of this feature.

Warnock Lake is shown on the Site Plan also at a relatively high (spring) water level stage, at an elevation of approximately 410.3 mASL. The feature is described as a *shallow and warm-water seasonal waterbody* that *provides minimal and restrictive fisheries habitat* (Savant, 2017). At its closest point the lake and wetland is approximately 35 m from the Subject Lands.

The hydrologic findings to date related to this system are summarized as follows:

- Caledon Creek and Warnock Lake have been studied in detail since about 1995 as part of the Caledon Sand and Gravel Pit southern extension Licencing reports (e.g. Harden Environmental Services Ltd., 1995 and 1996; Conestoga-Rovers & Associates, 1996), and by subsequent Credit Valley Conservation subwatershed studies (CVC, 1998).
- Assessment and monitoring is ongoing through both the Caledon Sand and Gravel Pit monitoring program and studies completed for the McCormick Pit site.

- There is no surface water (overland) flow from the proposed McCormick Pit extraction area directly to Caledon Creek or Wetland 11. There is some overland flow potential from site to Warnock Lake and Wetland 1.
- Caledon Creek is an intermittent seasonal watercourse, in the area of the site streamflow occurs primarily during snowmelt and heavy (e.g. spring or fall) precipitation. The Heart Lake Road creek crossing is typically dry during the summer months (Savanta, 2017; AECOM, 2013; Harden, 1995, 1996; CRA, 1996; CVC, 1998).
- Wetland 11, beginning just west of Heart Lake Road, occupies a depression which fills during larger creek flow events and rapidly infiltrates surface water. Rapid surface water infiltration (recharge) also occurs along Caledon Creek both east and west of Wetland 11.
- Infiltration rates in this area are so high that although high flows have been noted at Heart Lake Road, filling Wetland 11 with water, little of this streamflow actually reached the Warnock Lake area (AECOM, 2013; Harden, 1996). Caledon Creek immediately upstream of the Concession II Pond has also been described as an “ecological trap”, with water infiltrating so quickly after the spring freshet that small fish become stranded on the streambed (CSG).
- Flow from Caledon Creek can enter Warnock Lake when surface water in the creek is above about 411 mASL (e.g. during some spring snowmelt events) at the “inflow” point (AECOM, 2013; CRA, 1996). Depending on relative creek and lake levels, water can move either into the lake from the creek or from the lake into the creek. When water is present in Warnock Lake this feature begins to infiltrate (recharge) water. (AECOM, 2013; Harden, 1995, 1996; CRA, 1996).
- A detailed bathymetric survey has shown that the deepest portion of Warnock Lake corresponds to an elevation of 406.8 mASL. Water depths up to 4.7 m (411.5 mASL) are reported (AECOM, 2013; CRA, 1996).
- During high flow and recharge events the groundwater table “mounds” below Caledon Creek and Wetland 11, such that some shallow groundwater can also move laterally from the creek system to Warnock Lake. (Harden, 1995, 1996).
- The size and depth of Warnock Lake/Wetland 1 varies yearly, and seasonally, depending on the annual input of water, which typically occurs in the spring. The lake is also seasonal. Water is typically present in the spring by late summer this feature can be dry (AECOM, 2013; Harden, 1996; CRA, 1996).
- A simple review of historical aerial photography of the lake as available on Google Earth® provides an indication of the wide variation in the extent of the lake from year to year and over the seasons. Conditions shown include the lake/wetland areas completely full (similar to that shown on the Site Plan) to relatively dry.
- As described by AECOM (February 2013): *The soil profile beneath Warnock Lake (from standpipe monitors installed in the lake bed) consist of 2 m of organic muck, peat and calcareous mud underlain by native fine sand and silt (Harden, 1996a).* The fine grained soil will reduce infiltration rates and help Warnock Lake retain water for an extended period, compared to the adjacent Caledon Creek.

- Primary water inputs to Warnock Lake occur as direct snowpack accumulation over the winter period and winter/spring melt events, which can also bring water into the feature from Caledon Creek.
- Over the spring to late fall period there are limited water inputs to Warnock Lake and the lake slowly dries out via groundwater recharge and evaporation.
- Groundwater discharge and perennial flow occurs only within the lower reaches of Caledon Creek, over 4 km away from the site, near the confluence with the Credit River (CVC, 1998).

As shown on **Figure 2**, the CSG Pit Concession II Pond below water extraction has occurred within approximately 50 m of Warnock Lake. Below water extraction continues in a southern direction, “moving” the southern edge southward over time. When monitoring began at the McCormick Pit site the Concession II Pond edge was at the approximate middle of the common boundary. Currently the southern Concession II Pond extends across the entire common boundary and south of the full Subject Property.

As part of the historical mitigation program associated with the below water extraction, a hydraulic barrier wall was installed between Warnock Lake and the Concession II Pond in 2000-2003 (see **Figures 2 and 3**). As reported by James Dick Construction Ltd., the barrier was constructed by routine excavation of a trench to the underlying till unit. The basal width (and therefore depth) is reported to be approximately 11 m (Harden, 2001). The resulting trench was backfilled with fine grained (silty) overburden using mass placement techniques. The final barrier is estimated to have a hydraulic conductivity of 10^{-8} cm/s (Harden, 2001). The barrier was intended to limit northeast-southwest groundwater flow and therefore mitigate any potential groundwater table changes that would be associated with the below water extraction in order to maintain seasonal groundwater and surface water conditions within Warnock Lake.

Ongoing monitoring summaries completed for the CSG Pit (e.g. Harden, 2016) indicate that the barrier is effective at maintaining a water level difference (reported average of 2 m) between the Lake and pond. A similar barrier is proposed as needed at the McCormick Pit to mitigate potential groundwater table change in this area. Further discussion is provided in **Section 7.5** of this report.

The water drainage systems associated with Caledon Creek/Wetland 11/Warnock Lake have been altered over time from the assumed pre-existing “natural” state to the current condition through development. Land clearing and agriculture will have changed overall water flow patterns, distribution, evaporation, etc. Current agricultural practices (such as land preparation, planting patterns, annual crop rotation) also exert control on water movement. Development of roads and residential properties (including landscape maintenance or alteration), have also likely changed overall water movement in the area. For this assessment current conditions, including the existing local anthropogenic controls on water systems, are assumed to be the benchmark for impact comparisons.

3.6.2 Isolated Wetlands Within 120 m Of Subject Lands

Isolated wetlands located within 120 m of the proposed Licenced area (see **Figure 5**) are Wetland 3 and Wetland 4. Wetland 4 is part of the Provincially Significant Star Wetland Complex (Savanta, 2017).

Previous studies (e.g. AECOM, 2013) have characterized all of these isolated wetlands as perched above the groundwater table, and provide the following description:

> *Perched wetlands are common in this area. The hummocky topography with many small closed depressions results in water being stored in the depressions, which slowly infiltrates into the moderately permeable sandy silt till (CVCA, 1998). Sub-surface information (test pits, water well records) on the site and in the vicinity shows the presence of sporadic till cover at surface. …. This suggests that the perched wetlands were likely formed within localized areas of low permeability surficial till. …. Over time, as more organic matter and washed in fine sediments from surface water runoff collects in the these depressional features, the wetlands will tend to further seal off the bottom.*

Within a perched wetland system of this type, surface water from direct precipitation and runoff (overland flow) from the surrounding small catchment collects within the wetland. The fine grained soils at the bottom of the wetland depressions helps retain water, which over time slowly infiltrates or evaporates. A true perched system of this type is associated with an isolated saturated zone within the fine grained soil near surface, separated from the underlying local groundwater table by an unsaturated zone. Water movement between the perched system and the local groundwater table is by vertical gravity drainage. The water availability of the perched wetland, and annual or seasonal hydoperiod, is dependent on surface water inflow.

Catchment areas for (dry) depressions on and adjacent to the site, and, wetlands adjacent to the site are shown on **Figure 4**. Based on the sandy soils and sporadic nature of the till cover at surface, overall recharge rates are high and runoff may be limited to periods of snowmelt or significant rainfall. Much of the surface water input to these features will occur in the spring due to snowmelt.

Wetland 3

Wetland 3 is within a small depression located near the southern corner of the proposed Licence boundary. The proposed Licence boundary runs adjacent to this wetland, however the proposed extraction will not affect the catchment area. Based on Site Plan topographic mapping, the elevation of Wetland 3 is about 428 mASL. The Concession II Pond, with a surface water elevation less than 408.3 mASL, is less than 50 m from Wetland 3. Wetland 3 occurs in an area mapped as Till (sandy silt to silty sand) at surface. The adjacent TP36 confirms that silty/sandy till material occurs at surface and extends at least 4.5 m below the wetland.

Wetland 3 is perched above groundwater table. This characterization is supported by the occurrence of seasonal water accumulation, fine grained soils at the feature and elevation difference, of 10 m or more seasonally, between the wetland and the adjacent Concession II Pond. Based on the separation distance between the wetland and the groundwater table, Wetland 3 is not sensitive to groundwater table fluctuations or potential groundwater table changes in this area (e.g. that may have occurred related to the Concession II Pond or may occur due to the proposed McCormick Pit extraction). In addition, there would be no alteration of potential surface water inputs due to the proposed extraction.

Wetland 4

Wetland 4 is a larger elongated depression located near the eastern edge of the proposed Licence boundary. The wetland surface elevation shown on the Site Plan is approximately 411.6 mASL. Wetland 4 also occurs in an area mapped as Till at surface. TP19 and TP25 were completed adjacent to this feature. TP25, just north of the wetland, reports till extends from surface to a depth corresponding to approximately 412 mASL. TP19, west of the wetland, indicates that the upper materials at this location are sands, however till occurs below approximately 412.7 mASL and extends below 410.7 mASL.

Wetland 4 is described as having: *fluctuating water levels of 0.3 m, but year-round surface waters present with open water/shallow marsh habitat*; and, *north end of wetland used for livestock watering and south end shows evidence of agricultural equipment crossing* (Savanta, 2017). The overall landscape surrounding Wetland 4 has been altered due to agricultural and land management activities, including: layout and use of agricultural fields; hedgerow development; land clearing or woodlot management; and, the construction of the adjacent access laneway. These activities will have likely resulted in catchment changes over time, and the formation of the current hydroperiod and related habitat. The catchment area delineated on **Figure 4** reflects existing conditions.

Monitoring data at, and near, Wetland 4 supports the conclusion that the wetland is situated above the groundwater table that occurs within the proposed extraction area and is a groundwater recharge feature. Water level monitoring at MP-1 and MP-1b indicates that over the period 2013 to 2017 the surface water within Wetland 4 was typically observed at elevations between approximately 411.2 and 412.1 mASL. However the wetland was also noted to be dry at MP-1 in 2016, and the groundwater table was measured to be 1 m below the ground surface at that time. Groundwater levels at MP-1/MP-1b are measured to be typically below the surface water level, indicating a downward vertical hydraulic gradient, which occurs under recharge conditions.

Monitoring well BH5 was installed adjacent to, and west of, Wetland 4. The maximum and minimum groundwater table elevations measured at BH5 since 2003 are approximately 409.9 and 405.3 mASL, respectively. Based on the recent monitoring record at BH5 the groundwater table in the sand and gravel (resource) at the site is consistently 1 m or more below the surface water elevation at Wetland 4, and at times up to 5.9 m below the wetland. The proposed extraction would alter the catchment associated with Wetland 4. The proposed changes would remove some of the existing catchment area west of the wetland and add an (approximate) equivalent catchment area north of the wetland. The potential for extraction related impacts at Wetland 4 is further discussed in **Section 7.0** of this report.

3.6.3 Other Isolated Wetlands

Wetland 2 is a small isolated wetland located within farm fields between the site and Caledon Creek, and is approximately 140 m from the proposed Licence boundary (therefore not characterized by the NETR report). Based on Site Plan topographic mapping the wetland elevation is approximately 411.5 mASL. AECOM (2013) states that *Wetland 2 is a shallow depression that has been plowed through and planted with corn*. A review of historical aerial photography available on Google Earth® confirms that crops sometimes extend through the wetland. Conditions within Wetland 2 are linked to conditions in Caledon Creek and Wetland 11. Occasionally the groundwater table will be high enough to intercept this depression, however as the groundwater table declines the wetland dries up. Protection measures proposed for Caledon Creek, Wetland 11 and Warnock Lake/Wetland 1, as discussed in **Section 7.5** of this report, will also serve to maintain conditions in Wetland 2.

Wetlands 5, 6, 7, 8, 9, 10 and 12 occupy small depressions east and southeast of the site, and occur at varying distances from the site, from about 140 m to over 200 m. These wetlands range in elevation from approximately 419.3 to 425.5 mASL, and are 9 m or more above the defined local groundwater table. Wetlands 5 and 6 are also designated as part of the Provincially Significant Star Wetland Complex.

Based on the site setting and water level monitoring data, all of these wetlands (#5 to #10) are also “perched” and function as groundwater recharge features. Similarly, ponds and wetlands located further northeast and southeast of the site are also likely situated above the water table and rely on surface water inputs from individual catchment areas. The proposed extraction will not affect the catchment area of these more distant wetlands and/or ponds. Given that these features do not rely on groundwater for their function and that the surface water catchments will not change, Wetlands 5, 6, 7, 8, 9, 10 and 12, and other more distant surface water features, will not be affected by any potential groundwater table changes in this area (e.g. that may have occurred related to the Concession II Pond or may occur due to the proposed McCormick Pit extraction).

3.6.4 Silver Creek

The East Credit River Subwatershed (#13) is located southeast of the Caledon Creek Subwatershed, and in the area of study site the watershed divide is located just north of the Escarpment Side Road. The headwaters of Silver Creek (subcatchment 13-06), part of the East Credit system, begin southeast of the Escarpment Side Road, at a distance of approximately 1.5 Km from the site (Savanta, 2017). Silver Creek is characterized as a “cold water” system, which provides brook trout habitat. As described in **Section 4.0** of this report, groundwater flow from the McCormick Pit site and adjacent CSG Pit site flows southeastward, generally toward the Silver Creek headwater creek system.

Groundwater discharge areas form the headwaters of Silver Creek south of the Escarpment Site Road. The closest discharge areas are located between Heart Lake Road and Highway 10. As part of the CSG Pit monitoring program Harden obtains streamflow at several locations representing the Silver Creek discharge “outflow” closest to the CSG and McCormick sites. The 2016 Harden report, showing monitoring locations and flow measurement results, is provided in **Appendix D**.

Location SW3 (Station 3) represents the combined streamflow from the overall discharge area. Data reported by Harden at SW3 (Station 3) indicate that from the period 1997 to 2016 measured streamflow has generally increased. Since 2010 reported streamflow at SW3 was above 100 Litres per second (L/s). This location also corresponds to flow monitoring location A-2, as shown in the East Credit River Subwatershed Study (2007). As reported in the *East Credit (Subwatershed 13) Study - Water Budget and Groundwater Model Updates* memo (Aqua Resources Inc., July 6, 2007) Table 1, Silver Creek baseflow measured as part of the subwatershed study work at location A-2 varied from 56 to 89 L/s (low to high).

Given the distance from the proposed McCormick Pit extraction to the discharge areas forming the headwaters of Silver Creek, no direct influence to a specific discharge location is expected. However, potential water balance changes related to the proposed extraction can be compared to overall groundwater discharge in this area, as represented by Subwatershed 13 flow location A-2 (Harden SW3).

3.7 PRIVATE WATER WELLS AND LOCAL GROUNDWATER USE

As part of the background review for this study, and to update the original assessment, MOECC well records with reported locations within approximately 500 m of the full Subject Property were examined.

Table 2 provides a summary of well record information reviewed. Reported water well locations in the area of the site are shown in **Appendix A**. In addition, copies of select water well records, discussed below, are also included in **Appendix A**.

A total of 26 well records were reviewed. A total of 7 records report well abandonment, at the time of drilling (unused test holes, or due to insufficient supply), or, of pre-existing wells no longer in use, and provide limited information. This includes the well shown at the northern corner of the site, listed as a municipal test hole drilled on the road right-of-way and abandoned after drilling. Well use in the area is primarily for domestic purposes, with a few (older) wells also listing livestock watering purposes.

One municipal well is listed (#4907510, see **Appendix A**), however this was a test well location that is not used for water supply. The closest municipal well in use (Caledon Village #3) is located southeast of the village of Caledon, on the south side of Hurontario Street (Hwy 10) and at an approximate distance of 2 km from the McCormick Pit site. The CSG Pit ponds lie between the site and the Caledon municipal well.

Three bored wells are reported, all completed by the same driller and each with a depth of 18.3 m, installed within a clay (till), with overlying sand. Two of the bored wells (#4907129 and #4907130) are located along Escarpment Side Road, south of the CSG Pit Concession II Pond. These two wells are distant from the proposed extraction and with the intervening CSG pond in place, would not be affected by activities in the McCormick Pit site. The third bored well, #4907732 (see **Appendix A**), is likely shown in an incorrect location within the MOECC database. The sketch map on the well record indicates that the well is closer to the hamlet of Claude, which is southeast of Inglewood.

The remaining 16 records are reported to be drilled wells, completed in overburden or bedrock.

The well record for the McCormick Pit site farm house, #4905474 (see **Appendix A**) indicates, the well is completed at a depth of 32.3 m in a confined gravel layer overlain by 11 m of “hardpan” (till). Assuming a ground surface elevation of 417 mASL (Site Plan), the well is completed to an approximate elevation of 384.8 mASL, and the reported static level is 408.5. This corresponds well to the on-site test drilling results.

Record No.	Total Depth (m)	Type	Unit	Use	Static Level (m)	Bedrock Depth (m)	Source Classification
4900619	80.2	drilled	bedrock	domestic	30.5	73.2	confined shale bedrock aquifer
4903123	76.2	drilled	bedrock	domestic	32.0	66.8	confined shale bedrock aquifer
4903190	50.0	drilled	overburden	domestic	34.7	-	unconfined sand aquifer
4903200	48.5	drilled	overburden	domestic	33.5	-	unconfined sand aquifer
4903299	48.2	drilled	overburden	domestic	41.8	-	confined sand aquifer
4903846	46.3	drilled	test hole - abandoned, sand/clay (till) reported from surface to end of hole				
4903993	90.8	drilled	bedrock	domestic	27.4	50.3	confined shale bedrock aquifer
4904367	24.7	drilled	overburden	domestic, stock	5.8	-	confined gravel aquifer
4904891	57.9	drilled	insufficient supply - abandoned, primarily clay with sand/silt and gravel layers reported				
4904892	24.4	drilled	insufficient supply - abandoned, primarily clay with sand/silt and gravel layers reported				
4904893	53.3	drilled	insufficient supply - abandoned, primarily clay with sand/silt and gravel layers reported				
4905412	41.1	drilled	bedrock	domestic	12.2	38.1	confined shale bedrock aquifer
4905474	32.3	drilled	overburden	domestic, stock	8.5	-	confined gravel aquifer
4906191	28.3	drilled	unknown	domestic	22.6	-	well deepened, screen added
4906223	43.3	drilled	bedrock	domestic	14.6	32.0	confined shale bedrock aquifer
4907129	18.3	bored	overburden	domestic	7.9	-	unconfined, water found in clay
4907130	18.3	bored	overburden	domestic	9.1	-	unconfined sand, clay below
4907510	46.3	drilled	bedrock	municipal	17.5	42.7	confined shale bedrock aquifer
4907530	51.8	drilled	overburden	domestic	13.7	-	unconfined sand aquifer
4907732	18.3	bored	overburden	domestic	6.1	-	confined sand/clay aquifer
4909000	46.6	drilled	overburden	domestic	33.5	-	confined sand aquifer
4909318	well abandonment – limited information						
4909895	22.6	drilled	overburden	unknown	8.5	-	unconfined sand aquifer
4910230	28.3	well abandonment – limited information					
7176707	26.5	drilled	test hole - abandoned			23.8	clay/sand/gravel (till) over rock
7230718	17.1	drilled	overburden	domestic	7.3	-	confined gravel aquifer

Table 2: Well Record Summary

The next closest well to the site is located at the residence near the east corner of the proposed Licence, which is Building 5 as shown on the Site Plan. Google Earth® Street-view imagery from 2014 indicates a drilled well casing extends above ground surface at the residence. The sketch map and location description for well record #4906223 (incorrectly located on the north side of Heart Lake Road at the McCormick Pit site farm entrance) appears to correspond to Building 5, as shown on the well record map. Record #4906223 (see **Appendix A**) indicates the well is completed to a depth of 43.3 m in the confined shale bedrock overlain by 16 m of clay/stones (till). Assuming a ground surface elevation of 421 mASL (Site Plan), the well is completed to an approximate elevation of 377.7 mASL, bedrock was encountered at 389 mASL and the static level is 406.4 mASL. This generally corresponds to the on-site test drilling results, but suggests bedrock water levels are at a lower head (elevation) than overburden water levels.

The three drilled wells located north, and within 500 m, of the site, service existing residences on the north side of Heart Lake Road. One well (#4905412, see **Appendix A**) is completed to a depth of 41.1 m in the confined shale bedrock, overlain by boulders/clay/gravel (till). The two remaining wells, #4904367 and #7230718 (see **Appendix A**), are overburden wells, completed in confined gravel aquifers at depths of 24.7 and 17.1 m, respectively.

The remaining 13 wells are shown to be either greater than 500 m from the site, or along the Escarpment Side Road, and are more distant from the actual extraction area. Eight (8) are overburden wells completed in confined or unconfined sand/gravel aquifers, at depths between 22 and 52 m. Static levels for these overburden wells range in depth from 8.5 to 41.8 m. Five (5) are bedrock wells completed in the confined shale aquifer, at depths between 43 and 91 m. Static levels for the bedrock wells range from 14.6 to 32 m depth.

3.8 SOURCE PROTECTION CHARACTERIZATION

The proposed McCormick Pit is not within any municipal well head protection area (WHPA). The closest WHPA to the site is associated with Caledon Village #3 well, which extends generally north of that well and remains 1.5 km or more from the McCormick Pit site. In addition, existing gravel pit ponds occur between the site and the WHPA (and well), which will "buffer" the municipal well from any potential change associated with extraction at the proposed McCormick Pit.

Based on the fact that the site is not within a WHPA, or contributing area, no specific Source Protection Policies apply with regard to the proposed McCormick Pit Planning or ARA applications.

In general, the outwash deposit at the site is located within a Significant Groundwater Recharge Area (SGRA, >230 mm/yr) and Highly Vulnerable Aquifer (HVA). These classifications are expected as the site is located within an extensive sand and gravel deposit at surface that forms a regional unconfined aquifer. The surrounding landscape, including active gravel pits to the southwest, is classified similarly. Source Protection reports indicate the computer model calibrated groundwater recharge rates for the surficial gravel deposits are on the order of 350 mm/yr or more (*SPC Accepted Draft Integrated Water Budget Report - Tier 2, Credit Valley Source Protection Area*, AquaResource Inc. for Credit Valley Conservation Authority, April 2009).

4.0 HYDROGEOLOGIC SETTING

The hydrogeologic setting of the proposed McCormick Pit and surrounding area is discussed in context of the known regional setting and the findings of the assessments completed at the site.

In order to illustrate the specific conditions in this area of the site three schematic geologic cross-sections were developed based on site topographic mapping, water well record database, CSG assessment report borehole logs, McCormick property borehole logs and water level monitoring results. Cross-section locations are shown on **Figure 6**. The sections are provided as **Figure 7, Figure 8 and Figure 9**.

As illustrated by all 3 cross-sections, topography is variable both on-site and in the immediate area. The stratigraphy at the site is also variable, generally consisting of a discontinuous till unit (silty/sandy) at surface, underlain by a thick sequence of (primarily) sands and gravels with intermittent layers of till (clay/silt/sand) that extends to shale bedrock. A basal till is interpreted to occur directly overlying the bedrock within much of the site, however at one location (BH1) the till was absent and the sand/gravel unit extends to bedrock.

The basal till unit elevation within the CSG Concession II extraction area, as shown on Schematic Section A (**Figure 7**) and Schematic Section B (**Figure 8**), is based on historical drilling results at that site, in addition to reported conditions encountered during the extraction of the existing barrier wall (terminating in a till unit along the southwest edge of Warnock Lake).

Given the static water levels measured at the site, the sand and gravel “resource” targeted for extraction forms an unconfined aquifer. Semi-confined conditions may occur within deeper portions of the sand and gravel unit where it is overlain by till layers (e.g. BH1, some off-site private wells). The underlying shale bedrock, in use as water supply aquifer in the general area, appears to be primarily a confined system, however is also locally semi-confined to un-confined (e.g. at BH1).

The primary hydrogeologic function at the site is groundwater recharge, focused within localized and isolated depressions. The surrounding landscape has a similar form and function. The combination of enclosed drainage and presence of permeable soils over much of the area results in relatively high infiltration rates.

Within the proposed McCormick Pit extraction area the groundwater table within the sand and gravel aggregate resource unit is consistently below the bottom of the isolated depressions. Till deposits occur at the base of some depressions, which reduces infiltration. Additional fine-grain sediment and organic material accumulation over time further slows infiltration and has allowed several isolated wetlands to develop above the local water table, even within the sand/gravel deposit.

Recharge rates are also high within the Caledon Creek system immediately north of the site. Based on the observed surface water infiltration within this system, the creek bed and Wetlands #2 and #11 are developed on open sand and gravel which results in high recharge rates and lack of “standing” water. Water flow through this area may have prevented the accumulation of fine grained material along the channel bed.

Warnock Lake and associated Wetland #1 have developed a thick layer of organic (muck/peat) deposits and silt/clay over till (silt/sand), which limits recharge rates and results in an extended hydroperiod each year.

The outwash unit aquifer in general receives a significant input of water each year as snowmelt flows off of the till units to the north and infiltrates within the sand and gravel. Because of the large volume of seasonal water input, groundwater table fluctuations within the outwash unit can be large. As the outwash unit widens to the southwest this seasonal effect is distributed over a wider area. In addition, extensive aggregate ponds have been developed southwest of the McCormick Pit site, effectively increasing storage within the aquifer “system”. Therefore seasonal fluctuations are expected to be smaller in magnitude to the south and west of the McCormick Pit property.

This overall effect is evident in the water level variation at the site, and difference in seasonal fluctuation between monitors. As shown by the datalogger data, providing the most detailed set of seasonal measurements, the largest seasonal fluctuation at the site occurs within the northern portion of the site, and specifically at BH2R. The smallest seasonal fluctuation occurs at BH6.

As described in the AECOM (2013) report, and supported by both subwatershed and Source Protection studies, regional groundwater flow in the area is generally southward, with some component of flow within the adjacent gravel pit properties to the southwest and along the axis of the outwash deposit. The southward development of the CSG Concession II Pond over time is expected to exert some control on local flow.

Current (2015 to 2017) groundwater table elevations, and shallow groundwater flow, at the site under seasonal “high”, “average” and “low” conditions, are shown on **Figure 10**, **Figure 11** and **Figure 12** respectively. These maps incorporate available data at monitoring wells on and near the site, including the reported CSG Concession II Pond. The dates chosen for the groundwater table contour projections reflect the availability of reported data at BH2R and the CSG site.

As illustrated, several factors significantly influence groundwater table conditions at the site. Infiltration recharge, and associated groundwater mounding, along Caledon Creek each spring creates a local groundwater table “mound” and provides a “pulse” of water that moves relatively quickly in a southerly direction through the site. The groundwater table slope (gradient), and groundwater flow, across the site is highest during spring and early summer conditions.

As water levels decline through the summer and fall the overall gradient decreases and the groundwater table drops below Warnock Lake. Groundwater flow through the unconfined aquifer in the general area is also controlled by the aquifer characteristics such as hydraulic conductivity, saturated thickness and hydraulic gradients.

The original assessment (AECOM, 2013) assumed the hydraulic conductivity of the aquifer to be 1×10^{-2} m/s, as representative of sand and gravel. For the purposes of this assessment, the hydraulic conductivity of the aquifer is estimated using the Hazen formula ($K=d_{10}^{2}$) and grain-size analysis as presented in the AECOM report. Copies of the grain-size analysis plots are included in **Appendix B**. A summary of the estimates is provided in **Table 3**.

Soil Sample	d_{10} (mm)	Hydraulic Conductivity (K)	
		(cm/s)	(m/s)
BH1 58-60’, gravel and sand, trace silt	0.3720	0.1384	1.38×10^{-03}
BH2 22-24’, sandy gravel, trace silt	0.3065	0.0939	9.39×10^{-04}
BH3 60’, sandy gravel	1.9165	3.6730	3.67×10^{-02}
BH6 66’, gravel and sand, trace silt	0.2664	0.0710	7.10×10^{-04}
		Geometric Mean Value:	2.41×10^{-03}

Table 3: Hydraulic Conductivity Estimate

The groundwater table horizontal gradient under “average” conditions, as shown in **Figure 11**, is approximately 0.005 (2 m groundwater table decline over 415 m). The groundwater modelling completed as part of the CTC Tier 2 Integrated Water Budget Report (April 2009) indicates that vertical hydraulic gradients (between the unconfined sand and gravel aquifer and the bedrock system) are neutral to downward at the site.

The thickness of the upper saturated sand and gravel unit varies across the site and from season to season. Under “low” groundwater table conditions the aquifer thickness varies from about 6 m at BH4 to 15 m at BH 3, with an average of approximately 11 m.

The hydraulic barrier between Warnock Lake and the CSG Concession II Pond “holds” back some groundwater flow during high groundwater table conditions, directing some of that flow southward onto the McCormick Pit site. This effect continues through the year, however as the groundwater table and gradient declines this influence is less obviously reflected in the groundwater table contours.

The CSG Concession II Pond also exerts some control on groundwater flow south of the barrier. As expected in this setting, the pond has resulted in an increase in groundwater table elevations southwest of the McCormick Pit site, directing local flow south to southeast under all seasonal conditions. Overall current groundwater movement in the area of the site is consistently toward the south and southeast through the year.

5.0 PROPOSED EXTRACTION

The following general description of the proposed McComick Pit extraction is provided as a framework for the impact analysis. For specific details regarding existing site conditions or the extraction plan please refer to the Site Plan.

Several operational aspects of the proposed extraction have changed since the 2013 planning submissions. The current proposal is to operate the site in conjunction with the adjacent CSG Pit site. Extraction would move into the site from CSG Pit and extracted material would move via conveyor or haul truck to the existing CSG processing plant. No aggregate washing would occur at the proposed McCormick Pit.

The proposed License area is approximately 25.97 ha, and the proposed extraction area is approximately 20.75 ha. As extraction occurs, each sequential operational area will be stripped of topsoil and subsoil, this material will be stored on-site generally within berms or used for progressive rehabilitation. The extraction would remove the sand and gravel above the groundwater table, then proceed below water. Extraction below the groundwater table would be completed primarily by dragline to create a pond, which will extend over most of the site. There is no dewatering proposed as part of the below water extraction. Below water extraction would occur to the underlying till elevation (where encountered) or to a maximum depth corresponding to an elevation of 384 mASL.

Rehabilitation would occur progressively as extraction is completed through sequential operational areas, creating an open (pasture like) area around a large pond. The current extraction plan would result in a single pond at the site, connected to the adjacent CSG Concession II Pond. The pond rehabilitation scenario is shown on **Figure 13**. The proposed pond is 14.0 ha in size.

Based on the successful implementation of the hydraulic barrier wall in place at the CSG Pit, it is expected that a similar strategy can be used at the McCormick Pit site to mitigate potential groundwater impacts on the surrounding area, and specifically to the Caledon Creek-Warnock Lake system. The proposed (potential) location of the barrier wall is shown on the Site Plan. The proposed monitoring and mitigation plan includes the use of a barrier wall if needed, which can be constructed as part of the routine site extraction and rehabilitation operations. Details regarding the barrier are further discussed in **Section 7.5** of this report.

Fuel storage, handing and use on-site would conform to all applicable regulations and standards, as shown on the Site Plan. A spill response plan will be in place and enforced through Site Plan conditions.

Post extraction drainage within most of the Licenced area would be directed toward the proposed pond. Some drainage is also proposed to be directed to Wetland 4 to ensure the water balance for that feature is maintained. There are no other proposed water diversion, storage or drainage facilities on-site.

6.0 LEVEL 1 EVALUATION

The purpose of the Level 1 evaluation is to determine the final extraction elevation relative to the established groundwater table, and the potential for adverse effects to groundwater and surface water resources and their uses.

Under recent conditions the seasonal high groundwater table within the site varied from approximately 412.7 mASL (at BH2R) to 408 mASL (at the CSG Concession II Pond and southeast edge of the proposed extraction area). The seasonal low groundwater table varied from approximately 408.4 mASL (at BH2R) to 406 mASL (at the CSG Concession II Pond and southeast edge of the proposed extraction area). The proposed below water extraction would extend to the underlying till unit or to a maximum depth of 384 mASL.

Based on the setting, the elevation of the proposed pond within the McCormick Pit is expected to be largely controlled by the larger CSG Concession II Pond. A final pond level of 405.7 mASL is shown on the CSG Pit Rehabilitation Plan. Recent reported monitoring data indicates that the Concession II pond has fluctuated between approximately 406 and 408.5 mASL.

As the Concession II Pond extends southeastward, and downslope along the groundwater table, the pond level may decline somewhat as compared to the current condition. Based on the overall setting and information available at this time, the final average Concession II and McCormick Pit pond level would likely be in the range of 406 to 407 mASL. Seasonal high pond levels on the order of 408 mASL could also be expected.

Potential physical changes to the groundwater system related to the proposed extraction could include: temporary groundwater table effects during below groundwater table extraction; long-term changes to the groundwater table in the area of the proposed final pond; and, water balance changes (site or feature scale) due to re-grading the extraction area and pond creation.

Based on the setting and location of the site (e.g. separation distance from the site to known discharge areas) there is no significant potential for thermal impact to surface water features associated with the proposed McCormick Pit.

To assess the significance of potential on-site groundwater table effects and catchment changes due to the proposed extraction on water wells and natural environment features in the area of the site, an impact assessment and Level 2 evaluation is required.

The previous assessment (AECOM, 2013) provided an impact analysis related the potential need for water taking associated with aggregate washing at the McCormick Pit site. Aggregate washing is no longer proposed at the McCormick Pit site. This change in the operational plan eliminates any potential impacts related to water taking at the site.

An updated impact assessment is provided as **Section 7** of this report and the Level 2 evaluation is summarized as **Section 8** of this report.

7.0 IMPACT ASSESSMENT

The impact assessment is completed to examine issues related to the potential for the proposal to affect the local groundwater table or water balance at the site. The previous assessment (AECOM, 2013) provided impact analysis based on information available at that time and specific methodologies. The overall impact assessment has been updated incorporating more recent data and using alternate methodologies for comparison. A summary of previous work is included in each section below.

7.1 SITE WATER BALANCE

The water balance of the site as a whole will be altered due to changes in surface water patterns and the creation of a pond. The water balance analysis quantifies the potential for change and provides a reference to compare the magnitude of change to the local environmental setting. Previous work is summarized in **Section 7.1.1** and an updated site water balance is provided in **Section 7.1.2**.

7.1.1 Summary of Previous Work

AECOM (2013) provided an estimate of pre-extraction and post-extraction infiltration recharge for the site. In summary, the previous assessment calculated infiltration recharge as the difference between precipitation input and outputs consisting of evapotranspiration, pond evaporation, and, site runoff. The assessment assigned some site runoff potential under existing conditions, and assumed that all runoff was retained under final conditions. Relevant factors used in the water balance were as follows:

- average precipitation of 0.917 m/yr
- average evapotranspiration within “pasture” lands of 0.537 m/yr
- runoff potential of 5% of water surplus
- lake evaporation rate of 0.652 m/yr
- extraction area of 207,500 m^2
- final pond area of 111,400 m^2

Based on the calculations provided, the existing average site recharge was estimated to be 74,908 m^3yr (2.38 L/s) and runoff estimated to be 3,942 m^3yr (0.13 L/s). Under final rehabilitated conditions runoff was assumed to be zero and future recharge was estimated to be 66,039 m^3yr (2.09 L/s). The predicted change in recharge equates to 0.28 L/s. Overall a net loss in water contribution to the watershed of approximately 0.4 L/s was predicted. The loss is directly related to the higher evaporation rate within the future pond as compared to evapotranspiration within the existing pasture.

The AECOM assessment compared the total water loss within the watershed to measured flow within the Credit River (at Cataract) and concluded that the potential change was negligible.

7.1.2 Updated Site Recharge Balance

In order to examine the potential for changes to the site water balance within the proposed extraction area, an updated detailed site scale recharge water balance was completed for existing conditions and proposed post-extraction conditions. The water balance calculations are included in **Appendix E**.

The updated water balance is developed according to standard water input/output accounting type methodology recommended by various sources, including the *Oak Ridges Moraine Conservation Plan (May 2017)* and associated *Technical Paper Series (#10 Water Budgets).*

Water Budget Components

The water budget is based on average conditions, climate data for the area is based on monthly precipitation and temperature climate Normals (1981 to 2010) as reported by Environment Canada for the Orangeville MOE Climate Station (also used by the Source Protection Studies to represent conditions in this area). Annual average precipitation in the area of the site is estimated to be 901.5 mm/yr. Evapotranspiration, runoff and infiltration rates are estimated in accordance with MOECC development application guidelines (*Hydrogeological Technical Information Requirements for Land Development Applications*, April 1995) and stormwater management guidelines (*Stormwater Management Planning and Design Manual*, March 2003).

Based on the climate data, monthly potential (PET) and actual evapotranspiration (AET) estimates were calculated for soil and vegetation conditions relevant to the site and proposal using the *Computer Program for Estimating Evapotranspiration Using the Thornthwaite Method*, United States Department of Commerce, National Oceanic and Atmosphere Administration (NOAA) Technical Memorandum ERL GLERL-101 (November 1996). The PET rate is a theoretical maximum rate that occurs where there is an unlimited amount of water available at the soil surface for direct evaporation to air and transpiration by plants (e.g. within a wetland). The AET rate represents the expected evaporation and evapotranspiration rate that occurs for varying soil and cover types where the water table is at depth, and varies with the capacity of the soil to retain water (Soil Moisture Retention) between precipitation events. The AET estimates reflect the fact that a soil moisture deficit, which limits the amount of water available for evapotranspiration, typically occurs during summer months.

AET estimates were developed for the existing soil types and vegetation (cover) found within the proposed extraction area. Three Thornthwaite Method specified soil classifications are used, based on the surficial geologic classifications presented in the Geotechnical Report (Harrington McAvan Ltd., February 2013). A figure showing the surficial distribution of Outwash deposits, combined Outwash + Ice-Contact deposits, and, moraine (till) deposits at the site is included in **Appendix A**. For the purposes of the analysis, the Outwash deposit soils are classified as Fine Sand; the combined Outwash + Ice-Contact deposits are classified as Fine Sandy Loam; and the Moraine till deposits are classified as Silt Loam. Two Thornthwaite Method specified vegetation types are used, corresponding to Woodland (mature forest) and Deep Rooted Crops (pasture). The Woodland areas are based on the ELC mapping provided by Savanta (2017), and includes all Forests, Cultural Plantations/Woodlands and Hedgerows within the proposed extraction area. The remaining lands within the extraction area are classified as Pasture.

A Soil Moisture Retention (SMR) value is assigned to each combination of soil and vegetation type found at the site. The Thornthwaite Method calculates monthly AET values for each combination of soil and vegetation type based on the latitude of the site, average monthly temperature, monthly precipitation and SMR value. The SMR values and AET estimates are summarized in **Table E1** and **Table E2** (**Appendix E**).

The difference between precipitation falling on the assessment area (direct input) and evaporation/evapotranspiration (direct initial output) is termed the water "surplus". Surplus water within an assessment area can either infiltrate to recharge the groundwater system or form surface water runoff. Land surface runoff rates at the site are calculated according to the MOECC development application guidelines methodology, which assigns an Infiltration Factor (IF) to apply to the water "surplus" in order to calculate recharge. The IF depends on individual site characteristics related to topography, soil type and vegetation/cover. Based on the topography and slopes the entire site is characterization as Hilly Land according to the MOECC classification system. Therefore a slope factor value of 0.1 is used. Both the Outwash and Outwash + Ice-Contact deposits are characterized as Open Sandy Loam, having a soil factor value of 0.4, within the MOECC IF soil classification system. The Moraine till deposit is characterized as Medium Combinations of Clay and Loam for the purposes of the IF determination, with a soil factor value of 0.2. Areas of Woodland are assigned a (vegetation) cover factor of 0.4, and pasture (cultivated) lands are assigned a cover factor of 0.1. The IF value is a summation of the three individual factors for each slope, soil and cover type. The respective IF values are summarized in **Table E3 (Appendix E).**

The final free water surface (pond) evaporation rate of 682.4 mm/yr is estimated based on calculated values reported by United States Department of Commerce National Oceanic and Atmospheric Administration (NOAA) for Lake Ontario for the same long-term normal period (1981 to 2010), as reported at the NOAA website: *Great Lakes Monthly Hydrologic Data (ftp://ftp.glerl.noaa.gov/publications/tech_reports/glerl-083).*

Existing Condition Water Balance

The existing condition water balance calculations are summarized in a series of tables in **Appendix E**. Based on the catchment delineation, the site can be divided into three drainage areas.

A central area, consisting of most of the site, is internally drained and does not generate runoff that leaves the site. All precipitation and runoff that occurs within this area is directed toward, and retained within, depressions within the proposed extraction area. The internally drained area includes Outwash deposits, combined Outwash + Ice-Contact deposits, and, Moraine deposits. In addition, portions of the internally drained area are covered in Woodland and the remainder consists of Pasture.

An area along the northwest edge of the site drains toward Warnock Lake, all runoff that is generated in this area moves off-site to the northeast. This area includes Outwash deposits, combined Outwash + Ice-Contact deposits, and, Moraine deposits. The northwest runoff area has both Woodland and Pasture.

An area along the east edge of the site drains toward Wetland #4, all runoff generated in this area moves off-site and into Wetland #4. This area includes combined Outwash + Ice-Contact deposits, and, Moraine deposits. The east runoff area has both Woodland and Pasture.

As shown in **Appendix E**, AET estimates are provided for individual areas of each soil type and vegetation cover. A corresponding surplus is calculated and the appropriate IF factor applied to calculate annual infiltration recharge rates and runoff rates. The recharge and runoff rates are then multiplied by the surface areas within both the internally drained catchment and runoff catchments that correspond to each soil and cover type. The calculation provides detailed volumetric recharge and runoff estimates.

Based on a summation of the individual area calculations, a bulk estimate for the existing site recharge and runoff within the proposed extraction area is provided. As shown, total site recharge is estimated to be 64,788 m^3/yr (equivalent to 2.05 L/s). The existing annual average recharge rate for the site is therefore calculated to be 0.312 m/yr, which is within the expected range for cultivated surficial sand and gravel deposits in Southern Ontario and comparable to the Source Protection Study estimates for the overall area. Total runoff (water flowing overland and crossing the site boundaries) is calculated to be approximately 7,482 m^3/yr (equivalent to 0.24 L/s).

Future Site Water Balance

The reconfiguration of the site would result in additional precipitation retained on-site. However, a large pond is proposed, which will increase evaporation. Under future conditions there is no runoff leaving the site (original proposed extraction area). Therefore the site recharge is calculated as the difference between direct precipitation inputs, and, outputs consisting of evapotranspiration over land surface areas and lake evaporation. The calculations are provided in **Appendix E**.

Based on the exposure of sand and gravel along the site slopes by extraction, all of the rehabilitated site is classified as fine sand soils (i.e. equivalent to Outwash deposit) for the determination of SMR. A small area (approximately 0.34 ha) of the lands surrounding the lake, and within the original proposed extraction area, is proposed to be rehabilitated as Woodland, the remainder is assumed to be Pasture.

Future Site precipitation and AET rates and volumes are calculated as shown in **Appendix E**. Based on the calculations, the future average annual recharge volume would be approximately 55,209 m^3/yr (equivalent to 1.75 L/s). The annual average recharge rate for the site would be approximately 0.266 m/yr.

Note that the pond evaporation rate used is based on measurements and modeling undertaken for Lake Ontario, and is relatively conservative for the much smaller water body proposed. However published evaporation estimates for smaller water bodies are not available for this area. Therefore the evaporation rate used for this assessment is likely an overestimate and can be considered a worse-case scenario. Using this method, the recharge rate is expected to decrease by approximately 0.3 L/s, or about 15%.

Although differing methodologies are used, the total change in recharge predicted by the updated water balance is similar to the AECOM estimate. In order to provide context to the change estimated within the recharge water balance, comparisons are made to the measured discharge volumes within Silver Creek downgradient of the site.

7.1.3 Comparison To Discharge At Silver Creek

As noted in **Section 3.6.4**, measured baseflow within the Silver Creek headwater system nearest the site ranges from 56 to 89 L/s (low to high baseflow conditions). Recent measured streamflow volumes as reported by Harden range above 100 L/s. Given the setting, the groundwater discharging at Silver Creek is comprised of both local and regional flow systems within the overburden and bedrock systems.

The predicted change in recharge at the site would primarily affect the local overburden flow system. The change in recharge represents between 0.34 % and 0.54 % of the measured baseflow and 0.3 % of recently measured streamflow within the closest portion of the Silver Creek headwater system.

Therefore the small predicted change in recharge at the Site would not result in any measureable change in the baseflow of Silver Creek.

7.2 FEATURE WATER BALANCE

The extraction will alter some surface water catchment areas related to Wetland 4 and Warnock Lake/Wetland 1. In order to assess the potential scale of impact to these features, separate discussions and water balance calculations are provided.

7.2.1 Summary of Previous Work

The findings of the previous assessments regarding Wetland 4 are summarized as follows:

- The wetland is sustained by surface water inputs (e.g. direct precipitation and runoff from the surrounding catchment) therefore a change in catchment would directly affect the wetland.
- Extraction would remove some of the Wetland 4 catchment, however as part of rehabilitation drainage along the northeast edge of the wetland would be altered such that additional catchment area would be created. An overall 8% change in catchment area was anticipated based on the rehabilitation plan at that time.
- The potential loss in water inputs was characterized as minor and *not expected to negatively affect the form and function of PSW Wetland 4* (AECOM, 2013).
- Pit extraction and rehabilitation phasing will ensure that adequate surface water inputs are maintained during the operation of the pit.

The current rehabilitation plan differs from that proposed in 2013. In order to refine the assessment of potential impacts to Wetland 4, and reflect the current proposed rehabilitation plan, a more detailed water balance was completed.

7.2.2 Updated Wetland 4 Water Balance

In order to examine the potential change a feature based annual water balance was developed for Wetland 4. The water balance assumes no groundwater inputs to the wetland, consistent with the observed setting. An annual basis for the water balance was chosen because there are no changes that would affect the seasonal (or monthly) distribution of water flow or availability at the site. Seasonal (or monthly) processes that affect water availability at Wetland 4 will remain the same after extraction.

The calculations are included in **Appendix E**. Note that the Wetland 4 water balance assessment area extends outside of the proposed extraction area. For the purposes of this assessment, the Wetland 4 catchment area is divided into 3 components, consisting of:

the wetland, runoff contribution area within the proposed extraction area; and, runoff contribution area outside of the proposed extraction area.

Existing Condition Water Balance

Runoff and recharge rates are based on the methodology presented in **Section 7.1.2**. The current Wetland 4 catchment is approximately 4.37 ha. Wetland 4 is approximately 0.2 ha in size, and is developed on the Moraine deposit. The surrounding 4.17 ha of the catchment contributes runoff to the wetland. Land cover includes both Woodland and Pasture. The runoff contribution area within the proposed extraction area is 1.69 ha, and includes both Outwash + Ice-Contact and Moraine deposits. The runoff contribution area outside of the proposed extraction area is 2.48 ha and consists of Moraine deposits.

The calculated existing water runoff contribution to Wetland 4 from the extraction area, of 3,162 m^3/yr, is consistent with that presented in **Section 7.1.2**. This runoff contribution is not expected to change due to the proposed extraction. The calculated runoff from the catchment outside of the extraction area is 4,454 m^3/yr. Combined with direct precipitation, the total annual water inputs to Wetland 4 is estimated to be 9,419 m^3/yr. Evapotranspiration within the wetland (using PET) is estimated to be 1,149 m^3/yr. Therefore groundwater recharge at the wetland is approximately 8,270 m^3/yr.

Future Condition Water Balance

The proposed extraction would remove the 1.69 ha existing on-site catchment area. However, as shown in **Figure 14**, as a mitigation measure, the progressive extraction and rehabilitation plan would redirect runoff from an area of approximately 1.77 ha into Wetland 4. This area consists of the currently internally drained fields along Heart Lake Road, including a portion of the extraction area, and, retained fields within the Licence outside of the extraction area.

Based on the rehabilitation plan, most of the new catchment would consist of pasture lands, and a small portion would consist of woodland. This area would be developed primarily within outwash deposits. If the upper soils in this new drainage area are left relatively unchanged as open sandy loam (Option 1 as shown in **Appendix E**), the runoff contribution to Wetland 4 from the new catchment would be 2,407 m^3/yr. The remaining runoff and direct precipitation volumes would remain the same, therefore total water inputs to Wetland 4 would be 8,664 m^3/yr. This represents a decrease of approximately 775 m^3/yr. Total water inputs exceed evapotranspiration needs, therefore the total recharge within the wetland would decline by approximately 8%.

However if the upper soils (e.g. 1 to 2 m) in the new drainage area are augmented or replaced with fine grained material (e.g. excess subsoil, silt till from the extraction area or wash fines the CSG site) that can be characterized as medium combinations of clay and loam (similar to the Moraine deposits), infiltration rates would be reduced and runoff rates to Wetland 4 would increase (as compared to open sandy loam). Under this scenario (Option 2 as shown in **Appendix E**), the net change would be an increase in water input to Wetland 4 of approximately 350 m^3/yr. Although approximate, this calculation indicates that if the new catchment area is rehabilitated properly, the overall water balance change at Wetland 4 would be negligible.

With regard to Warnock Lake/Wetland 1, we note that the Caledon Creek and Credit River Subwatershed study identified that the drainage area for Upper Subwatershed 16 (upstream of Heart Lake Road) is approximately 25 km^2. The catchment area reduction associated with the proposed extraction is approximately 3.42 ha. This represents about 0.1% of the overall Warnock Lake/Wetland 1 watershed area. Therefore no significant change in surface water contribution to Warnock Lake/Wetland 1 can be expected due to the proposed extraction.

7.3 TEMPORARY GROUNDWATER TABLE EFFECTS

The removal of aggregate from below the groundwater table results in an inflow of water to replace the solid material removed, forming a pond. As the aggregate is removed by dragline from the working edge of the pond, it is stockpiled adjacent to the pond and most of the retained groundwater drains back into the excavation. Using an average sand and gravel aquifer porosity of 0.3 as a conservative estimate, 70% of the extracted volume is aggregate and 30% is groundwater. It is generally assumed that a water volume equivalent of 5% of the aquifer volume can be retained and removed with the aggregate, and 25% drains back into the excavation. Therefore an estimated total of 75% of the aggregate volume removed during excavation must be replaced by water inflow. The water filling the excavation can be groundwater inflow from the surrounding aquifer, direct precipitation or precipitation runoff from the surrounding area.

This effect is often analyzed as an equivalent pumping assuming all of the water flowing into the excavation is groundwater. However, it is important to note that little actual water is removed from the site. The “pumping” is essentially an intermittent transfer of water from the aquifer to the pond, generally resulting in a short-term groundwater table decline in the vicinity of the excavation. Prior to extraction, water is “stored” within the porosity of the sand and gravel deposit. Once the aggregate is removed, the on-site water storage volume increases within the extracted area (pond). The drawdown is short-term in that “recovery” occurs between excavation periods (overnight, on weekends/holidays and between operational seasons); and, during rainfall recharge events.

Measurable drawdown at the pond and within the surrounding aquifer can occur in response to aggregate removal during the initial stages of extraction. However, as the extraction pond enlarges and off-setting effects such as daily recovery and occasional precipitation recharge events begin to occur, actual drawdown at, and adjacent to, the pond becomes more difficult to measure. Once the pond is established the pond volume tends to buffer instantaneous pond level drawdown related to the aggregate removal.

7.3.1 Summary of Previous Work

AECOM (2013) provided a drawdown estimate for active extraction periods, please refer to that report (Section 7.1.1 and Appendix D) for specific details.

The previous assessment calculated drawdown that could be associated with below water extraction and pond evaporation using a large diameter well (including well bore storage) analysis methodology under various scenarios. The scenarios include the initial active extraction (small pond), the end of active extraction (pond near maximum extent), and, post rehabilitation (no extraction, drawdown due to pond evaporation only).

As part of that assessment the extraction rate was assumed to be 2,100 tonnes per day (maximum daily rate of pit), the pond was assumed to be 17 m deep and the hydraulic conductivity estimated to be 1.0 x 10^{-2} m/s.

After one week of extraction the pond was estimated to be 20 m in diameter (assumed to be circular). At the extraction pond, drawdown was estimated to be 4 cm total. At an assumed distance of 35 to 45 m (Warnock Lake and Wetland 11) drawdown was projected to be 2 cm. At a distance of 180 m (closest private well) a drawdown of 1 cm was predicted.

Near the end of operations the pond was estimated to be 401 m in diameter. After one week of extraction drawdown was estimated to be 3 cm at the pond, 3 cm at 35-45 m distance, and, 2 cm at 180 m distance.

After rehabilitation the drawdown associated with evaporation over a one week period (e.g. during hot summer conditions) was estimated to be 2 cm at the pond, 2 cm at a distance of 35-45 m, and 1 cm at 180 m distance.

Based on the analysis the potential drawdown effects were described as limited to the immediate area of the pit and minor in extent.

7.3.2 Updated Drawdown Assessment

For the purposes of this impact assessment the drawdown projection was updated using an alternate methodology, commonly used to predict drawdown effects at dewatering sites. The methodology is based on the predicted cumulative effect of multiple wells spaced along the edge of the extraction (e.g. as described in: J. Patrick Powers et al, 1992; *Construction Dewatering and Groundwater Control: New Methods and Applications*).

The theoretical maximum “equivalent pumping” effect was assessed using the Aqtesolv® pumping test analysis program. The projection includes continuous extraction over a 60 day period with no recharge or recovery (to off-site drawdown) as a conservative approach. A forward Neuman unconfined aquifer analysis was completed using the following site-specific assumptions (in addition to the typical analytical assumptions associated with the Neuman method):

- average aquifer thickness of 11 m, extends laterally in all directions;
- aquifer K = 2.4 x 10^{-3} m/s, Kz/Kr = 0.1;
- T = Kb = 0.0264 m^2/s, S = 0.25 (drainable porosity);
- 60 day below groundwater table extraction period, average pond depth of 11 m;
- below groundwater table extraction of 2,100 tonnes/day;
- density of 1.8 tonnes/m, extraction rate equals 1,167 m^3/day;
- groundwater inflow (75% of extraction volume) Q = 875 m^3/day (0.6076 m^3/min) averaged over 60 day extraction period;
- after 60 days pond area is 6,364 m^2, equates to a circle of radius 45 m;
- drawdown simulated using 8 wells (each 0.1 m radius) equally spaced along the outside of a circular “excavation pond” of radius 45 m, individual pumping rates of 0.0760 m^3/min;
- no precipitation recharge for analysis period.

The program output is included in **Appendix F**. The drawdown analysis calculated the expected water level decline in an idealized aquifer at distances of 50 m, 100 m, 200 m, and 400 m from the excavation. As illustrated by the analysis results, the expected drawdown within the aquifer system decreases with distance from the pond edge and will recover after the extraction ends each season. Under the "worst case scenario" of 60 days of continual extraction and no recharge, the maximum groundwater table change at 50 m distance is projected to be less than 13 cm. At 200 m distance the maximum drawdown would be less than 8 cm, and approximately 4 cm at 400 m distance.

The assumptions used for the analysis are conservative in that: the minimum aquifer thickness is assumed; groundwater table effects over the entire extraction period are assumed to radiate immediately from the full extent of the pond (whereas actual groundwater table effects will slowly develop from the initial below water extraction area and would not reach the full pond extent for some time); some water level recovery would be expected during non-operational periods (overnight and during weekends); and, some recharge would be expected during a typical extraction period. Any direct precipitation or recharge would reduce "drawdown"; therefore actual groundwater table effects are typically less than projected using an equivalent pumping approach. Also, due to seasonal recharge, the groundwater table recovery after annual operations cease is more rapid than predicted by the analysis.

It is also important to note that the extraction pond represents an increase in storage, and there will be an increase in rainfall water volume retained on-site during fall and spring (outside of the annual operating period), specifically during snowmelt. This storage volume tends to reduce the daily response of the pond and groundwater table to extraction.

7.4 LONG-TERM GROUNDWATER TABLE EFFECTS

As the below groundwater table extraction forms a pond, a level (pond) water surface replaces what was previously a sloping groundwater table within the aquifer. The pond level is typically lower than the groundwater table was on the upgradient side, and higher than the water was on the downgradient side. This typically causes a groundwater table decline immediately upgradient of the pond and rise immediately downgradient of the pond. The magnitude of change is dependent on the final pond level, which in this setting would be the average of the original upgradient and downgradient elevations. This groundwater table change declines with distance from the pond. The centre-line of this change within the pond area is referred to as a "hinge" line, where the pond equilibrates to a level that is equal to the groundwater table elevation (cross-gradient) on either side.

As discussed in **Section 6.0**, based on information available at this time the final combined CSG Concession II and McCormick Pit pond could have a final average pond level of between 406 and 407 mASL, with a seasonal range up to 408 mASL. As part of future analysis work proposed (see **Section 7.5**) the complete rehabilitation plan for the James Dick Aggregate Concession II site should be reviewed, and the final pond level estimated, in greater detail.

Based on the proposed extraction scenario, the entire on-site shoreline of the McCormick Pond would constitute an "upgradient" edge, with the largest effect occurring at the north corner of the property. Based on information available at this time, the groundwater table change at the north corner of the site would vary seasonally from: 1 to 2 m during low groundwater table conditions; 2 to 3 m during average conditions; and, 3 to 4 m during seasonal (spring) high groundwater table conditions. At the site boundary along Warnock Lake the groundwater table decline would range seasonally between 0.7 m (low groundwater table) and 2 m (high groundwater table) as compared to existing conditions.

Due to the magnitude of predicted groundwater table change and the proximity of the Caledon Creek-Warnock Lake system, it is expected that a mitigation measure such as a hydraulic barrier wall, similar to that in place at the CSG Pit, will be required. The barrier has been proven to be effective in maintaining a large head difference between Warnock Lake and the CSG Concession II Pond in the spring. The barrier helps maintain the seasonal water input/output relationship at Warnock Lake and the overall hydroperiod of that system.

The barrier would have the additional benefit of limiting potential below water extraction drawdown effects between the site and the Caledon Creek-Warnock Lake system.

7.5 PROPOSED BARRIER

As part of the AECOM (2013) report a hydraulic barrier wall mitigation strategy was proposed. The proposal included a barrier design, consisting essentially of the same design used at the CSG Pit site. An excerpt from the Conestoga-Rovers & Associates, August 1996 evaluation, showing the CSG barrier details, is provided in **Appendix A**.

The CSG Pit barrier wall design and location was developed through a computer modelling exercise (CRA, August 1996). The barrier design includes a low permeability core that extends from above the groundwater table, through the sand and gravel aquifer to the underlying till unit. The core of the barrier would consist of fine-grained material, such as aggregate wash fines, with a hydraulic conductivity of 1×10^{-4} cm/s (1×10^{-6} m/s) or less. The barrier is constructed by routine below water excavation to create a “trench” that extends to the underlying till unit. The core is emplaced through end dumping of fined grained material to fill the trench.

At present, based on the AECOM recommendations, the barrier is shown on the Site Plan could extend along all of the northwest site boundary, between the proposed extraction and the Caledon Creek, Wetland 11, Warnock Lake and Wetland 1 natural environment system. In addition both ends of the barrier are shown to extend to the southeast. The barrier as shown does not connect to the CSG Pit barrier, there would be a gap of approximately 30 m between the two barriers. No change is recommended at this time to the initial and “conceptual” location of the barrier as shown on the Site Plan.

If constructed along the entire common boundary, and particularly if the barriers are “joined”, the barrier system may significantly reduce the groundwater flow that currently moves from the Caledon Creek – Warnock Lake area south onto the McCormick Pit site during high groundwater table conditions. This could have the effect of lengthening the hydroperiod within Warnock Lake and Wetland 1. At this time it is assumed that lengthening the hydroperiod of these features is not an environment target that would be preferred by MNRF or CVC. Appropriate environmental targets for these features should be confirmed with each agency through the technical review process.

It is expected that some reduction in groundwater flow potential would be needed when below groundwater table extraction begins to mitigate potential declines in groundwater table elevation and increases to the horizontal gradient. A more detailed analysis is needed to design a barrier that will meet the currently understood goal of no net change in seasonal water availability and hydroperiod within the natural environment feature, or other features or receptors in the overall area. With an increased horizontal gradient groundwater flow can be maintained within current ranges by, for example, reducing the aquifer area through which that flow occurs. Potential alternatives to the barrier design could include:

- a partial depth barrier along the entire common boundary;
- a full depth barrier along a portion of the common boundary;
- a combination of full and partial depth barrier; and,
- extending some portion of the barrier along Heart Lake Road.

Although the concept has been proven in place between the CSG Pit site and Warnock Lake, we recommend that the barrier location and extent at the McCormick Pit site be refined through a computer modelling study, to be completed as a condition of approval and prior to any extraction activities at the site.

8.0 LEVEL 2 EVALUATION SUMMARY

The Level 2 evaluation includes the groundwater system impact assessment (**Section 7.0**) and relates any potential for impact to local "receptors" including Water Wells and Natural Environment Features.

8.1.1 Potential For Impact To Water Wells

Four private wells are reported to be located within 500 m of the site, and within the upgradient area in which water table changes could occur. Reported well details are summarized in **Table 4**.

Well	Total Depth (mbgs)	Recommended Pump Setting (mbgs)	Static Level (mbgs)	Available Drawdown (m)		Proven Yield (gallons per minute)
				Total Well	To Pump	
4904367	24.7	21.3	5.8	18.9	15.5	5
4905412	41.1	19.8	12.2	29.0	7.6	3
4906223	43.3	42.7	14.6	28.7	28.0	6
7230718	17.1	15.2	7.3	9.8	7.9	8

Table 4: Private Well Available Drawdown Summary

Based on the limited drawdown associated with active below water table extraction (**Section 7.3.2**), no impacts are expected at local private wells due to the extraction process (drawdown related to the removal of aggregate from below water). Based on the relative location of known private wells, available drawdown and proven yield at upgradient wells within 500 m of the site, and, proposed use of a hydraulic barrier to limit potential groundwater table effects, no significant change in water availability at private wells is expected due to potential long-term changes in water table associated with the proposed pond.

As noted in the AECOM (2013) report, if a well interference complaint does occur and is shown to be related to the extraction, pumps or wells can be deepened, or replaced, to reestablish water supplies as part of standard well interference response. We recommend that a standard well interference response condition be included on the Site Plan to ensure any well interference complaint is dealt with appropriately.

It is also recommended that as a condition of approval a private water well survey be completed prior to any extraction activities at the site to further document local water supplies and obtain baseline water level and quality data.

8.1.2 Potential For Impact to Natural Environment Features

Many of the wetlands in the overall area are perched and will not be affected by the proposed extraction. In addition, based on the separation distance and limited overall (water balance) impact to groundwater system, no significant effect on groundwater conditions at Silver Creek or perennial reaches of Caledon Creek is expected.

Wetland 4 is also developed above the groundwater table, and therefore groundwater changes associated with the proposed extraction will not affect this feature. The catchment area of Wetland 4 will change due to the proposed extraction. The extraction would remove a portion of the catchment that extends into the "middle" of the site and add new catchment area within the northern portion of the site. Water balance changes can be minimized if the upper soil in the new catchment area is amended or replaced with fine grained materials, such as subsoil or till found on-site.

Groundwater table changes are expected due to the creation of the pond. If unmitigated, these changes have the potential to affect the portions of Caledon Creek, Wetland 11, Warnock Lake and Wetland 1 natural environment system closest to the site. A hydraulic barrier wall is in place between Warnock Lake and the CSG Concession II Pond, and is reported to be effective in maintaining conditions within this natural environment system. We recommend that as a condition of approval and prior to any extraction activities at the site, a hydraulic barrier be designed and constructed as appropriate at the McCormick Pit site to ensure similar protection for the Caledon Creek, Wetland 11, Warnock Lake and Wetland 1 system. At this time we consider that the barrier should be designed to maintain the existing seasonal groundwater output at the system in order to ensure seasonal water availability and overall hydroperiod is also maintained.

8.1.3 Subwatershed Study Targets

As noted in the previous assessment, the site is located within Subcatchment 1609 as identified by the *Caledon Creek and Credit River Subwatershed Study (Subwatersheds 16 & 18) Phase III: Implementation Report* (December 2001). The AECOM (2013) report provided a detailed comparison of Environmental Targets and Objectives and Best Management Practices identified for Subcatchment 1609 with the McCormick Pit application study results. A copy of the comparison is included in **Appendix G** of this report for reference.

Based on the findings of this updated assessment, there is no recommended change to the environmental targets and best management practices analysis regarding the McCormick Pit proposal. With the removal of aggregate washing from the proposal, overall impact is reduced and there is improved alignment with the identified environmental targets.

8.1.4 NEP Development Criteria

There are no *Key Hydrologic Features*, as defined by the NEP, within the proposed McCormick Pit Licence (development) area. Key Hydrologic Features within 120 m of the proposed Licence area include:

- Caledon Creek;
- Wetland 11;
- Warnock Lake and Wetland 1;
- Wetland 3; and,
- Wetland 4.

Based on the impact assessment and proposed mitigation measures, no alteration, or negative impact, to the hydrologic functions of those features is expected. Some changes to the Wetland 4 catchment shape will occur, however existing drainage volumes and water contribution to that feature will be maintained. No other significant hydrologic alterations, such as changes to natural streams or drainage patterns, are associated with the proposed extraction.

The impact assessment also indicates that no changes to the overall quantity or quality of groundwater and surface water, as related to the watershed water budget or existing municipal drinking water systems in the area, are expected.

There are no *Key Natural Heritage Features*, as defined by the NEP, related to groundwater or surface water within the proposed McCormick Pit Licence (development) area. Key Natural Environment Features related to groundwater or surface water resources, wetlands and/or fish habitat within 120 m of the proposed Licence area include:

- Caledon Creek ;
- Wetland 11;
- Warnock Lake and Wetland 1;
- Wetland 3; and,
- Wetland 4.

Discussion related to Key Natural Heritage Features and *Protective Vegetation Zone(s)*, as defined by the NEP, will be provided through the NETR (Savanta, 2017) and Planning summaries. However, based on the impact assessment and proposed mitigation measures, no significant changes, or negative impacts, to groundwater or surfaced water quality or quantity at those features is expected.

With regard to Mineral Aggregate Resources policies, based on the impact assessment and proposed mitigation, Key Hydrologic Features within 120 m of the proposed Licence will be protected through the maintenance of the groundwater and surface water quantity inputs and groundwater quality. In addition, there are no active water management measures proposed during extraction or after rehabilitation. There is no perpetual active water management associated with the proposed extraction. Discussions related to other Mineral Aggregate Resources policy considerations are provided by others.

8.2 MONITORING PLAN RECOMMENDATIONS

The following recommendations in ***bold italics*** should be listed on the Site Plan.

Although no well interference is predicted or expected, in order to provide assurance to local residents, the following general recommendation, consistent with the *Protocol To Address Environmental Complaints, Pit and Quarry Applications in the Province of Ontario, Between the Ministry of Natural Resources and Ministry of Environment* (MNR Policies and Procedures Manual, April 2006) should also be shown on the Site Plan to ensure that water well interference complaints, if made during the life of the ARA Licence, are dealt with appropriately:

Water Well Interference Complaint Response

Where the Ministry of Natural Resources and Forestry with the assistance of the Ministry of the Environment and Climate Change has determined that the operation of the pit has caused any well water to be adversely affected, the licensee shall, at the licensee's expense, either deepen the well or replace the well to ensure that historic water production quality standards are maintained for that well. If this pit operation has caused a water supply problem, the

> ***licensee shall, at their expense, ensure a continuous supply of potable water to the affected landowner*.**

The following additional study requirements are recommended as a condition of approval to be implemented prior to extraction activities at the site:

> ***Hydraulic Barrier Study***
>
> ***A detailed assessment, that shall include a computer groundwater modelling study if needed, shall be completed in order to refine the design and location of the hydraulic barrier wall and ensure the seasonal water availability and hydroperiod at the Caledon Creek/Wetland 11 and Warnock Lake/Wetland 1 natural environment system is maintained. The study shall incorporate any agency review comments and technical input provided and available through the ARA application process by the Ministry of Natural Resources and Forestry, the Ministry of Environment and Climate Change, Credit Valley Conservation, the Region of Peel and the Town of Caledon.***

The following recommendations are made regarding rehabilitation of the new drainage/catchment area for Wetland 4:

> ***Wetland 4 Catchment Area***
>
> ***During rehabilitation and area regrading, the subsoil within the new drainage area north of Wetland 4 should be amended or replaced with fine grained material from on-site, such as till.***

The following Monitoring Program is recommended to be listed on the Site Plan:

> ***Monitoring Program***
>
> 1. ***Prior to extraction activities a private water well survey shall be completed for all residences within 500 m of the Licence boundary. The survey shall obtain water level measurements and water quality samples (anions and metals) to serve as a baseline data set at all residences for which access is provided by the homeowner and resident at the time of the survey.***
> 2. ***Groundwater level monitoring shall be completed at monitors BH1, BH2R, BH3, BH4, BH5, BH6 and MP-1b. Monitoring shall include semi-continuous measurements using water level dataloggers installed at each location and recording on an hourly basis. Manual quarterly measurements and data download shall also be completed.***
> 3. ***If access is available, a staff gauge and water level monitoring station shall be established at Warnock Lake prior to extraction activities at the site. Monitoring shall be completed using a datalogger and include quarterly manual measurements, similar to that completed at on-site locations.***
> 4. ***The hydraulic barrier shall be completed prior to below groundwater table extraction at the site. The barrier design shall be finalized through the computer modelling study and construction shall be overseen by a qualified engineer.***
> 5. ***Prior to the commencement of below groundwater table extraction, water level trigger levels shall be identified for BH1, BH2R, BH3 and BH4. The trigger levels shall incorporate both seasonal baseline data for each location***

established through the monitoring program and the results of the computer modelling study.

6. ***Upon commencement of below groundwater table extraction at the site a qualified geoscientist shall review the groundwater monitoring data and prepare an annual report on the following:***
    a. ***a summary of the monitoring data from the current year and previous years;***
    b. ***a recommendation regarding the adequacy of the monitoring program, and any amendments that may be required; and,***
    c. ***the need to implement the contingency plan, if necessary and warranted.***
7. ***The annual monitoring report shall be provided to the Ministry of Natural Resources and Forestry, the Ministry of Environment and Climate Change, Credit Valley Conservation, the Region of Peel and the Town of Caledon.***

8.3 TRIGGER MECHANISMS

The following trigger mechanisms are recommended to be listed on the Site Plan.

Trigger Mechanisms for Contingency Response

The contingency plan shall be implemented if any of the following conditions occur:

1. ***Groundwater levels in the monitors are reduced below the trigger levels, as determined prior to below water extraction at the site; or***
2. ***The ecological inspection identifies unusual stress response adjacent to the pit area that is not present elsewhere in the vicinity; or***
3. ***A water well complaint is substantiated by the investigation to have resulted from the operation of the pit.***

8.4 MITIGATION AND CONTINGENCY PLAN

The following Mitigation and Contingency Plan is recommended to be listed on the Site Plan:

In the event that the contingency plan is triggered, the following actions shall be implemented:

1. ***The operator shall cease any below-water extraction operations;***
2. ***The district office of the Ministry of the Environment and Climate Change and the Ministry of Natural Resources and Forestry shall be informed of the trigger, and the implementation of the contingency plan;***
3. ***Groundwater level monitoring shall be continue to be collected and data downloaded during the period when the impact persists;***
4. ***The monitoring data and other relevant information shall be reviewed by a qualified biologist and/or geoscientist (depending on the issue) who shall, as soon as reasonably possible, prepare a mitigation plan specific to the issue, documenting: the nature, extent and significance of the trigger, a recommendation regarding its mitigation, recommendations regarding any additional monitoring requirements, and***

recommendations regarding the resumption of operations. The report shall be circulated to the district office of the Ministry of the Environment and Climate Change and the Ministry of Natural Resources and Forestry; and,

5. ***Subject to approval by the district office of the Ministry of the Environment and Climate Change and the Ministry of Natural Resources and Forestry, the operator shall implement the mitigation plan.***

9.0 CONCLUSIONS

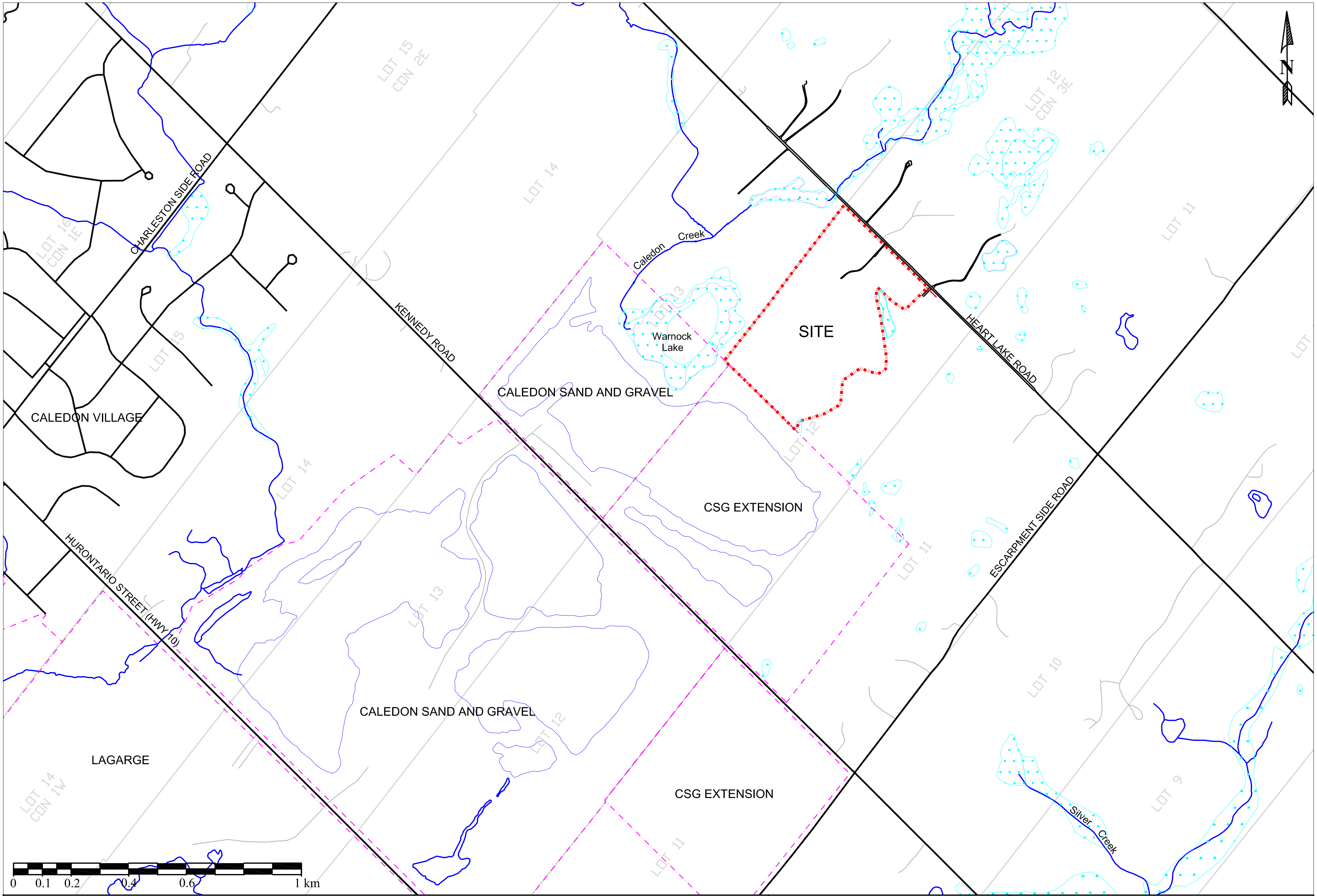
Based on the results of the impact assessment potential adverse effects to groundwater and surface water resources and their uses can be minimized through the recommended mitigation strategies.

In addition, based on the proposed extraction plan, monitoring plan, successful implementation of mitigation strategies at the site and rehabilitation plan, no significant impacts to local natural environment features or water wells is expected as a result of the proposed McCormick Pit.

Andrew Pentney, P.Geo.
Senior Hydrogeologist
Groundwater Science Corp.

PROFESSIONAL GEOSCIENTIST
ANDREW H. PENTNEY
PRACTISING MEMBER
0652
ONTARIO

Figures



Proposed Licence Boundary (approximate)
Existing Licence Boundary (approximate)
Surface Water Features (creek, pond)
Wetlands (MNRF LIO)

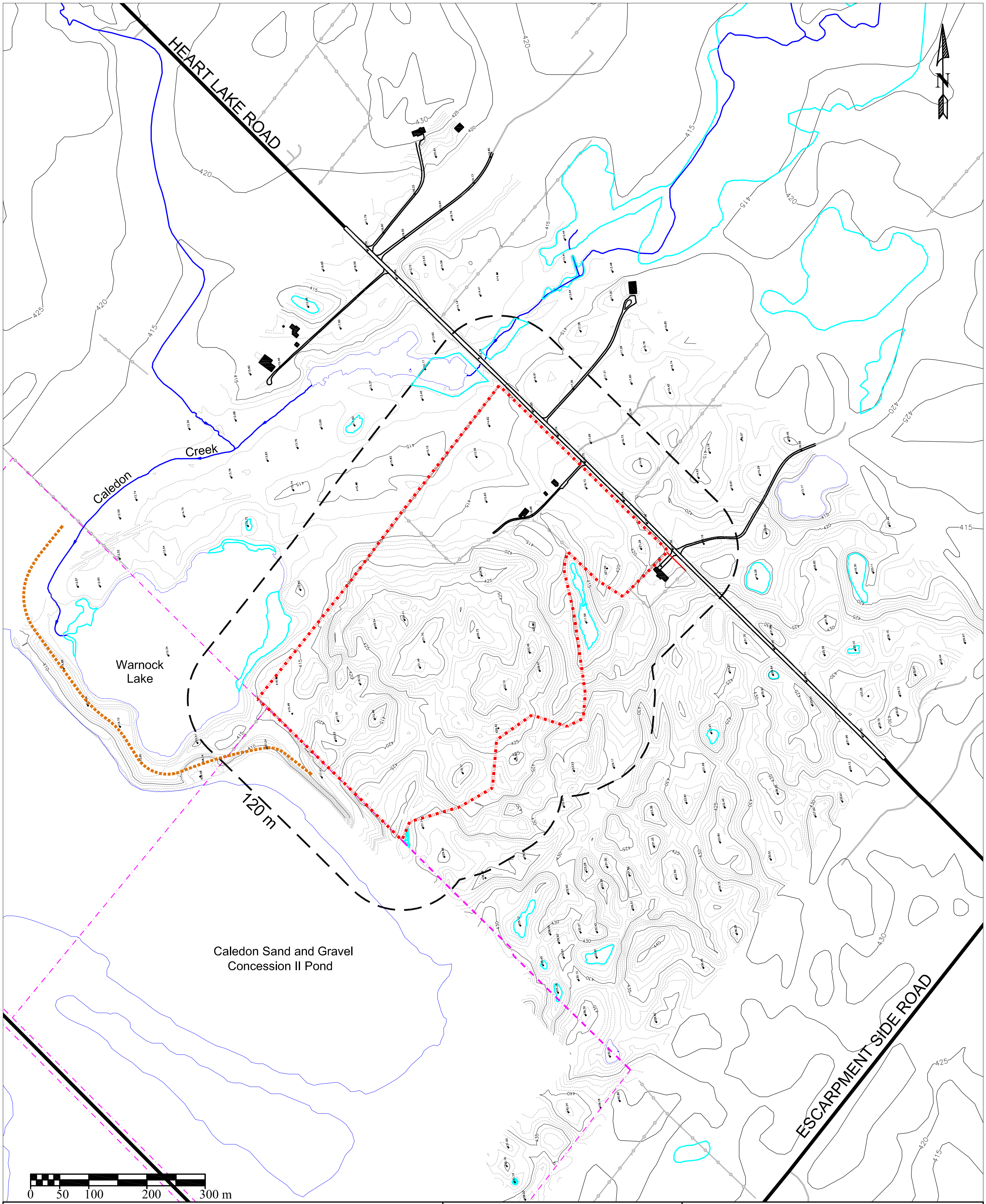
modified from: OBM mapping
UNDER LICENSE, WITHOUT PREJUDICE OR ENDORSEMENT,
FROM THE QUEEN'S PRINTER OF ONTARIO, 2005
Contains information licensed under the Open Government Licence Ontario

October 2017
Scale: as shown

Groundwater Science Corp.

Figure 1: Site Location

Blueland Farms
Proposed McCormick Pit



Wetland (Site Plan, NETR)

Pond, Creek

Existing Hydraulic Barrier (approximate, as reported)

Ground Surface Contours (interval as shown)

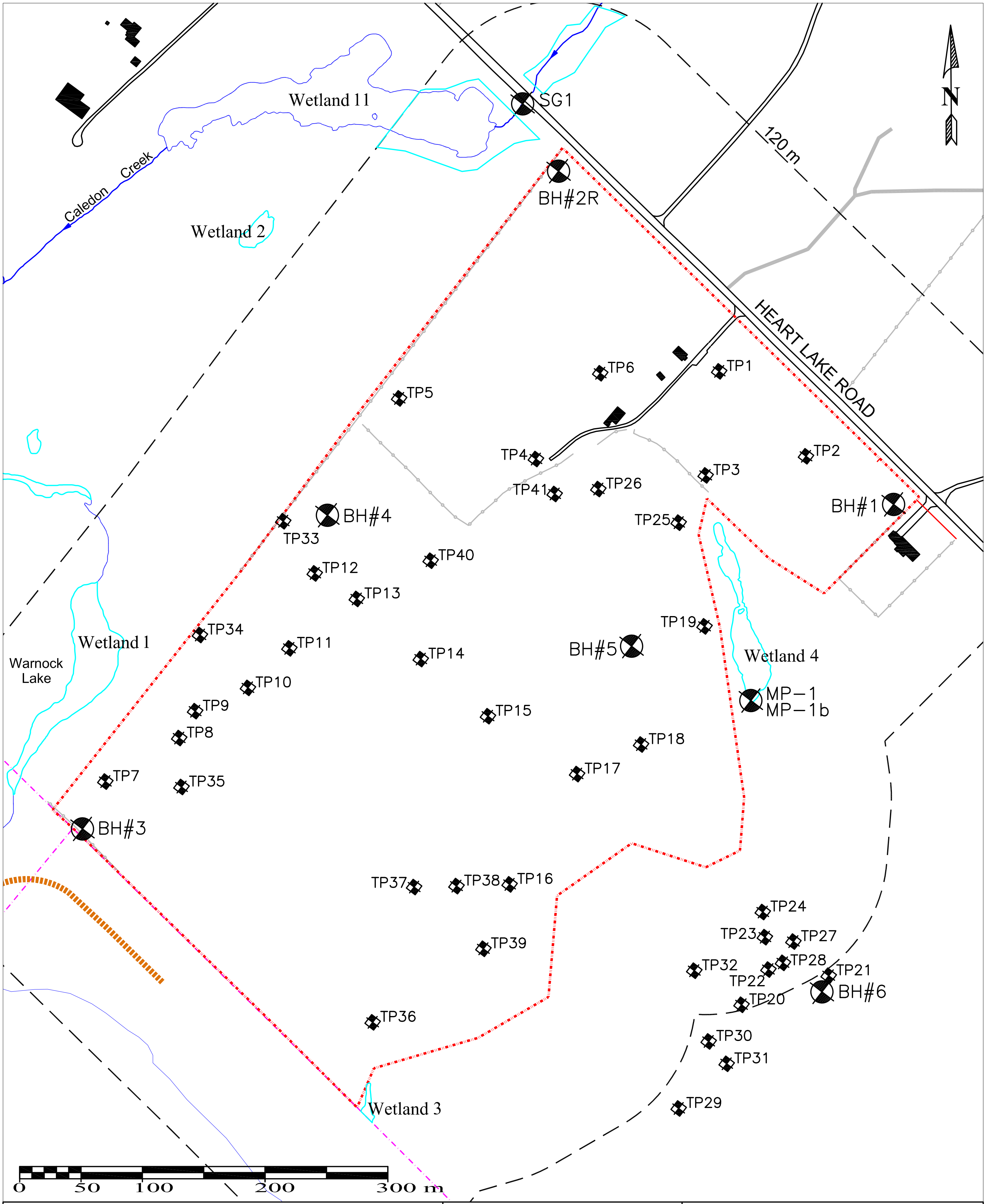
modified from: OBM mapping
UNDER LICENSE, WITHOUT PREJUDICE OR ENDORSEMENT,
FROM THE QUEEN'S PRINTER OF ONTARIO

October 2017
Scale: as shown

Groundwater Science Corp.

Figure 2: Site Setting

Blueland Farms
Proposed McCormick Pit



⊗ Borehole or Monitoring Location and Reference

◈ Test Pit Location and Reference

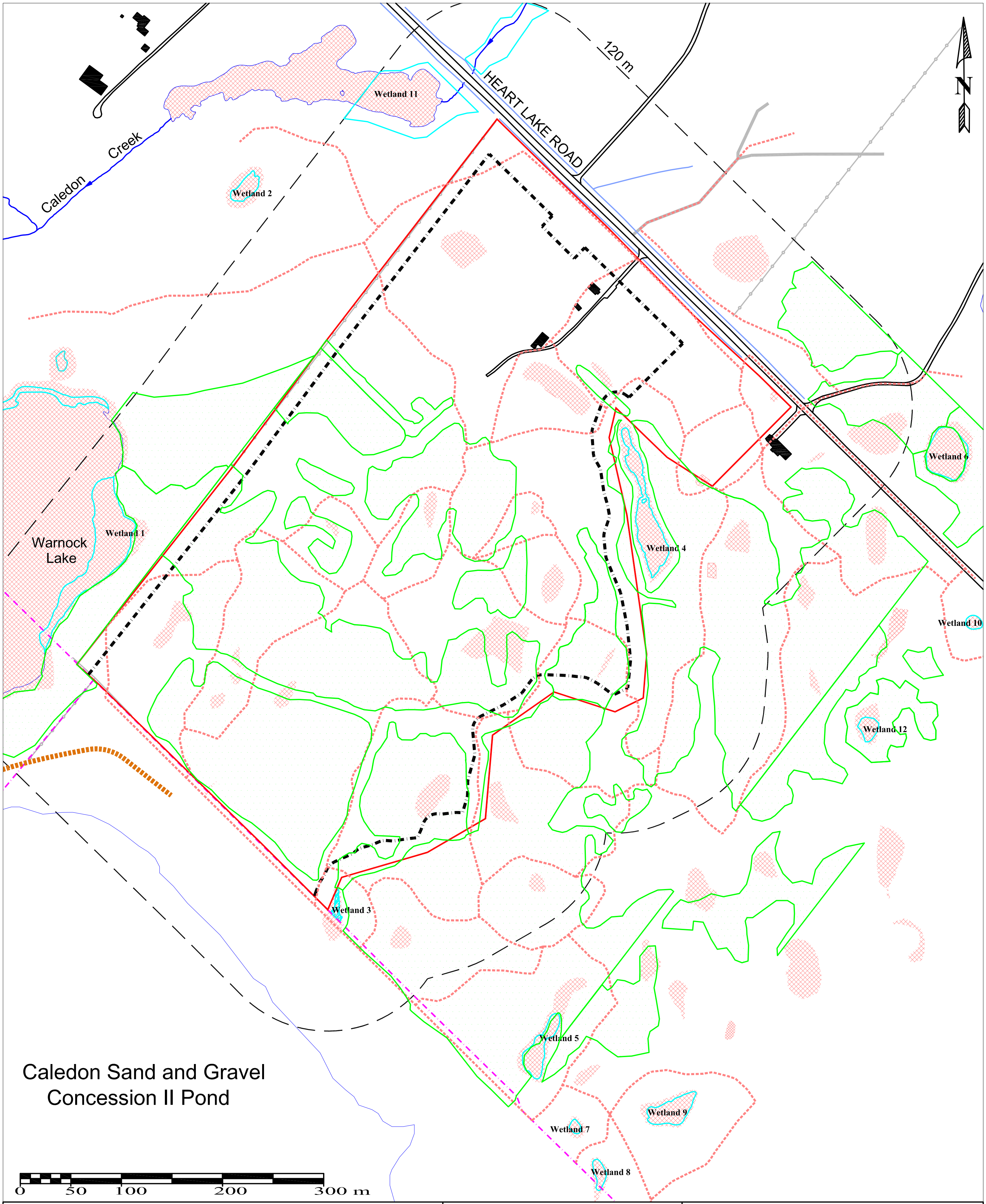
modified from: OBM mapping
UNDER LICENSE, WITHOUT PREJUDICE OR ENDORSEMENT, FROM THE QUEEN'S PRINTER OF ONTARIO

October 2017
Scale: as shown

Groundwater Science Corp.

Figure 3: Drilling, Test Pit and Monitoring Locations

Blueland Farms
Proposed McCormick Pit



Woodland (NETR)
Proposed Licence Limit
Infiltration Area
Extraction Limit
Drainage Divide
Wetland (NETR, Site Plan)

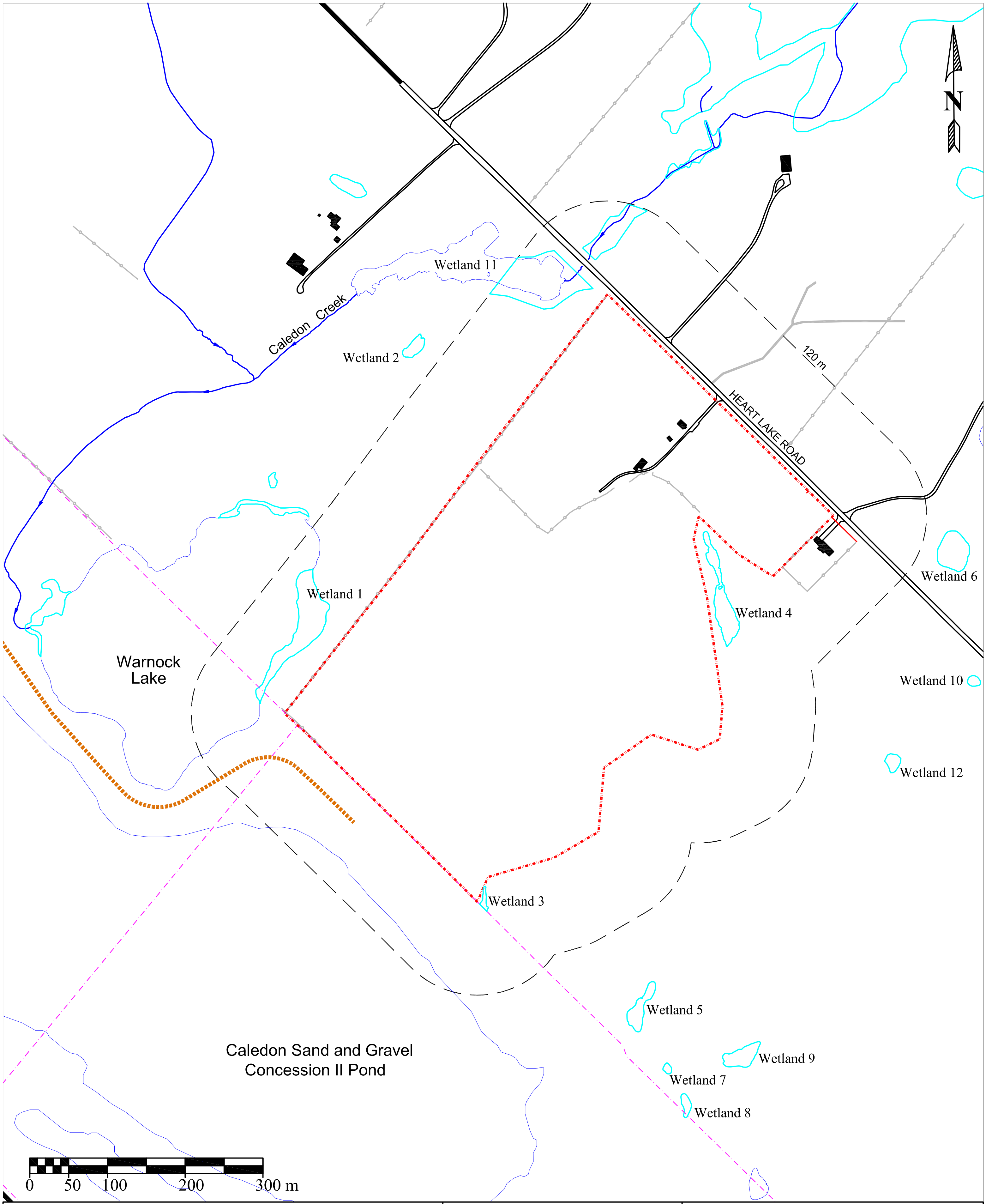
modified from: OBM mapping
UNDER LICENSE, WITHOUT PREJUDICE OR ENDORSEMENT, FROM THE QUEEN'S PRINTER OF ONTARIO

October 2017
Scale: as shown

Groundwater Science Corp.

Figure 4: Existing Catchments

Blueland Farms
Proposed McCormick Pit



🟥	Proposed Licence Boundary (approximate)
🟦	Wetland (NETR, Site Plan)
🟦	Surface Water Features (creek, pond)

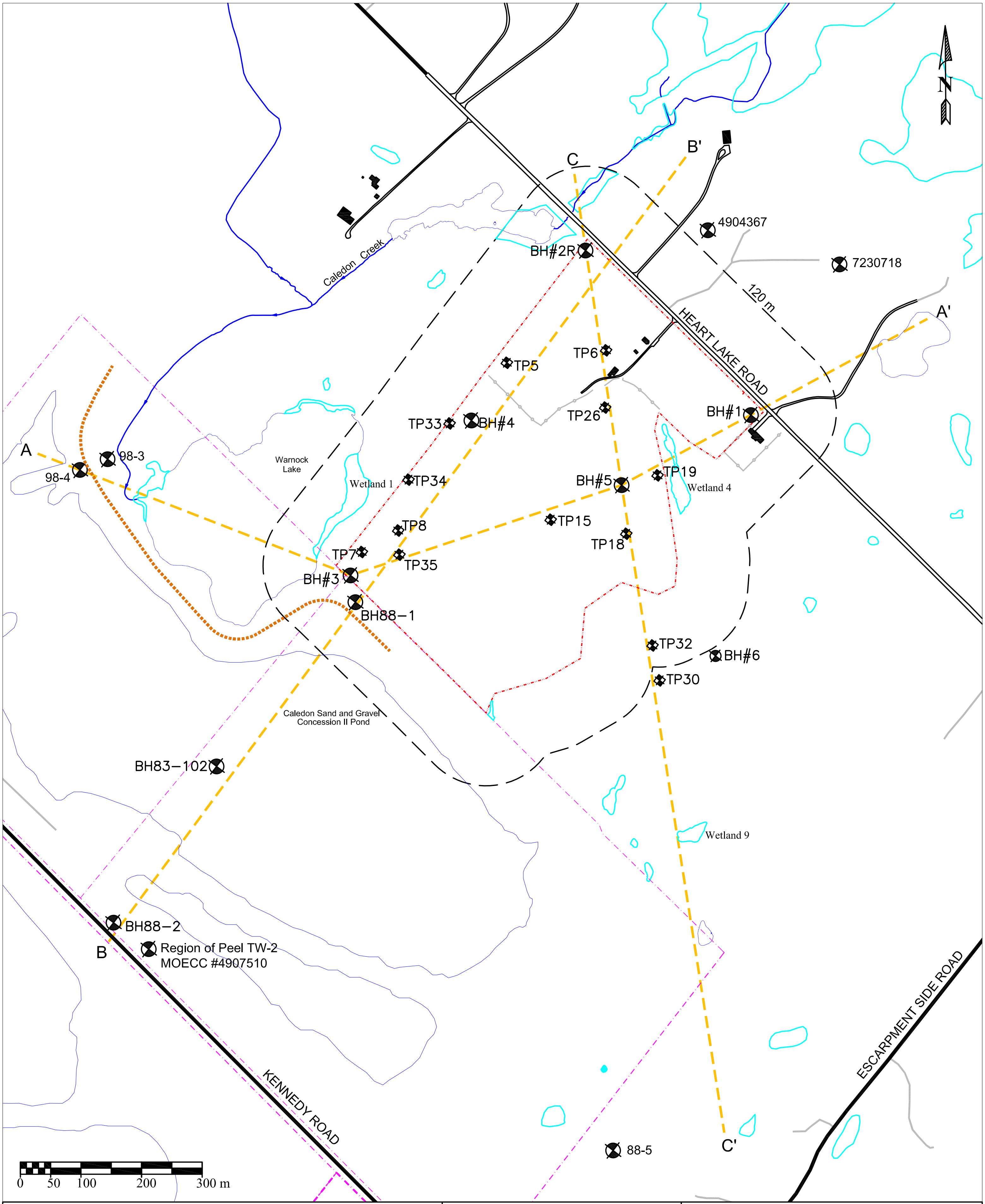
modified from: OBM mapping
UNDER LICENSE, WITHOUT PREJUDICE OR ENDORSEMENT, FROM THE QUEEN'S PRINTER OF ONTARIO

October 2017
Scale: as shown

Groundwater Science Corp.

Figure 5: Wetland Identifiers

Blueland Farms
Proposed McCormick Pit



▬ ▬ ▬ Section Line

modified from: OBM mapping
UNDER LICENSE, WITHOUT PREJUDICE OR ENDORSEMENT, FROM THE QUEEN'S PRINTER OF ONTARIO

October 2017
Scale: as shown

Groundwater Science Corp.

Figure 6: Schematic Section Locations

Blueland Farms
Proposed McCormick Pit

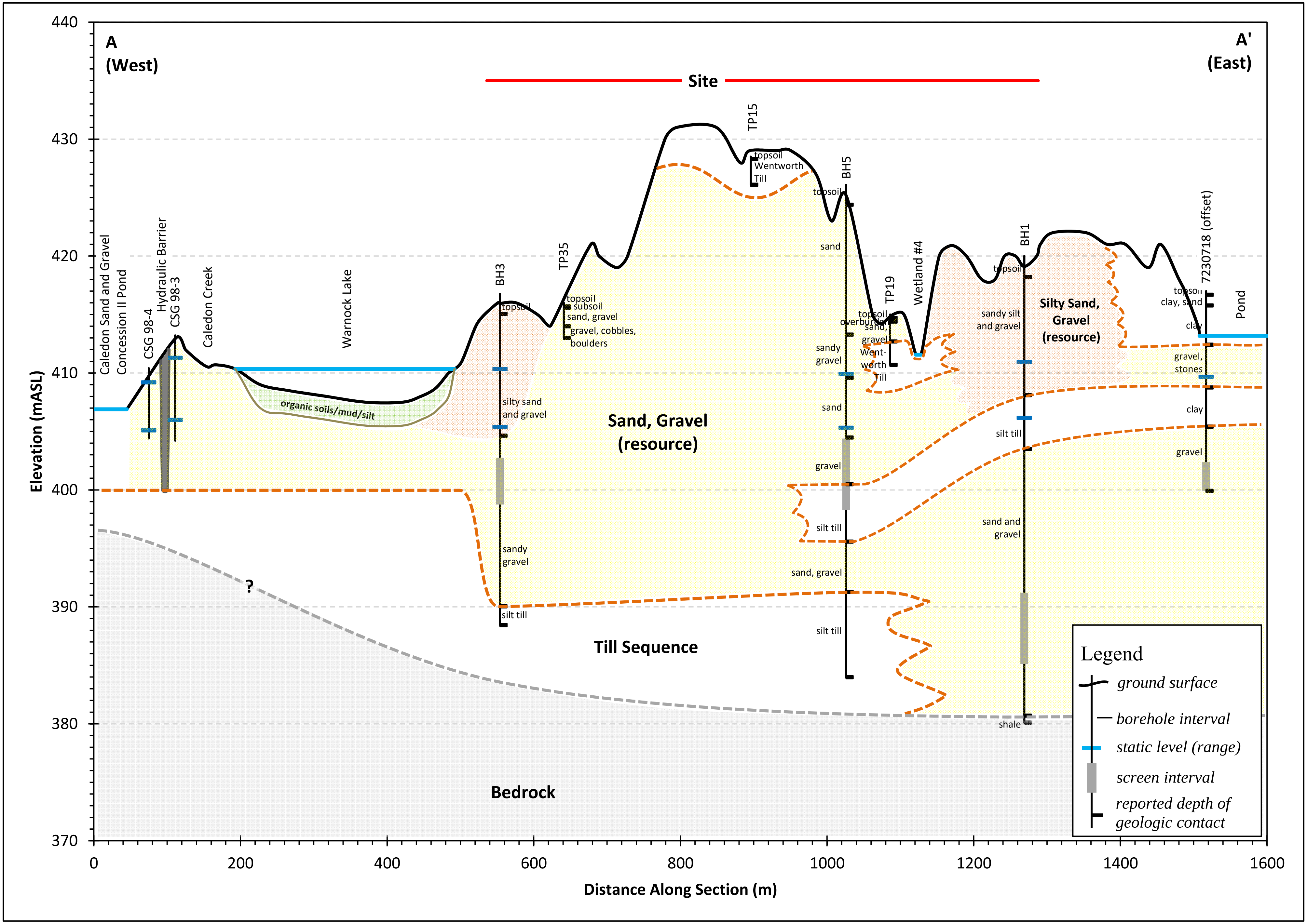


Figure 7: Schematic Section A

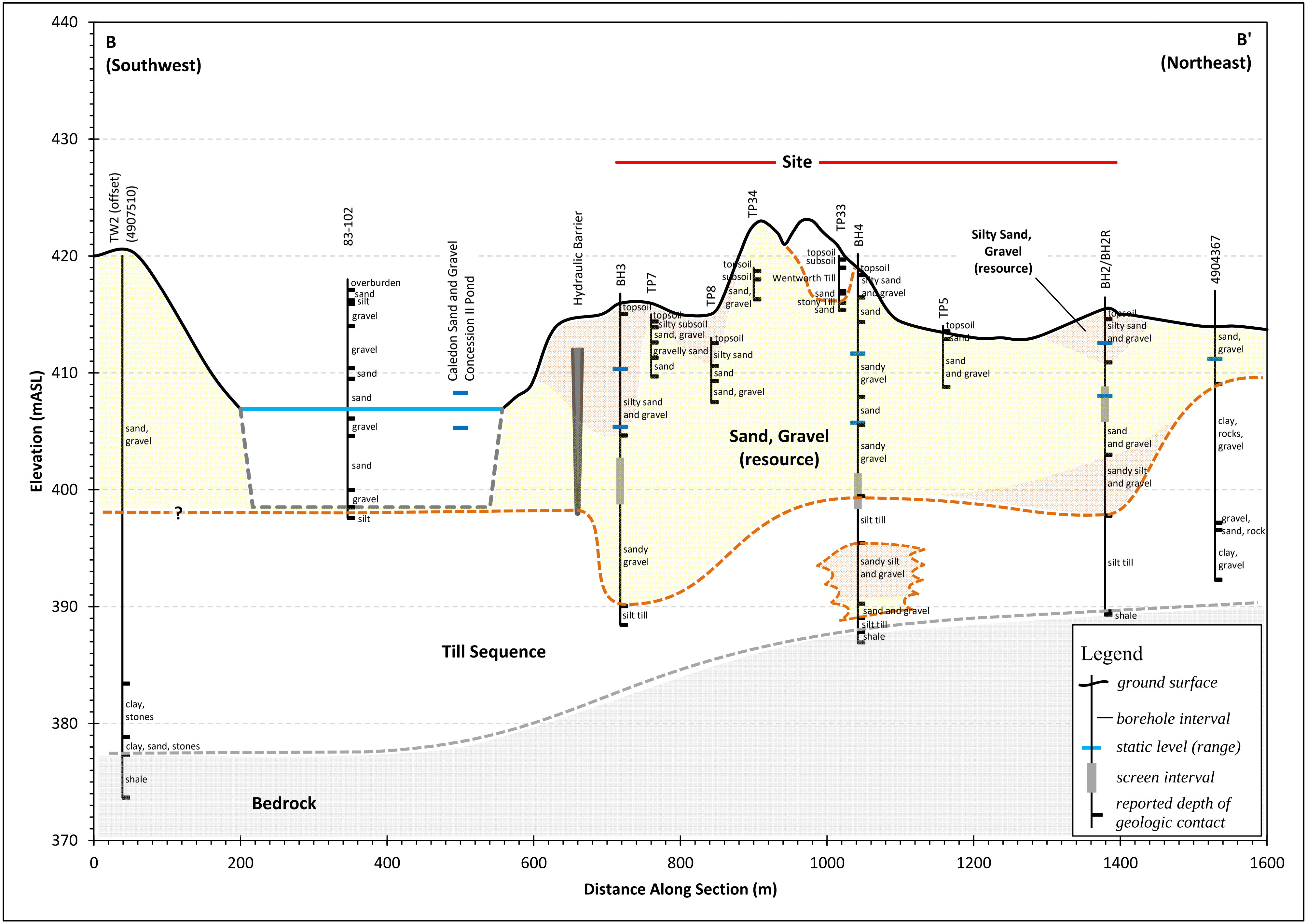


Figure 8: Schematic Section B

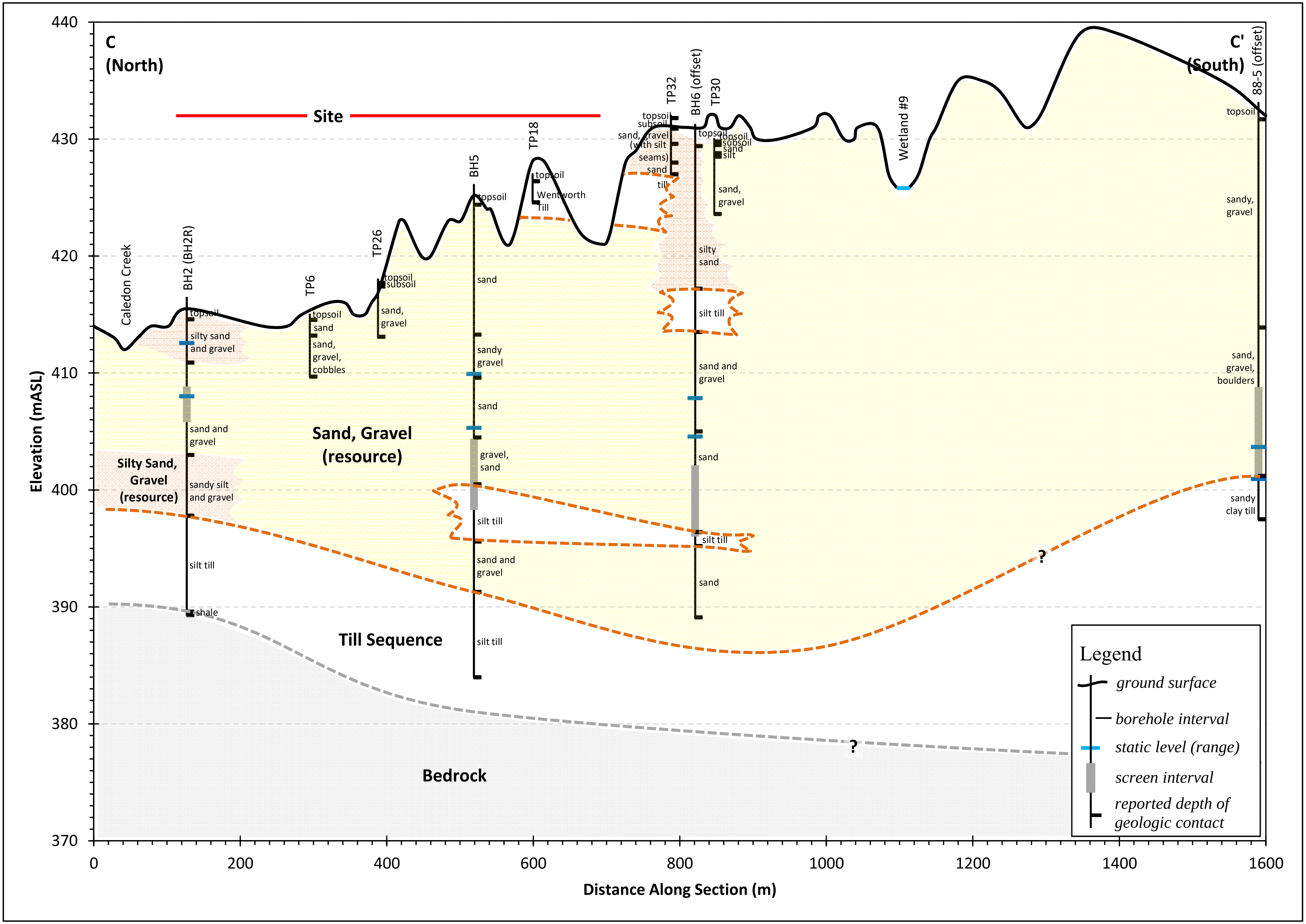
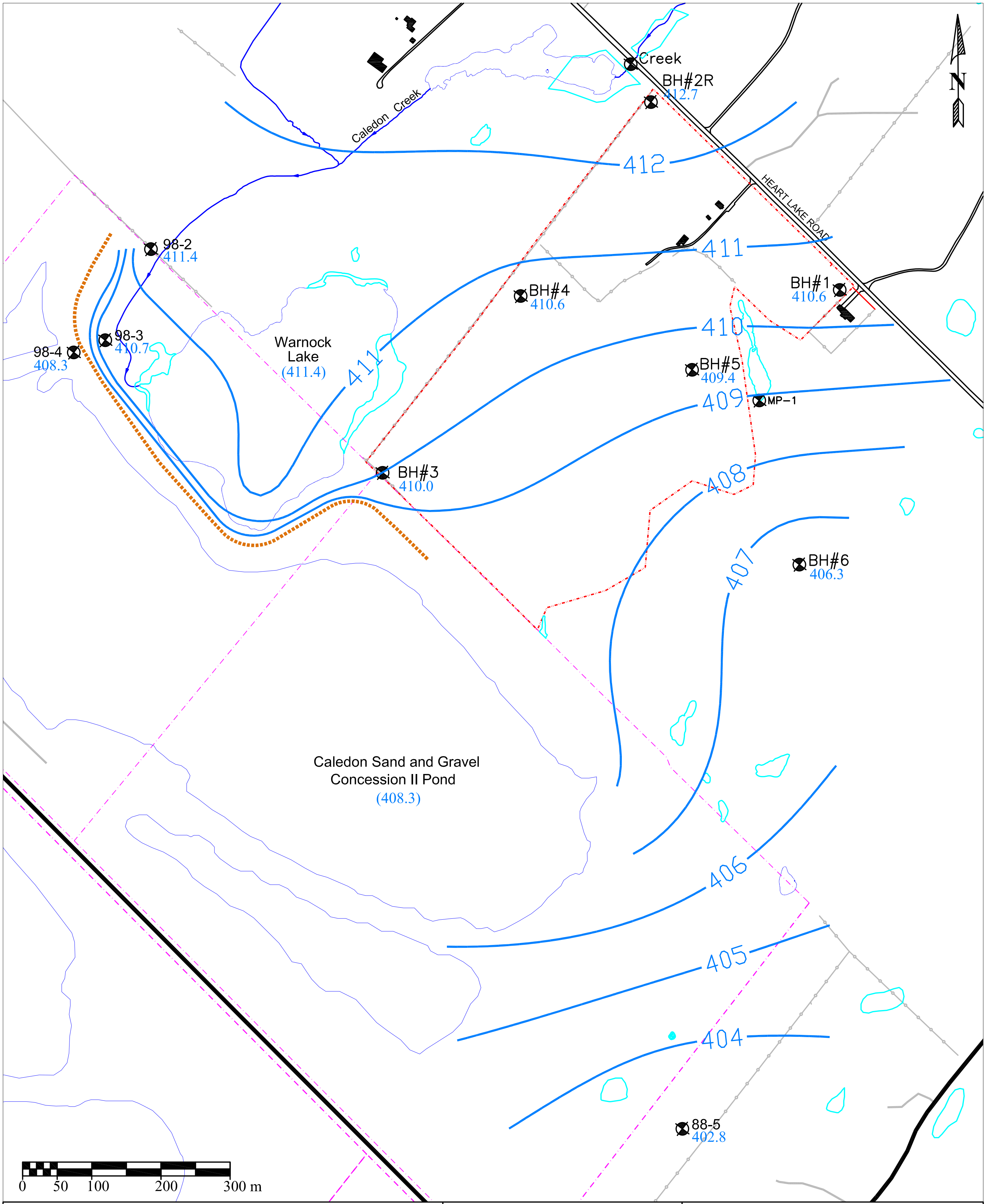


Figure 9: Schematic Section C



⊗ BH#6 406.3	Monitoring Location and Reference Water Level Elevation (April 14, 2016)
━	Water Table Contours (interval as shown)

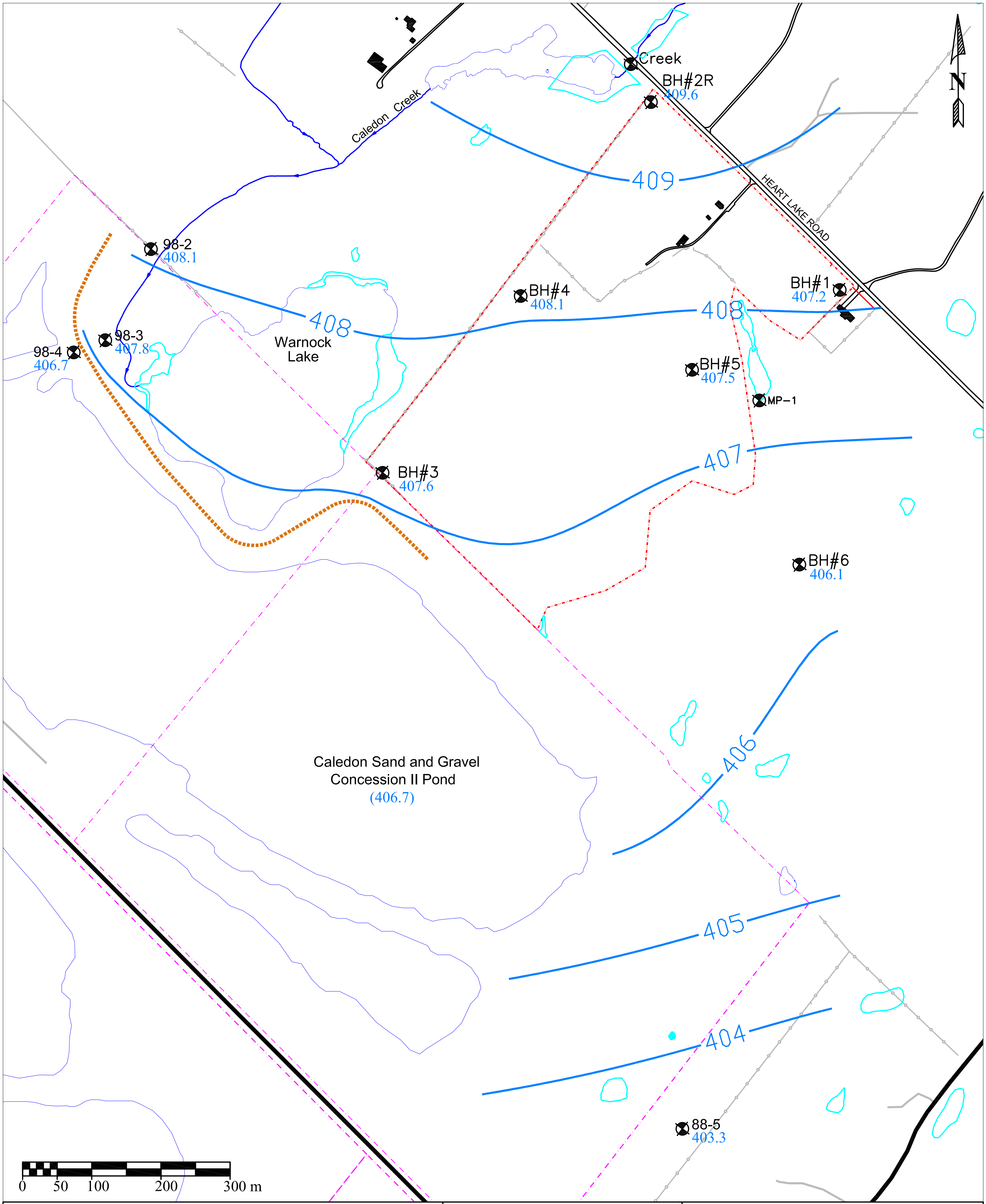
modified from: OBM mapping
UNDER LICENSE, WITHOUT PREJUDICE OR ENDORSEMENT, FROM THE QUEEN'S PRINTER OF ONTARIO

October 2017
Scale: as shown

Groundwater Science Corp.

Figure 10: High Water Table

Blueland Farms
Proposed McCormick Pit



BH#6 406.1 Monitoring Location and Reference Water Level Elevation (September 22, 2016)

Water Table Contours (interval as shown)

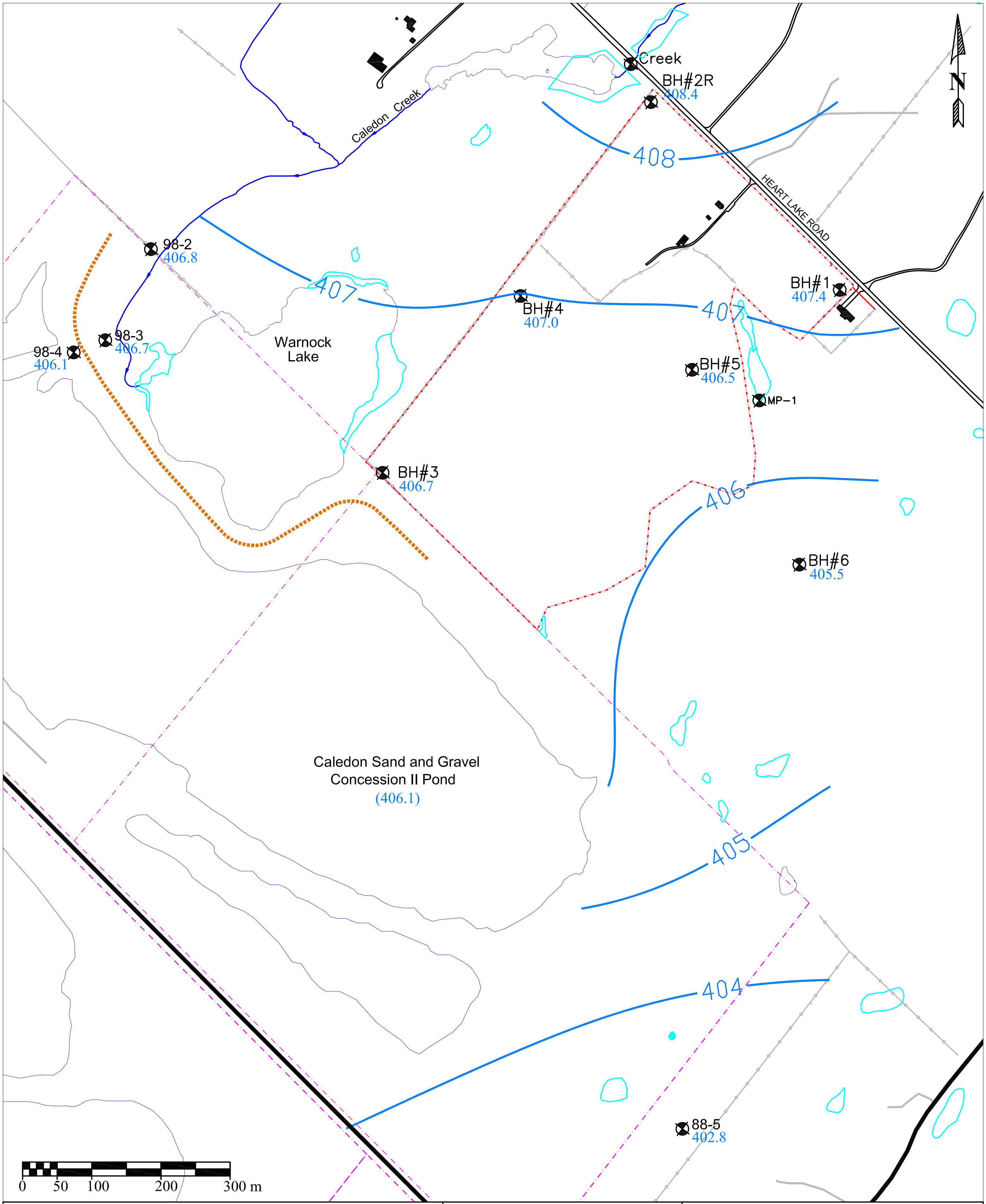
modified from: OBM mapping
UNDER LICENSE, WITHOUT PREJUDICE OR ENDORSEMENT,
FROM THE QUEEN'S PRINTER OF ONTARIO

October 2017
Scale: as shown

Groundwater
Science Corp.

Figure 11: Average Water Table

Blueland Farms
Proposed McCormick Pit



⊗ BH#6 405.5 Monitoring Location and Reference Water Level Elevation (December 11, 2015)

— Water Table Contours (interval as shown)

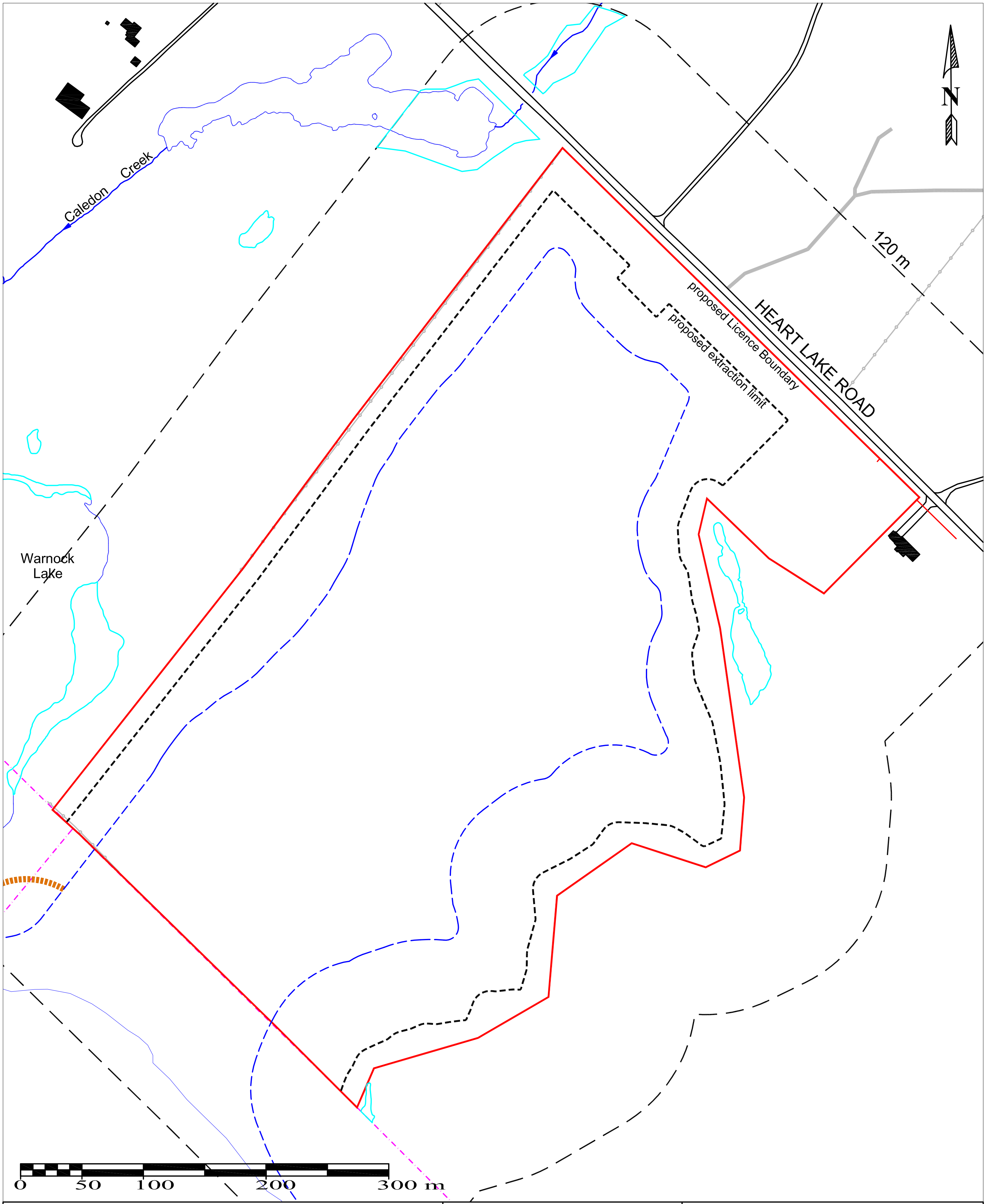
modified from: OBM mapping
UNDER LICENSE, WITHOUT PREJUDICE OR ENDORSEMENT, FROM THE QUEEN'S PRINTER OF ONTARIO

October 2017
Scale: as shown

Groundwater Science Corp.

Figure 12: Low Water Table

Blueland Farms
Proposed McCormick Pit



— Existing Pond Edge

- - Proposed Pond Edge

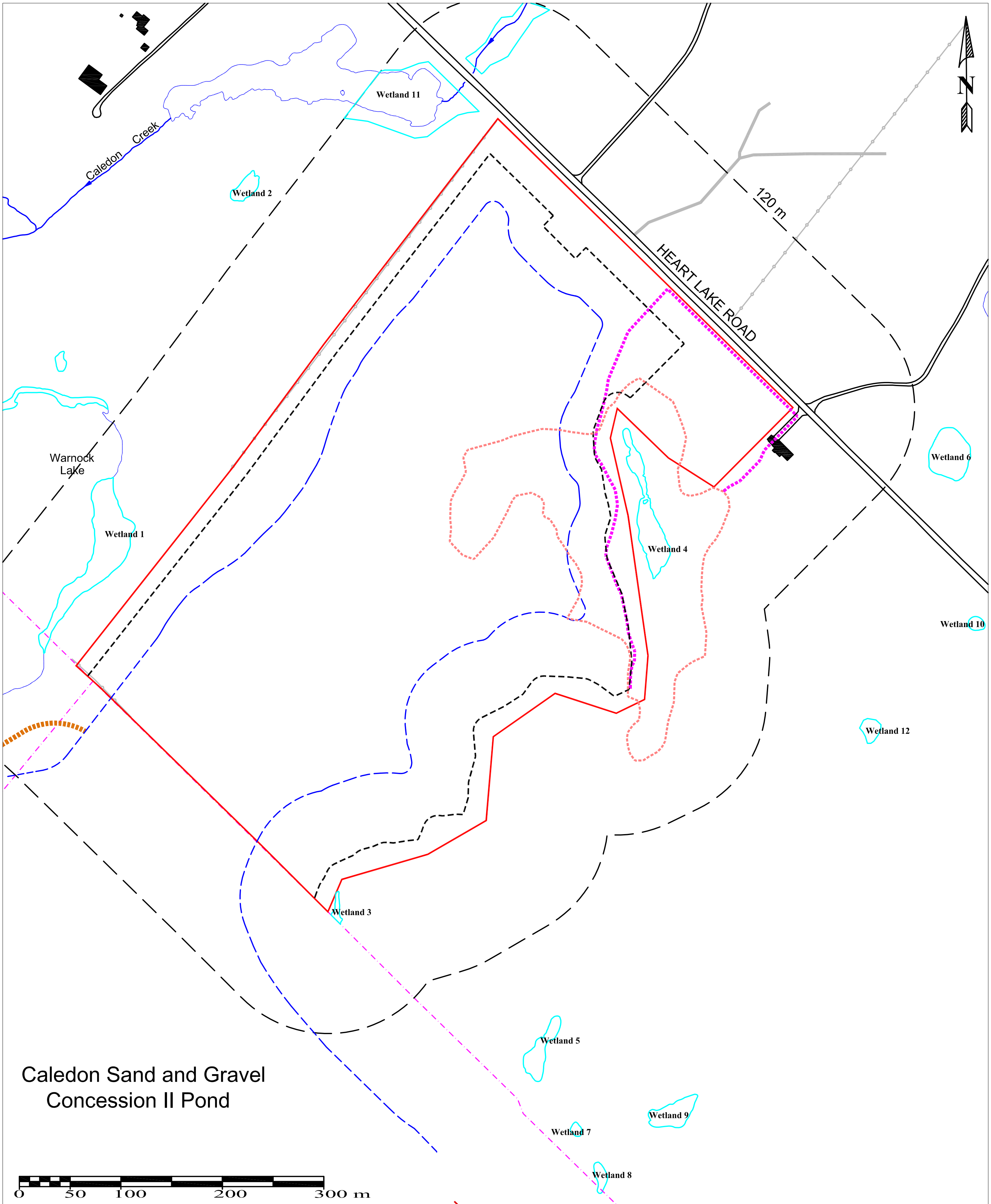
modified from: OBM mapping
UNDER LICENSE, WITHOUT PREJUDICE OR ENDORSEMENT,
FROM THE QUEEN'S PRINTER OF ONTARIO

Figure 13: Proposed Pond

October 2017
Scale: as shown

Groundwater Science Corp.

Blueland Farms
Proposed McCormick Pit



┅	Existing Wetland 4 Catchment
┅	Proposed Final Catchment Boundary and Addition

modified from: OBM mapping
UNDER LICENSE, WITHOUT PREJUDICE OR ENDORSEMENT, FROM THE QUEEN'S PRINTER OF ONTARIO

October 2017
Scale: as shown

Groundwater Science Corp.

Figure 14: Future Catchment

Blueland Farms
Proposed McCormick Pit

Appendix A
Background Information

in the deposit are contained within the presently licensed properties. However, small additional resources remain in the areas between the licensed pits, and resource protection for these portions should be considered.

Face heights in the pits vary from 10 to 40 feet (3 to 12 m) and expose moderately to well stratified sand and gravel, consisting in places of up to 70 percent gravel. Some exposures, such as those at Pit Nos. 8 and 12, consist of uniform well sorted pebble- and cobble-sized gravel well suited for crushing. As in Selected Sand and Gravel Resource Areas 1 and 2, the presence of siltstone fragments reduces the quality of the aggregate and necessities beneficiation procedures."

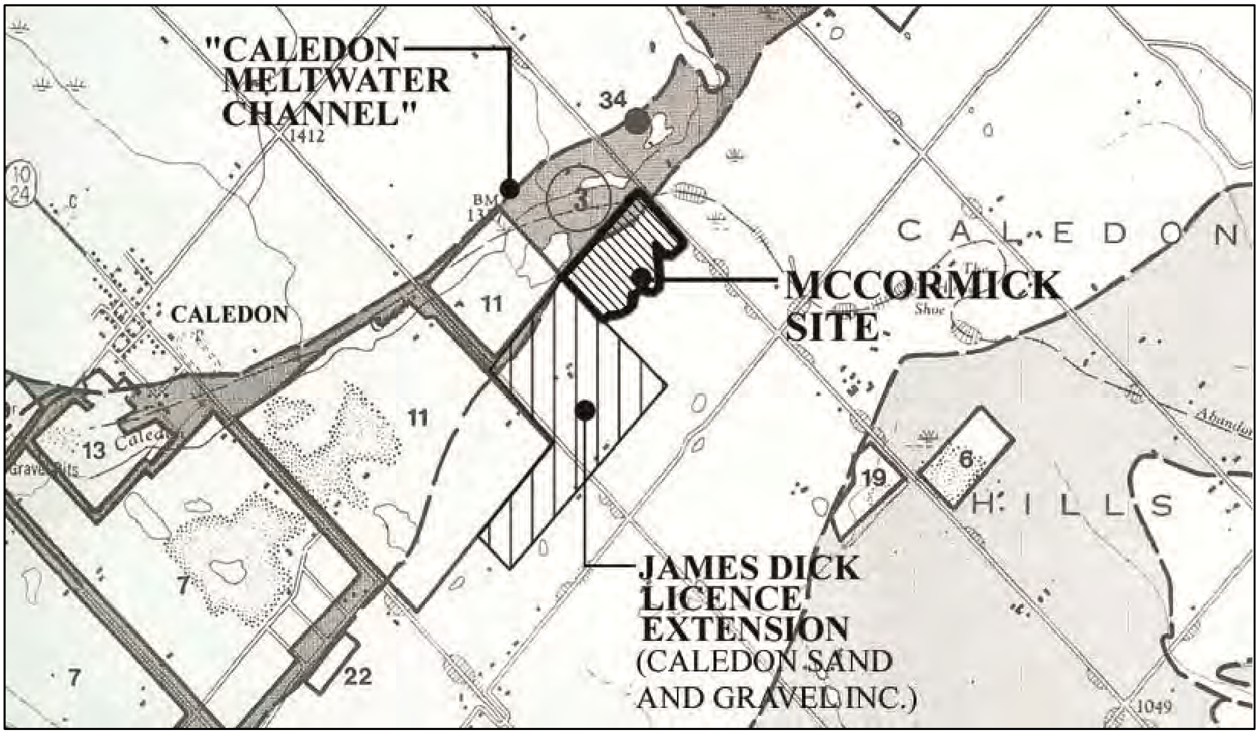


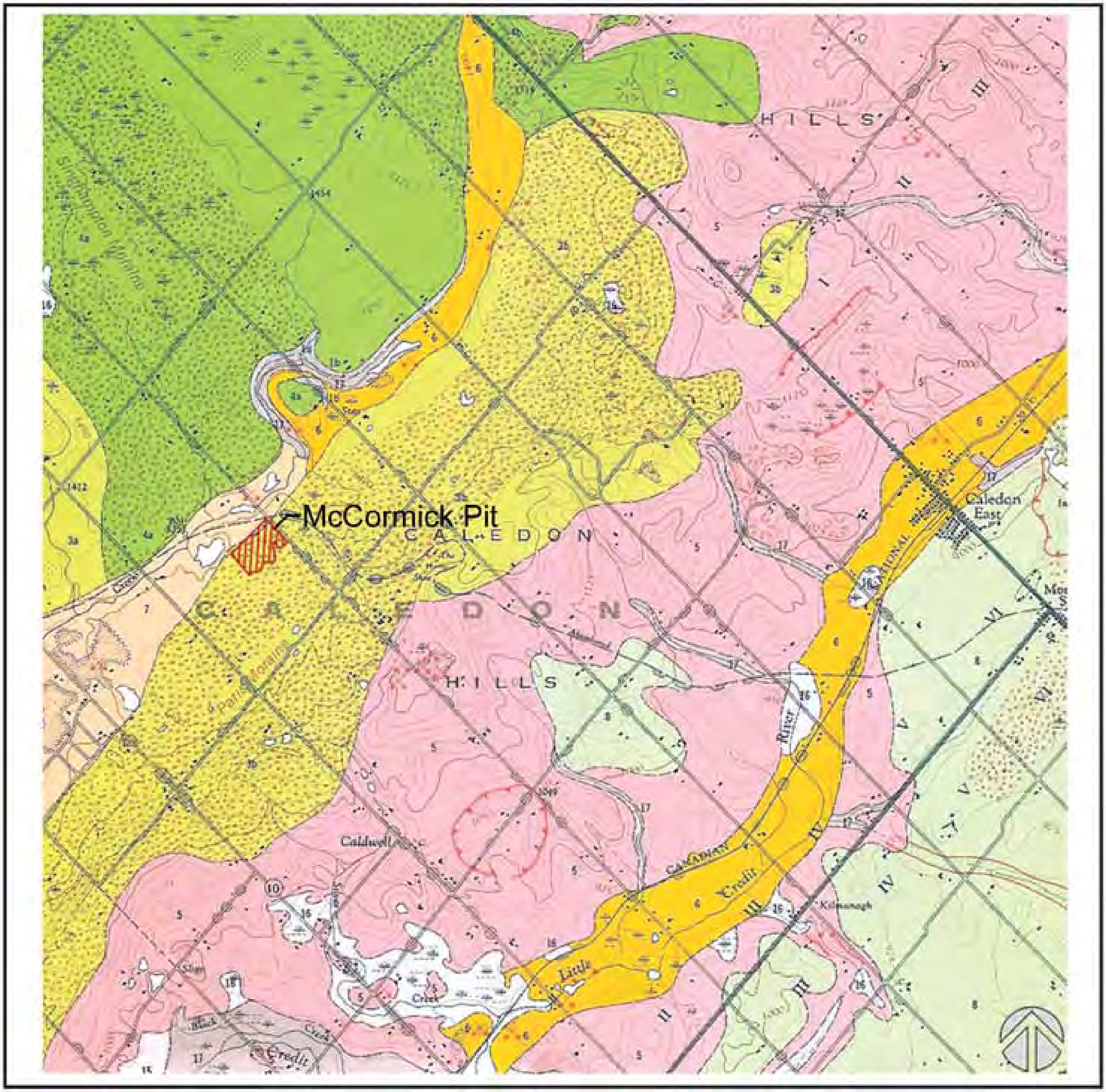
Figure 8- ARIP Map Excerpt

The northeast corner of the McCormick site is mapped with the Selected Sand and Gravel Resource Area 3 (see Figure 8).

<u>*Quaternary Geology of the Bolton Area - Geological Report 117* by Owen White MNR 1975</u>

On pages 37 and 38 of the report, the **Caledon Meltwater channel** is described as follows: *"The Caledon Meltwater Channel traverses the rim of the escarpment in the northwestern part of the Bolton area from Sleswick, south and southwest through Star past the village of Caledon and thence southwest beyond the map area.*

The channel is a broad, shallow valley with a flat to gently undulating floor. The channel is over 1 mile wide at Caledon but narrows considerably at Sleswick. The northern confining wall varies from a steep drift or rock face up to 40 feet high to a low, almost indistinct "step" near Caledon.



Geological Report 117, Map 2275, Quaternary Geology of the Bolton Area, MNR

N.T.S.

McCormick Pit

Blueland Farms Limited

LEGEND:

8	8 Halton Till: brown loam to silt loam till
7	7 Gravel: outwash gravel usually covered by several feet of sand
6	6 Sand: deposited in meltwater channels- often underlain by gravels.
5	5 Ice contact stratified drift; sand and grave land (locally) silt. Structure often disturbed of kame, outwash and outwash and collapse origin. Is frequently exposed long river valleys
4	4a Northern lower till: light brown and red sandy loam till 4b Northern lower till: light brown very gravelly sandy loam till 4c Northern lower till: light brown-grey gravelly loam gravelly loam to sandy loam till.
3	3a Wentworth Till: red, sandy loam till (possibly a Cary (pre-Huron) till). 3b Wentworth Till: light brown gravelly sandy loam and loam till. Considerable stratified material.

PALEOZOIC	SILURIAN
1	1a Amabel formation 1b Clinton and Cataract Groups
▒	Drumlin
✳	Individual Kame
◠	Ice block depression
⁓	Spillway, water cut channel
●	Morainal topography
✕	Sand and gravel pit

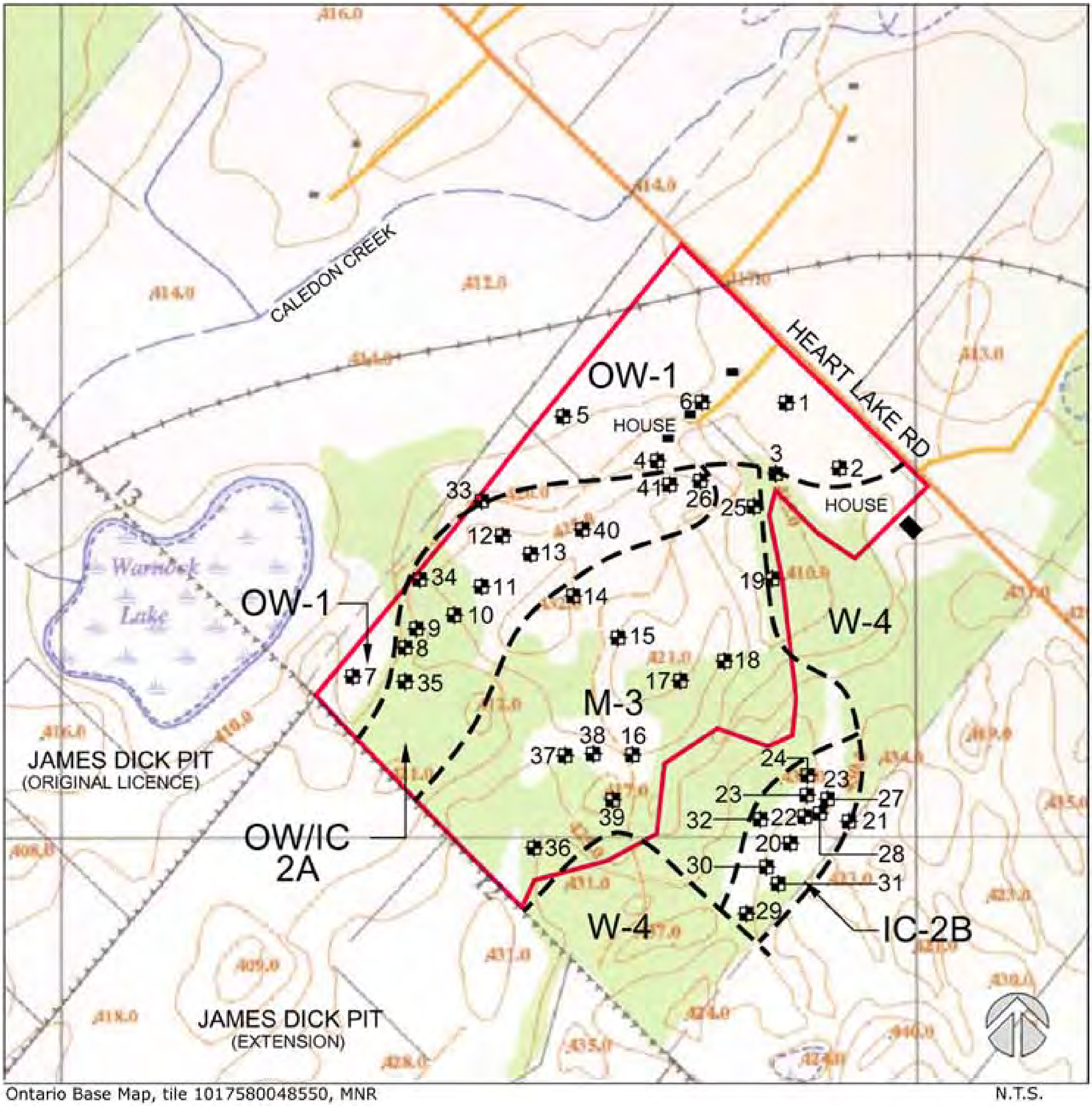
Quaternary Geology Map

February 2013

Harrington McAvan Ltd

FIGURE

9



Ontario Base Map, tile 1017580048550, MNR

N.T.S.

McCormick Pit

Blueland Farms Limited

LEGEND:

⊞ 5	Test Pit No. and location
OW	Outwash -1
OW/IC	Outwash/ Ice contact- 2A

Paris Moraine:

IC	Ice contact - 2B
M	Scattered Trees and Shrubs -3
W	Wooded Areas - 4
▬	Proposed licence boundary

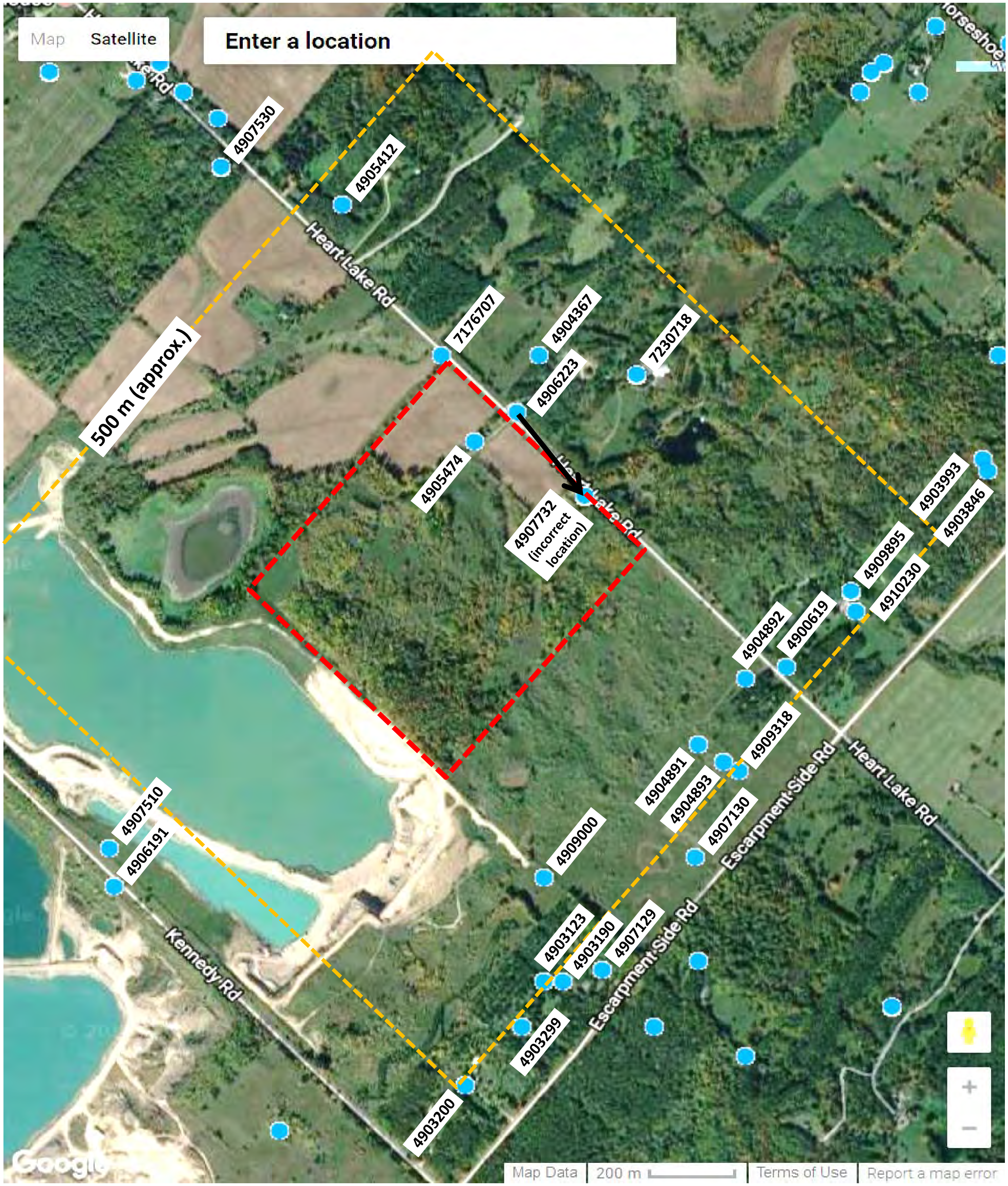
Test Pit Location Map

February 2013

Harrington
McAvan Ltd

FIGURE

10



modified from:
https://www.ontario.ca/environment-and-energy/map-well-records

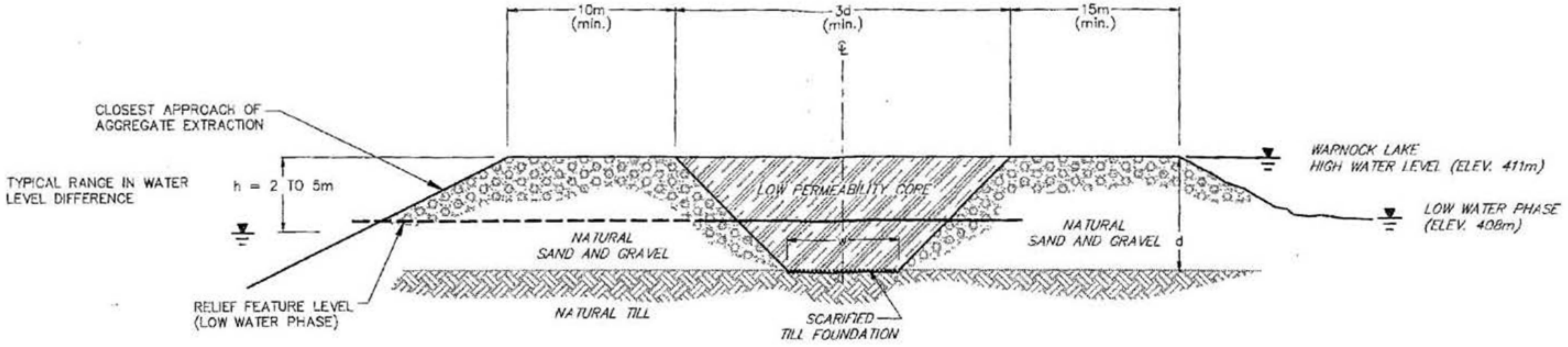
⬚ Study Area (approximate ownership parcel)

Date: January 2017
scale: as shown (approx.)

Reported Water Well Locations

Groundwater Science Corp.

Blueland Farms McCormick Pit
Hydrogeologic Assessment



DRAWING NOTES:

1. THE HYDRAULIC BUFFER IS TO CONSIST OF A CORE OF LOW PERMEABILITY SOIL THAT EXTENDS THROUGH THE NATURAL SAND AND GRAVEL DEPOSITS AND INTO THE UNDERLYING LOW PERMEABILITY UNIT (TILL) ALONG THE ENTIRE BUFFER ALIGNMENT. THE BUFFER MUST BE COMPLETED ALONG THE ENTIRE LENGTH PRIOR TO AGGREGATE EXTRACTION BELOW THE GROUNDWATER TABLE WITHIN A DISTANCE OF 500m OF WARNOCK LAKE EXCEPT FOR THE PROPOSED WETLAND IN THE NORTHWEST PORTION OF CONCESSION II (STAGE 2) WHICH MAY PROCEED BELOW THE WATER TABLE PRIOR TO COMPLETION OF THE BUFFER.
2. THE WIDTH (w) AT THE BASE OF THE BUFFER CORE WILL BE DETERMINED BY THE DEPTH (d) OF THE TILL FOUNDATION BELOW THE HIGH WATER LEVEL OF WARNOCK LAKE. A MINIMUM CORE WIDTH (w) IS DEFINED AS $w=10m$ FOR $d \leq 10m$, AND $w=d$ IF $d>10m$.
3. THE HYDRAULIC BUFFER EXCAVATION BELOW THE GROUNDWATER LEVEL IS TO BE UNDERTAKEN DURING THE TIME OF LOW WATER LEVELS IN WARNOCK LAKE (LATE SUMMER AND FALL).
4. THE SIDE SLOPE OF THE CORE EXCAVATION THROUGH THE NATURAL SAND AND GRAVEL DEPOSITS ARE TO BE CUT AT A STABLE ANGLE SUCH THAT SLOUGHING OF GRAVEL ONTO THE PREPARED TILL FOUNDATION DOES NOT OCCUR AND CAN BE NOT STEEPER THAN 1H:1V.
5. ALL GRAVEL IS TO BE REMOVED FROM THE TILL FOUNDATION SURFACE OVER THE ENTIRE SPECIFIED CORE THICKNESS AND THE TILL FOUNDATION IS TO BE SCARIFIED TO A MINIMUM DEPTH OF 150mm OVER THE ENTIRE SPECIFIED CORE THICKNESS.
6. PREPARATION OF THE CORE FOUNDATION AS OUTLINED IN NOTE 5 IS TO BE COMPLETE PRIOR TO CORE CONSTRUCTION. PLACEMENT OF THE APPROVED MATERIAL IS TO PROGRESS IN A CONTINUOUS UNIFORM MANNER AND FOLLOW CLOSE BEHIND PREPARATION OF THE FOUNDATION AS POSSIBLE.
7. THE CORE BACK FILL MATERIAL IS TO CONSIST OF A COHESIONLESS SILT OR SIMILAR MATERIAL WITH HYDRAULIC CONDUCTIVITY OF NO GREATER THAN 10^{-4} cm/sec. A GRAIN SIZE ANALYSIS OF A SILT SAMPLE RECOVERED FROM THE ADJACENT AGGREGATE WASH PROCESS INDICATES THE WASH MATERIAL IS AN ACCEPTABLE CORE MATERIAL. THE UNIFORMITY AND USE OF THE SILT WASH OR SIMILAR MATERIAL AS CORE MATERIAL IS TO BE VERIFIED BY TESTING PRIOR TO AND DURING PLACEMENT. VERIFICATION SAMPLES DURING PLACEMENT ARE TO BE RECOVERED AT A RATE OF ONE (1) SAMPLE PER 5000 CUBIC METRES OF CORE MATERIAL PLACED.
8. THE CORE MATERIAL BELOW THE WATER LEVEL WILL BE PLACED BY END DUMPING. THE CORE MATERIAL ABOVE THE WATER LEVEL IS TO BE PLACED BY SPREADING IN LOOSE LIFT OF 450 TO 600mm IN THICKNESS. NOMINAL COMPACTION OF THE CORE MATERIAL ONLY, AS GENERATED BY THE SPREADING EQUIPMENT, IS REQUIRED.
9. THE NATURAL SAND AND GRAVEL DOWNSTREAM OF THE CORE IS TO BE A MINIMUM OF 10m AT THE CREST WITH END SIDE SLOPE NOT EXCEEDING 2H:1V. THIS IS THE DEFINED CLOSEST APPROACH OF AGGREGATE EXTRACTION TO WARNOCK LAKE AFTER COMPLETION OF THE HYDRAULIC BUFFER ALONG THE ENTIRE ALIGNMENT.
10. FEATURES TO PROVIDE HIGH WATER RELIEF AND TO ACHIEVE THE LEVELS OF THE LOW WATER PHASE OF WARNOCK LAKE ARE TO BE DETAILED IN THE FINAL DESIGN THE RELIEF FEATURES CAN PROVIDE MULTIPLE PATHWAYS AND INCLUDE SURFACE SWALES WITH SAND AND GRAVEL UNDER DRAINS AND CONTROLLED RELIEF WELLS.
11. THE DETAILED DESIGN OF THE HYDRAULIC BUFFER WILL BE CONDUCTED BY A PROFESSIONAL GEOTECHNICAL ENGINEER IN ASSOCIATION WITH HYDROGEOLOGISTS AND ECOLOGISTS.

figure 5.1

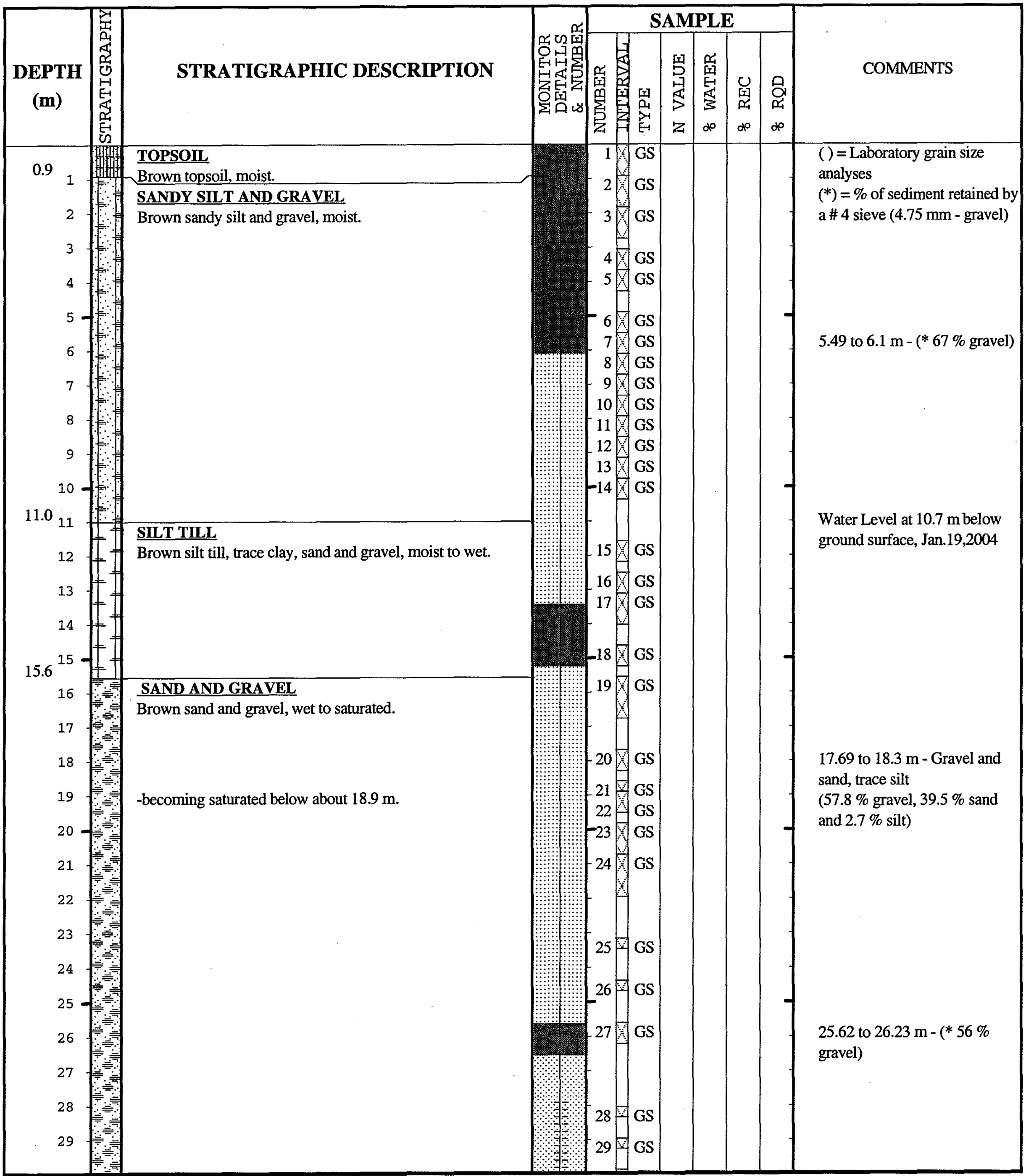
HYDRAULIC BUFFER CONCEPT
CROSS-SECTION VIEW
Caledon Sand and Gravel Inc.

<u>Reference:</u> Conestoga-Rovers & Associates, 1986: Warnock Lake Evaluation, Proposed Caledon Sand and Gravel Inc. Pit Expansion, Ref. No. 8186 (2), August 1996.

CRA

Appendix B
Borehole and Test Pit Logs

BOREHOLE LOG	**PROJECT:** 23-348	**BOREHOLE:** 1 1 of 2
McCormick Pit Caledon, Ontario-Hart Lake Road **FOR:** Harrington and Hoyle		**DATE:** 08 September 2003 **LOGGED BY** DL **GROUND ELEV** 419.11 m ASL



DEPTH (m)	STRATIGRAPHIC DESCRIPTION	COMMENTS
0.9	**TOPSOIL** Brown topsoil, moist.	( ) = Laboratory grain size analyses (*) = % of sediment retained by a # 4 sieve (4.75 mm - gravel)
11.0	**SANDY SILT AND GRAVEL** Brown sandy silt and gravel, moist.	5.49 to 6.1 m - (* 67 % gravel) Water Level at 10.7 m below ground surface, Jan.19,2004
15.6	**SILT TILL** Brown silt till, trace clay, sand and gravel, moist to wet.	
	SAND AND GRAVEL Brown sand and gravel, wet to saturated. -becoming saturated below about 18.9 m.	17.69 to 18.3 m - Gravel and sand, trace silt (57.8 % gravel, 39.5 % sand and 2.7 % silt) 25.62 to 26.23 m - (* 56 % gravel)

SAMPLE NUMBER	TYPE	N VALUE	% WATER	% REC	% RQD
1	GS				
2	GS				
3	GS				
4	GS				
5	GS				
6	GS				
7	GS				
8	GS				
9	GS				
10	GS				
11	GS				
12	GS				
13	GS				
14	GS				
15	GS				
16	GS				
17	GS				
18	GS				
19	GS				
20	GS				
21	GS				
22	GS				
23	GS				
24	GS				
25	GS				
26	GS				
27	GS				
28	GS				
29	GS				

BOREHOLE LOG

PROJECT: 23-348

BOREHOLE: 1 2 of 2

McCormick Pit
Caledon, Ontario-Hart Lake Road
FOR: Harrington and Hoyle

DATE: 08 September 2003
LOGGED BY DL
GROUND ELEV 419.11 m ASL

DEPTH (m)	STRATIGRAPHIC DESCRIPTION	SAMPLE NUMBER	TYPE	N VALUE	% WATER	% REC	% RQD	COMMENTS
		30	GS					
31								
32		31	GS					
33		32	GS					
34		33	GS					
35								
36		34	GS					
37								
38		35	GS					37.52 to 38.13 m - (* 48 % gravel)
38.4	**SHALE** Red Shale	36	GS					
39.0 39	Borehole terminated in red shale at about 39.04 m.							

Printed: 22 Jan 04
File Location:

Gartner Lee Limited

BOREHOLE LOG

PROJECT: 23-348

BOREHOLE: 2 1 of 1

McCormick Pit
Caledon, Ontario-Hart Lake Road
FOR: Harrington and Hoyle

DATE: 09 September 2003
LOGGED BY DL
GROUND ELEV 415.50 m ASL

DEPTH (m)	STRATIGRAPHIC DESCRIPTION	COMMENTS
0.9	**TOPSOIL** Brown topsoil, moist.	( ) = Laboratory grain size analyses (*) = % of sediment retained by a # 4 sieve (4.75 mm - gravel)
4.6	**SILTY SAND AND GRAVEL** Brown silty sand and gravel, moist.	2.75 to 3.05 m - (* 58 % gravel)
12.5	**SAND AND GRAVEL** Brown sand and gravel, moist.	6.71 to 7.32 m - Sandy gravel, trace silt (60.1 % gravel, 35.2 % sand and 4.7 % silt) 9.15 to 9.76 m - (* 42 % gravel)
17.7	**SANDY SILT AND GRAVEL** Brown sandy silt and gravel, moist.	14.03 to 14.64 m - (* 39 % gravel)
25.9	**SILT TILL** Brown silt till, trace clay, sand and gravel, moist.	
26.2	**SHALE** Red Shale	

Borehole terminated in red shale at about 26.23 m.
Borehole dry upon completion - no monitor installed.

SAMPLE NUMBER	TYPE	N VALUE	% WATER	% REC	% RQD
1	GS				
2	GS				
3	GS				
4	GS				
5	GS				
6	GS				
7	GS				
8	GS				
9	GS				
10	GS				
11	GS				
12	GS				
13	GS				
14	GS				
15	GS				
16	GS				
17	GS				
18	GS				
19	GS				
20	GS				
21	GS				
22	GS				
23	GS				
24	GS				
25	GS				
26	GS				
27	GS				
28	GS				
29	GS				
30	GS				
31	GS				
32	GS				
33	GS				
34	GS				
35	GS				
36	GS				
37	GS				
38	GS				
39	GS				
40	GS				
41	GS				
42	GS				
43	GS				

Printed: 22 Jan 04
File Location:

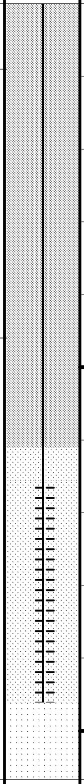
Gartner Lee Limited

BOREHOLE LOG

McCormick Pit Caledon, Ontario-Hart Lake Road **Client:** Harrington and Hoyle	**PROJECT:** 60116872 **Northing:** N/A **Easting:** N/A **Methodology:** Air Rotary **Contractor:** Gerrits	**BOREHOLE:** 2R 1 of 1 **DATE:** December 17, 2013 **LOGGED BY** SRB **GROUND ELEV** 415.50 m ASL

DEPTH (m) (mASL)	STRATIGRAPHIC DESCRIPTION
	TOPSOIL Brown topsoil, moist.
0.9 414.6	**SILTY SAND AND GRAVEL** Brown silty sand and gravel, moist. Cobbles encountered below about 4 m.
4.6 410.9	**SAND AND GRAVEL** Brown sand and gravel, some cobbles, moist. Becoming saturated below about 6.4 m.
10.7 404.8	Borehole terminated at about 10.67 m in sand and gravel. Stratigraphy inferred from adjacent borehole 2.

MONITOR DETAILS & NUMBER	SAMPLE NUMBER	INTERVAL	TYPE	N VALUE	% WATER	% REC	% RQD	N VALUE	WATER CONTENT (%)
								15 30 45 60	10 20 30 40



AECOM

BOREHOLE LOG

PROJECT: 23-348

BOREHOLE: 3 1 of 1

McCormick Pit
Caledon, Ontario-Hart Lake Road
FOR: Harrington and Hoyle

DATE: 10 September 2003
LOGGED BY DL
GROUND ELEV 415.95 m ASL

DEPTH (m)	STRATIGRAPHIC DESCRIPTION	SAMPLE NUMBER	SAMPLE INTERVAL	SAMPLE TYPE	N VALUE	% WATER	% REC	% RQD	COMMENTS
	TOPSOIL Brown topsoil, moist.	1	☒	GS					( ) = Laboratory grain size analyses (*) = % of sediment retained by a # 4 sieve (4.75 mm - gravel)
0.9 1		2	☒	GS					
	SILTY SAND AND GRAVEL Brown silty sand and gravel, moist to wet.	3	☒	GS					
2		4	☒	GS					
		5	☒	GS					
3		6	☒	GS					
4		7	☒	GS					
		8	☒	GS					4.27 m - (* 6 % gravel)
5		9	☒	GS					
6		10	☒	GS					
		11	☒	GS					
7		12	☒	GS					
		13	☒	GS					
8		14	☒	GS					
9		15	☒	GS					Water level at 8.8 m below ground surface, Jan.19, 2004
		16	☒	GS					
10	-becoming saturated below about 9.8 m.	17	☒	GS					9.15 m - (* 38 % gravel)
		18	☒	GS					
11.3 11		19	☒	GS					
12	**SANDY GRAVEL** Brown sandy gravel to sand and gravel ,saturated.	20	☒	GS					
		21	☒	GS					12.2 m - (* 18 % gravel)
13		22	☒	GS					
		23	☒	GS					
14		24	☒	GS					
15		25	☒	GS					
		26	☒	GS					
16		27	☒	GS					
17		28	☒	GS					
		29	☒	GS					
18		30	☒	GS					
		31	☒	GS					18.3 m - Sandy gravel (77 % gravel, 22.4 % sand and 0.6 % silt)
19		32	☒	GS					
20		33	☒	GS					
		34	☒	GS					
21		35	☒	GS					
		36	☒	GS					
22		37	☒	GS					
23		38	☒	GS					
		39	☒	GS					
24		40	☒	GS					
		41	☒	GS					
25		42	☒	GS					
25.9 26		43	☒	GS					25.62 m - (* 65 % gravel)
	SILT TILL Brown silt till, some clay, trace sand and gravel, saturated.	44	☒	GS					
27.5 27		45	☒	GS					

Borehole terminated in silt till at about 27.45 m.

Printed:22 Jan 04
File Location:

Gartner Lee Limited

BOREHOLE LOG

PROJECT: 23-348

BOREHOLE: 4 1 of 2

McCormick Pit
Caledon, Ontario-Hart Lake Road
FOR: Harrington and Hoyle

DATE: 10 September 2003
LOGGED BY DL
GROUND ELEV 419.26 m ASL

DEPTH (m)	STRATIGRAPHY	STRATIGRAPHIC DESCRIPTION	MONITOR DETAILS & NUMBER	SAMPLE NUMBER	SAMPLE INTERVAL	SAMPLE TYPE	SAMPLE N VALUE	SAMPLE % WATER	SAMPLE % REC	SAMPLE % RQD	COMMENTS
		TOPSOIL		1	☒	GS					(*) = % of sediment retained by
0.9 1		Brown topsoil, moist.		2	☒	GS					a # 4 sieve (4.75 mm - gravel)
		SILTY SAND AND GRAVEL		3	☒	GS					
2		Brown silty sand and gravel, moist.		4	☒	GS					1.83 m - (* 49 % gravel)
2.8				5	☒	GS					
3		**SAND**		6	☒	GS					
4		Brown sand, moist.		7	☒	GS					
4.9				8	☒	GS					
5		**SANDY GRAVEL**		9	☒	GS					
6		Brown sandy gravel to sand and gravel , moist to wet.		10	☒	GS					
				11	☒	GS					
7				12	☒	GS					
				13	☒	GS					
8				14	☒	GS					7.93 m - (* 44 % gravel)
9				15	☒	GS					
				16	☒	GS					
10				17	☒	GS					
				18	☒	GS					
11.3 11				19	☒	GS					Water level at 10.9 m below
12		**SAND**		20	☒	GS					ground surface, Jan.19, 2004
		Brown sand, occassional gravel, wet to saturated.		21	☒	GS					
13		-becoming saturated below about 12.2 m.		22	☒	GS					
13.7				23	☒	GS					
14		**SANDY GRAVEL**		24	☒	GS					
15		Brown sandy gravel, saturated.		25	☒	GS					
				26	☒	GS					
16				27	☒	GS					
17				28	☒	GS					
				29	☒	GS					17.08 m - (* 63 % gravel)
18				30	☒	GS					
				31	☒	GS					
19				32	☒	GS					
19.8 20				33	☒	GS					
		SILT TILL		34	☒	GS					
21		Brown silt till, trace clay, sand and gravel, saturated.		35	☒	GS					
				36	☒	GS					
22				37	☒	GS					
23				38	☒	GS					
23.8				39	☒	GS					
24		**SANDY SILT AND GRAVEL**		40	☒	GS					
		Brown sandy silt and gravel, moist.		41	☒	GS					
25				42	☒	GS					
26				43	☒	GS					25.62 m - (* 34 % gravel)
				44	☒	GS					
27				45	☒	GS					
28				46	☒	GS					
				47	☒	GS					
29.0 29				48	☒	GS					
		SAND AND GRAVEL		49	☒	GS					29.28 m - (* 33 % gravel)

Printed: 22 Jan 04
File Location:

Gartner Lee Limited

BOREHOLE LOG	**PROJECT:** 23-348	**BOREHOLE:** 4 2 of 2

McCormick Pit
Caledon, Ontario-Hart Lake Road
FOR: Harrington and Hoyle

DATE: 10 September 2003
LOGGED BY DL
GROUND ELEV 419.26 m ASL

DEPTH (m)	STRATIGRAPHY	**STRATIGRAPHIC DESCRIPTION**	MONITOR DETAILS & NUMBER	**SAMPLE** NUMBER	INTERVAL	TYPE	N VALUE	% WATER	% REC	% RQD	COMMENTS
30.2		Brown sand and gravel, saturated.		50	☒	GS					
31.4 31		**SILT TILL**		51	☒	GS					
		Brown silt till, trace clay, sand and gravel, saturated.		52	☒	GS					
32.3 32		**SHALE**		53	☒	GS					
		Red Shale									
		Borehole terminated in red shale at about 32.33 m.									

Printed: 22 Jan 04
File Location:

Gartner Lee Limited

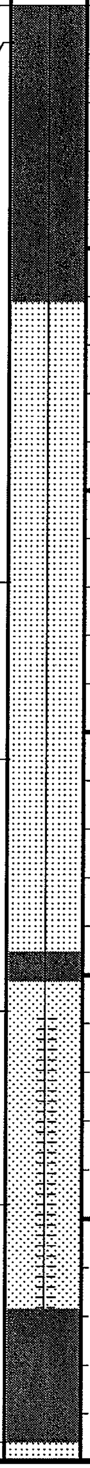
BOREHOLE LOG	**PROJECT:** 23-348	**BOREHOLE:** 5 1 of 2

McCormick Pit
Caledon, Ontario-Hart Lake Road
FOR: Harrington and Hoyle

DATE: 11 September 2003
LOGGED BY DL
GROUND ELEV 425.19 m ASL

DEPTH (m)	STRATIGRAPHIC DESCRIPTION
	TOPSOIL Brown topsoil, moist.
0.8	**SAND** Brown sand, occassional gravel, moist.
11.9	**SANDY GRAVEL** Brown sandy gravel, moist.
15.6	**SAND** Brown sand, trace gravel, moist to wet. -becoming saturated below about 19.2 m.
20.7	**GRAVEL** Brown gravel, some sand, saturated.
24.7	**SILT TILL** Brown silt till, trace clay, sand and gravel, saturated.
29.6	

MONITOR DETAILS & NUMBER



SAMPLE

NUMBER	TYPE	N VALUE	% WATER	% REC	% RQD
1	GS				
2	GS				
3	GS				
4	GS				
5	GS				
6	GS				
7	GS				
8	GS				
9	GS				
10	GS				
11	GS				
12	GS				
13	GS				
14	GS				
15	GS				
16	GS				
17	GS				
18	GS				
19	GS				
20	GS				
21	GS				
22	GS				
23	GS				
24	GS				
25	GS				
26	GS				
27	GS				
28	GS				
29	GS				
30	GS				
31	GS				
32	GS				
33	GS				
34	GS				
35	GS				
36	GS				
37	GS				
38	GS				
39	GS				
40	GS				
41	GS				
42	GS				
43	GS				
44	GS				
45	GS				
46	GS				
47	GS				
48	GS				
49	GS				

COMMENTS

(*) = % of sediment retained by a # 4 sieve (4.75 mm - gravel)

6.71 m - (* 46 % gravel)

13.42 m - (* 62 % gravel)

Water level at 18 m below ground surface, Jan.19, 2004

21.96 m - (* 28 % gravel)

Printed: 22 Jan 04
File Location:

Gartner Lee Limited

BOREHOLE LOG

PROJECT: 23-348

BOREHOLE: 5 2 of 2

McCormick Pit
Caledon, Ontario-Hart Lake Road
FOR: Harrington and Hoyle

DATE: 11 September 2003
LOGGED BY DL
GROUND ELEV 425.19 m ASL

DEPTH (m)	STRATIGRAPHY	STRATIGRAPHIC DESCRIPTION	MONITOR DETAILS & NUMBER	SAMPLE NUMBER	SAMPLE INTERVAL	SAMPLE TYPE	N VALUE	% WATER	% REC	% RQD	COMMENTS
		SAND AND GRAVEL Brown sand and gravel, saturated.		50	☒	GS					
31				51	☒	GS					
				52	☒	GS					
32				53	☒	GS					31.72 m - (* 66 % gravel)
				54	☒	GS					
33				55	☒	GS					
33.9 34		**SILT TILL** Brown to red, silt till, trace clay, sand and gravel, saturated.		56	☒	GS					
				57	☒	GS					
35				58	☒	GS					
				59	☒	GS					
36				60	☒	GS					
37				61	☒	GS					
				62	☒	GS					
38				63	☒	GS					
				64	☒	GS					
39				65	☒	GS					
40				66	☒	GS					
				67	☒	GS					
41.2 41		Borehole terminated in silt till at about 41.18 m.									

BOREHOLE LOG

PROJECT: 23-348

BOREHOLE: 6 1 of 2

McCormick Pit
Caledon, Ontario-Hart Lake Road
FOR: Harrington and Hoyle

DATE: 12 September 2003
LOGGED BY DL
GROUND ELEV 430.31 m ASL

DEPTH (m)	STRATIGRAPHIC DESCRIPTION	COMMENTS
0.9	**TOPSOIL** Brown topsoil, moist.	( ) = Laboratory grain size analyses (*) = % of sediment retained by a # 4 sieve (4.75 mm - gravel)
13.1	**SILTY SAND** Brown silty sand, trace gravel, moist.	6.71 m - Silty sand, some gravel (16.8 % gravel, 56.7 % sand and 26.5 % silt)
16.8	**SILT TILL** Brown silt till, trace clay, sand and gravel, moist.	
25.3	**SAND AND GRAVEL** Brown sand and gravel, moist to wet. -becoming saturated below about 22.9 m.	17.08 m - (* 76 % gravel) 6.71 m - Gravel and sand, trace silt (48.6 % gravel, 46.3 % sand and 5.1 % silt) 23.18 m - (* 42 % gravel)
	SAND Brown sand, trace gravel, moist to wet.	Water level at 25.4 m below ground surface, Jan.19, 2004

SAMPLE

NUMBER	INTERVAL	TYPE	N VALUE	% WATER	% REC	% RQD
1	☒	GS				
2	☒	GS				
3	☒	GS				
4	☒	GS				
5	☒	GS				
6	☒	GS				
7	☒	GS				
8	☒	GS				
9	☒	GS				
10	☒	GS				
11	☒	GS				
12	☒	GS				
13	☒	GS				
14	☒	GS				
15	☒	GS				
16	☒	GS				
17	☒	GS				
18	☒	GS				
19	☒	GS				
20	☒	GS				
21	☒	GS				
22	☒	GS				
23	☒	GS				
24	☒	GS				
25	☒	GS				
26	☒	GS				
27	☒	GS				
28	☒	GS				
29	☒	GS				
30	☒	GS				
31	☒	GS				
32	☒	GS				
33	☒	GS				
34	☒	GS				
35	☒	GS				
36	☒	GS				
37	☒	GS				
38	☒	GS				
39	☒	GS				
40	☒	GS				
41	☒	GS				
42	☒	GS				
43	☒	GS				
44	☒	GS				
45	☒	GS				
46	☒	GS				
47	☒	GS				
48	☒	GS				
49	☒	GS				

Printed: 22 Jan 04
File Location:

BOREHOLE LOG

PROJECT: 23-348

BOREHOLE: 6 2 of 2

McCormick Pit
Caledon, Ontario-Hart Lake Road
FOR: Harrington and Hoyle

DATE: 12 September 2003
LOGGED BY DL
GROUND ELEV 430.31 m ASL

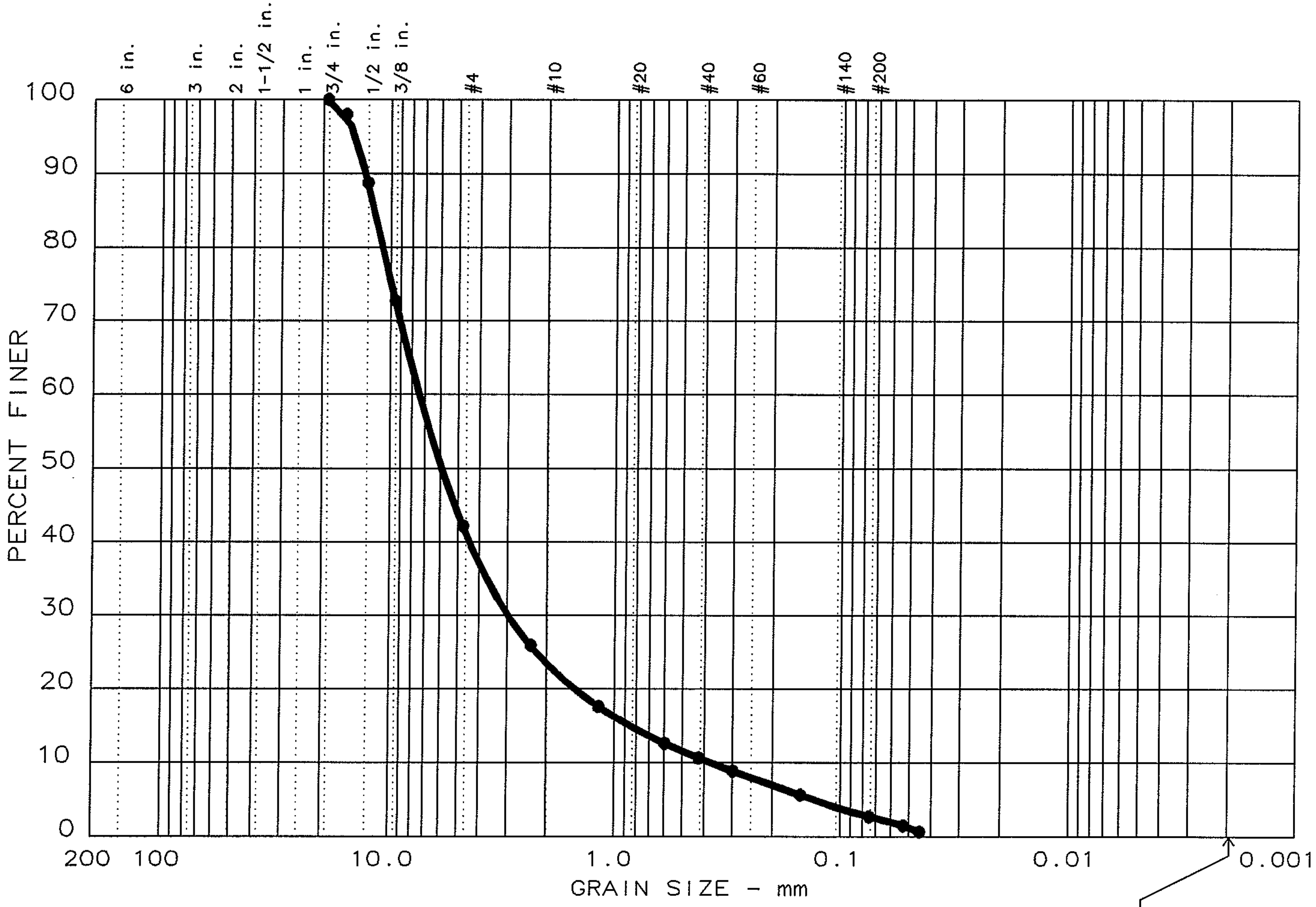
DEPTH (m)	STRATIGRAPHIC DESCRIPTION	SAMPLE NUMBER	SAMPLE TYPE	N VALUE	% WATER	% REC	% RQD	COMMENTS
		50	GS					
31		51	GS					30.5 m - (* 9 % gravel)
		52	GS					
32		53	GS					
		54	GS					
33		55	GS					
33.9 34	**SILT TILL** Brown to red, silt till, trace clay, sand and gravel, saturated.	56	GS					
		57	GS					
35.1 35	**SAND** Grey sand, saturated.	58	GS					
		59	GS					
36		60	GS					
37		61	GS					
		62	GS					
38		63	GS					
		64	GS					
39		65	GS					
40		66	GS					
41.2 41		67	GS					

Borehole terminated in sand at about 41.18 m.

Printed:22 Jan 04
File Location:

Gartner Lee Limited

GRAIN SIZE DISTRIBUTION TEST REPORT



	Test	% +3"	% GRAVEL	% SAND	% SILT	% CLAY
●	13	0.0	57.8	39.5	2.7	

	LL	PI	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
●			11.84	7.42	5.90	2.955	0.8327	0.3720	3.16	20.0

MATERIAL DESCRIPTION	USCS	AASHTO
● GARVEL and SAND, trace silt		

Project No.: 03-006
Project: 23-348
● Location: GLL1, 58'-60'

Date: 03-12-01

Remarks:

Prepared for:

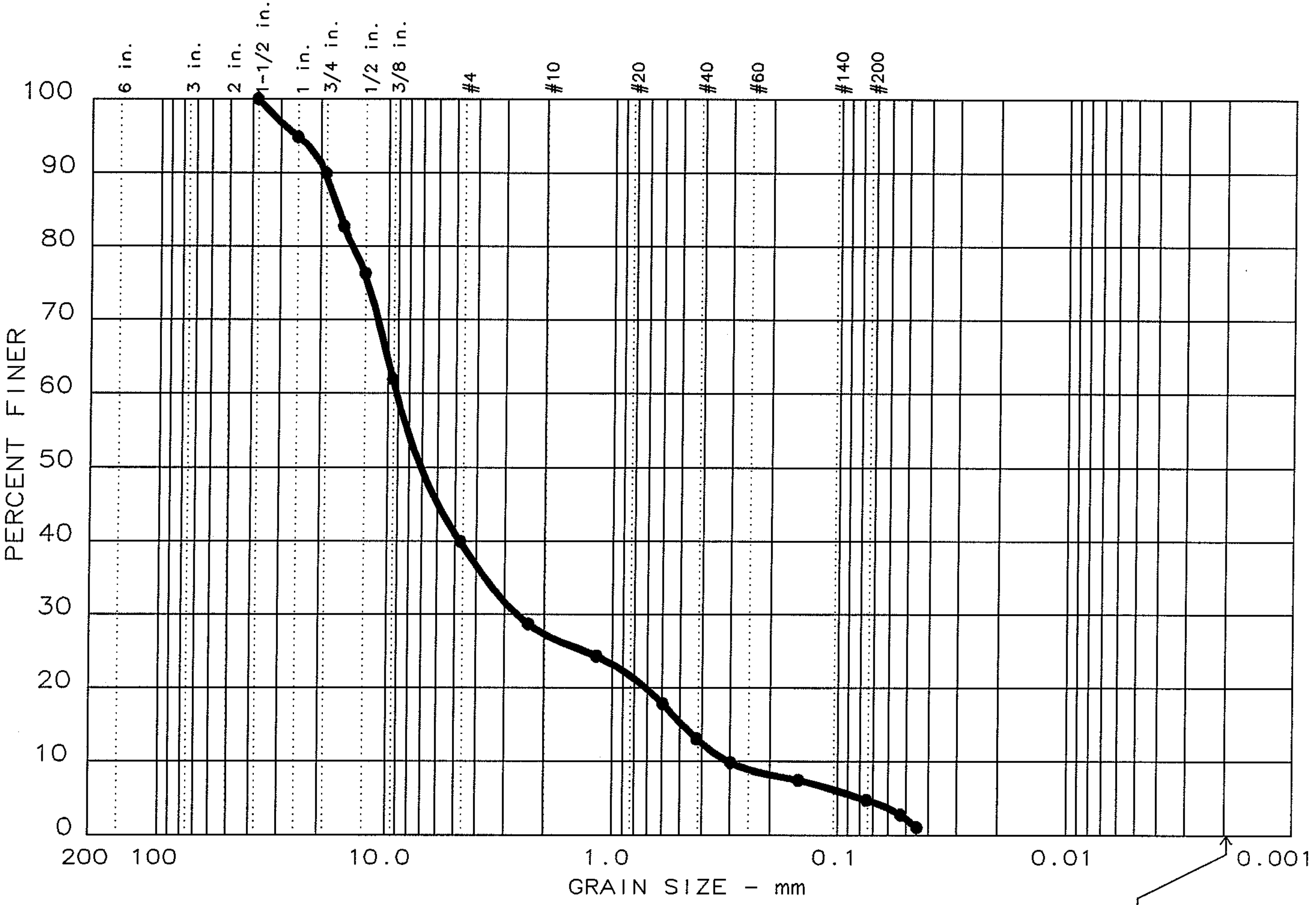
Gartner Lee Ltd.

GRAIN SIZE DISTRIBUTION TEST REPORT

alston associates inc.

Figure No. 1

GRAIN SIZE DISTRIBUTION TEST REPORT



	Test	% +3"	% GRAVEL	% SAND	% SILT	% CLAY
●	14	0.0	60.1	35.2	4.7	

	LL	PI	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
●			16.79	9.15	7.10	2.639	0.4858	0.3065	2.48	29.9

MATERIAL DESCRIPTION	USCS	AASHTO
● SANDY GRAVEL, trace silt		

Project No.: 03-006
Project: 23-348
● Location: GLL2, 22'-24'

Date: 03-12-01

GRAIN SIZE DISTRIBUTION TEST REPORT

alston associates inc.

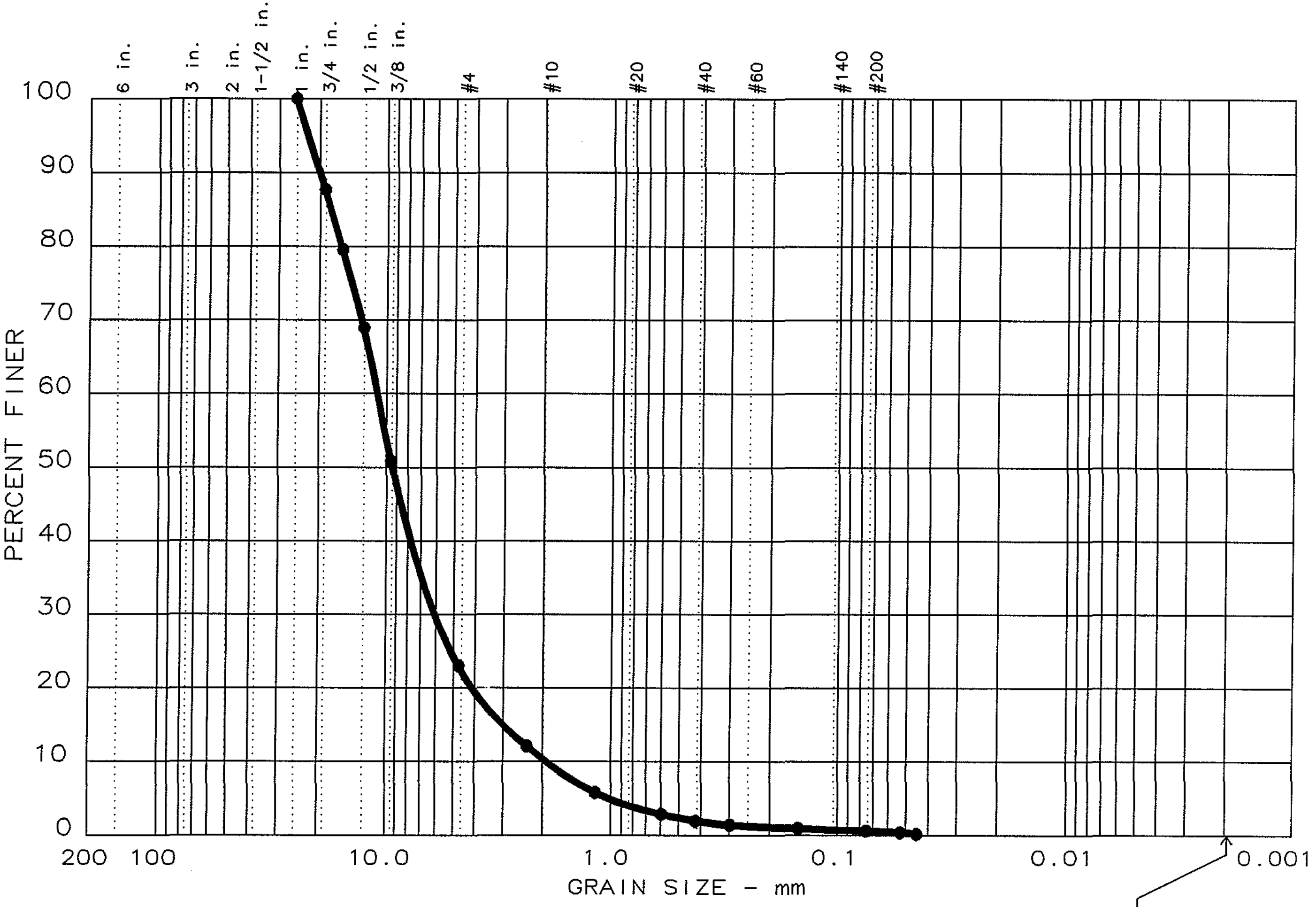
Remarks:

Prepared for:

Gartner Lee Ltd.

Figure No. 2

GRAIN SIZE DISTRIBUTION TEST REPORT



	Test	% +3"	% GRAVEL	% SAND	% SILT	% CLAY
●	15	0.0	77.0	22.4	0.6	

	LL	PI	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
●			17.93	10.98	9.39	6.060	3.0026	1.9165	1.75	5.7

MATERIAL DESCRIPTION	USCS	AASHTO
● SANDY GRAVEL		

Project No.: 03-006
Project: 23-348
● Location: GLL3, 60'

Date: 03-12-01

GRAIN SIZE DISTRIBUTION TEST REPORT

alston associates inc.

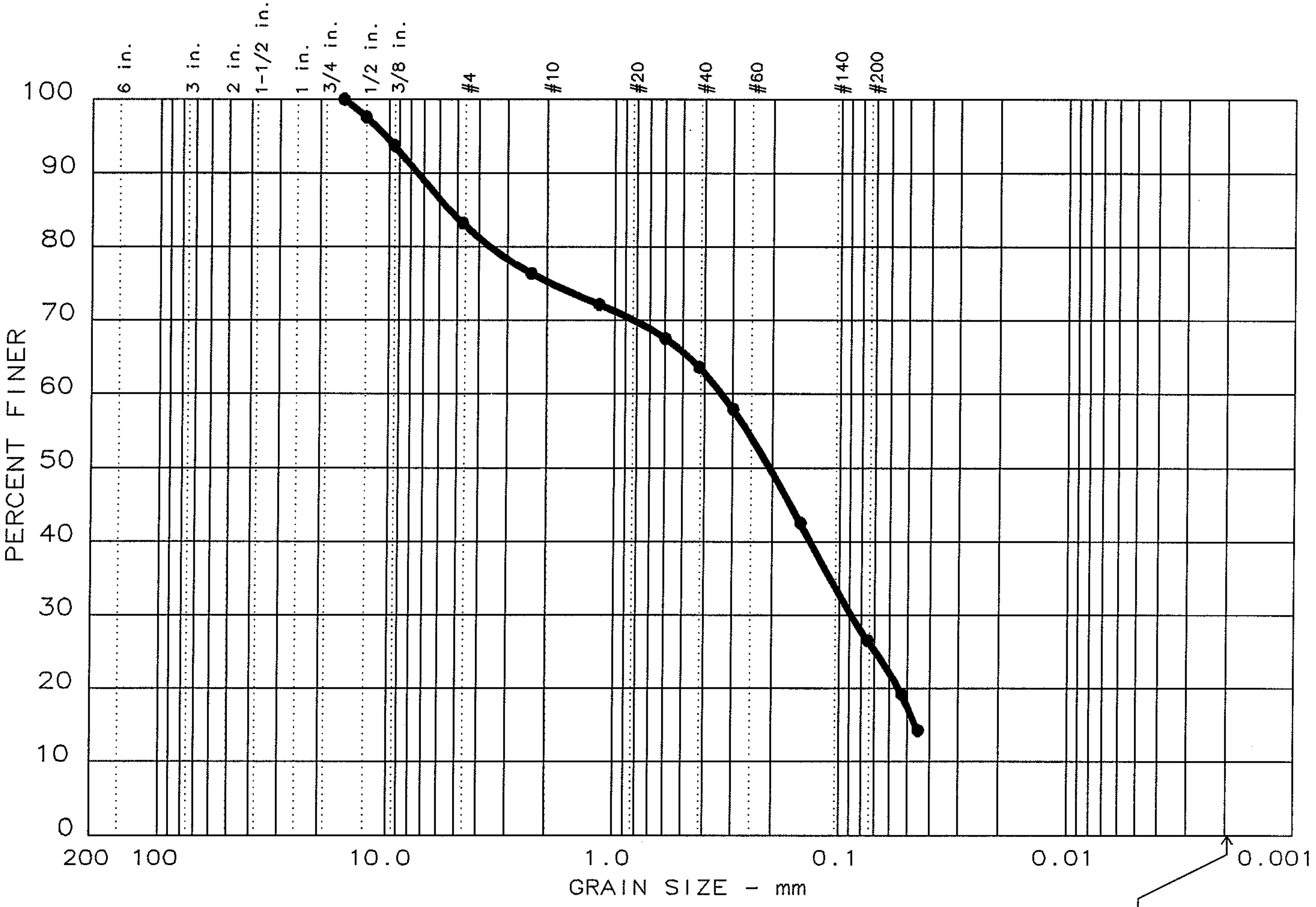
Remarks:

Prepared for:

Gartner Lee Ltd.

Figure No. 3

GRAIN SIZE DISTRIBUTION TEST REPORT



	Test	% +3"	% GRAVEL	% SAND	% SILT	% CLAY
●	16	0.0	16.8	56.7	26.5	

	LL	PI	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
●			5.37	0.33	0.20	0.088	0.0460			

MATERIAL DESCRIPTION	USCS	AASHTO
● SILTY SAND, some gravel		

Project No.: 03-006
Project: 23-348
● Location: GLL6, 22'

Date: 03-12-01

GRAIN SIZE DISTRIBUTION TEST REPORT

alston associates inc.

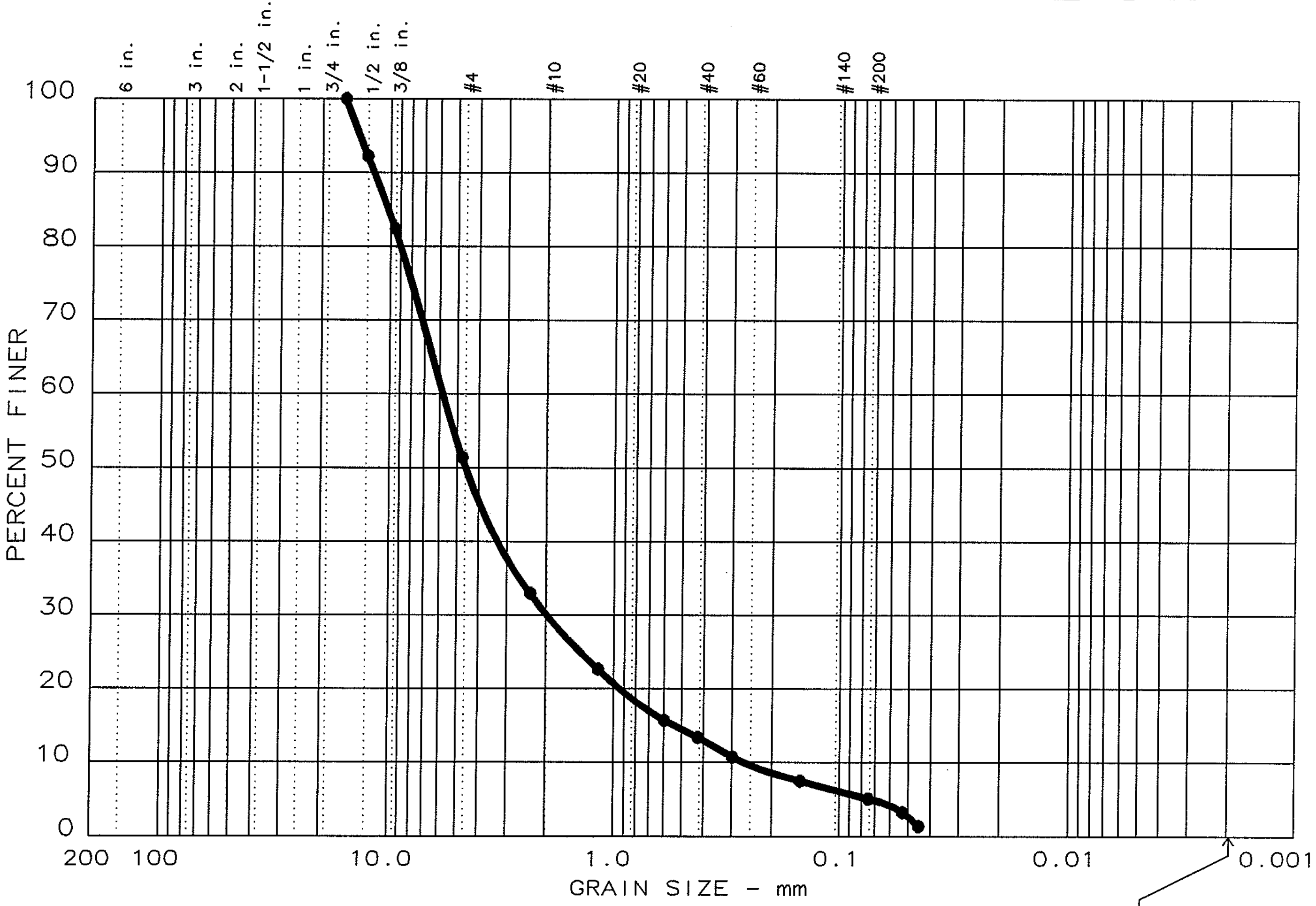
Remarks:

Prepared for:

Gartner Lee Ltd.

Figure No. 4

GRAIN SIZE DISTRIBUTION TEST REPORT



	Test	% +3"	% GRAVEL	% SAND	% SILT	% CLAY
●	17	0.0	48.6	46.3	5.1	

	LL	PI	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
●			10.22	5.79	4.58	1.975	0.5315	0.2664	2.53	21.8

MATERIAL DESCRIPTION	USCS	AASHTO
● GRAVEL and SAND, trace silt		

Project No.: 03-006
Project: 23-348
● Location: GLL6, 66'

Date: 03-12-01

GRAIN SIZE DISTRIBUTION TEST REPORT
alston associates inc.

Remarks:

Prepared for:

Gartner Lee Ltd.

Figure No. 5

BOREHOLE LOG

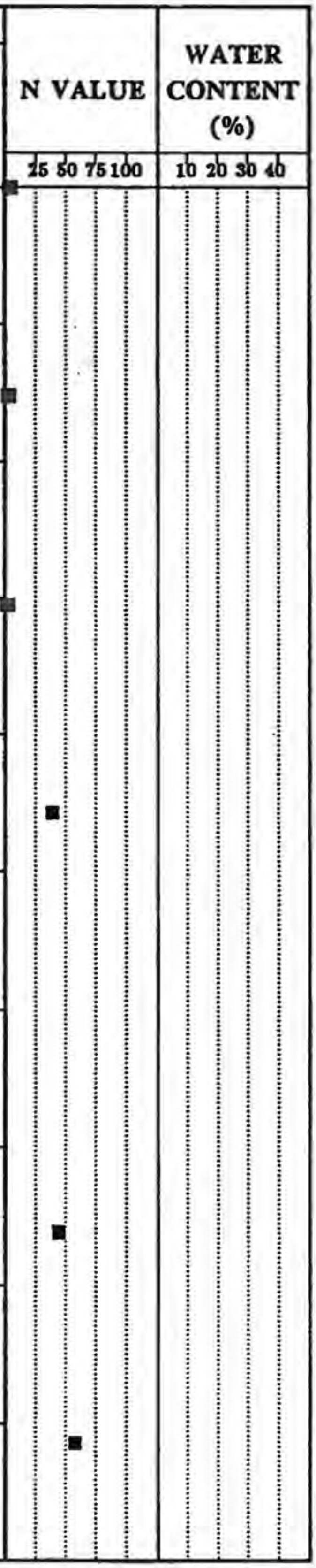
PROJECT: 88267

BOREHOLE: 8801

Caledon S & G Geological/Hydrogeological Study
Caledon, Ontario
FOR: James Dick Construction Ltd.

DATE: 27 September 1988
GEOLOGIST BMH
ELEVATION 415.8 m ASL

DEPTH (m)	STRATIGRAPHIC DESCRIPTION	NUMBER	TYPE	N VALUE	% WATER	% REC	% RQD
	TOPSOIL	1	SS	5			
1.0	**SAND** Dark brown silty gravelly coarse sand, with organic/roots, heavily oxidized, occasional pebble, moist.	2	SS	4			
	-becomes medium sand, with fine to coarse sand, stratified.						
		3	SS	3			
4.2	**SANDY GRAVEL** Brown gravelly coarse sand to sandy gravel, poorly sorted,uniform, occasional cobble from +/-11.0m., moist.	4	SS	39			
	-with coarse sand seam from +/-6.0 to 6.5 m.	5	SS	42 0.28m			
		6	SS	44			
		7	SS	58			
	-becomes wet at +/-9.6m.						



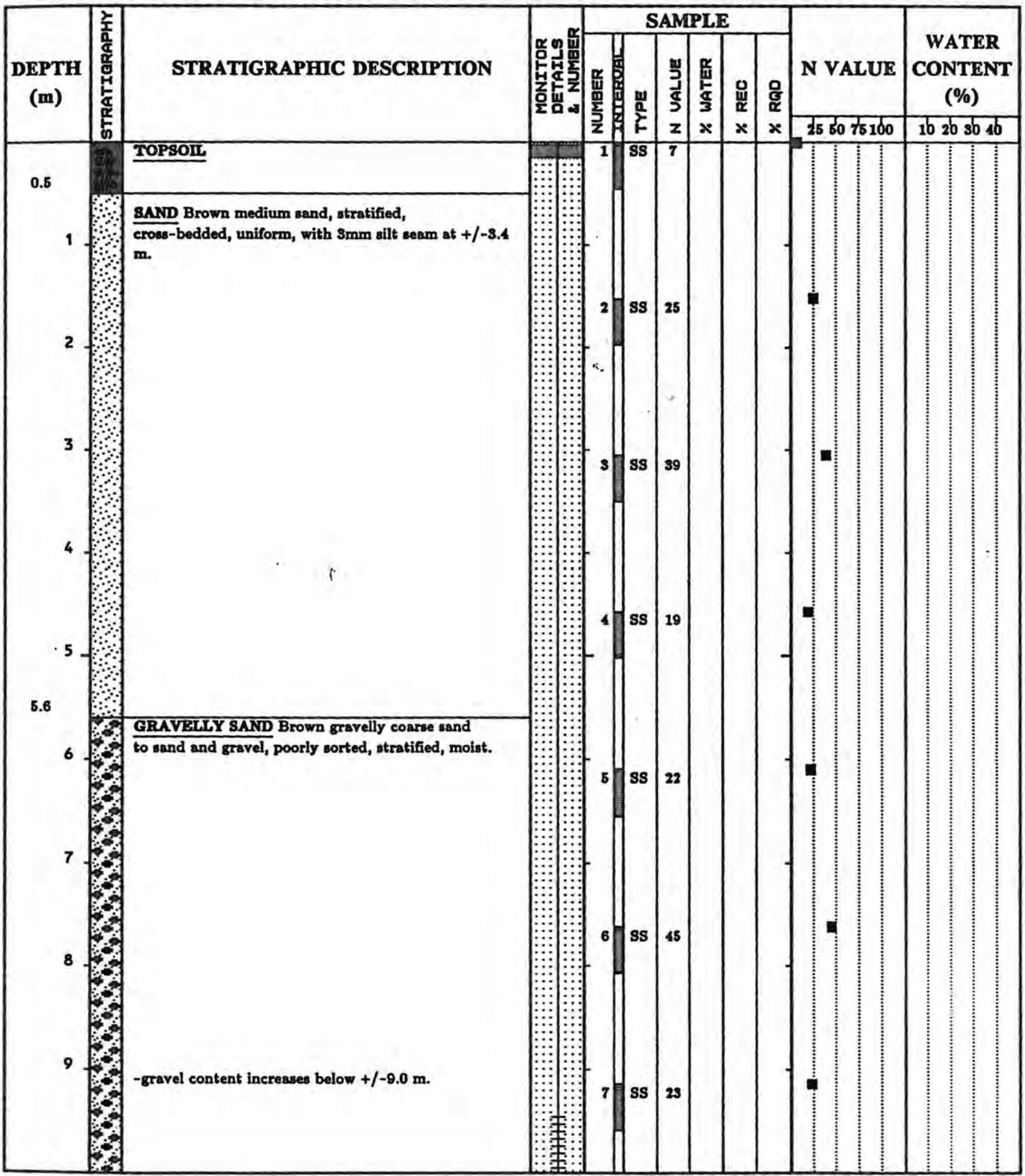
Gartner Lee Limited

BOREHOLE LOG	**PROJECT:** 88267	**BOREHOLE:** 8801
Caledon S & G Geological/Hydrogeological Study Caledon, Ontario **FOR:** James Dick Construction Ltd.		**DATE:** 27 September 1988 **GEOLOGIST** BMH **ELEVATION** 415.8 m ASL

DEPTH (m)	STRATIGRAPHY	STRATIGRAPHIC DESCRIPTION	MONITOR DETAILS & NUMBER	SAMPLE							N VALUE	WATER CONTENT (%)
				NUMBER	INTERVAL	TYPE	N VALUE	% WATER	% REC	% RQD	25 50 75 100	10 20 30 40
11				8	▨	SS	79/0					
11.4												
		Borehole terminated at +/- 11.35m. on boulder.										

Gartner Lee Limited

BOREHOLE LOG	PROJECT: 88267	BOREHOLE: 8802
Caledon S & G Geological/Hydrogeological Study Caledon, Ontario FOR: James Dick Construction Ltd.		DATE: 27 September 1988 GEOLOGIST BMH ELEVATION 418.9 m ASL



DEPTH (m)	STRATIGRAPHIC DESCRIPTION
0.5	**TOPSOIL**
5.6	**SAND** Brown medium sand, stratified, cross-bedded, uniform, with 3mm silt seam at +/-3.4 m.
	GRAVELLY SAND Brown gravelly coarse sand to sand and gravel, poorly sorted, stratified, moist. -gravel content increases below +/-9.0 m.

NUMBER	TYPE	N VALUE
1	SS	7
2	SS	25
3	SS	39
4	SS	19
5	SS	22
6	SS	45
7	SS	23

Gartner Lee Limited

BOREHOLE LOGS

COPIES DIRECTLY FROM INGHAM 1983

BOREHOLE No. 102

INTERVAL METRES	DESCRIPTION
0 - 0.9	OVERBURDEN: This organic layer underlain by brownish fine sand.
0.9 - 1.8	SAND: Light yellowish brown, fine, trace of silt.
1.8 - 2.1	SILT: Yellowish brown, clay-silt in part, minor seams of inne sand. (SS 102-1, 1.8-2.1 m.)
2.1 - 4.0	GRAVEL: Light brownish grey, generally medium with occational coarse layers. Well graded sand. Trace of silt 2.4-3.0 m. (SS 102-2, 2.4-2.7 m.) (SS 102-3, 3.0-3.3 m.)
4.0 - 7.6	GRAVEL: Light brownish grey, fine with minor medium gravel. Well graded to coarse sand. Thin seams of medium sand 5.5-6.4 m. (SS 102-4, 4.6-4.9 m.) (SS 102-5, 6.1-6.4 m.) (SS 102-6, 7.6-7.9 m.)
7.6 - 8.5	SAND: Brownish grey, fine to medium.
8.5 - 11.9	SAND: Brownish grey, well graded to coarse. Thin seams of fine gravel throughout. Fine to grey to light brownish grey sand 10.7-11.0 m. (SS 102-7, 9.1-9.4 m.) Damp. (SS 102-8, 10.7-11.0 m.) Saturated.

102 - CONTINUED

11.9 - 13.4	GRAVEL: Brownish grey, medium to coarse. Very coarse gravel or boulders at 13.4 m. Generally medium sand. Minor grey silt seams. (SS 102-9, 12.2-12.5 m.)
13.4 - 18.0	SAND: Grey to light brownish grey, generally medium with some coarse and fine layers. Thin interbedded layers of fine gravel. Occasional cobbles. Minor grey silt. (SS 102-10, 13.7-14.0 m.) (SS 102-11, 15.2-15.5 m.)
18.0 - 19.5	GRAVEL: Grey interbedded medium to fine gravel and medium to fine sand. Occasional boulders. Some grey silt. Trace of grey clay 18.9-19.5 m. (SS 102-12. 18.3-18.5 m.) (SS 102-13, 19.2-19.5 m.)
19.5 - 20.4	SILT: Grey, clay-silt. Approximately 50% sand and fine gravel. Minor coarse gravel and boulders. 10% grey clay. 19.8-20.4 m. Hole terminated at 20.4 m.

Note: Piezometer installed; initial water level 10.21 m.

Ontario Ministry of the Environment

Measurements recorded in: ☐ Metric ☐ Imperial

Well Tag No. *(Place Sticker and/or Print Below)*

Tag #: A169399

Well Record

Regulation 903 Ontario Water Resources Act

Page ____ of ____

[redacted]

Address of Well Location (Street Number/Name)	Township CALEDON	Lot 12	Concession 3 EHS
County/District/Municipality PEEL	City/Town/Village	Province **Ontario**	Postal Code
UTM Coordinates Zone 17 Easting 584111 Northing 4857676 NAD 83	Municipal Plan and Sublot Number	Other	

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

General Colour	Most Common Material	Other Materials	General Description	Depth (m/ft) From	To
BLACK	TOPSOIL	—	SOFT	0	1
BROWN	CLAY	SAND	HARD	1	4
BROWN	CLAY	—	HARD	4	15
BROWN	GRAVEL	STONES	COARSE	15	27
GREY	CLAY	—	HARD	27	38
GREY	GRAVEL	—	LOOSE, COARSE	38	56

Annular Space

Depth Set at (m/ft) From	To	Type of Sealant Used (Material and Type)	Volume Placed (m³/ft³)
0	20	HOLE PLUG.	4

Method of Construction

☐ Cable Tool ☑ Rotary (Conventional) ☐ Rotary (Reverse) ☐ Boring ☐ Air percussion ☐ Other, *specify*

☐ Diamond ☐ Jetting ☐ Driving ☐ Digging

Well Use

☐ Public ☑ Domestic ☐ Livestock ☐ Irrigation ☐ Industrial ☐ Other, *specify*

☐ Commercial ☐ Municipal ☐ Test Hole ☐ Cooling & Air Conditioning

☐ Not used ☐ Dewatering ☐ Monitoring

Construction Record - Casing

Inside Diameter (cm/in)	Open Hole OR Material (Galvanized, Fibreglass, Concrete, Plastic, Steel)	Wall Thickness (cm/in)	Depth (m/ft) From	To
6'4	STEEL	188	+2	29
5'2	STEEL	188	25	48

Construction Record - Screen

Outside Diameter (cm/in)	Material (Plastic, Galvanized, Steel)	Slot No.	Depth (m/ft) From	To
5'2	STAINLESS	16 4/18	48	56

Status of Well

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

Water Details

Water found at Depth 56 (m/ft) ☐ Gas Kind of Water: ☑ Fresh ☐ Untested ☐ Other, *specify*

Water found at Depth (m/ft) ☐ Gas Kind of Water: ☐ Fresh ☐ Untested ☐ Other, *specify*

Water found at Depth (m/ft) ☐ Gas Kind of Water: ☐ Fresh ☐ Untested ☐ Other, *specify*

Hole Diameter

Depth (m/ft) From	To	Diameter (cm/in)
0	30	8 3/4
30	56	6'18

Well Contractor and Well Technician Information

Business Name of Well Contractor: R&B WELL DRILLING LTD

Well Contractor's Licence No. 4645

Business Address (Street Number/Name): 3569 SIDEROAD 10, BEETON

Municipality: NEW TECUMSETH

Province: ON

Postal Code: L0G 1A0

Business E-mail Address: RBWELLDRILLING.COM

Bus. Telephone No. *(inc. area code)*: 9057292950

Name of Well Technician (Last Name, First Name): KOWALSKI, ROBERT

Well Technician's Licence No.: 2425

Signature of Technician and/or Contractor:

Date Submitted: 20140929

Results of Well Yield Testing

After test of well yield, water was:
☑ Clear and sand free
☐ Other, *specify*

If pumping discontinued, give reason:

Pump intake set at *(m/ft)*: 50 FT.

Pumping rate *(l/min / GPM)*: 8 GPM

Duration of pumping: 1 hrs + ____ min

Final water level end of pumping *(m/ft)*: 37 FT

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

Recommended pump depth *(m/ft)*: 50 FT

Recommended pump rate *(l/min / GPM)*: 6 GPM

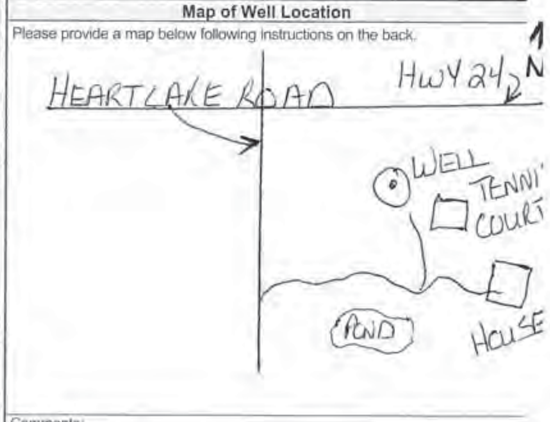
Well production *(l/min / GPM)*: 10 GPM

Disinfected? ☑ Yes ☐ No

Draw Down Time (min)	Water Level (m/ft)	Recovery Time (min)	Water Level (m/ft)
Static Level	24		
1	26	1	33
2	28	2	30
3	31	3	26
4	34	4	24
5	37	5	24
10	37	10	24
15	37	15	24
20	37	20	24
25	37	25	24
30	37	30	24
40	37	40	24
50	37	50	24
60	37	60	24

Map of Well Location

Please provide a map below following instructions on the back.



Comments:

Well owner's information package delivered ☑ Yes ☐ No

Date Package Delivered: 20140929

Date Work Completed: 20140925

Ministry Use Only

Audit No. Z183967

0506E (2007/12)

Ministry's Copy

Ministry of the Environment
Ontario

The Ontario Water Resources Act

WATER WELL RECORD

1. PRINT ONLY IN SPACES PROVIDED
2. CHECK ☒ CORRECT BOX WHERE APPLICABLE

11 4907510 MUNICIP 49002 CON. HS E TW 02

COUNTY OR DISTRICT	TOWNSHIP, BOROUGH, CITY, TOWN, VILLAGE	CON., BLOCK, TRACT, SURVEY, ETC.	LOT
Region of Peel	Town of Caledon(Caledon)	~~1st line east~~ con II EHS	LOT 10

OWNER (SURNAME FIRST)	ADDRESS	DATE COMPLETED
Region of Peel	10 Peel Centre Drime,Brampton,Ont.	DAY 13 MO Feb YR 91

21 ZONE EASTING NORTHING RC ELEVATION RC BASIN CODE

LOG OF OVERBURDEN AND BEDROCK MATERIALS (SEE INSTRUCTIONS)

GENERAL COLOUR	MOST COMMON MATERIAL	OTHER MATERIALS	GENERAL DESCRIPTION	DEPTH - FEET FROM	DEPTH - FEET TO
Brown	sand(coarse)	gravel streaks	layered	0	120
Brown	clay	stones	hard	120	135
Reddish	clay	sand, stones	layered	135	140
Reddish	shale		dense	140	152

31

32

41 WATER RECORD

WATER FOUND AT - FEET	KIND OF WATER
116	1 ☒ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERALS 6 ☐ GAS
	1 ☐ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERALS 6 ☐ GAS
	1 ☐ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERALS 6 ☐ GAS
	1 ☐ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERALS 6 ☐ GAS
	1 ☐ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERALS 6 ☐ GAS

51 CASING & OPEN HOLE RECORD

INSIDE DIAM INCHES	MATERIAL	WALL THICKNESS INCHES	DEPTH - FEET FROM	DEPTH - FEET TO
6	1 ☒ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☐ OPEN HOLE 5 ☐ PLASTIC	.188	+2	[redacted] 104
6	1 ☐ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☒ OPEN HOLE 5 ☐ PLASTIC		105	152
	1 ☐ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☐ OPEN HOLE 5 ☐ PLASTIC			

SCREEN

SIZE(S) OF OPENING (SLOT NO.)	DIAMETER	LENGTH
20	5 3/4 INCHES	12 FEET

MATERIAL AND TYPE	DEPTH TO TOP OF SCREEN
Sta. St. wire wd	104 FEET

61 PLUGGING & SEALING RECORD

DEPTH SET AT - FEET FROM	TO	MATERIAL AND TYPE (CEMENT GROUT, LEAD PACKER, ETC.)
152	116	peastone
116	60	Heavy bentonite&d.c.
60	0	Cement greut.

71 PUMPING TEST

PUMPING TEST METHOD	PUMPING RATE	DURATION OF PUMPING
1 ☒ PUMP 2 ☐ BAILER	[redacted] 300 GPM	24 HOURS MINS.

WATER LEVELS DURING: 1 ☒ PUMPING 2 ☐ RECOVERY

STATIC LEVEL	WATER LEVEL END OF PUMPING	15 MINUTES	30 MINUTES	45 MINUTES	60 MINUTES
57.45 FEET	68.00 FEET	69.70 FEET	72.65 FEET	73.20 FEET	73.10 FEET

IF FLOWING, GIVE RATE	PUMP INTAKE SET AT	WATER AT END OF TEST
GPM	100 FEET	1 ☒ CLEAR 2 ☐ CLOUDY

RECOMMENDED PUMP TYPE	RECOMMENDED PUMP SETTING	RECOMMENDED PUMPING RATE
☐ SHALLOW ☒ DEEP	100 FEET	200 GPM

FINAL STATUS OF WELL

- 1 ☐ WATER SUPPLY
- 2 ☐ OBSERVATION WELL
- 3 ☒ TEST HOLE
- 4 ☐ RECHARGE WELL
- 5 ☐ ABANDONED, INSUFFICIENT SUPPLY
- 6 ☐ ABANDONED, POOR QUALITY
- 7 ☐ UNFINISHED
- ☐ DEWATERING

WATER USE

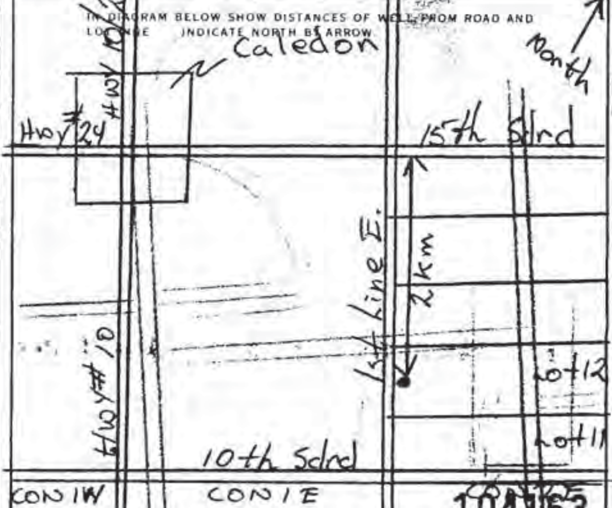
- 1 ☐ DOMESTIC
- 2 ☐ STOCK
- 3 ☐ IRRIGATION
- 4 ☐ INDUSTRIAL
- ☐ OTHER
- 5 ☐ COMMERCIAL
- 6 ☒ MUNICIPAL
- 7 ☐ PUBLIC SUPPLY
- 8 ☐ COOLING OR AIR CONDITIONING
- 9 ☐ NOT USED

METHOD OF CONSTRUCTION

- 1 ☐ CABLE TOOL
- 2 ☒ ROTARY (CONVENTIONAL)
- 3 ☐ ROTARY (REVERSE)
- 4 ☐ ROTARY (AIR)
- 5 ☐ AIR PERCUSSION
- 6 ☐ BORING
- 7 ☐ DIAMOND
- 8 ☐ JETTING
- 9 ☐ DRIVING
- ☐ DIGGING
- ☐ OTHER

LOCATION OF WELL

IN DIAGRAM BELOW SHOW DISTANCES OF WELL FROM ROAD AND LOT LINE. INDICATE NORTH BY ARROW.



104163

DRILLERS REMARKS

CONTRACTOR

NAME OF WELL CONTRACTOR	WELL CONTRACTOR'S LICENCE NUMBER
Northern Well Drilling Limited	3903

ADDRESS: P.O. Box 358 Unionville,Ont.

NAME OF WELL TECHNICIAN	WELL TECHNICIAN'S LICENCE NUMBER
G. Bridges	T-0002

SIGNATURE OF TECHNICIAN/CONTRACTOR	SUBMISSION DATE
Jerry W. R	DAY 31 MO mar YR 91

OFFICE USE ONLY

DATA SOURCE	CONTRACTOR	DATE RECEIVED
	3903	APR 02 1991

DATE OF INSPECTION

INSPECTOR

REMARKS

MOECC UTM
NAD83 — Zone 17
Easting: 582975.40
Northing: 4856553.00

MINISTRY OF THE ENVIRONMENT COPY

FORM NO. 0506 (11/86) FORM 9

30M/13W

MINISTRY OF THE ENVIRONMENT
The Ontario Water Resources Act

WATER WELL RECORD

Ontario

1. PRINT ONLY IN SPACES PROVIDED
2. CHECK ☒ CORRECT BOX WHERE APPLICABLE

11 | 14904367 | MUNICIP 49002 | CON. H.S. E C 03

COUNTY OR DISTRICT: PEEL
TOWNSHIP, BOROUGH, CITY, TOWN, VILLAGE: CALEDON
CON., BLOCK, TRACT, SURVEY, ETC.: ~~11 E~~ H.S.
LOT: 012

[redacted] R.R. 2 INGLEWOOD Ont.

DATE COMPLETED: DAY 07 MO. 06 ~~[illegible]~~ YR. 74

				RC	ELEVATION	RC	BASIN CODE		
[redacted]			4857509	4	1380	5	24	OCT 17, 1975	80

LOG OF OVERBURDEN AND BEDROCK MATERIALS (SEE INSTRUCTIONS)

GENERAL COLOUR	MOST COMMON MATERIAL	OTHER MATERIALS	GENERAL DESCRIPTION	DEPTH - FEET FROM	TO
BROWN	SAND	-GRAVELY		0	26
				26	65
~~BROWN~~ BROWN	-GRAVEL ~~CLAY~~	~~ROCKS~~ SAND ~~GRAVEL~~ ROCKS		65	67
BROWN	-Clay-	layers of gravel		67	81

31 0026628 1 1 | 0065605 2 1 | 0067 1 28 2 | 0081605 1 | ~~[illegible]~~

32 ~~[illegible]~~ ~~Caledon~~ [illegible]

41 WATER RECORD

WATER FOUND AT - FEET	KIND OF WATER
0065 ~~[illegible]~~	1 ☐ FRESH 3 ☐ SULPHUR 2 ☐ SALTY 4 ☐ MINERAL
15-18	1 ☐ FRESH 3 ☐ SULPHUR 2 ☐ SALTY 4 ☐ MINERAL
20-23	1 ☐ FRESH 3 ☐ SULPHUR 2 ☐ SALTY 4 ☐ MINERAL
25-28	1 ☐ FRESH 3 ☐ SULPHUR 2 ☐ SALTY 4 ☐ MINERAL
30-33	1 ☐ FRESH 3 ☐ SULPHUR 2 ☐ SALTY 4 ☐ MINERAL

51 CASING & OPEN HOLE RECORD

INSIDE DIAM. INCHES	MATERIAL	WALL THICKNESS INCHES	DEPTH - FEET FROM	TO
05"	1 ☑ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☐ OPEN HOLE	.188	0	0081
17-18	1 ☐ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☐ OPEN HOLE			20-23
24-25	1 ☐ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☐ OPEN HOLE			27-30

SCREEN
SIZE(S) OF OPENING (SLOT NO.) 31-33 | DIAMETER 34-38 INCHES | LENGTH 39-40 FEET
MATERIAL AND TYPE | DEPTH TO TOP OF SCREEN 41-44 FEET

61 PLUGGING & SEALING RECORD

DEPTH SET AT - FEET FROM	TO	MATERIAL AND TYPE (CEMENT GROUT, LEAD PACKER, ETC.)
10-13	14-17	
18-21	22-25	
26-29	30-33	

71 PUMPING TEST

PUMPING TEST METHOD: 1 ☐ PUMP 2 ☑ BAILER
PUMPING RATE: 0005 GPM
DURATION OF PUMPING: 01 HOURS 00 MINS

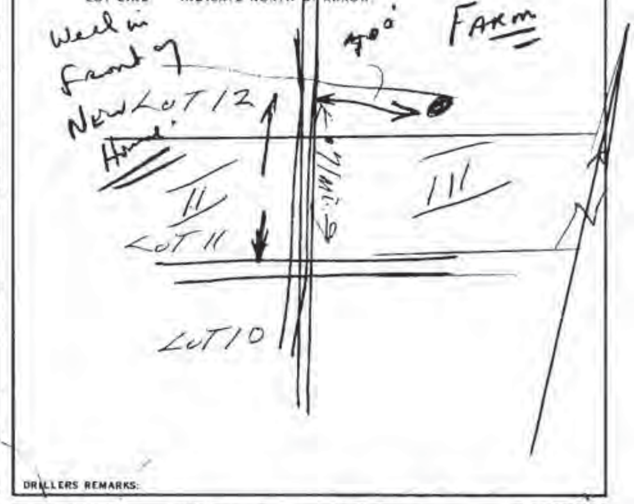
STATIC LEVEL	WATER LEVEL END OF PUMPING	WATER LEVELS DURING 15 MINUTES	30 MINUTES	45 MINUTES	60 MINUTES
019 FEET	061 FEET	061 FEET	061 FEET	061 FEET	061 FEET

1 ☑ PUMPING 2 ☐ RECOVERY

IF FLOWING GIVE RATE: GPM
PUMP INTAKE SET AT: FEET
WATER AT END OF TEST: 1 ☐ CLEAR 2 ☑ CLOUDY
RECOMMENDED PUMP TYPE: ☐ SHALLOW ☑ DEEP
RECOMMENDED PUMP SETTING: 070 FEET
RECOMMENDED PUMPING RATE: 0004 GPM
0004 GPM./FT. SPECIFIC CAPACITY

LOCATION OF WELL

IN DIAGRAM BELOW SHOW DISTANCES OF WELL FROM ROAD AND LOT LINE. INDICATE NORTH BY ARROW.



DRILLERS REMARKS:

FINAL STATUS OF WELL
1 ☑ WATER SUPPLY
2 ☐ OBSERVATION WELL
3 ☐ TEST HOLE
4 ☐ RECHARGE WELL
5 ☐ ABANDONED, INSUFFICIENT SUPPLY
6 ☐ ABANDONED, POOR QUALITY
7 ☐ UNFINISHED

WATER USE 12
1 ☑ DOMESTIC
2 ☑ STOCK
3 ☐ IRRIGATION
4 ☐ INDUSTRIAL
☐ OTHER
5 ☐ COMMERCIAL
6 ☐ MUNICIPAL
7 ☐ PUBLIC SUPPLY
8 ☐ COOLING OR AIR CONDITIONING
9 ☐ NOT USED

METHOD OF DRILLING
1 ☑ CABLE TOOL
2 ☐ ROTARY (CONVENTIONAL)
3 ☐ ROTARY (REVERSE)
4 ☐ ROTARY (AIR)
5 ☐ AIR PERCUSSION
6 ☐ BORING
7 ☐ DIAMOND
8 ☐ JETTING
9 ☐ DRIVING

CONTRACTOR
NAME OF WELL CONTRACTOR: LADCO DRILLING | LICENCE NUMBER: 3316
ADDRESS: Hillsburg R.R. #1
NAME OF DRILLER OR BORER: THOMAS LANG | LICENCE NUMBER: 3316
SIGNATURE OF CONTRACTOR: J. Lang
SUBMISSION DATE: DAY 7 MO. JUNE 74

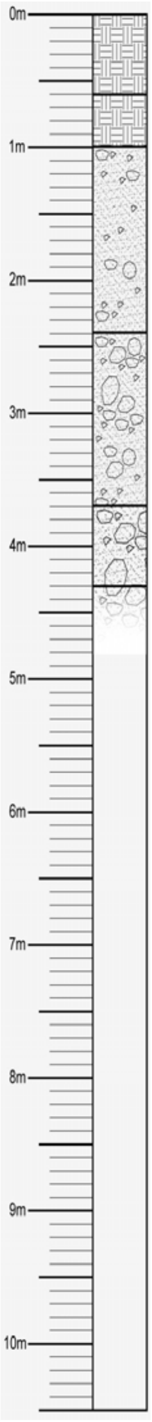
OFFICE USE ONLY
DATA SOURCE: 1 | CONTRACTOR: 3316 | DATE RECEIVED: 150774
DATE OF INSPECTION: JAN 23/75 | INSPECTOR
REMARKS
P/O.B.
WI

MOECC UTM
NAD83 — Zone 17
Easting: 583893.40
Northing: 4857732.00

MINISTRY OF THE ENVIRONMENT COPY

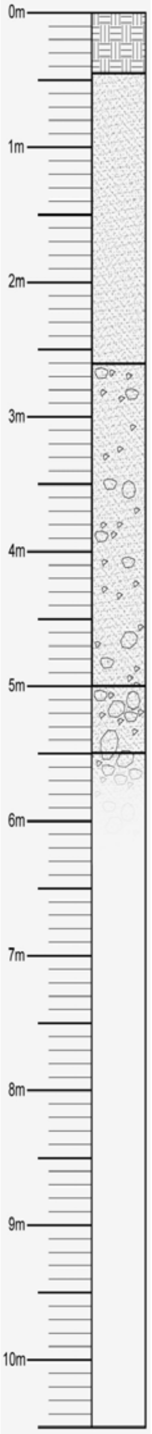
FORM 7 07-091

Caledon Pit (McCormick Property)	**Test Pit Log 1**
HM Project Number: 02-48	Date: November 6, 2002
Location: Pt. Lot 12, Conc. 2 EHS, Town of Caledon	Supervisor: S.M.
Method: John Deere 200LC Excavator	Elevation TOC:
Samples:	GS: +/- 418 m asl

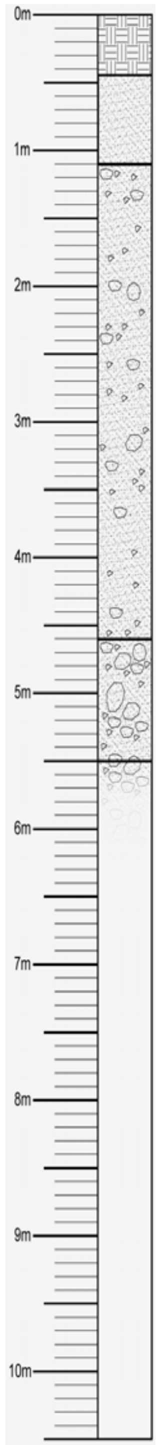
Depth (m)	**Sample:**	**Description:**	**Remarks:**
		0 - 0.6 m Topsoil (dark brown)	Location – 23 m south of laneway and 37 m from east fenceline on knoll
		0.6 – 1.0 m Overburden	
		1.0 – 2.4 m Clean, coarse sand and gravel with 2 to 3 inch (5.0 – 7.5 cm) pebbles	40% stone;
		2.4 – 3.7 m Clean, medium to coarse sand with 3 to 4 inch (7.5 -10 cm) cobbles	approximately 40 - 50% stone
		3.7 – 4.3 m Medium sand and clean, coarse sand and gravel with 3 to 5 inch (7.5 – 12.5 cm) cobbles, horizontally bedded; cobbles up to 9 inches (22.5 cm)	approximately 50% stone; some flat, elongated cobbles noted; very clean material all the way to the bottom of the test pit; bulk sample taken
		Dry at bottom of test pit	

Caledon Pit (McCormick Property) Test Pit Log 2

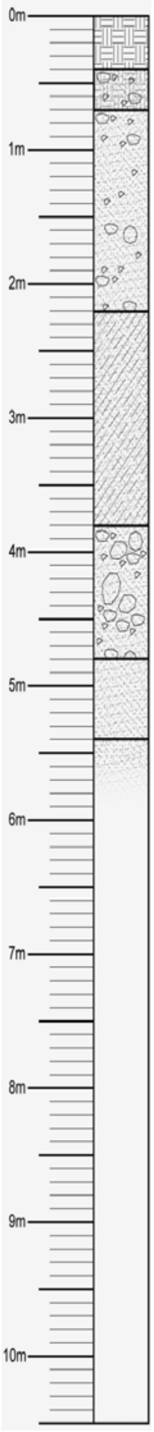
HM Project Number: 02-48	Date: November 6, 2002
Location: Pt. Lot 12, Conc. 2 EHS, Town of Caledon	Supervisor: S.M.
Method: John Deere 200LC Excavator	Elevation TOC:
Samples:	GS: +/- 416 m asl

Depth (m)	**Sample:**	**Description:**	**Remarks:**
		0 - 0.45 m Topsoil (dark brown)	Location – south of laneway and 37 m from east fenceline within a hollow south of TP#1
		0.45 – 2.6 m Silty, very fine sand (tan to yellowish-brown)	
		2.6 – 5.0 m Clean, coarse sand and gravel with 2 to 3 inch (5.0 – 7.5 cm) pebbles	approximately 40% stone;
		5.0 – 5.5 m Becoming stonier with larger pebbles and cobbles mixed with clean coarse sand and some medium sand	approximately 40% stone; ave. size of stone 3 – 5 inches (7.5 – 12.5 cm); very clean material; bulk sample taken
		Dry at bottom of test pit	

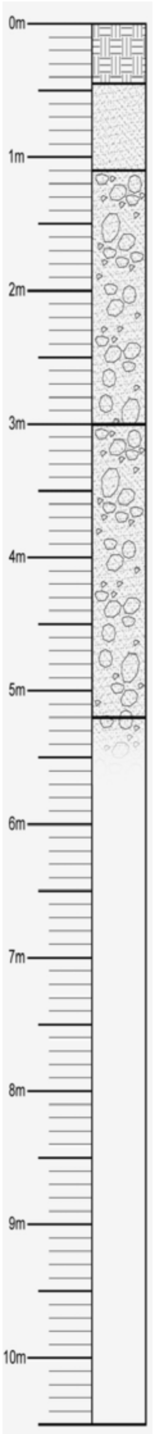
Caledon Pit (McCormick Property)	**Test Pit Log 3**
HM Project Number: 02-48	Date: November 6, 2002
Location: Pt. Lot 12, Conc. 2 EHS, Town of Caledon	Supervisor: S.M.
Method: John Deere 200LC Excavator	Elevation TOC:
Samples:	GS: +/- 415 m asl

Depth (m)	Sample:	Description:	Remarks:
		0 - 0.45 m Topsoil (dark brown)	Location – south of laneway, west of TP#1 and east of cedar rail fence in low depression in hay field
		0.45 – 1.1 m Tan to yellowish-brown overburden;	Subsoil very dry and dusty
		1.1 – 4.6 m Clean, coarse sand and gravel with 2 to 3 inch (5.0 – 7.5 cm) pebbles and 4 inch (10 cm) cobbles	approximately 40% stone;
		4.6 – 5.5 m Clean, medium and coarse sand and gravel with 3 to 4 inch (7.5 – 10 cm) cobbles; some 5 inch (12.5 cm) cobbles	approximately 40 - 45% stone; appears to be more bony as depth increases; good clean material;
		Dry at bottom of test pit	

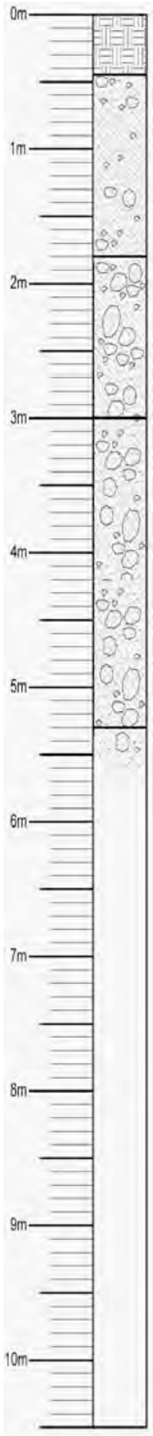
## Caledon Pit (McCormick Property)	## Test Pit Log 4
HM Project Number: 02-48	Date: November 6, 2002
Location: Pt. Lot 12, Conc. 2 EHS, Town of Caledon	Supervisor: S.M.
Method: John Deere 200LC Excavator	Elevation TOC:
Samples:	GS: +/- 419 m asl

Depth (m)	**Sample:**	**Description:**	**Remarks:**
		0 - 0.4 m Topsoil (dark brown) 0.4 – 0.7 m Stony subsoil (yellowish brown) 0.7 – 2.2 m Coarse gravel in a clean medium to coarse sand (brown) matrix with 1 to 3 inch (2.5 – 7.5 cm) stone 2.2 – 3.8 m Fine to medium sand with some silt lenses (moist) 3.8 – 4.8 m Pebbly to cobbly gravel (3-5 inch) in sand matrix 4.8 – 5.4 m Clean, medium sand Dry at bottom of test pit	Location – 72 m west of shed and 16.5 m north of the fence near the interface between moraine and outwash deposit 30 - 40% stone; stone rounded to sub-rounded; carbonates (dolostone & limestone) with some crystallines > 40% stone Masonary sand

Caledon Pit (McCormick Property)	**Test Pit Log 5**
HM Project Number: 02-48	Date: November 7, 2002
Location: Pt. Lot 12, Conc. 2 EHS, Town of Caledon	Supervisor: S.M.
Method: John Deere 200LC Excavator	Elevation TOC:
Samples:	GS: +/- 414 m asl

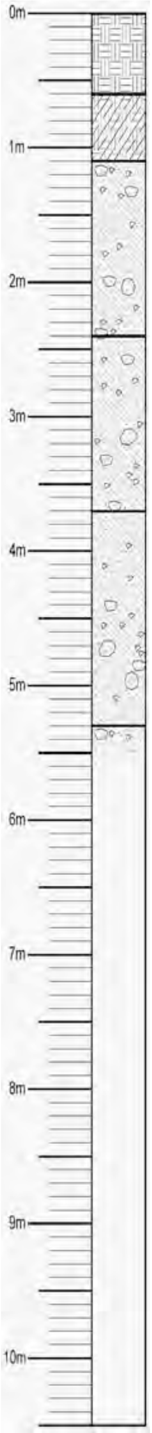
Depth (m)	**Sample:**	**Description:**	**Remarks:**
		0 - 0.45 m Topsoil (dark brown)	Location – 23 m south of north property line and 39 m from fence line in the low area in the north hay filed
		0.45 – 1.1 m Clean, medium sand	
		1.1 – 3.0 m Clean, coarse sand and gravel with 2 to 3 inch (5.0 – 7.5 cm) pebbles	60% stone;
		3.0 – 5.2 m Clean, medium to coarse sand and gravel with 3 to 5 inch (7.5 – 12.5 cm) cobbles	approximately 60 - 70% stone; very clean material
		Dry at bottom of test pit	

Caledon Pit (McCormick Property)	**Test Pit Log 6**
HM Project Number: 02-48	Date: November 7, 2002
Location: Pt. Lot 12, Conc. 2 EHS, Town of Caledon	Supervisor: S.M.
Method: John Deere 200LC Excavator	Elevation TOC:
Samples:	GS: +/- 415 m asl

Depth (m)	**Sample:**	**Description:**	**Remarks:**
		0 - 0.45 m Topsoil (dark brown)	Location – 39 m north of shed on a small knoll in the north hay field
		0.45 – 1.8 m Clean, medium sand with 2 to 3 inch (5.0 – 7.5 cm) pebbles	approximately 50% stone;
		1.8 – 3.0 m Clean, coarse sand and gravel with 3 to 5 inch (7.5 – 12.5 cm) cobbles; becoming stonier with depth	approximately 50 - 60% stone;
		3.0 – 5.3 m Clean, coarse sand and gravel with 3 to 5 inch (7.5 – 12.5 cm) cobbles	> 60% stone; outwash deposit, horizontally bedded; very good material
		Dry at bottom of test pit	

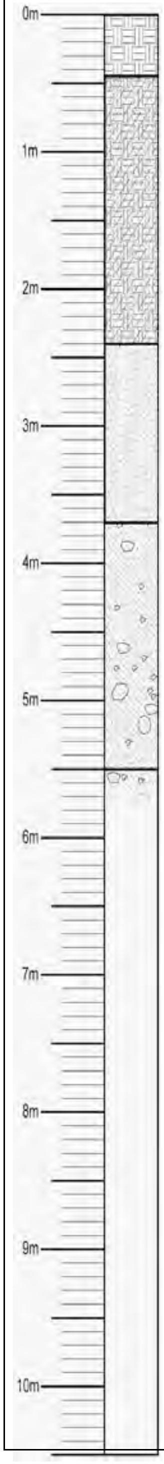
Caledon Pit (McCormick Property) Test Pit Log 7

HM Project Number: 02-48	Date: November 7, 2002
Location: Pt. Lot 12, Conc. 2 EHS, Town of Caledon	Supervisor: S.M.
Method: John Deere 200LC Excavator	Elevation TOC:
Samples:	GS: +/- 415 m asl

Depth (m)	**Sample:**	**Description:**	**Remarks:**
		0 - 0.6 m Topsoil (dark brown) 0.6 – 1.1 m Silty subsoil (light brown)	Location – 23 m south of north property line and 45 m from west fence in the west hay field at rear of site
		1.1 – 2.4 m Clean, medium to coarse sand and gravel with 2 to 3 inch (5.0 – 7.5 cm) pebbles	approximately 25% stone;
		2.4 – 3.7 m Clean, coarse gravelly sand with 2 to 3 inch (5.0 - 7.5 cm) pebbles	approximately 20% stone; very clean, good material; bulk sample taken
		3.7 – 5.3 m Clean, coarse sand with some gravel up to 3 inch (7.5 cm) pebbles/cobbles	
		Dry at bottom of test pit	

Caledon Pit (McCormick Property) Test Pit Log 8

HM Project Number: 02-48	Date: November 7, 2002
Location: Pt. Lot 12, Conc. 2 EHS, Town of Caledon	Supervisor: S.M.
Method: John Deere 200LC Excavator	Elevation TOC:
Samples:	GS: +/- 413 m asl

Depth (m)	Sample:	Description:	Remarks:
		0 - 0.45 m Topsoil (dark brown)	Location – in low depression at east end of the west hay field at rear of site
		0.45 – 2.4 m Silty sand subsoil and overburden (yellowish brown)	Very dry soil
		2.4 – 3.7 m Clean, fine sand	
		3.7 – 5.5 m Clean, medium sand and gravel with 2 to 3 inch (5.0 - 7.5 cm) pebbles and cobbles; some coarse sand and occasional boulder Dry at bottom of test pit	approximately 40% stone; increase in stone with depth; very clean, good material; bulk sample taken

Caledon Pit (McCormick Property)	**Test Pit Log 9**
HM Project Number: 02-48	Date: November 7, 2002
Location: Pt. Lot 12, Conc. 2 EHS, Town of Caledon	Supervisor: S.M.
Method: John Deere 200LC Excavator	Elevation TOC:
Samples:	GS: +/- 417 m asl

Depth (m)	**Sample:**	**Description:**	**Remarks:**
		0 - 0.6 m Topsoil (dark brown) 0.6 – 1.8 m clean medium sand with coarse gravel; 2 - 3 inch (5.0 -7.5 cm) pebbles 1.8 – 3.7 m Clean, coarse sand and gravel with 3 to 6 inch (7.5 - 15 cm) cobbles; becoming coarser with depth Dry at bottom of test pit	Location – channel cut on side of hill at the southeast corner of the west hay field approximately 40% stone; some silt noted approximately 40% stone; clean, good material;

Caledon Pit (McCormick Property)	**Test Pit Log 10**
HM Project Number: 02-48	Date: November 7, 2002
Location: Pt. Lot 12, Conc. 2 EHS, Town of Caledon	Supervisor: S.M.
Method: John Deere 200LC Excavator	Elevation TOC:
Samples:	GS: +/- 421 m asl

Depth (m)	**Sample:**	**Description:**	**Remarks:**
		0 - 0.6 m Topsoil (dark brown) with overburden	Location – on top of first hill/ridge in the moraine at the southeast corner of the west hay field
		0.6 – 1.8 m coarse sand and gravel with 3 to 4 inch (7.5 - 10 cm) cobbles	approximately 40% stone; fairly consistent
		1.8 – 4.3 m Sandy, silt - Wentworth till (tan to yellowish brown)	stop dig
		Dry at bottom of test pit	

Caledon Pit (McCormick Property) Test Pit Log 11

HM Project Number: 02-48	Date: November 7, 2002
Location: Pt. Lot 12, Conc. 2 EHS, Town of Caledon	Supervisor: S.M.
Method: John Deere 200LC Excavator	Elevation TOC:
Samples:	GS: +/- 426 m asl

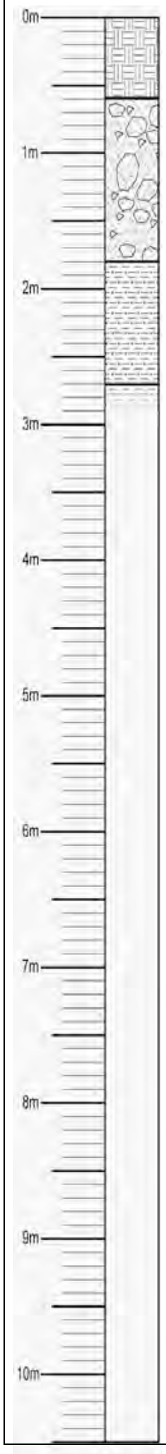
Depth (m)	**Sample:**	**Description:**	**Remarks:**
		0 - 1.0 m Topsoil (dark brown) and overburden	Location – on top of the next hill/ridge in the moraine, to the east of TP #10
		1.0 – 3.0 m Clean, medium sand with lenses of fine sand (laminated) and gravel with 1 to 3 inch (2.5 – 7.5 cm) stones	approximately 20% stone; bulk sample taken
		3.0 – 3.6+ m Clean, fine and medium sand with 5 inch (12.5 cm) cobbles and a few larger boulders	Becoming coarser with depth; dolostone and crystalline boulders; sides caving in; stop test pit
		Dry at bottom of test pit	

Caledon Pit (McCormick Property)	**Test Pit Log 12**
HM Project Number: 02-48	Date: November 7, 2002
Location: Pt. Lot 12, Conc. 2 EHS, Town of Caledon	Supervisor: S.M.
Method: John Deere 200LC Excavator	Elevation TOC:
Samples:	GS: +/- 425 m asl

Depth (m)	**Sample:**	**Description:**	**Remarks:**
		0 - 0.6 m Topsoil (dark brown) 0.6 – 1.8 m Wentworth Till (sandy –silt till) 1.8 – 5.2 m Clean, fine sand and some medium sand Dry at bottom of test pit	Location – adjacent to lane way on north side of property, on moraine to the northeast of TP #11

Caledon Pit (McCormick Property) Test Pit Log 13

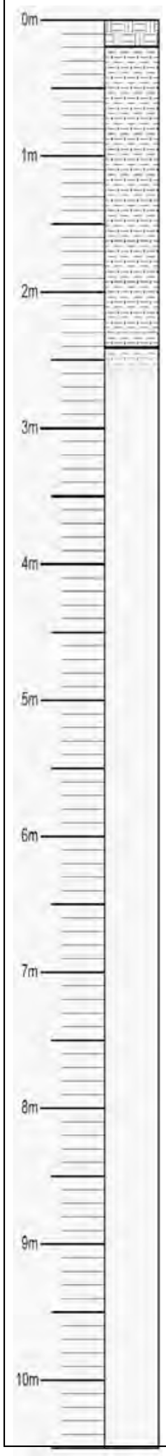
HM Project Number: 02-48	Date: November 7, 2002
Location: Pt. Lot 12, Conc. 2 EHS, Town of Caledon	Supervisor: S.M.
Method: John Deere 200LC Excavator	Elevation TOC:
Samples:	GS: +/- 426 m asl

Depth (m)	Sample:	Description:	Remarks:
		0 - 0.6 m Topsoil (dark brown) and overburden 0.6 – 1.8 m Medium to coarse sand and coarse to cobbly gravel with occasional boulders up to 0.6 m 1.8 – 2.7 m Wentworth till Dry at bottom of test pit	Location – on small gravelly ridge on moraine to the south of TP #12 Ice-contact deposit on side of hill sloping steeply to the east at greater than 45 degrees (away from ridge which is comprised of Wentworth till); > 40% stone

Caledon Pit (McCormick Property)	**Test Pit Log 14**
HM Project Number: 02-48	Date: November 7, 2002
Location: Pt. Lot 12, Conc. 2 EHS, Town of Caledon	Supervisor: S.M.
Method: John Deere 200LC Excavator	Elevation TOC:
Samples:	GS: +/- 431 m asl

Depth (m)	**Sample:**	**Description:**	**Remarks:**
		0 - 0.2 m Topsoil (dark brown)	Location – on next ridge on moraine to the south of TP #13
		0.2 – 1.0 m Till-like flows with fine sand layers	
		1.0 – 3.0 m Wentworth till	Tan – yellowish brown; compact and difficult to dig
		Dry at bottom of test pit	

Caledon Pit (McCormick Property)	**Test Pit Log 15**
HM Project Number: 02-48	Date: November 7, 2002
Location: Pt. Lot 12, Conc. 2 EHS, Town of Caledon	Supervisor: S.M.
Method: John Deere 200LC Excavator	Elevation TOC:
Samples:	GS: +/- 425 m asl

Depth (m)	**Sample:**	**Description:**	**Remarks:**
		0 - 0.2 m Topsoil (dark brown)	Location – on next ridge on moraine 65 m to the south of TP #14
		0.2 – 2.4 m Wentworth till	Tan – yellowish brown; compact and difficult to dig; stop test pit
		Dry at bottom of test pit	

Caledon Pit (McCormick Property) **Test Pit Log 16**

HM Project Number: 02-48	Date: November 7, 2002
Location: Pt. Lot 12, Conc. 2 EHS, Town of Caledon	Supervisor: S.M.
Method: John Deere 200LC Excavator	Elevation TOC:
Samples:	GS: +/- 425 m asl

Depth (m)	**Sample:**	**Description:**	**Remarks:**
		0 - 0.6 m Topsoil (dark brown) and subsoil	Location – on next ridge on moraine west of TP #15 going toward woodlot
		0.6 – 1.0 m Overburden	
		1.0 – 1.5 m Clean, fine sand	
		1.5 – 3.7 m Dirty (silty) sand with cobbles and occasional boulder > 12 inches (0.3 m)	Tan – yellowish brown, appears to be till-like (Wentworth till); stop test pit
		Dry at bottom of test pit	

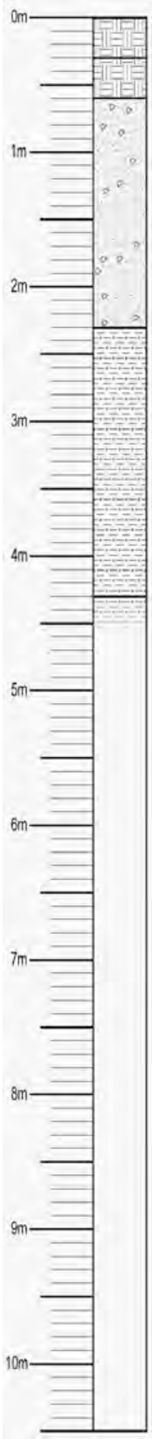
Caledon Pit (McCormick Property)	**Test Pit Log 17**
HM Project Number: 02-48	Date: November 7, 2002
Location: Pt. Lot 12, Conc. 2 EHS, Town of Caledon	Supervisor: S.M.
Method: John Deere 200LC Excavator	Elevation TOC:
Samples:	GS: +/- 422 m asl

Depth (m)	Sample:	Description:	Remarks:
		0 - 0.6 m Topsoil (dark brown) and overburden	Location – in gully north and east of TP #16
		0.6 – 1.8 m Clean, fine sand and gravel with small pebbles 1.5 to 2.5 inches (3.75 – 6.25 cm)	Approximately 25% stone; sloping downward on an angle
		1.8 – 2.4 m Some cleaner material noted on lower side of test pit	
		2.4 – 3.7 m Wentworth Till	
		Dry at bottom of test pit	stop test pit

Caledon Pit (McCormick Property)	**Test Pit Log 18**
HM Project Number: 02-48	Date: November 7, 2002
Location: Pt. Lot 12, Conc. 2 EHS, Town of Caledon	Supervisor: S.M.
Method: John Deere 200LC Excavator	Elevation TOC:
Samples:	GS: +/- 425 m asl

Depth (m)	**Sample:**	**Description:**	**Remarks:**
		0 - 0.6 m Topsoil (dark brown) and overburden 0.6 – 2.4 m Wentworth Till Dry at bottom of test pit	Location – On side of hill south of TP #17 discontinue test pit

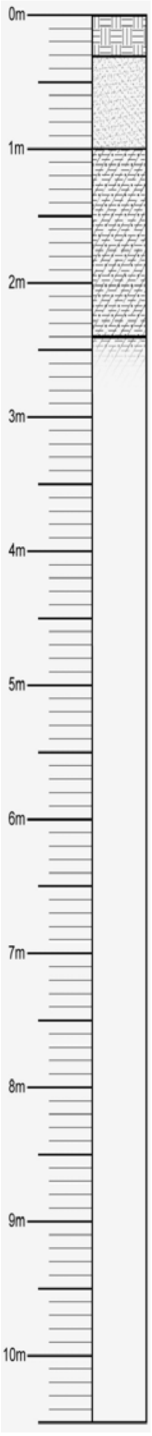
Caledon Pit (McCormick Property)	**Test Pit Log 19**
HM Project Number: 02-48	Date: November 7, 2002
Location: Pt. Lot 12, Conc. 2 EHS, Town of Caledon	Supervisor: S.M.
Method: John Deere 200LC Excavator	Elevation TOC:
Samples:	GS: +/- 415 m asl

Depth (m)	Sample:	Description:	Remarks:
		0- 0.3 m Topsoil (dark brown)	Location – On flat area to the northwest of large kettle depression
		0.3 - 0.6 m Overburden	
		0.6 – 2.3 m Fairly clean, fine sand with some medium sand and fine gravel	Sand layers dipping to the east at 30 degrees
		2.3 – 4.3 m Wentworth till to bottom	
		Dry at bottom of test pit	discontinue test pit

Caledon Pit (McCormick Property)	**Test Pit Log 20**
HM Project Number: 02-48	Date: November 7, 2002
Location: Pt. Lot 12, Conc. 2 EHS, Town of Caledon	Supervisor: S.M.
Method: John Deere 200LC Excavator	Elevation TOC:
Samples:	GS: +/- 430 m asl

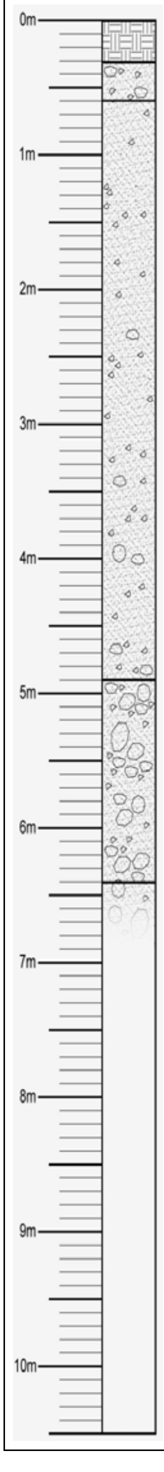
Depth (m)	**Sample:**	**Description:**	**Remarks:**
		0- 0.3 m Topsoil (dark brown)	Location – On the north slope of small ridge, 54 m from the south property line
		0.3 – 1.0 m Subsoil/overburden	
		1.0 – 4.0 m Fine to coarse gravel (half inch to 3 inches) with occasional cobble; fine to coarse sand; some silt	Ice-contact deposit with layers dipping to the south at 30 degrees (away from ridge); 30 – 40% gravel
		4.0 m+ Wentworth till	
		Dry at bottom of test pit	Discontinue test pit

Caledon Pit (McCormick Property)	**Test Pit Log 21**
HM Project Number: 02-48	Date: November 7, 2002
Location: Pt. Lot 12, Conc. 2 EHS, Town of Caledon	Supervisor: S.M.
Method: John Deere 200LC Excavator	Elevation TOC:
Samples:	GS: +/- 430 m asl

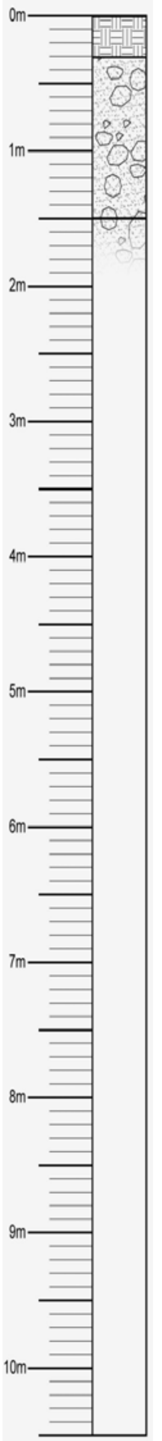
Depth (m)	**Sample:**	**Description:**	**Remarks:**
		0- 0.3 m Topsoil (dark brown) 0.3 – 1.0 m Fine yellow sand 1.0 – 2.4 m Silt with some clay (moist) Dry at bottom of test pit	Location – Southeast of test pit #20 adjacent to wooded area, 23.5 m from the south property line Discontinue test pit

Caledon Pit (McCormick Property) Test Pit Log 22

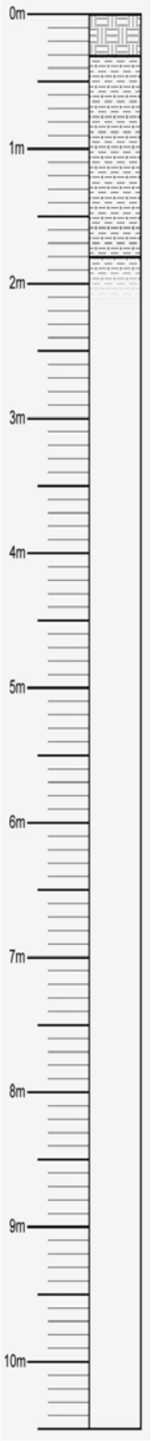
HM Project Number: 02-48	Date: November 7, 2002
Location: Pt. Lot 12, Conc. 2 EHS, Town of Caledon	Supervisor: S.M.
Method: John Deere 200LC Excavator	Elevation TOC:
Samples:	GS: +/- 431 m asl

Depth (m)	**Sample:**	**Description:**	**Remarks:**
		0- 0.3 m Topsoil (dark brown) and subsoil	Location – 30 m east of test pit #20 on south slope of small ridge
		0.3 – 0.6 m Clean, fine to coarse sand and gravel	> 40% stone; slightly dipping to the south
		0.6 – 4.9 m Becoming sandier with clean, medium sand and pebbly gravel	some silt balls or lenses noted
		4.9 – 6.4 m Becoming coarser with pebbly to cobbly gravel	occasional boulder, up to 0.6 m in diameter; some flat elongated cobbles
		6.4 m+ - Still in sand and gravel	Maximum reach of excavator; generally good material
		Dry at bottom of test pit	

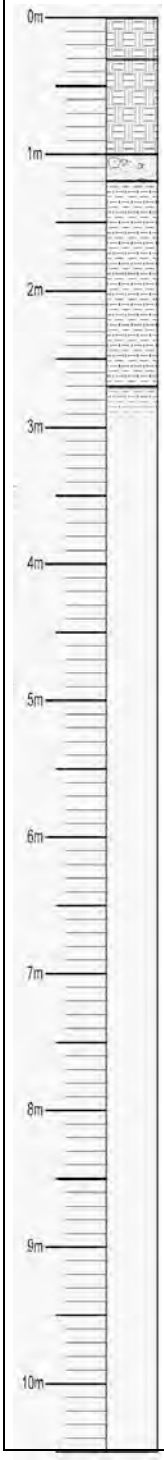
Caledon Pit (McCormick Property)	**Test Pit Log 23**
HM Project Number: 02-48	Date: November 7, 2002
Location: Pt. Lot 12, Conc. 2 EHS, Town of Caledon	Supervisor: S.M.
Method: John Deere 200LC Excavator	Elevation TOC:
Samples:	GS: +/- 432 m asl

Depth (m)	**Sample:**	**Description:**	**Remarks:**
		0- 0.3 m Topsoil 0.3 – 1.5 m Dirty, sand and gravel with numerous boulders Dry at bottom of test pit	Location – 22 m east of TP #22 on top of small ridge Refusal at 1.5 m; Discontinue test pit

Caledon Pit (McCormick Property)	**Test Pit Log 24**
HM Project Number: 02-48	Date: November 7, 2002
Location: Pt. Lot 12, Conc. 2 EHS, Town of Caledon	Supervisor: S.M.
Method: John Deere 200LC Excavator	Elevation TOC:
Samples:	GS: +/- 432 m asl

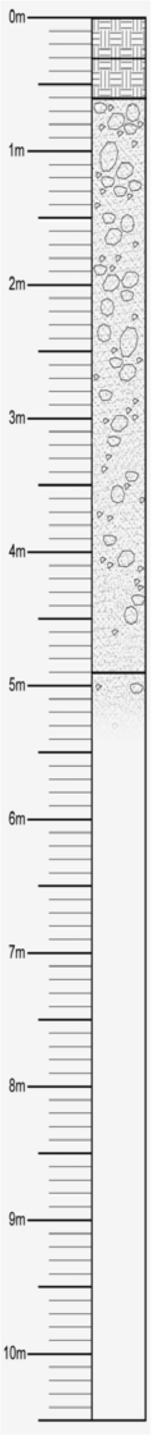
Depth (m)	**Sample:**	**Description:**	**Remarks:**
		0- 0.3 m Topsoil 0.3 – 1.8 m Wentworth till Dry at bottom of test pit	Location – east of TP #23 on top of small ridge Discontinue test pit

Caledon Pit (McCormick Property)	**Test Pit Log 25**
HM Project Number: 02-48	Date: November 7, 2002
Location: Pt. Lot 12, Conc. 2 EHS, Town of Caledon	Supervisor: S.M.
Method: John Deere 200LC Excavator	Elevation TOC:
Samples:	GS: +/- 415 m asl

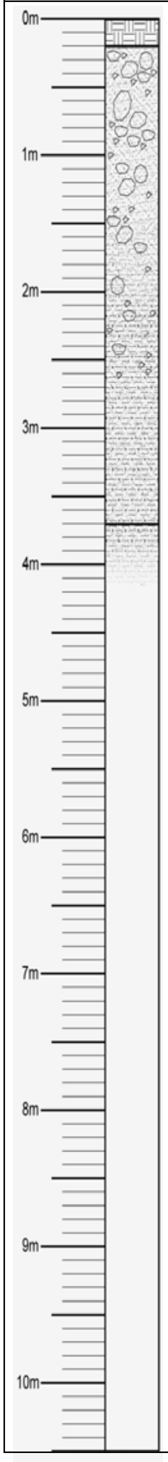
Depth (m)	**Sample:**	**Description:**	**Remarks:**
		0- 0.3 m Topsoil (dark brown) 0.3 – 1.0 m Subsoil/overburden 1.0 – 1.2 m Dirty sand and gravel 1.2 – 2.7 m Wentworth till Dry at bottom of test pit	Location – on flat area at the north end of the kettle depression, 37 m west of rail fence Discontinue test pit

Caledon Pit (McCormick Property) — Test Pit Log 26

HM Project Number: 02-48	Date: November 7, 2002
Location: Pt. Lot 12, Conc. 2 EHS, Town of Caledon	Supervisor: S.M.
Method: John Deere 200LC Excavator	Elevation TOC:
Samples:	GS: +/- 421 m asl

Depth (m)	**Sample:**	**Description:**	**Remarks:**
		0- 0.3 m Topsoil (dark brown) 0.3 – 0.6 m Yellowish-brown subsoil 0.6– 4.9 m Clean, sand and gravel; fine to coarse gravel grading to cobbly gravel with medium to coarse sand; becoming finer pebbly gravel (half to 3 inches) with depth; bottom of test pit was still in sand and gravel Dry at bottom of test pit	Location – Approximately half way up hill south of TP #4 at interface between moraine and outwash > 40% stone; poorly sorted; minor cementation noted on some cobbles; some flat, elongated cobbles; rounded to sub-rounded stone up to 10 inches (25 cm) in diameter; discontinue test pit because sides are caving in; good material

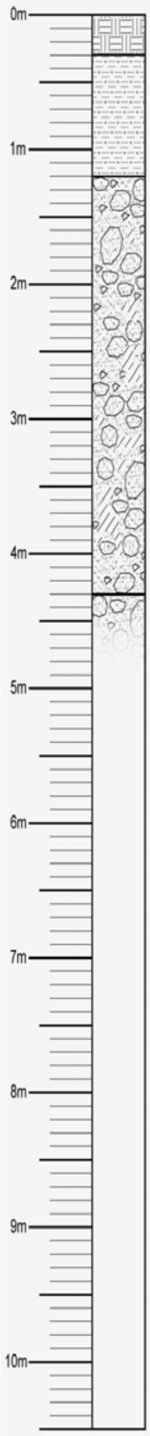
Caledon Pit (McCormick Property)	**Test Pit Log 27**
HM Project Number: 02-48	Date: November 8, 2002
Location: Pt. Lot 12, Conc. 2 EHS, Town of Caledon	Supervisor: S.M.
Method: John Deere 200LC Excavator	Elevation TOC:
Samples:	GS: +/- 429 m asl

Depth (m)	**Sample:**	**Description:**	**Remarks:**
		0- 0.2 m Topsoil (dark brown) and subsoil 0.2 – 3.7 m Some boulders with sand near surface; then tan-light brown, sandy silt till (Wentworth till) with few stones Dry at bottom of test pit	Location – 30 m southeast of test pit #22 and 39 m north of test pit #21 on flat area discontinue test pit

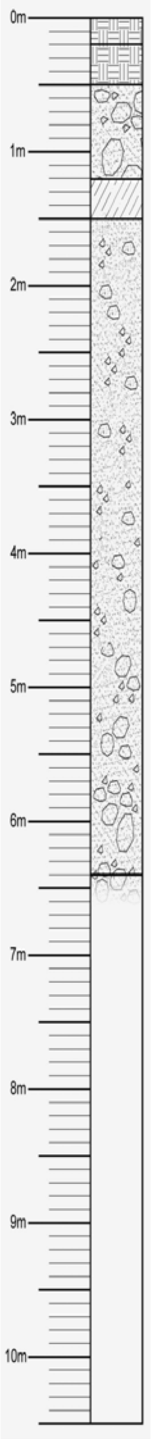
Caledon Pit (McCormick Property)	**Test Pit Log 28**
HM Project Number: 02-48	Date: November 8, 2002
Location: Pt. Lot 12, Conc. 2 EHS, Town of Caledon	Supervisor: S.M.
Method: John Deere 200LC Excavator	Elevation TOC:
Samples:	GS: +/- 430 m asl

Depth (m)	Sample:	Description:	Remarks:
		0- 0.35 m Topsoil (dark brown)	Location – 7 m southeast of test pit #22 at bottom of slope of ridge
		0.35 – 1.4 m Overburden	
		1.4 – 1.6 m Layer of fine to medium sand	
		1.6 – 2.7 m Dirty sand and gravel; horizontally bedded pebbles and cobbles	30- 40% stone; some boulders
		2.7 – 5.1 m Laminated layers of silt and fine sand becoming till-like at depth	
		Dry at bottom of test pit	discontinue test pit

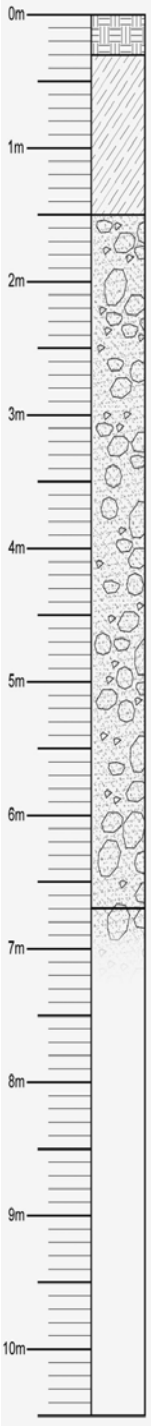
Caledon Pit (McCormick Property)	**Test Pit Log 29**
HM Project Number: 02-48	Date: November 8, 2002
Location: Pt. Lot 12, Conc. 2 EHS, Town of Caledon	Supervisor: S.M.
Method: John Deere 200LC Excavator	Elevation TOC:
Samples:	GS: +/- 433 m asl

Depth (m)	**Sample:**	**Description:**	**Remarks:**
		0- 0.3 m Topsoil (dark brown)	Location – approximately 170 m west of test pit #22 on ridge at southwest woodlot
		0.3 – 1.2 m Sandy, silty till (Wentworth)	
		1.2 – 4.3 m Fine to coarse gravel (half to 3 inches) with cobbles up to 10 inches (25 cm); dirty, silty sand with some pockets of clean coarse sand	some boulders up to 0.35 m; weathered crystalline boulders
		Dry at bottom of test pit	material till-like at depth; difficult to dig; discontinue test pit

Caledon Pit (McCormick Property)	**Test Pit Log 30**
HM Project Number: 02-48	Date: November 8, 2002
Location: Pt. Lot 12, Conc. 2 EHS, Town of Caledon	Supervisor: S.M.
Method: John Deere 200LC Excavator	Elevation TOC:
Samples:	GS: +/- 430 m asl

Depth (m)	Sample:	Description:	Remarks:
		0- 0.2 m Topsoil (dark brown)	Location – approximately 60 m east of test pit #29 and 59 m north of south property line on south slope of small ridge
		0.2 - 0.5 m Overburden	
		0.5 – 1.2 m Poorly sorted sand and gravel ranging from half inch to cobble size	30- 40% stone; good material
		1.2 – 1.5 m Silt layer	Silt dipping to the south at 10 degrees
		1.5 – 6.4 m Clean, medium to coarse, brown sand with gravel becoming coarser at depth; sand becoming finer at depth	> 40% stone; some boulders up to 0.38 m; stone rounded to sub-rounded; some silt at depth
		Sand and gravel at bottom of test pit	At maximum reach of excavator; discontinue test pit
		Dry at bottom of test pit	

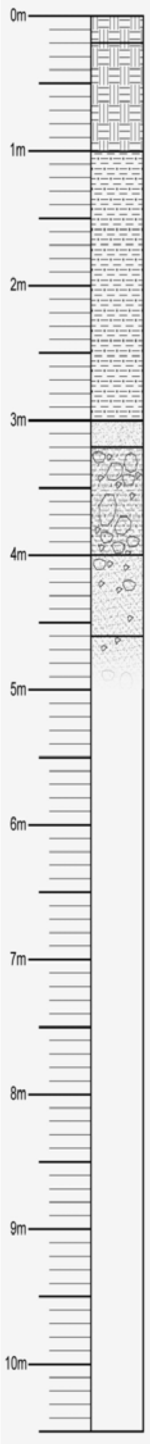
Caledon Pit (McCormick Property)	**Test Pit Log 31**
HM Project Number: 02-48	Date: November 8, 2002
Location: Pt. Lot 12, Conc. 2 EHS, Town of Caledon	Supervisor: S.M.
Method: John Deere 200LC Excavator	Elevation TOC:
Samples:	GS: +/- 429 m asl

Depth (m)	**Sample:**	**Description:**	**Remarks:**
		0- 0.3 m Topsoil (dark brown)	Location – approximately 22 m south of test pit #30 on level area
		0.3 - 1.5 m Yellowish-brown sandy, silt loam (very dry subsoil)	Overburden increases by metres on the west side of test pit; sloping at 70 degrees
		1.5 – 6.7 m Poorly sorted sand and gravel ranging from half inch to cobble size; clean, fine to medium sand becoming medium sand with pebbly to cobbly gravel; alternating layers of clean and dirtier materials at depth	30- 40% stone; some boulders; good material Silt seams 0.3 – 0.45 cm in thickness at depth; some silt coating on stones
		Sand and gravel at bottom of test pit Dry at bottom of test pit	At maximum reach of excavator; discontinue test pit

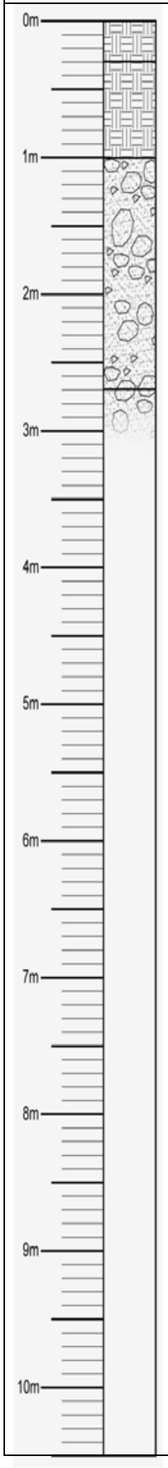
Caledon Pit (McCormick Property)	**Test Pit Log 32**
HM Project Number: 02-48	Date: November 8, 2002
Location: Pt. Lot 12, Conc. 2 EHS, Town of Caledon	Supervisor: S.M.
Method: John Deere 200LC Excavator	Elevation TOC:
Samples:	GS: +/- 432 m asl

Depth (m)	**Sample:**	**Description:**	**Remarks:**
		0- 0.2 m Topsoil (dark brown)	Location – approximately 59 m northeast of test pit #30 on north facing slope of ridge
		0.2 - 1.1 m Subsoil/overburden	
		1.1 – 2.4 m Fairly clean, fine to medium sand with poorly sorted gravel ranging from half inch to boulders	> 30% stone; rounded to sub-rounded carbonate and crystalline stones; boulders up to 0.6 m; Ice-contact deposit with layers dipping 30 degrees to the north and west;
		2.4 – 4.0 m Silt seams; sand and gravel becoming dirtier; bouldery, silt layer – till-like	Silt seams 0.2 cm in thickness at depth; some silt coating on stones
		4.0 – 5.0 m Clean, medium sand with some pebbles and cobbles	
		5.0 m + - till-like material	
		Dry at bottom of test pit	Material becoming compact and difficult to dig; discontinue test pit

Caledon Pit (McCormick Property)	**Test Pit Log 33**
HM Project Number: 02-48	Date: November 8, 2002
Location: Pt. Lot 12, Conc. 2 EHS, Town of Caledon	Supervisor: S.M.
Method: John Deere 200LC Excavator	Elevation TOC:
Samples:	GS: +/- 420 m asl

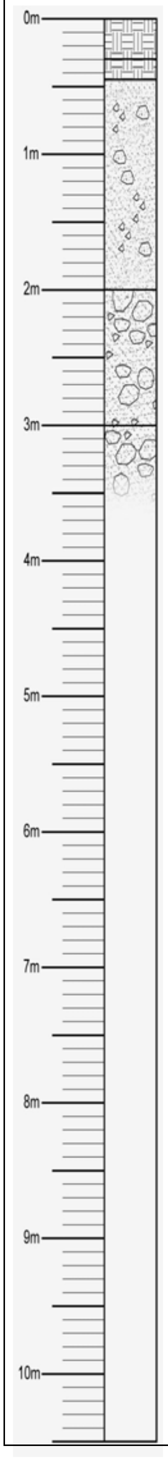
Depth (m)	**Sample:**	**Description:**	**Remarks:**
		0- 0.3 m Topsoil (dark brown)	Location – On moraine, north of TP #12 approximately 9 m from north fence line
		0.3 - 1.0 m Subsoil/overburden	
		1.0 – 3.0 m Wentworth till	
		3.0 – 3.2 m Thin layer of clean, medium sand	
		3.2 – 4.0 m Stonier, till-like material	compact and difficult to dig;
		4.0 – 4.6 m Clean, fine sand with some 1-3 inches (2.5 – 7.5 cm) pebbles	10 – 15% stone;
		Dry at bottom of test pit	

Caledon Pit (McCormick Property)	**Test Pit Log 34**
HM Project Number: 02-48	Date: November 8, 2002
Location: Pt. Lot 12, Conc. 2 EHS, Town of Caledon	Supervisor: S.M.
Method: John Deere 200LC Excavator	Elevation TOC:
Samples:	GS: +/- 419 m asl

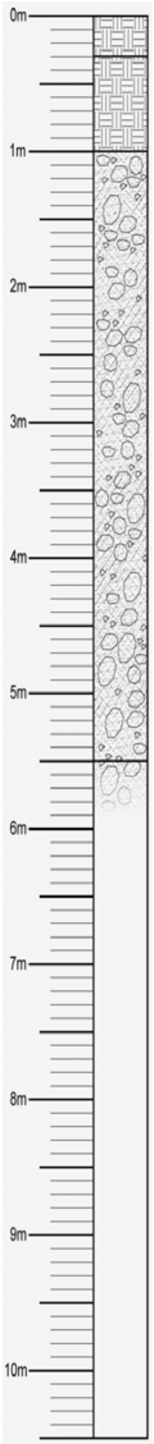
Depth (m)	**Sample:**	**Description:**	**Remarks:**
		0- 0.3 m Topsoil (dark brown) 0.3 - 1.0 m Light brown subsoil 1.0 – 2.7 m Clean, sand and gravel with 3 to 8 inch (7.5 – 20 cm) cobbles and some boulders; fine to medium sand with 1 to 3 inch (2.5 – 7.5 cm) pebbles Dry at bottom of test pit	Location – Channel cut on side of hill, approximately 123 m west of TP #33 on south side of laneway; 12.1 m south of fence line > 30% stone; sand and gravel dipping north at 20 degrees

Caledon Pit (McCormick Property) Test Pit Log 35

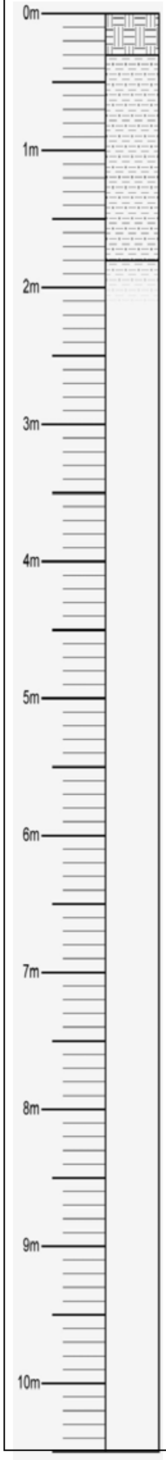
HM Project Number: 02-48	Date: November 8, 2002
Location: Pt. Lot 12, Conc. 2 EHS, Town of Caledon	Supervisor: S.M.
Method: John Deere 200LC Excavator	Elevation TOC:
Samples:	GS: +/- 416 m asl

Depth (m)	**Sample:**	**Description:**	**Remarks:**
		0- 0.3 m Topsoil (dark brown) 0.3 – 0.45 m Light brown subsoil	Location – Channel cut on side of hill, southwest of TP #8 on south side of hay field
		0.45 – 2.0 m Very clean, sand and gravel with 1 to 3 inch (2.5 – 7.5 cm) pebbles	> 30% stone; sides easily cave in
		2.0 – 3.0 m+ Very bony gravel with numerous cobbles and boulders	> 60% stone; reddish coating on carbonate stones
		Dry at bottom of test pit	Difficulty digging through large boulders; discontinue test pit

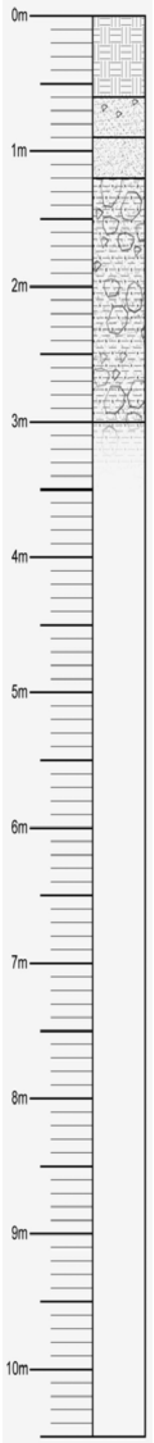
Caledon Pit (McCormick Property)	**Test Pit Log 36**
HM Project Number: 02-48	Date: November 8, 2002
Location: Pt. Lot 12, Conc. 2 EHS, Town of Caledon	Supervisor: S.M.
Method: John Deere 200LC Excavator	Elevation TOC:
Samples:	GS: +/- 429 m asl

Depth (m)	Sample:	Description:	Remarks:
		0- 0.3 m Topsoil (dark brown)	Location – On small ridge north of the southwest woodlot, approximately 61 m east of the west property line
		0.3 – 1.0 m Light brown subsoil	
		1.0 – 5.5 m Poorly sorted, dirty sand and gravel with silt seams; cleaner, medium sand and pebbly gravel with some cobbles; becoming dirtier with depth	> 30% stone;
			Silty, till-like material at depth
		Dry at bottom of test pit	Difficulty digging through till; discontinue test pit

Caledon Pit (McCormick Property)	**Test Pit Log 37**
HM Project Number: 02-48	Date: November 8, 2002
Location: Pt. Lot 12, Conc. 2 EHS, Town of Caledon	Supervisor: S.M.
Method: John Deere 200LC Excavator	Elevation TOC:
Samples:	GS: +/- 424 m asl

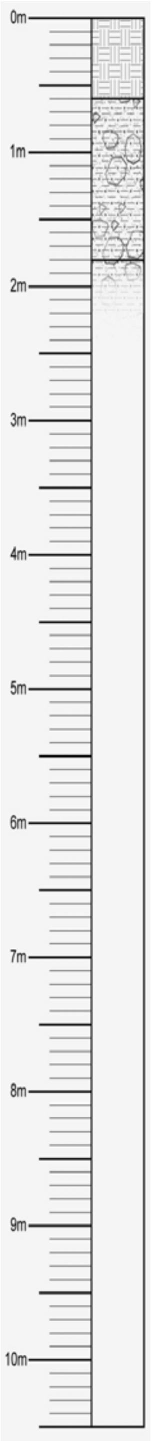
Depth (m)	**Sample:**	**Description:**	**Remarks:**
		0- 0.3 m Topsoil (dark brown) and overburden 0.3 – 1.8 m Wentworth till Dry at bottom of test pit	Location – On small ridge, approximately 84 m east of the old fence row by large basswood tree discontinue test pit

Caledon Pit (McCormick Property)	**Test Pit Log 38**
HM Project Number: 02-48	Date: November 8, 2002
Location: Pt. Lot 12, Conc. 2 EHS, Town of Caledon	Supervisor: S.M.
Method: John Deere 200LC Excavator	Elevation TOC:
Samples:	GS: +/- 425 m asl

Depth (m)	**Sample:**	**Description:**	**Remarks:**
		0- 0.6 m Topsoil (dark brown) and overburden	Location – On side of small ridge, approximately 32 m south of TP #37
		0.6 – 0.9 m A thin layer of sand and fine gravel	Layer dips to the west at about 10 degrees (away from hill)
		0.9 – 1.2 m A thin layer of fine sand	
		1.2 – 3.0 m Sandy, stony, silty till with some boulders (Wentworth)	
		Dry at bottom of test pit	discontinue test pit

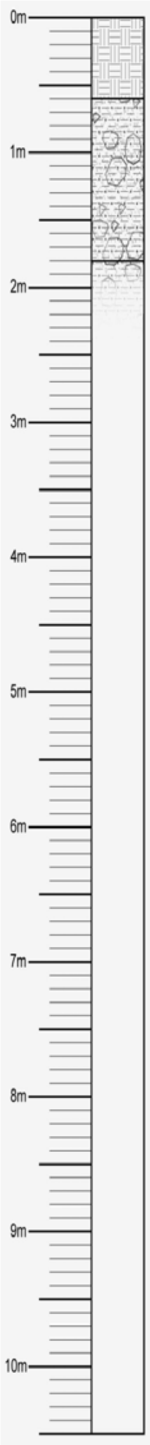
Caledon Pit (McCormick Property) Test Pit Log 39

HM Project Number: 02-48	Date: November 8, 2002
Location: Pt. Lot 12, Conc. 2 EHS, Town of Caledon	Supervisor: S.M.
Method: John Deere 200LC Excavator	Elevation TOC:
Samples:	GS: +/- 420 m asl

Depth (m)	Sample:	Description:	Remarks:
		0- 0.6 m Topsoil (dark brown) and overburden 0.6 – 1.8 m Sandy, stony, silty till with some boulders (Wentworth) Dry at bottom of test pit	Location – On north side of small depression near southwest woodlot discontinue test pit

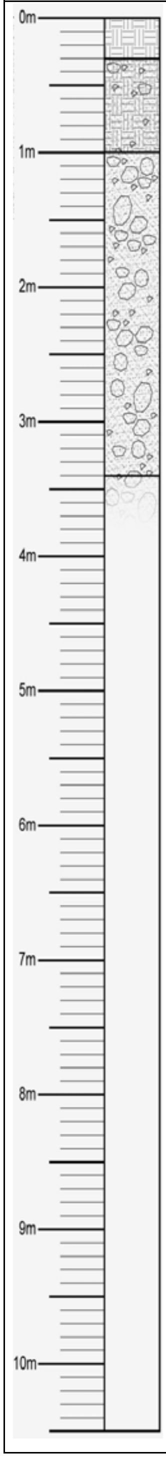
Caledon Pit (McCormick Property) Test Pit Log 40

HM Project Number: 02-48	Date: November 8, 2002
Location: Pt. Lot 12, Conc. 2 EHS, Town of Caledon	Supervisor: S.M.
Method: John Deere 200LC Excavator	Elevation TOC:
Samples:	GS: +/- 423 m asl

Depth (m)	Sample:	Description:	Remarks:
		0- 0.6 m Topsoil (dark brown) and overburden 0.6 – 1.8 m Sandy, stony, silty till (Wentworth till) Dry at bottom of test pit	Location – on moraine, 43.5 m west of corner of hay field Compact and difficult to dig through discontinue test pit

Caledon Pit (McCormick Property) Test Pit Log 41

HM Project Number: 02-48	Date: November 8, 2002
Location: Pt. Lot 12, Conc. 2 EHS, Town of Caledon	Supervisor: S.M.
Method: John Deere 200LC Excavator	Elevation TOC:
Samples:	GS: +/- 422 m asl

Depth (m)	**Sample:**	**Description:**	**Remarks:**
		0- 0.3 m Topsoil (dark brown)	Location – near top of moraine, southwest of TP #4
		0.3 – 1.0 m Sandy, stony subsoil	
		1.0 - 3.4 m Clean, sand and gravel; medium to coarse sand; fine to coarse gravel with cobbles	> 30% stone;
		Sand and gravel at bottom of test pit	Sides of test pit were caving in; discontinue test pit
		Dry at bottom of test pit	

Appendix C

Water Level Monitoring Results

	Water Level Elevation (mASL)					
Date	BH1	BH2R	BH3	BH4	BH5	BH6
11-Sep-03	#N/A	#N/A	406.18	#N/A	407.12	#N/A
19-Dec-03	407.90	#N/A	406.38	407.40	406.25	404.57
19-Jan-04	408.85	#N/A	407.17	408.38	407.22	404.90
5-May-04	410.64	#N/A	409.87	410.57	409.21	406.15
30-Aug-04	408.20	#N/A	407.31	408.01	407.39	407.86
22-Nov-04	407.09	#N/A	406.50	406.93	406.46	405.33
9-Feb-05	408.97	#N/A	407.72	408.65	407.69	405.58
6-Apr-05	410.08	#N/A	409.97	410.31	408.58	405.85
22-Aug-05	407.85	#N/A	407.11	407.67	407.14	405.83
16-Nov-05	406.74	#N/A	405.39	405.74	405.32	405.13
12-Jan-06	407.84	#N/A	406.63	407.50	406.54	405.08
26-Apr-06	410.77	#N/A	409.90	410.75	409.52	406.69
14-Aug-06	408.13	#N/A	407.31	407.96	407.41	406.03
23-Oct-06	407.24	#N/A	406.67	407.09	406.59	405.47
22-Jan-07	409.57	#N/A	408.12	409.28	408.26	405.88
11-Apr-07	410.49	#N/A	409.61	410.55	409.35	406.33
23-Jul-07	408.32	#N/A	407.47	408.16	407.57	406.02
16-Aug-07	407.82	#N/A	407.03	407.66	407.15	405.80
6-Nov-07	406.65	#N/A	406.07	406.45	406.07	405.10
4-Jan-08	406.17	#N/A	405.78	406.01	405.64	404.74
15-Apr-08	410.94	#N/A	410.34	411.01	409.53	405.84
19-Aug-08	408.25	#N/A	407.48	408.10	407.53	406.05
12-Dec-08	407.68	#N/A	406.79	407.45	406.76	405.39
6-Feb-09	409.77	#N/A	408.85	409.58	408.63	406.18
27-Apr-09	410.03	#N/A	409.57	411.66	409.21	406.32
13-Aug-09	409.08	#N/A	408.12	408.90	408.19	406.58
9-Nov-09	407.46	#N/A	407.72	408.34	407.51	406.02
18-Jan-10	408.51	#N/A	407.27	408.54	407.61	406.28
10-May-10	410.22	#N/A	409.09	410.04	409.05	407.40
8-Sep-10	408.67	#N/A	407.79	408.54	407.95	406.32
23-Nov-10	408.09	#N/A	407.08	407.89	407.23	405.65
4-Mar-11	408.81	#N/A	407.72	408.65	407.71	405.79
24-May-11	410.93	#N/A	409.93	410.92	409.93	407.04
23-Aug-11	408.54	#N/A	407.69	408.36	407.86	406.39
24-Nov-11	407.78	#N/A	406.96	407.57	407.02	405.90
22-Feb-12	409.41	#N/A	408.23	409.23	408.42	406.26
25-May-12	410.22	#N/A	409.02	410.07	409.24	406.85
30-Aug-12	407.81	#N/A	407.15	407.63	407.18	405.95
27-Nov-12	407.38	#N/A	406.54	407.13	406.54	405.33
25-Feb-13	408.40	#N/A	407.26	408.16	407.29	405.48
28-May-13	410.50	#N/A	409.39	410.44	409.43	406.80
26-Aug-13	408.77	#N/A	407.89	408.59	408.02	406.46
31-Oct-13	408.07	#N/A	407.27	407.89	407.24	405.94
5-Dec-13	408.49	#N/A	407.47	408.30	407.56	405.62
17-Dec-13	#N/A	409.81	#N/A	#N/A	#N/A	#N/A
12-Feb-14	408.06	409.47	407.25	407.89	407.25	406.78
23-May-14	410.57	#N/A	409.65	410.52	409.59	407.00

	Water Level Elevation (mASL)					
Date	BH1	BH2R	BH3	BH4	BH5	BH6
22-Aug-14	408.39	409.75	407.63	408.25	407.71	406.32
18-Nov-14	407.65	#N/A	406.94	407.47	406.95	405.73
25-Feb-15	408.03	409.45	407.27	407.91	407.28	405.75
27-May-15	409.73	411.50	408.73	409.58	408.74	406.42
21-Aug-15	408.95	410.45	408.18	408.86	408.19	406.40
30-Nov-15	407.23	408.44	406.70	407.08	406.65	405.55
26-Feb-16	407.87	409.46	406.82	407.74	406.74	405.24
29-Apr-16	410.62	412.57	409.65	410.60	409.54	406.66
29-Aug-16	408.00	409.26	407.31	407.83	407.35	406.08
21-Nov-16	406.82	408.02	406.34	406.68	406.29	405.32
23-Jan-17	406.80	408.14	406.22	406.59	406.04	405.03
24-Apr-17	410.58	412.58	409.70	410.58	409.42	406.42
3-Oct-17	409.12	410.55	408.31	409.02	408.42	406.81

notes:
Data prior to 2017 as reported by AECOM
mASL = metres above mean sea level
#N/A = not available (not yet installed, not measured or inaccessible)

	Water Level Elevation (mASL)					
Date	MP-1	MP-1 SW	MP-1b	MP-1b SW	Creek	SG1
11-Sep-03	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
19-Dec-03	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
19-Jan-04	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
5-May-04	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
30-Aug-04	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
22-Nov-04	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
9-Feb-05	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
6-Apr-05	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
22-Aug-05	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
16-Nov-05	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
12-Jan-06	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
26-Apr-06	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
14-Aug-06	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
23-Oct-06	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
22-Jan-07	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
11-Apr-07	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
23-Jul-07	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
16-Aug-07	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
6-Nov-07	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
4-Jan-08	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
15-Apr-08	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
19-Aug-08	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
12-Dec-08	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
6-Feb-09	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
27-Apr-09	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
13-Aug-09	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
9-Nov-09	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
18-Jan-10	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
10-May-10	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
8-Sep-10	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
23-Nov-10	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
4-Mar-11	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
24-May-11	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
23-Aug-11	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
24-Nov-11	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
22-Feb-12	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
25-May-12	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
30-Aug-12	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
27-Nov-12	#N/A	#N/A	#N/A	#N/A	Frozen	#N/A
25-Feb-13	#N/A	#N/A	#N/A	#N/A	Frozen	#N/A
28-May-13	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
26-Aug-13	411.38	411.42	#N/A	#N/A	413.75	#N/A
31-Oct-13	411.33	411.31	#N/A	#N/A	413.75	#N/A
5-Dec-13	411.24	411.27	#N/A	#N/A	Frozen	#N/A
17-Dec-13	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
12-Feb-14	411.36	411.38	#N/A	#N/A	Frozen	#N/A
23-May-14	412.03	412.02	#N/A	#N/A	413.21	#N/A

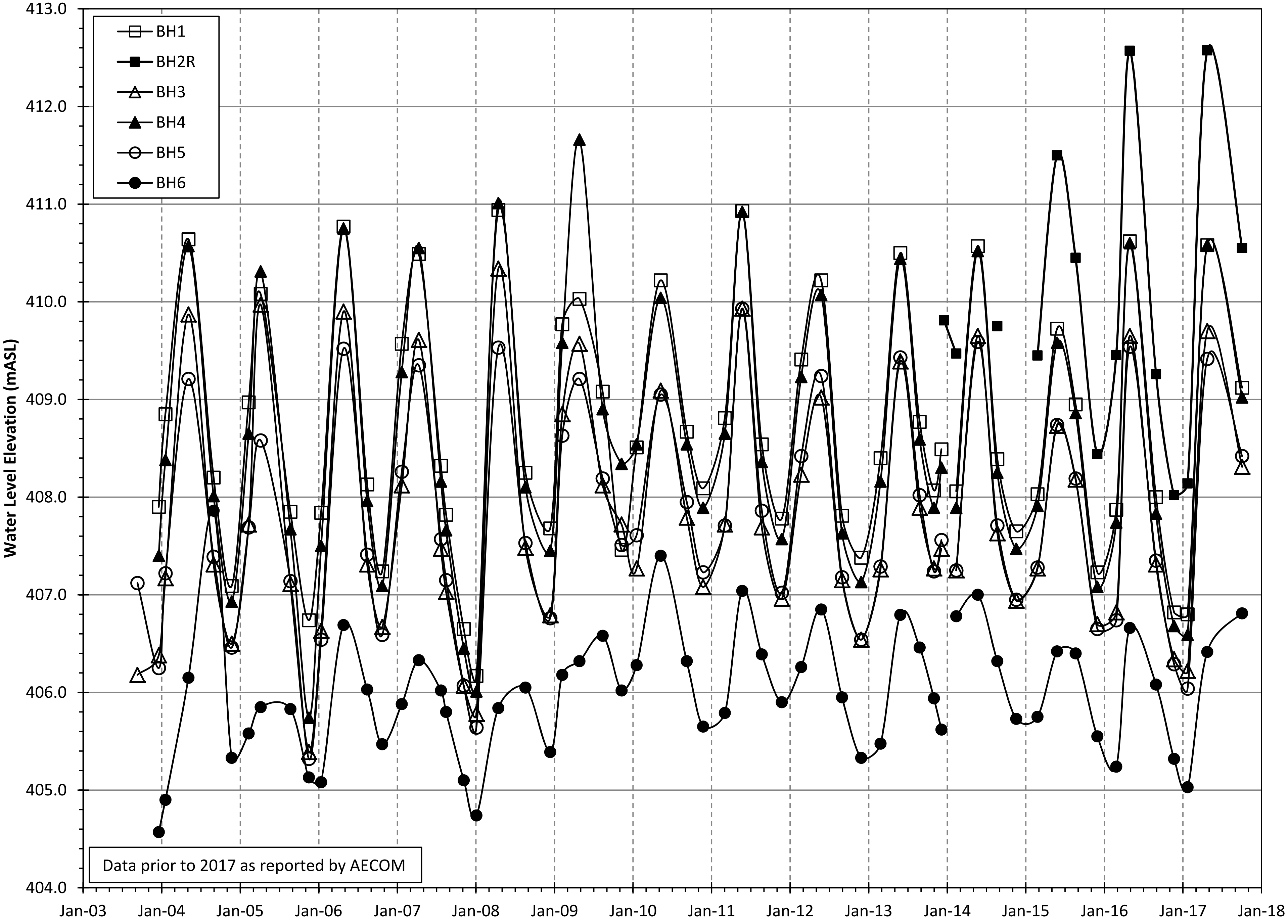
Water Level Elevation (mASL)						
Date	MP-1	MP-1 SW	MP-1b	MP-1b SW	Creek	SG1
22-Aug-14	411.25	411.34	#N/A	#N/A	Soil Wet	#N/A
18-Nov-14	410.99	411.30	#N/A	#N/A	Frozen	#N/A
25-Feb-15	411.21	411.25	#N/A	#N/A	Frozen	#N/A
27-May-15	411.46	411.49	#N/A	#N/A	413.28	#N/A
21-Aug-15	411.30	411.38	#N/A	#N/A	#N/A	#N/A
30-Nov-15	410.72	Soil Wet	#N/A	#N/A	Dry	#N/A
26-Feb-16	410.70	411.22	#N/A	#N/A	Frozen	#N/A
29-Apr-16	#N/A	#N/A	#N/A	#N/A	413.16	#N/A
29-Aug-16	410.81	411.16	#N/A	#N/A	Dry	#N/A
21-Nov-16	409.95	Dry	#N/A	#N/A	Dry	#N/A
23-Jan-17	410.64	411.09	#N/A	#N/A	413.25	#N/A
24-Apr-17	411.61	411.56	411.60	411.57	413.11	413.12
3-Oct-17	411.57	411.59	411.57	411.61	#N/A	#N/A

notes:

Data prior to 2017 as reported by AECOM

mASL = metres above mean sea level SW = surface water

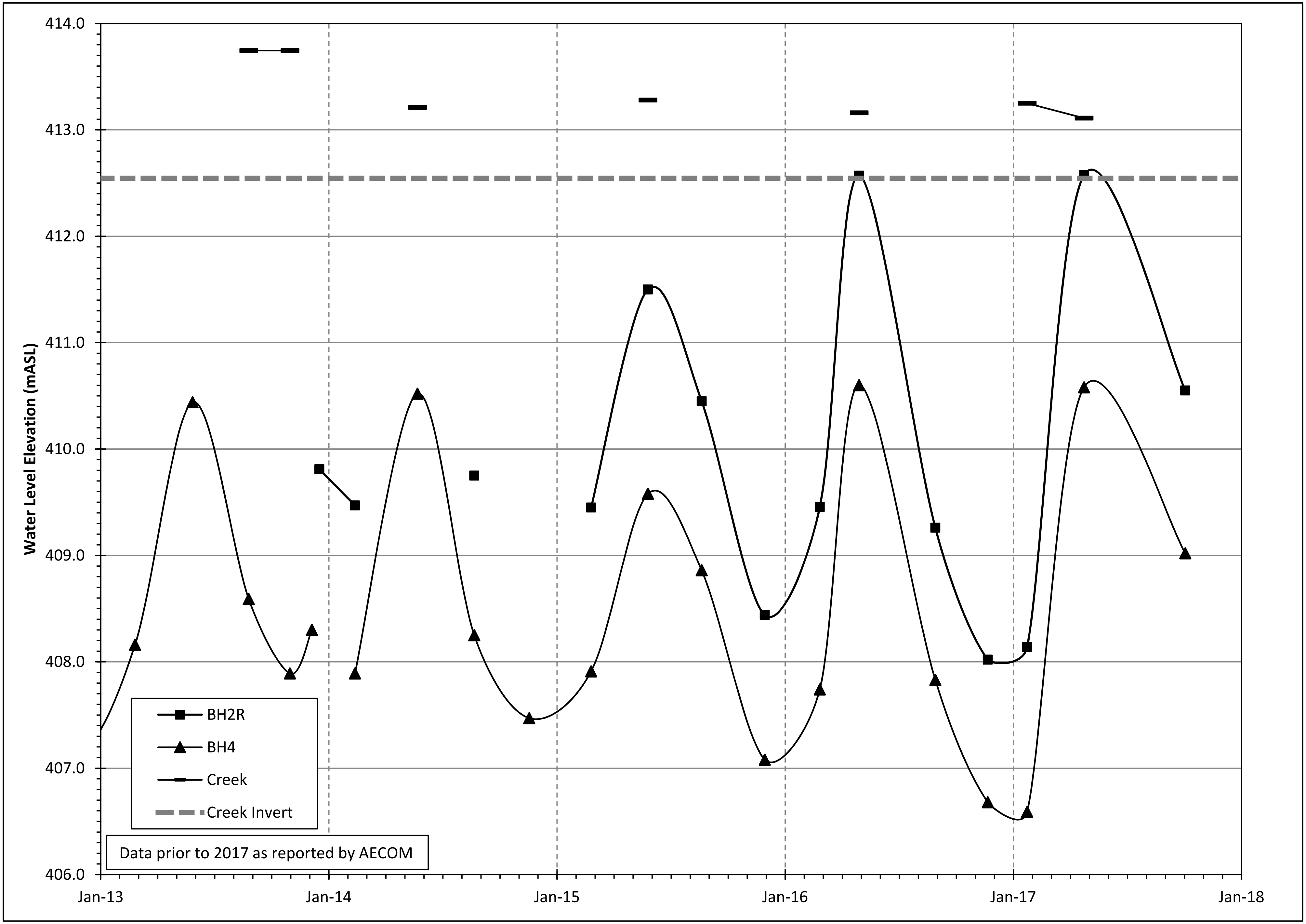
#N/A = not available (not yet installed, not measured or inaccessible)



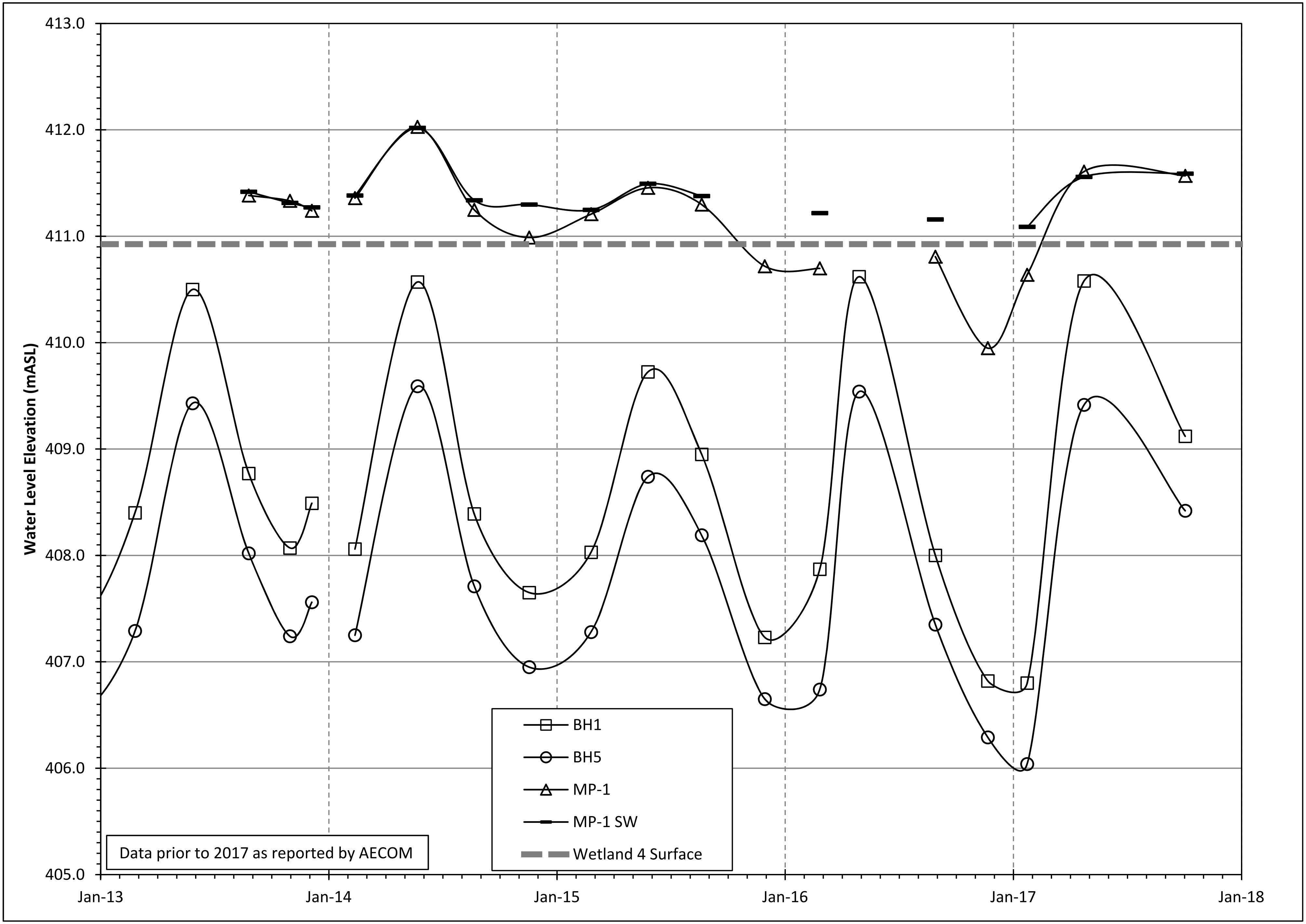
Blueland Farms Limited
Proposed McCormick PIt

Monitoring Well
Hydrograph of Manual Measurements

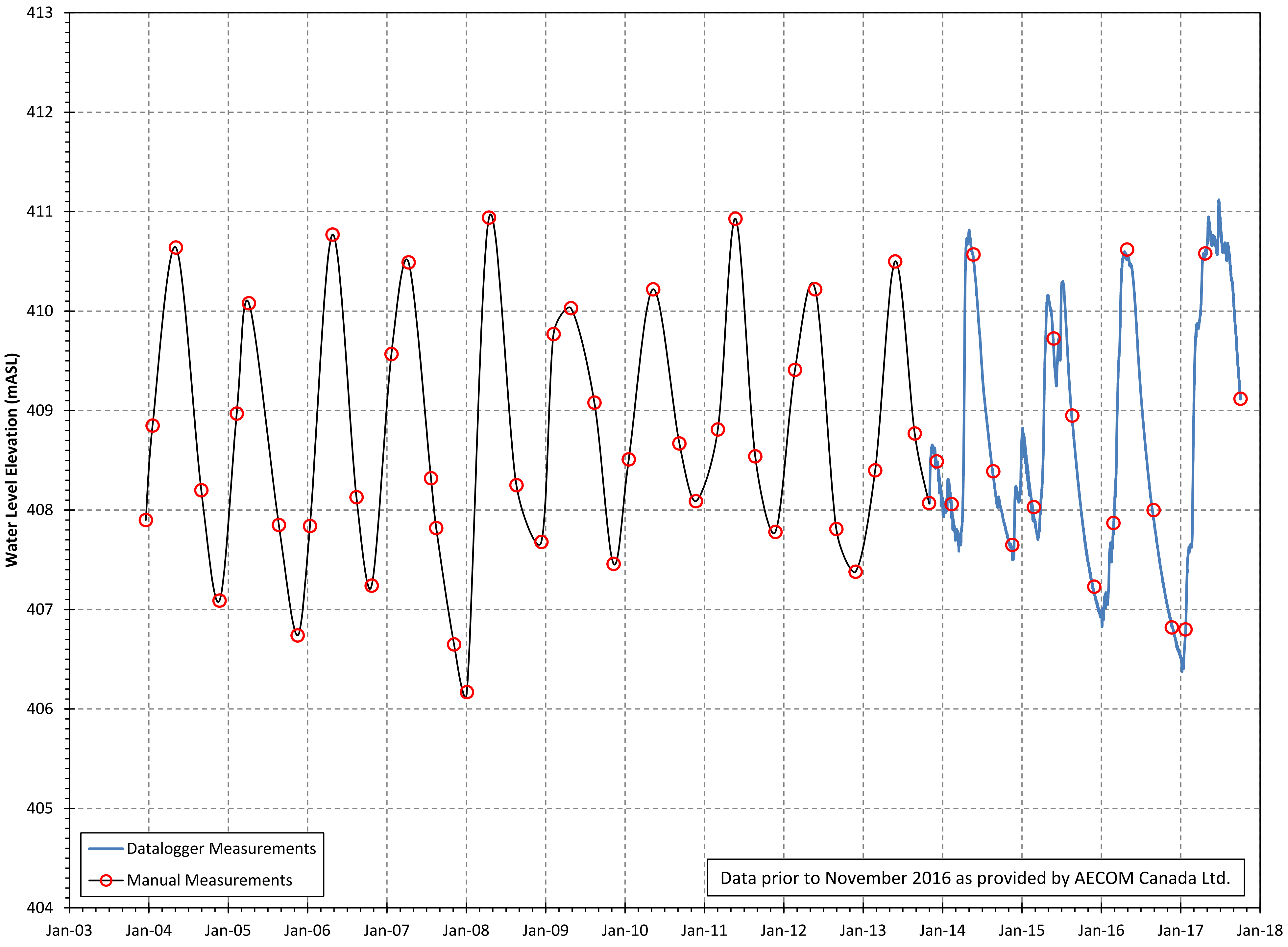
Groundwater Science Corp.
Hydrogeologic Assessment



Caledon Creek Area
Hydrograph of Manual Measurements



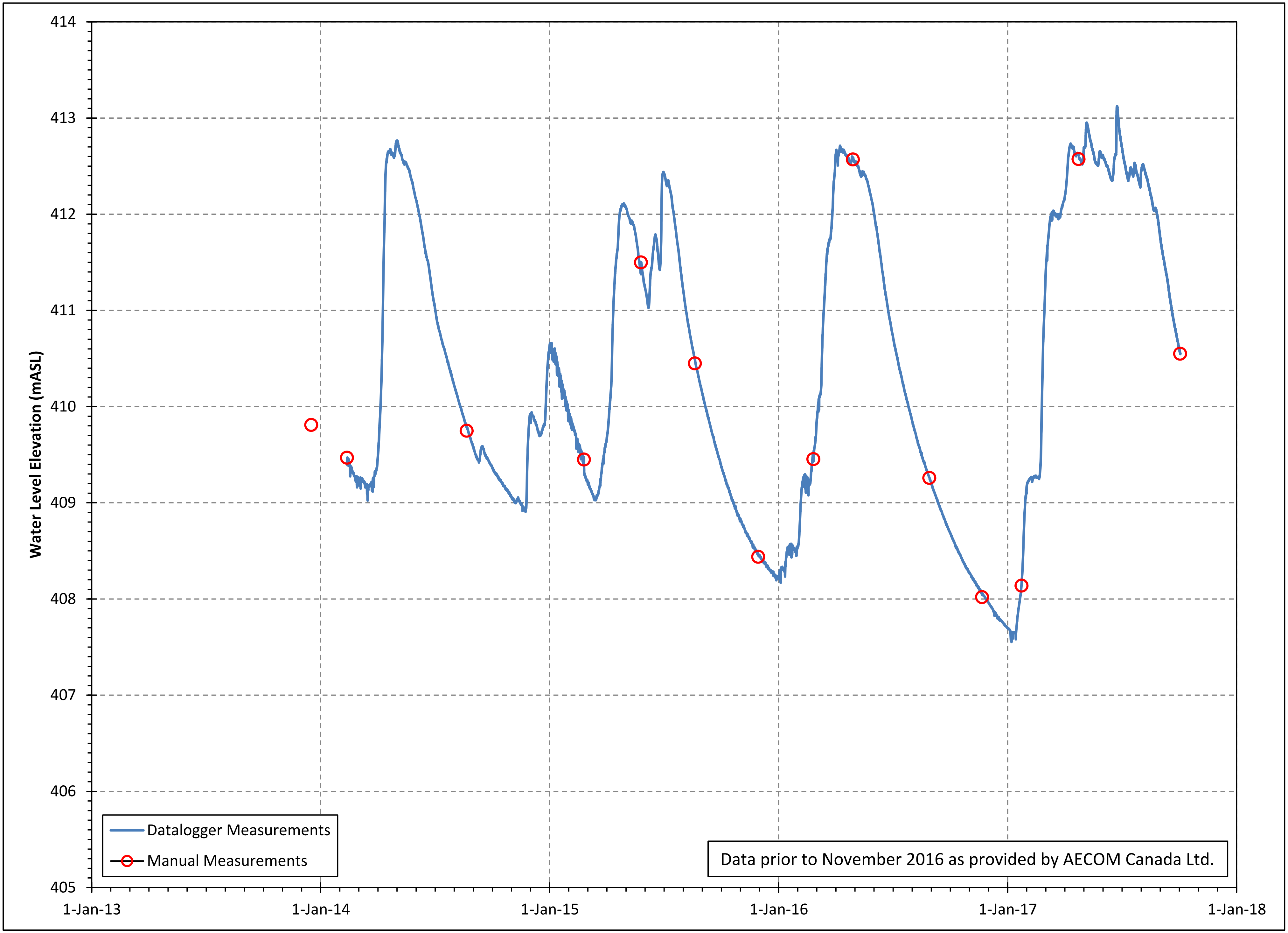
Wetland 4 Area
Hydrograph of Manual Measurements



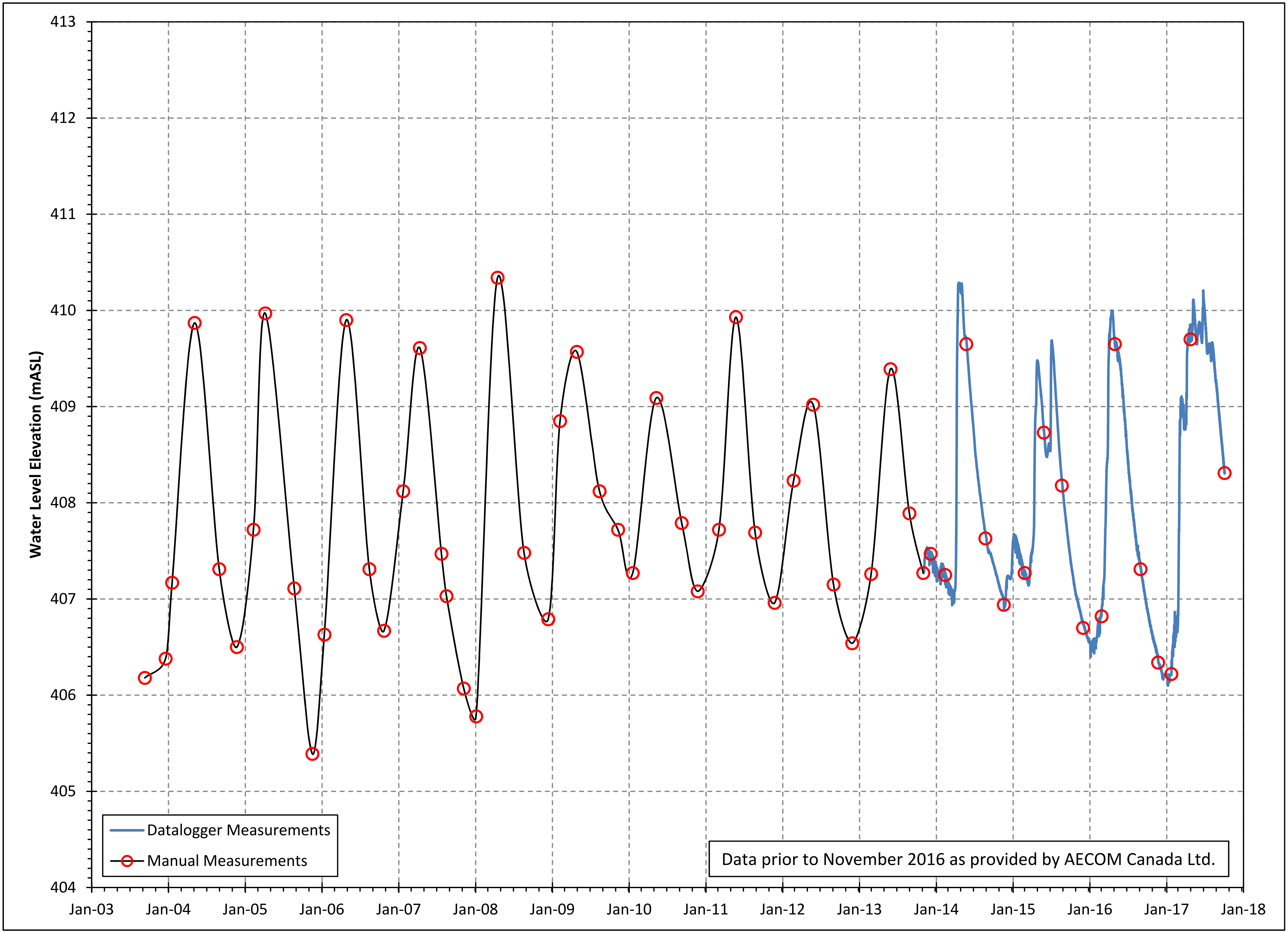
Blueland Farms Ltd.
Proposed McCormick Pit

BH1 Water Level Hydrograph

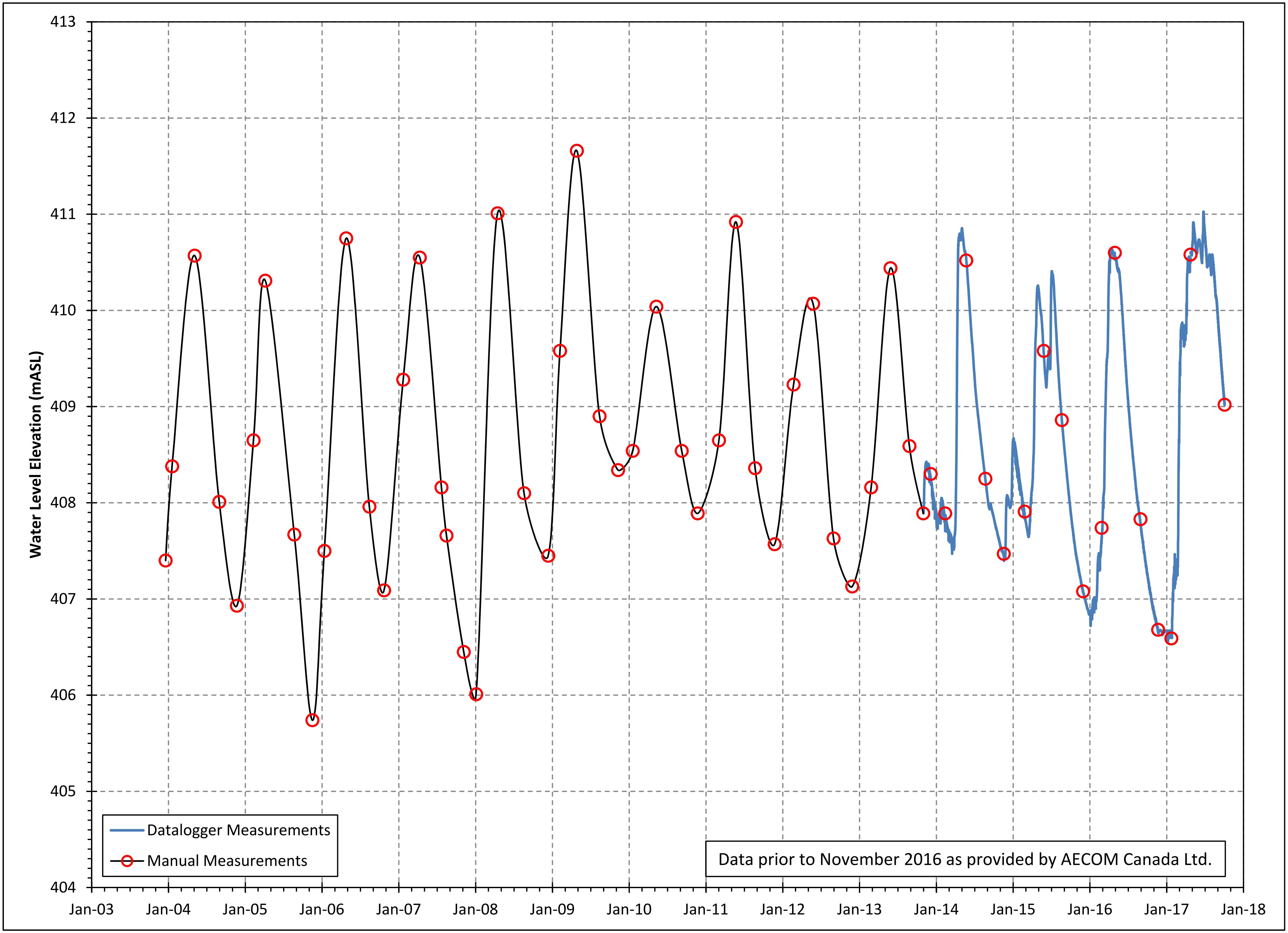
Groundwater Science Corp.
Hydrogeologic Assessment



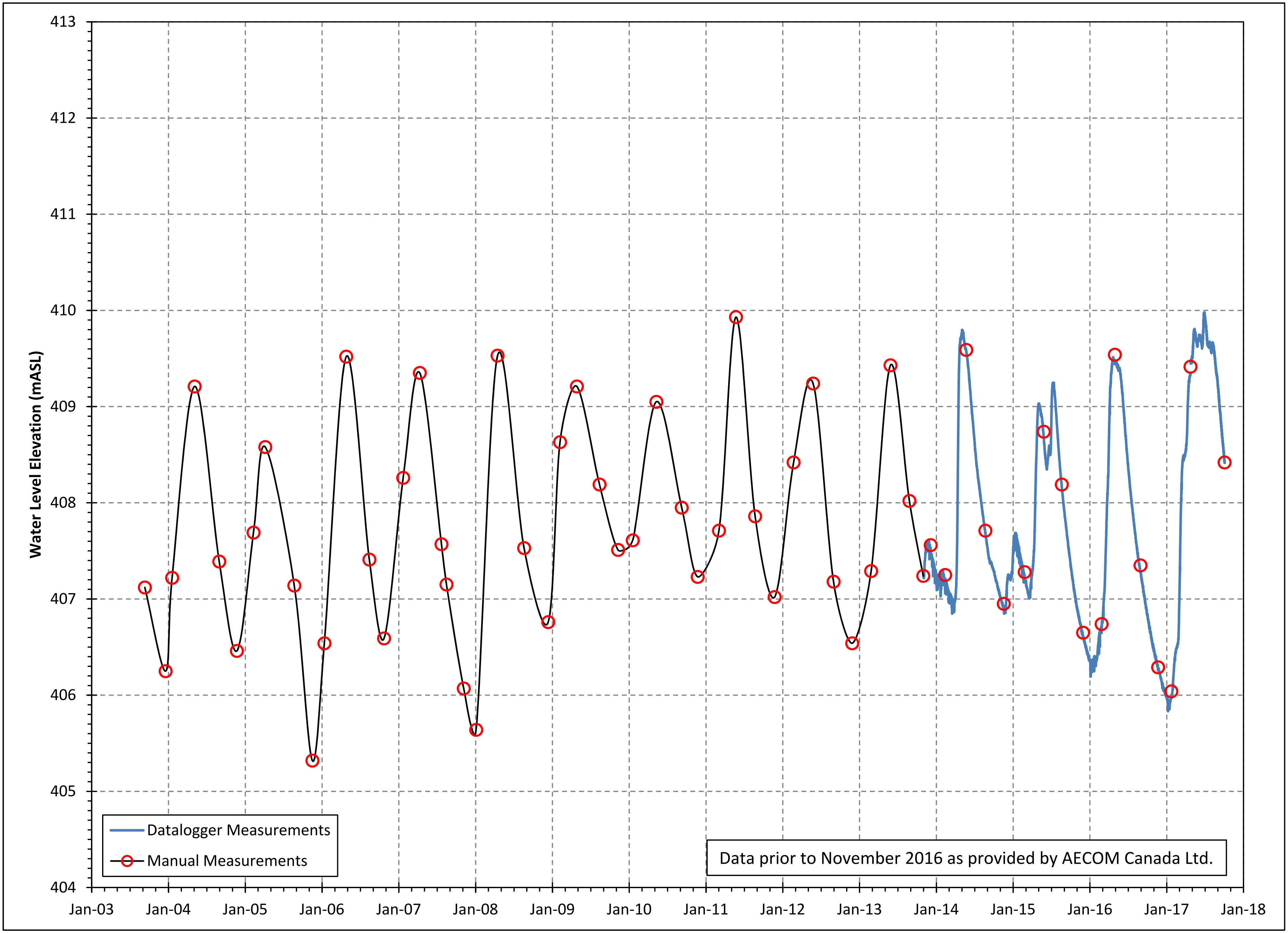
BH2R Water Level Hydrograph



BH3 Water Level Hydrograph

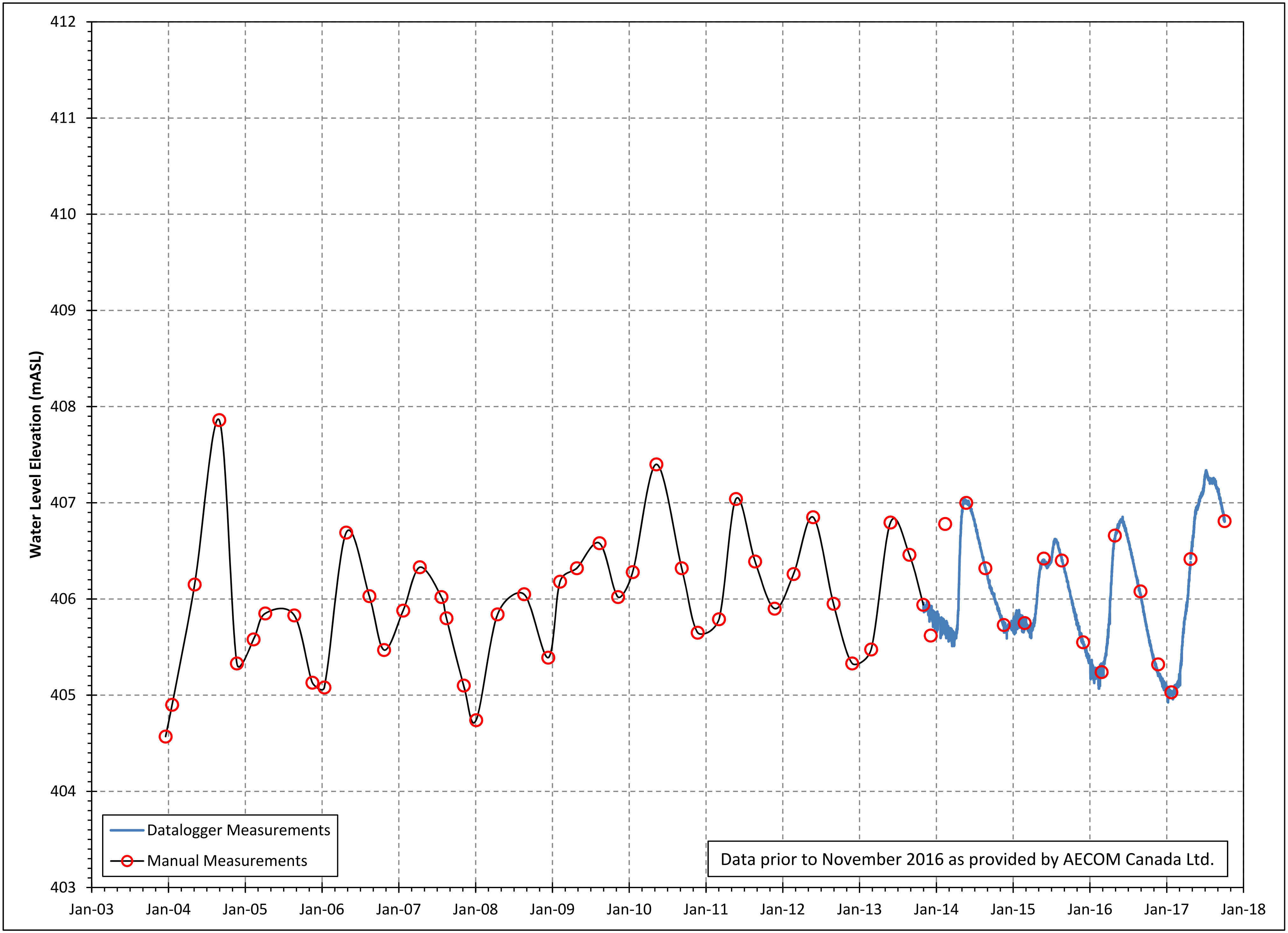


BH4 Water Level Hydrograph

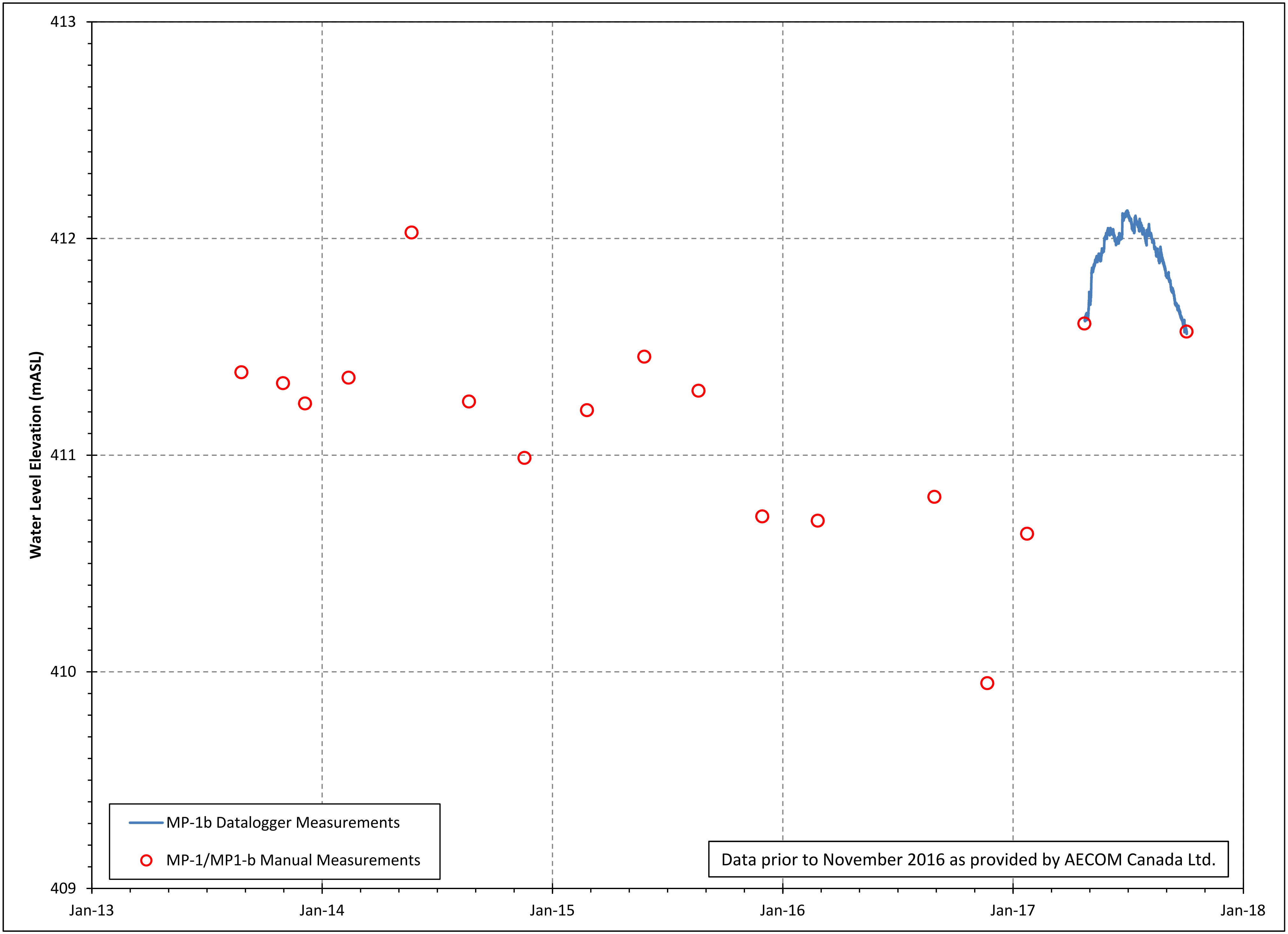


Data prior to November 2016 as provided by AECOM Canada Ltd.

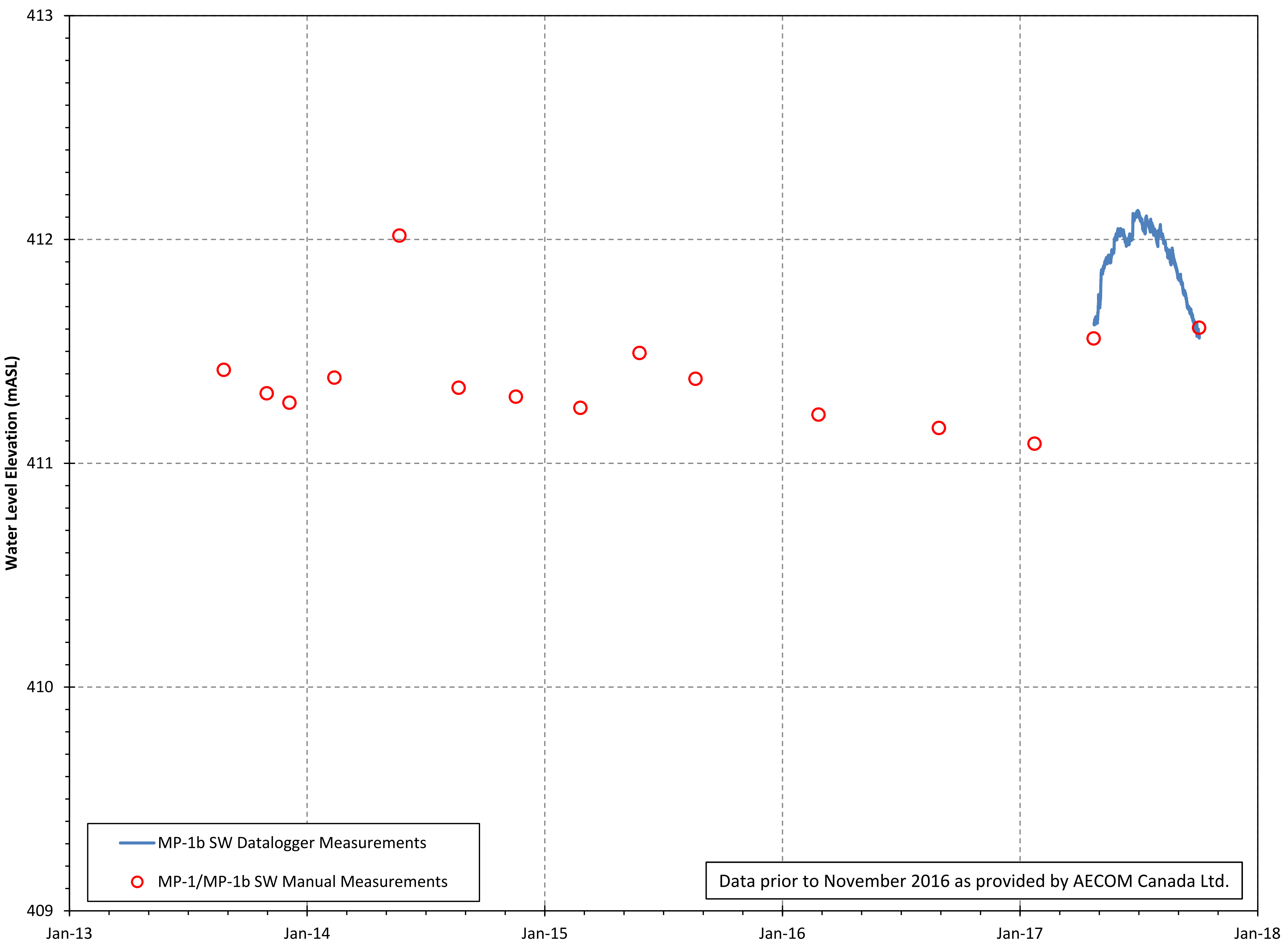
BH5 Water Level Hydrograph



BH6 Water Level Hydrograph



MP-1/MP-1b Groundwater Level Hydrograph



Blueland Farms Ltd.
Proposed McCormick Pit

MP-1/MP-1b Surface Water Level Hydrograph

Groundwater Science Corp.
Hydrogeologic Assessment

Appendix D

Caledon Sand and Gravel Monitoring Report

Harden Environmental Services Ltd.

4622 Nassagaweya-Puslinch Townline R.R. 1 Moffat Ontario Canada L0P 1J0
Phone: 519.826.0099 fax: 519.826.9099 www.hardenv.com

Groundwater Studies
Geochemistry
Phase I / II
Regional Flow Studies
Contaminant Investigations
OMB Hearings
Water Quality Sampling
Monitoring
Groundwater Protection Studies
Groundwater Modelling
Groundwater Mapping

Our File: 9401

January 19, 2016

James Dick Construction Ltd.
P.O. Box 470
14442 Highway 50
Bolton, Ontario
L7E 5T4

Attention: Mr. Gregory Sweetnam
Property Manager

Re: Caledon Sand and Gravel
2015 Annual Monitoring Report

1.0 Introduction

This monitoring report is a summary of data acquired up to December 31, 2015. This report has been prepared for compliance with the Caledon Sand & Gravel (CSG) aggregate license. The monitoring reports began in 1999 with the commencement of extraction from the expansion area in Concession II.

2.0 Monitors Removed and New Monitor Installations

Groundwater monitors have occasionally been removed from the monitoring program due to the expansion of the extraction area or physical damage to the monitor. All of the site monitors including those removed to-date from the monitoring program are shown on Figure 1.

Monitor 96-3 was removed from the monitoring program in late fall of 2010. This monitor was removed due to expansion of the extraction area. The bottom of the monitor did not penetrate the current pit floor elevation, decommissioning was not required.

Monitors MW-01, MW-02 and MW-03 were installed as part of requirements for the PTTW. These monitors have been instrumented with automatic data loggers (hourly recordings) and manual water levels are taken on a quarterly basis.

Sometime between December 18, 2013 and April 24, 2014 monitor MW-02 was irreparably damaged by a mix plant vehicle. An attempt to repair the monitor and retrieve the datalogger was unsuccessful.

Monitor 88-1 was buried and is no longer accessible.

Active monitoring locations are shown on Figures 2 and 3.

3.0 Precipitation

Figure 4 shows the monthly precipitation data from the Orangeville station for 2015. Figure 5 depicts annual precipitation data from the Orangeville station with a 12-month moving average. Total precipitation in 2015 was 765 mm which is 137 mm less than the climate normal of 902 mm. A summary of the data is presented in Table 1.

4.0 Groundwater Elevations

Historical groundwater elevations including those obtained in 2015 are summarized in Table 2. In general, groundwater elevations in 2015 remained within historical ranges. Figures 6 through 14 provide hydrograph plots for site monitors. Individual results are summarized as follows.

88-5 and 88-6

Water levels in monitors 88-5 and 88-6 are representative of groundwater elevations within the Paris Moraine, south of the active extraction areas. The above-water-table extraction face is approximately 60 metres from 88-6 and 300 metres from 88-5. Water levels at 88-5 remained above the historical average throughout the 2015 monitoring year. Water levels at monitor 88-6 also remained above the historical average throughout the 2015 monitoring year. Since 2008 groundwater levels have shown less seasonal variation than historically. Since 2004 groundwater levels have been trending upwards.

79-4

Monitor 79-4, is representative of groundwater elevations between Caledon Sand & Gravel and Peel Region Well No. 3. There was a declining trend in water levels between 1992 and 2003. Water levels remained below the historical average for much of the period between 1999 to 2003. Recovery occurred throughout 2004, and up until 2011 water levels have remained within the historical range (Figure 8). Throughout 2012 water levels declined reaching the trigger level of 399.80 m AMSL on the last quarterly measurement.

During 2013 water levels returned to historical average with a level 0.71 metres higher on the last quarterly measurement compared to the last quarterly measurement of 2012. The first three quarterly measurements of 2014 were above the historical average and water levels fell below historical average in the fourth quarter. Throughout the 2015 monitoring year water levels were below historical average. The fourth quarter measurement on December 11 was 399.78 m AMSL which is two centimetres below the trigger level of 399.80 m AMSL. Verification measurements performed on December 18, 2015 and January 6, 2016 were 399.77 and 399.91 m AMSL respectively. No action was taken for the slight breach in trigger level since the gravel washing operations were shut down for the season and the water levels had risen back above the trigger level by January 6, 2016. Lower precipitation levels in 2015 likely had an impact on the low water levels in 79-4 as did the prolonged washing season.

98-# Series

The 98# series of monitors were installed to record water levels on either side of the hydraulic barrier in Concession II. Monitors 98-2 and 98-3 and are on the East Side (upgradient) of the hydraulic barrier while 98-4 is on the West Side (Figure 1). The effectiveness of the barrier is apparent upon comparison of the pre-barrier (1997) and post-barrier (1998-Present) data. Water levels in the 98-# series monitors peaked in the spring of 2013 and then declined similar to groundwater levels seen at other monitoring wells around the site. In 2015 the barrier's effectiveness was maintained, as shown by the differences of 0.62 to 3.40 metres in hydraulic potential measured in monitor 98-4 compared to monitors 98-2 and 98-3 (see Table 2 and Figure 9). The gradient between 98-4 and the other 98-# series monitors was maintained throughout the 2015 monitoring year.

96-1 Shallow and Deep / 96-2 Shallow and Deep

Monitors 96-1 and 96-2 represent both shallow and deep sediments south of the extraction area in Concession I. The 2015 monitoring showed that water levels remain within the historical range (Figures 10 and 11).

TW-2

Following a decline during 2012, water levels at TW-2 returned to the historical average range during 2013 to 2015 (Figures 13).

4.1 Trigger Levels

Trigger levels are as follows:

Monitor ID	Trigger Level (m AMSL)
79-4	399.80
88-1	403.90
88-5	400.45
96-1S	397.84
96-1D	395.87
96-2S	399.52

As shown in the associated hydrographs for the above monitors, the trigger level for monitor 79-4 was breached in December of 2015. The fourth quarter measurement of 79-4 on December 11 was 399.78 m AMSL which is two centimetres below the trigger level. Verification measurements performed on December 18, 2015 and January 6, 2016 were 399.77 and 399.91 m AMSL respectively. No action was taken for the slight breach in trigger level since the gravel washing operations were shut down for the season and the water levels had risen back above the trigger level by January 6, 2016. A prolonged washing season and lower than average precipitation likely contributed to the threshold breach.

5.0 Surface Water Features

Surface water bodies are created and altered by below water table extraction. The South and East ponds in Concession I were not altered in 2014. An open water channel approximately 70 metres wide and 100 metres in length was excavated between the North and West Ponds in late 2011 and now connects the two ponds (Figure 2). Southward moving aggregate extraction in Concession II expanded the Concession II pond in 2015. The annual progression of the southeast face since 2004 is shown on Figure 2. Current pond surface areas based on May 22, 2015 aerial imagery are as follows (depicted in Figure 2).

Pond ID	Surface Area (m^2)
North and West	364,965
East	178,376
South	199,235
Concession II	425,820

Since late 2008 the pond water level elevations, with the exception of the Concession II pond are converging and have limited seasonal fluctuation (Figure 15). The convergence of water levels is occurring as a result of increasing water levels in the West Pond (since 2004) and a decline in water levels in the East Pond since 2009. In 2015 the maximum difference in elevation between the ponds was 0.34 metres, occurring between the East Pond and South Pond on April 14, 2015.

6.0 Temperature Measurements

Temperatures obtained from groundwater and surface water stations are summarized in Tables 3A and 3B and depicted on Figures 16 through 23. Groundwater temperatures are measured with a Solinst TLC water level meter and the temperature probe placed at the screened interval within the well.

Groundwater temperatures in monitor 79-4 fell within the historic range of 7° – 15° C. The influence of the pit ponds is evident as the high groundwater temperatures occur in the month of December (Figure 16).

High seasonal groundwater temperatures in TW-2 increased by two to three degrees Celsius in 2013 (Figure 17). This was repeated in 2014 and 2015. Similarly, peak temperatures in 96-1S and 96-1D increased by one degree in 2013 and were repeated in 2014 and 2015 (Figure 18).

There are no anomalous temperature readings for the Cosgrove Well, Warnock Lake or Concession II pond (Figure 20).

Surface water temperatures in the North, South East and West ponds are within historical range (Figure 21).

Surface water temperatures in Silver Creek are all within historical range and there are no obvious trends in the data (Figure 22).

The surface water temperature of 24.1° C measured on June 24th at the Booth Residence outfall was the highest recorded since monitoring commenced in 2002 (Figure 23). The pond temperature is mainly a reflection of solar radiation and there are no temperature increases in groundwater monitors 88-5 and 96-2S located between the pond and the active extraction.

7.0 Streamflow

Streamflow monitoring stations are shown on Figure 3. Flow measurements for SW1, SW2, SW3, the Eaton out-fall and the Booth out-falls are summarized in Table 4. Measurements are made volumetrically with a pail and stopwatch when possible or by velocity-area method Marsh McBirney velocity meter. Figures 24 through 30 provide streamflow plots for these monitoring locations.

Streamflow measured in 2015 at SW1 (North) ranges from 6 L/s to 10 L/s which is off of the higher flows observed between 2006 and 2011 (Figure 24). The flow rate in 2015 was similar to that observed between 1995 and 2004.

The watercourse originating from the Booth Trout Pond Outfall splits in two directions near Kennedy Road. This first occurred in 2008 possibly due to a tree that fell over partially blocking the full amount of flow from reaching Station SW2. Since then, streamflow measurements have been taken at this new watercourse just before it joins SW1 at the culvert diverting flow under the road. This results in an inverse relationship between the rate of flow for SW2 and SW1 (South) Wetland as seen in Figures 25 and 26. In 2015 the total discharge at SW2 dropped to zero on June 24th. All water that used to flow through SW2 was diverted to SW1 (South) for the remainder of 2015.

The measured streamflow at SW3 has a generally increasing trend since 1999 (Figure 27). A similar trend is observed at the Eaton Outfall (Figure 28). The Booth Residence pond outfall (Figure 28) and the Booth Fishfarm outfall (Figure 29) have higher flow rates in 2015 than when measurements began in 2000, however, there is a less obvious increasing trend than observed in SW3 and the Eaton outfall.

8.0 Water Quality

Water samples were collected at the following locations on July 6, 2015:

96-1S	**79-4**
96-1D	**Conc II Pond**
88-5	**West Pond**

Samples were submitted to Maxxam Analytics Inc. at 5:00pm on the day of sampling.

Water quality thresholds set for allowable concentrations of DOC were not breached in 2015 as shown on Figure 31. The total organic carbon did not exeed the Aesthetic Objective of 5 mg/l as shown on Figure 32.

F2-F4 hydrocarbons were not detected in any of the samples taken in 2015.

Testing for volatile organic compounds (VOC's) was conducted on samples from the West Pond and monitor 79-4. VOC's were not detected in the sample from monitor 79-4 or the West Pond.

A summary of water quality data is presented in Table 5.

9.0 Warnock Lake Hydraulic Barrier

The hydraulic barrier was completed during the 2000/2001 monitoring period. Since being installed, the barrier has been effective at maintaining an average water level difference of 2.00 metres between Concession II pond and Warnock Lake.

10.0 Conveyor System

A conveyor was constructed underneath Kennedy Rd (Concession I Rd) and has been in operation since late in 2002. The system carries material from the Concession II extraction area to the crusher in the main pit.

11.0 Permit to Take Water

The Permit to Take Water (PTTW) #8248-6E4QWB issued in March 2006 expired on March 31, 2013. An application for the renewal/amendment of this PTTW was made in 2013 and the new PTTW #8575-96LJJE was issued on May 30, 2013.

An additional monitoring requirement was added to this permit. A monthly sample for total suspended solids (TSS) must be taken of the discharge to Caledon Creek from the North Pond when dewatering is occurring. TSS from the discharge to Caledon Creek must not exceed 25 mg/L. During the 2014 dewatering of the North Pond, two samples for TSS were taken (April 24 and June 13). In both test results TSS were not detected (<10 mg/L). Dewatering of the North Pond was not required during 2015, no samples for TSS were taken in 2015.

In addition, this permit required a qualified person to assess the capacity of Caledon Creek to accommodate the requested increase in discharge from the Concession II Pond. The assessment was completed by Ed Gazendam, Sr. Fluvial Geomorphologist of Water's Edge Environmental Solutions Team Ltd. The Water's Edge report was submitted to the Ministry in December of 2013. On February 26, 2014 an email from Rebecca Scobie (Surface Water Specialist, Ministry of the Environment) to Harden Environmental stated the following: "I have reviewed the Caledon Sand and Gravel Fluvial Geomorphological and Erosion Threshold Assessment and am in agreement with the recommendations outlined. This submission satisfies Condition 4.3 of PTTW No.: 8575-96LJJE."

12.0 Summary

Water levels have remained within historic elevations throughout the 2015 season. In general water levels have remained relatively high or near the historical average since 2008. The water level in monitor 79-4 dropped a few centimetres below the trigger level in December 2015. No action was taken for the slight breach in trigger level since the gravel washing operations were shut down for the season and the water levels had risen back above the trigger level by January 6, 2016. A prolonged washing season and lower than average precipitation likely contributed to the threshold breach.

Since late 2008 the pond water level elevations, with the exception of the Concession II pond are converging. In 2015 the maximum seasonal difference in elevations was within 0.34 metres (historical average is 1.5 metres).

The effectiveness of the hydraulic barrier continues to remain evident in the water level differences between Concession II pond and Warnock Lake.

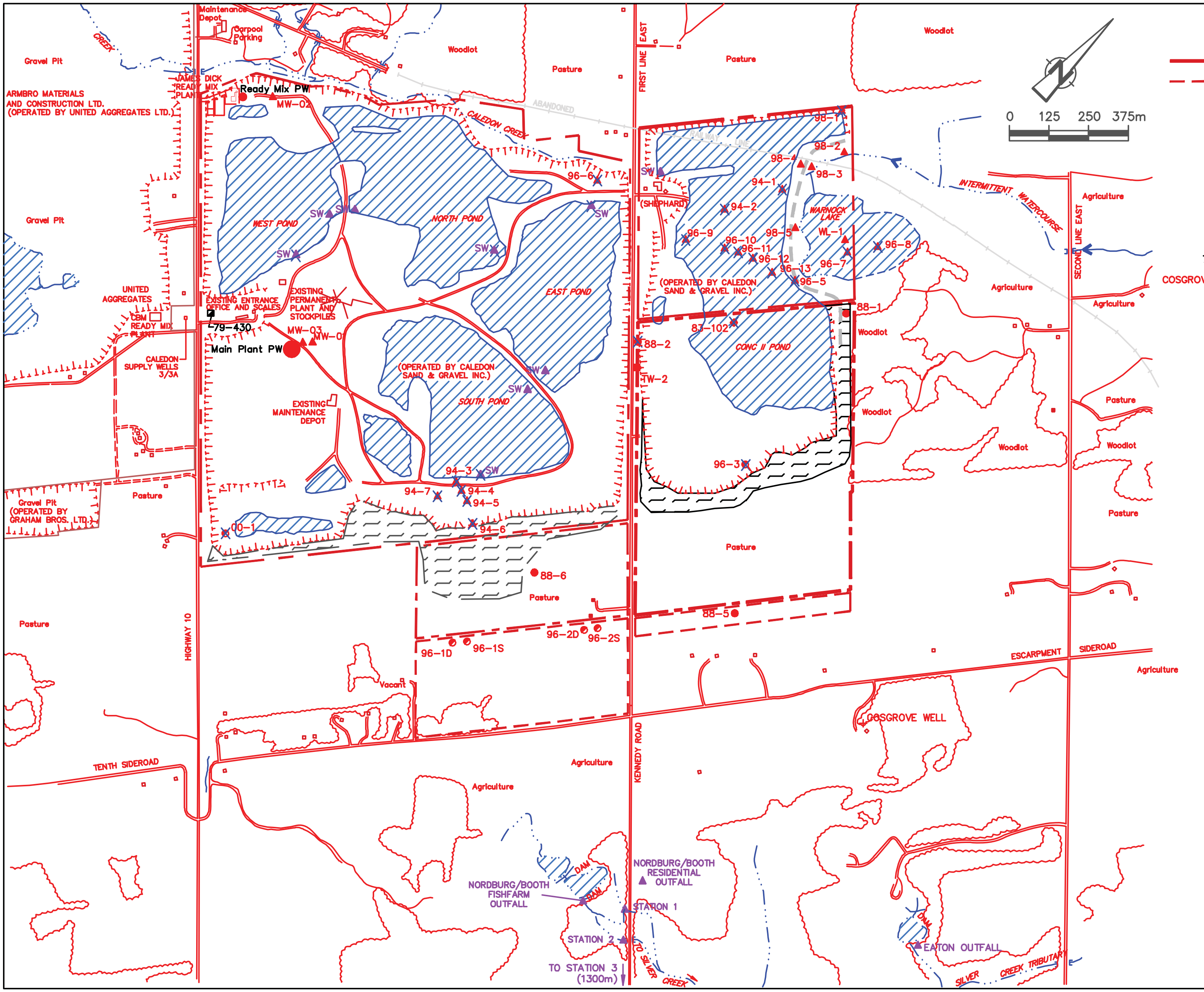
If you have any questions or comments pertaining to this report please do not hesitate to contact Stan Denhoed at (519) 826-0099.

Sincerely,
Harden Environmental Services Ltd.

Stan Denhoed

Stan Denhoed, M.Sc., P. Eng.
Senior Hydrogeologist

LICENSED PROFESSIONAL ENGINEER
S. E. DENHOED
PROVINCE OF ONTARIO



LONG TERM MONITORS

88–1	88–5
Cosgrave Well (Eaton Property)	
96–2S	96–1S
79–4	TW–2
96–1D	96–2D

INTERM MONITORS

88–2	88–6
94–1 Through 94–7	
96–3 Through 96–13	

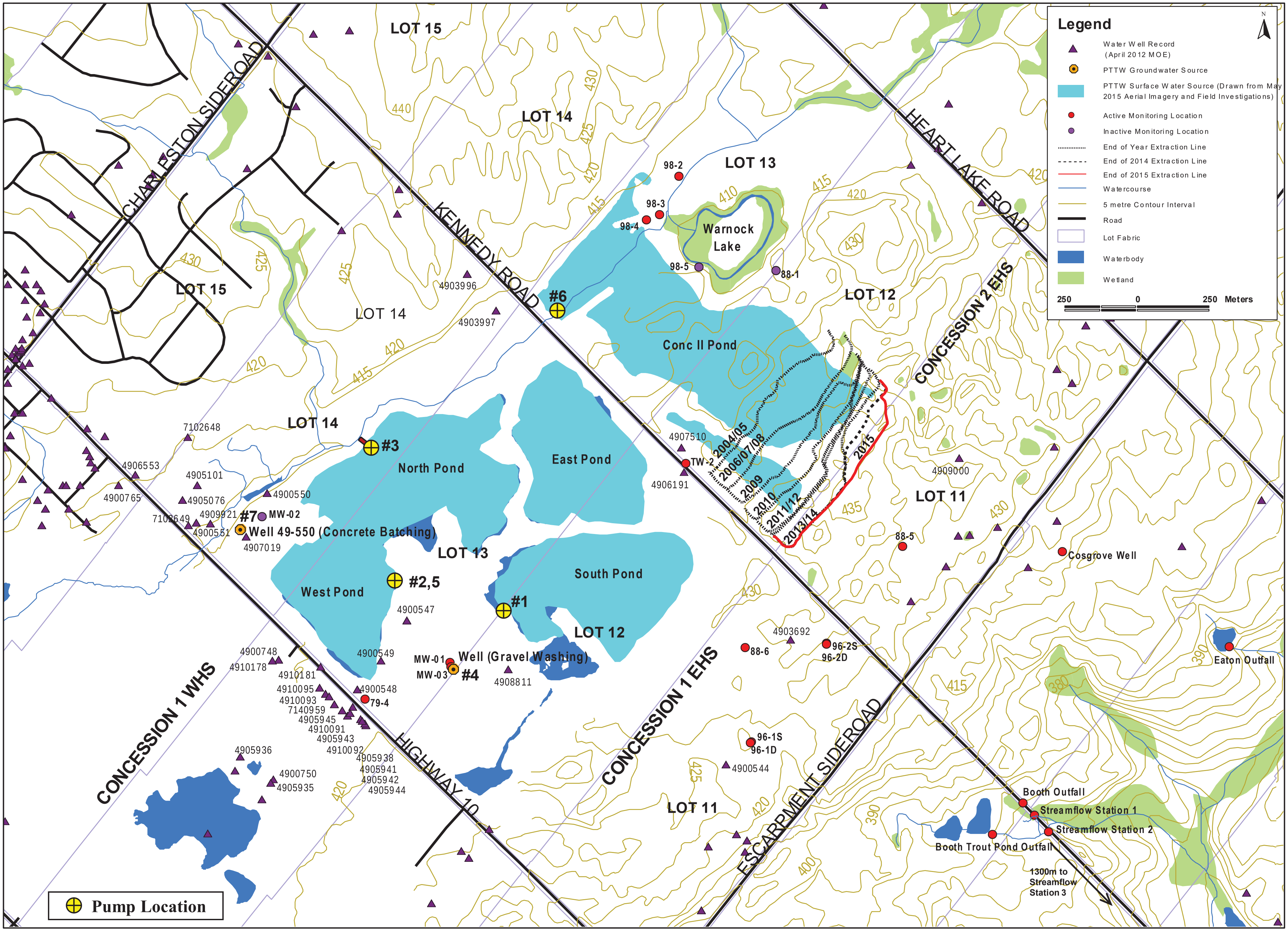
* Continuously changing; current depiction representative of December 2011 conditions

HARDEN ENVIRONMENTAL

JDCL - Caledon Sand & Gravel

SITE MAP

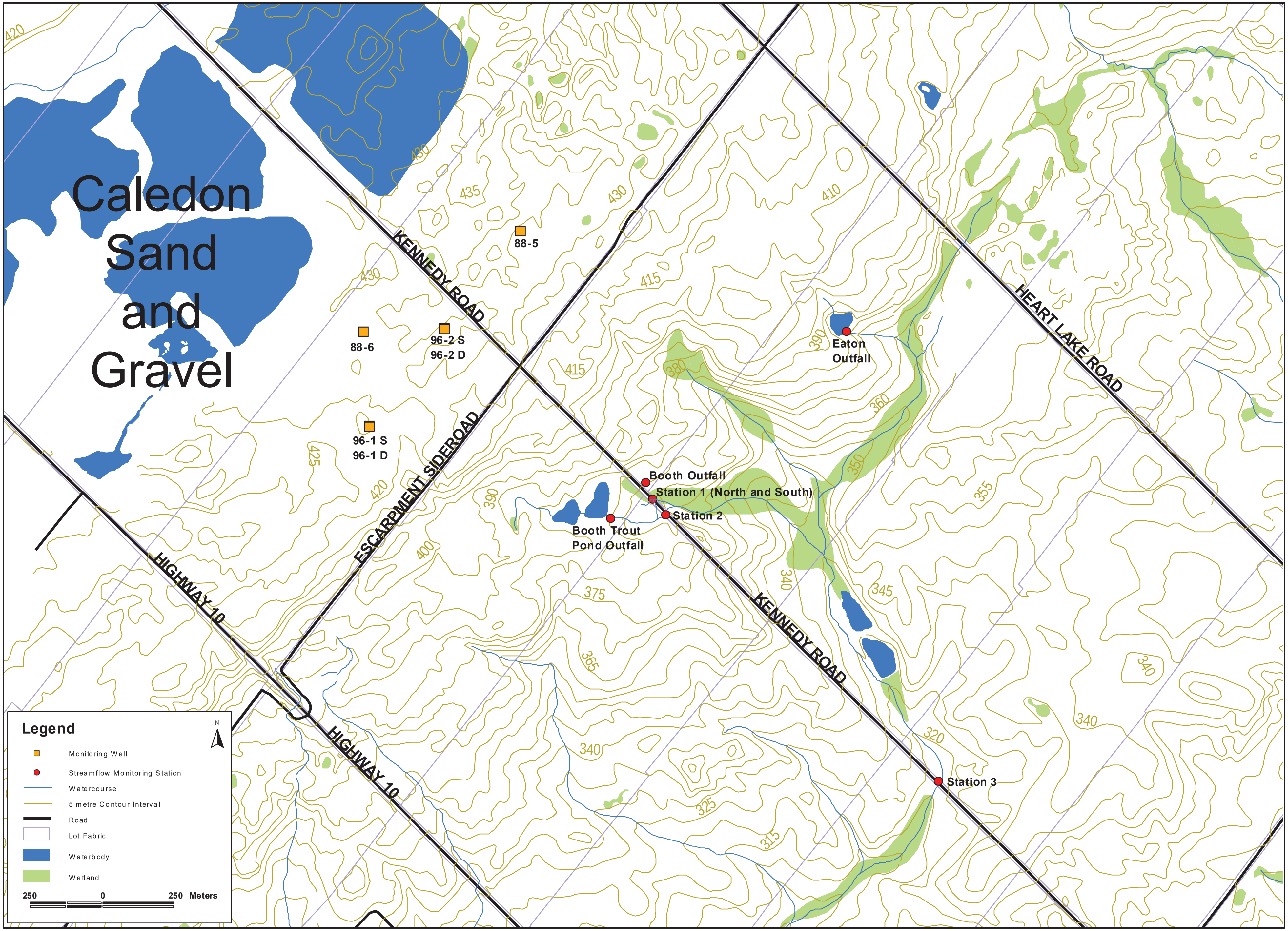
DATE: Dec 2011
FIGURE 1
PROJECT: 9401
DRAWN BY: AW



Harden Environmental Services Ltd.

Project No: 9401	2015 Annual Monitoring Report Caledon Sand and Gravel Inc. – James Dick Construction Ltd.
Date: Jan 2016	
Drawn By: AR	Lots 12, 13 & PT14, Concessions 1 & 2 EHS Town of Caledon, Regional Municipality of Peel

Figure 2: Active Monitoring Locations



Harden Environmental Services Ltd.

Project No: 9401

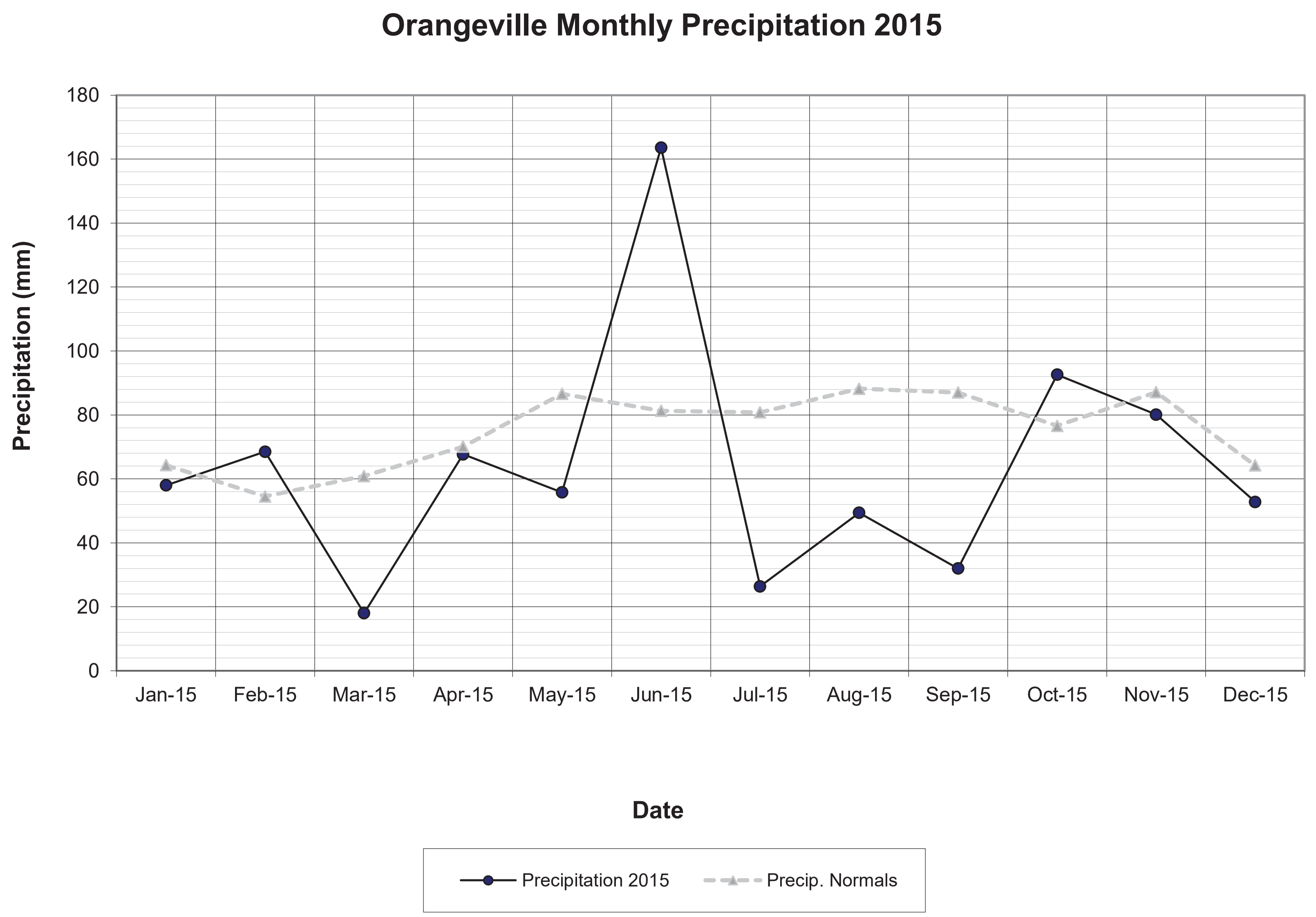
Date: Jan 2016

Drawn By: AR

2015 Annual Monitoring Report
Caledon Sand and Gravel Inc. – James Dick Construction Ltd.

Lots 12, 13 & PT14, Concessions 1 & 2 EHS
Town of Caledon, Regional Municipality of Peel

Figure 3: Streamflow Monitoring Stations



Harden Environmental Services Ltd.

Project No: 9401

Date: Jan 2016

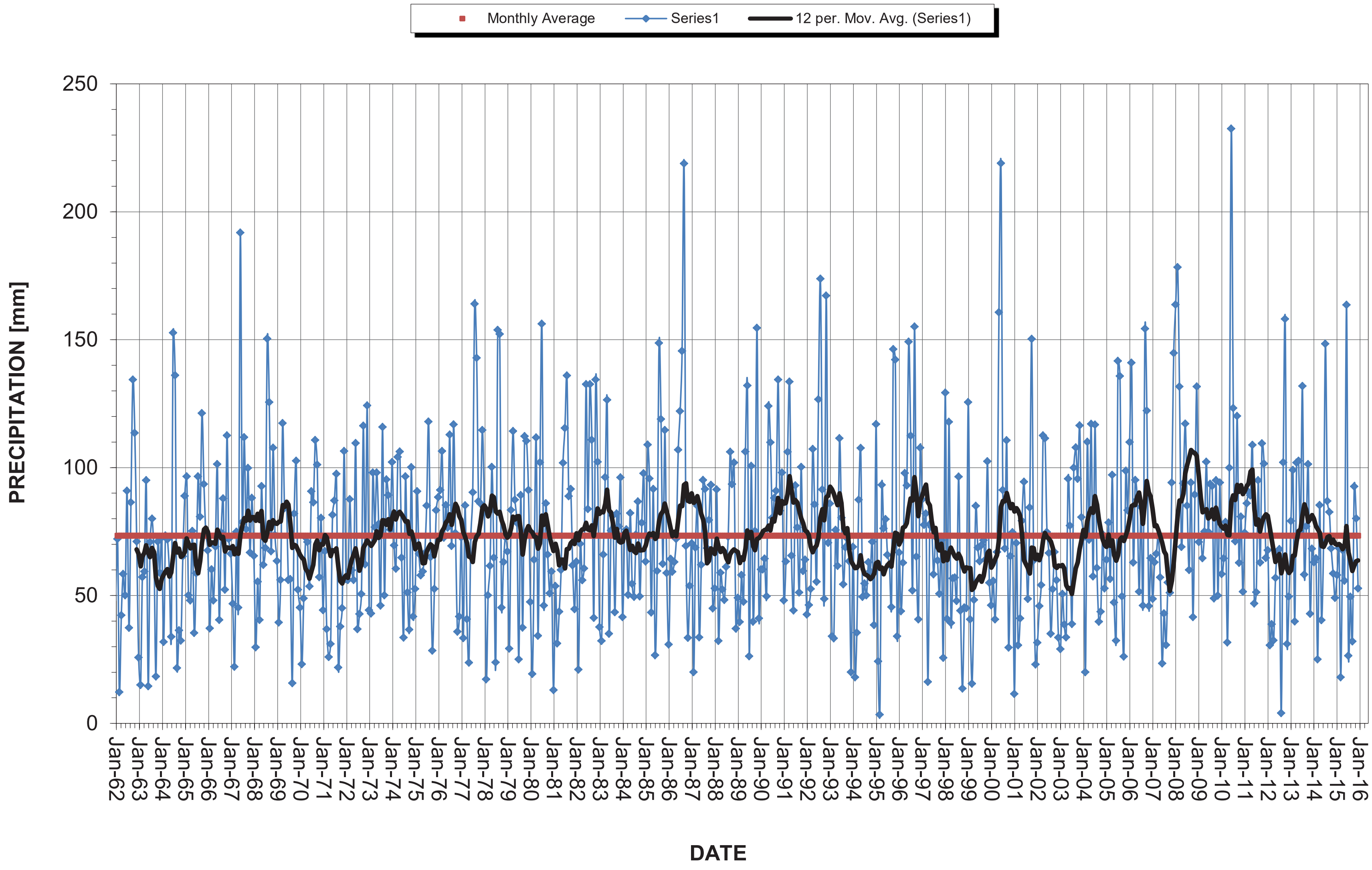
Drawn By: AR

2015 Annual Monitoring Report
Caledon Sand and Gravel Inc. – James Dick Construction Ltd.

Lots 12, 13 & PT14, Concessions 1 & 2 EHS
Town of Caledon, Regional Municipality of Peel

Figure 4: Orangeville Monthly Precipitation 2015

ORANGEVILLE MONTHLY PRECIPITATION 1962-2015
(12 Month Moving Average)



Harden
Environmental
Services Ltd.

Project No: 9401

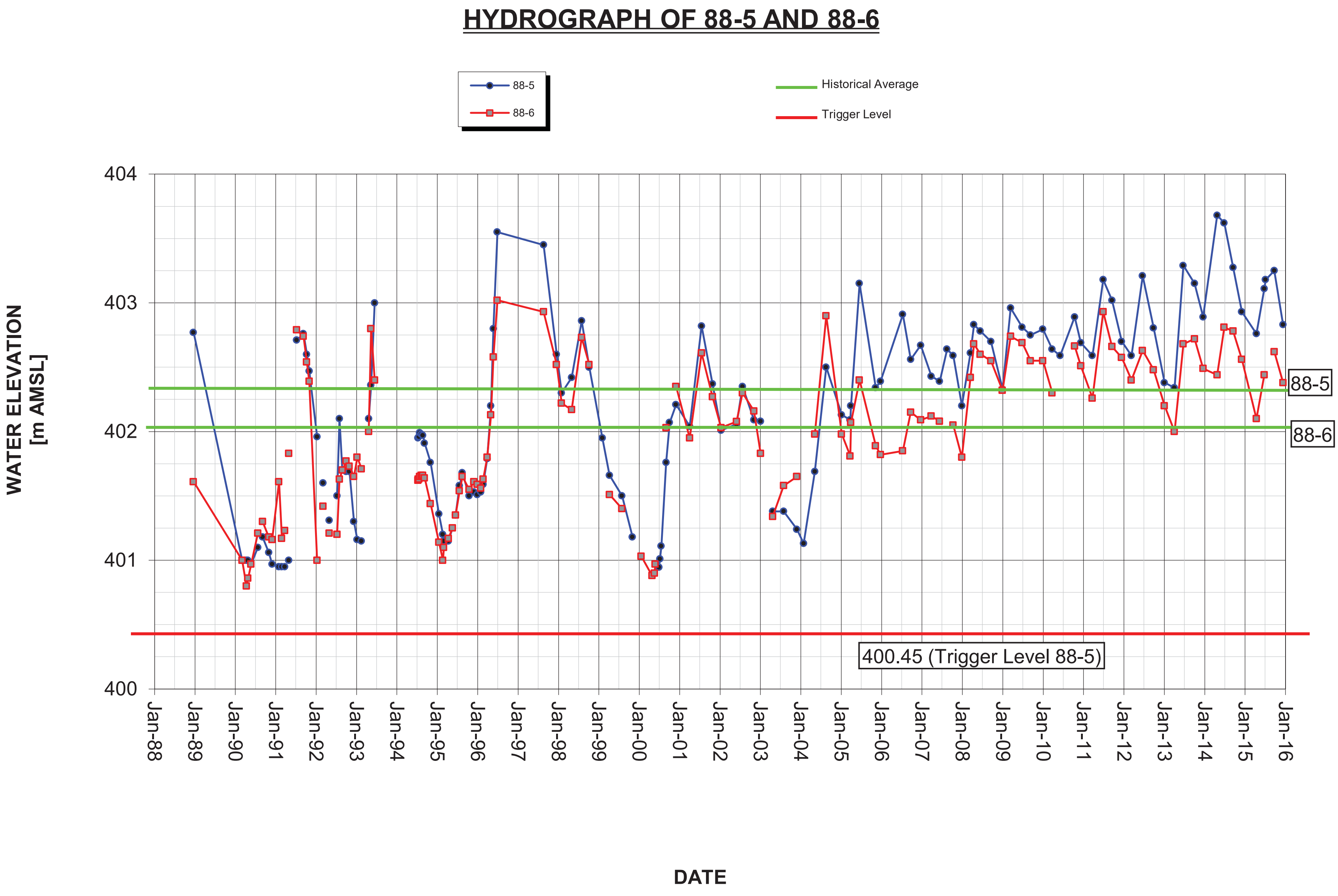
Date: Jan 2016

Drawn By: AR

2015 Annual Monitoring Report
Caledon Sand and Gravel Inc. – James Dick Construction Ltd.

Lots 12, 13 & PT14, Concessions 1 & 2 EHS
Town of Caledon, Regional Municipality of Peel

Figure 5: Orangeville Monthly Precipitation 1962-2015



Harden
Environmental
Services Ltd.

Project No: 9401

Date: Jan 2016

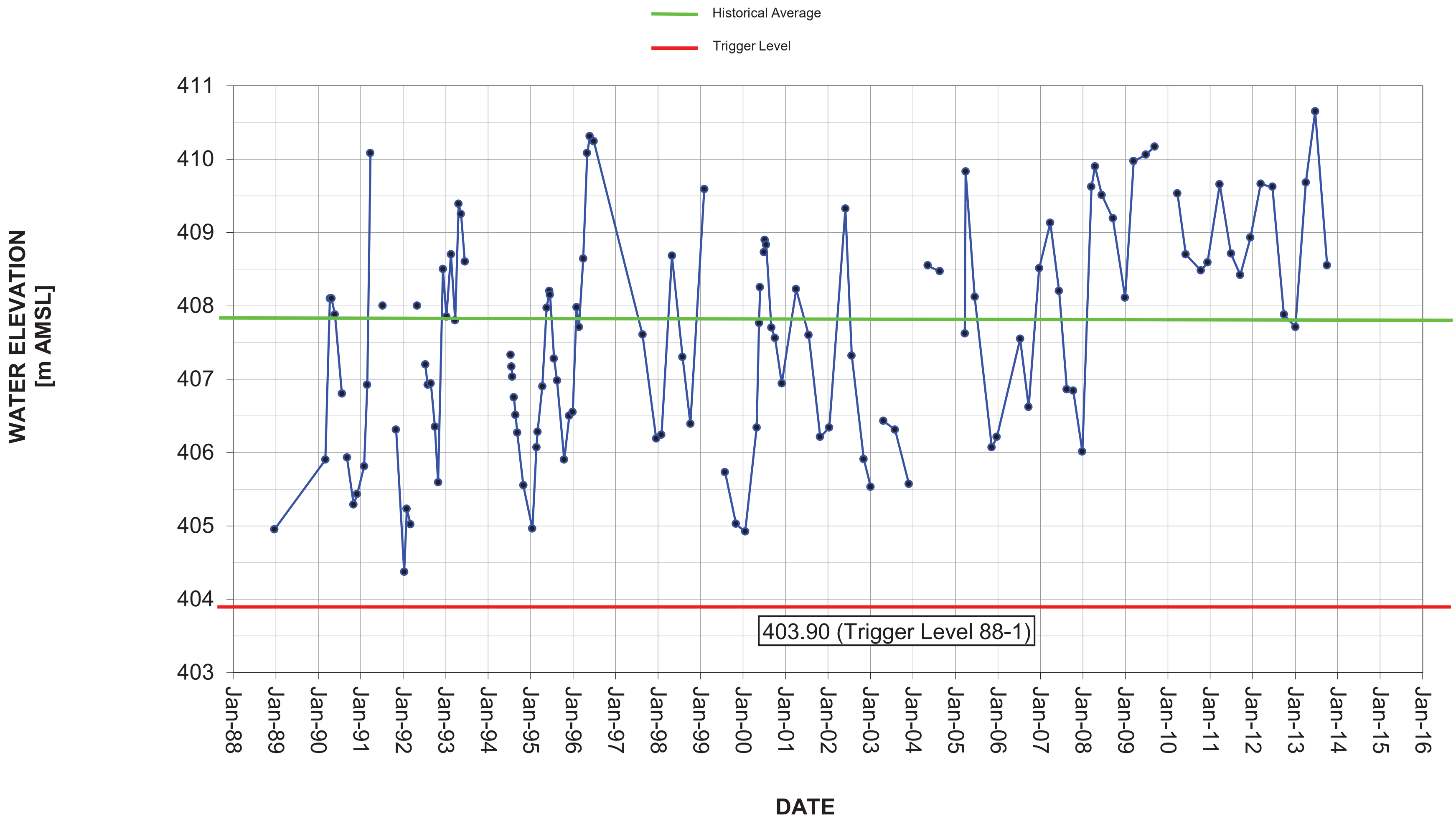
Drawn By: AR

2015 Annual Monitoring Report
Caledon Sand and Gravel Inc. – James Dick Construction Ltd.

Lots 12, 13 & PT14, Concessions 1 & 2 EHS
Town of Caledon, Regional Municipality of Peel

Figure 6: Hydrograph of 88-5 and 88-6

HYDROGRAPH OF 88-1



Harden
Environmental
Services Ltd.

Project No: 9401

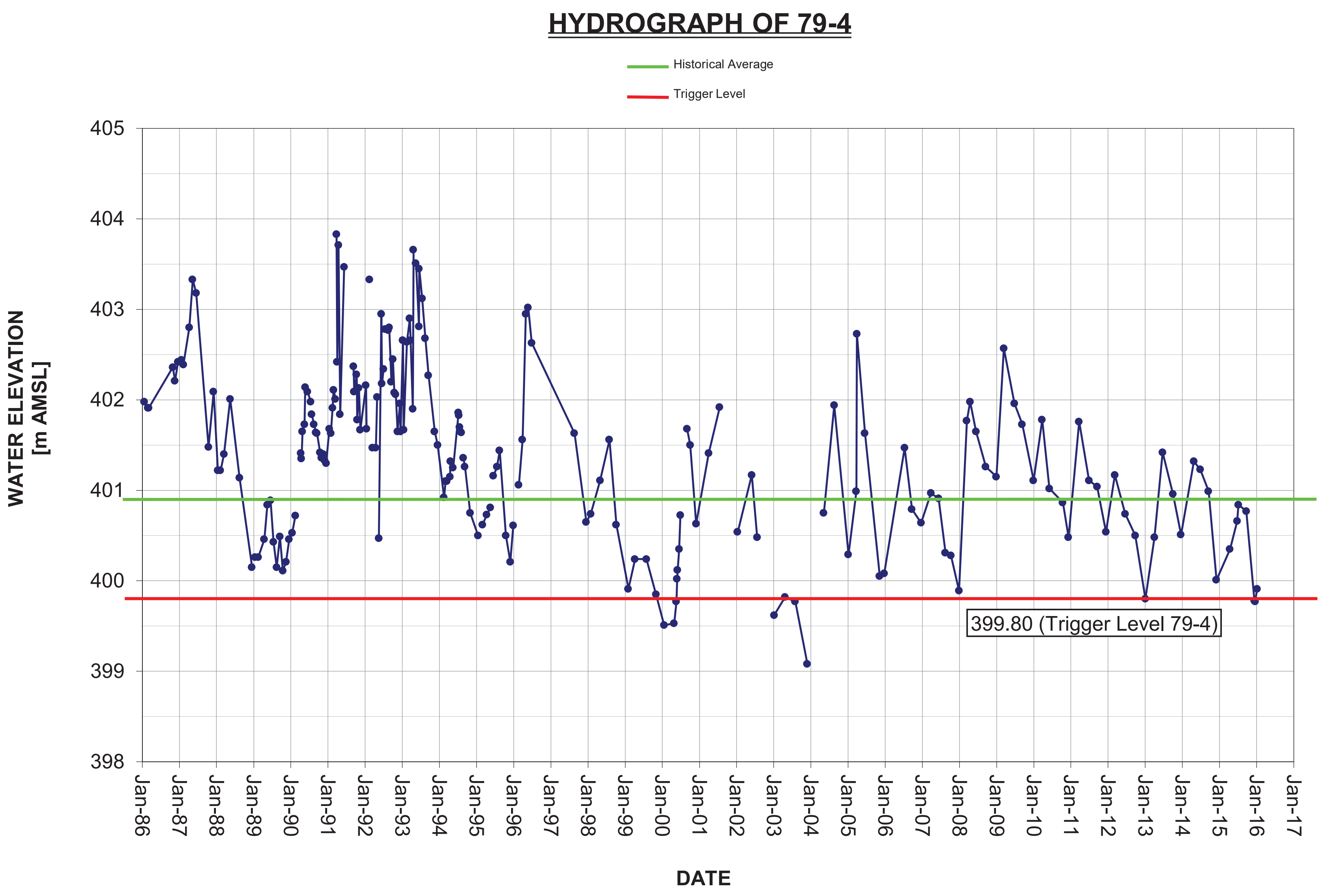
Date: Jan 2016

Drawn By: AR

2015 Annual Monitoring Report
Caledon Sand and Gravel Inc. – James Dick Construction Ltd.

Lots 12, 13 & PT14, Concessions 1 & 2 EHS
Town of Caledon, Regional Municipality of Peel

Figure 7: Hydrograph of 88-1



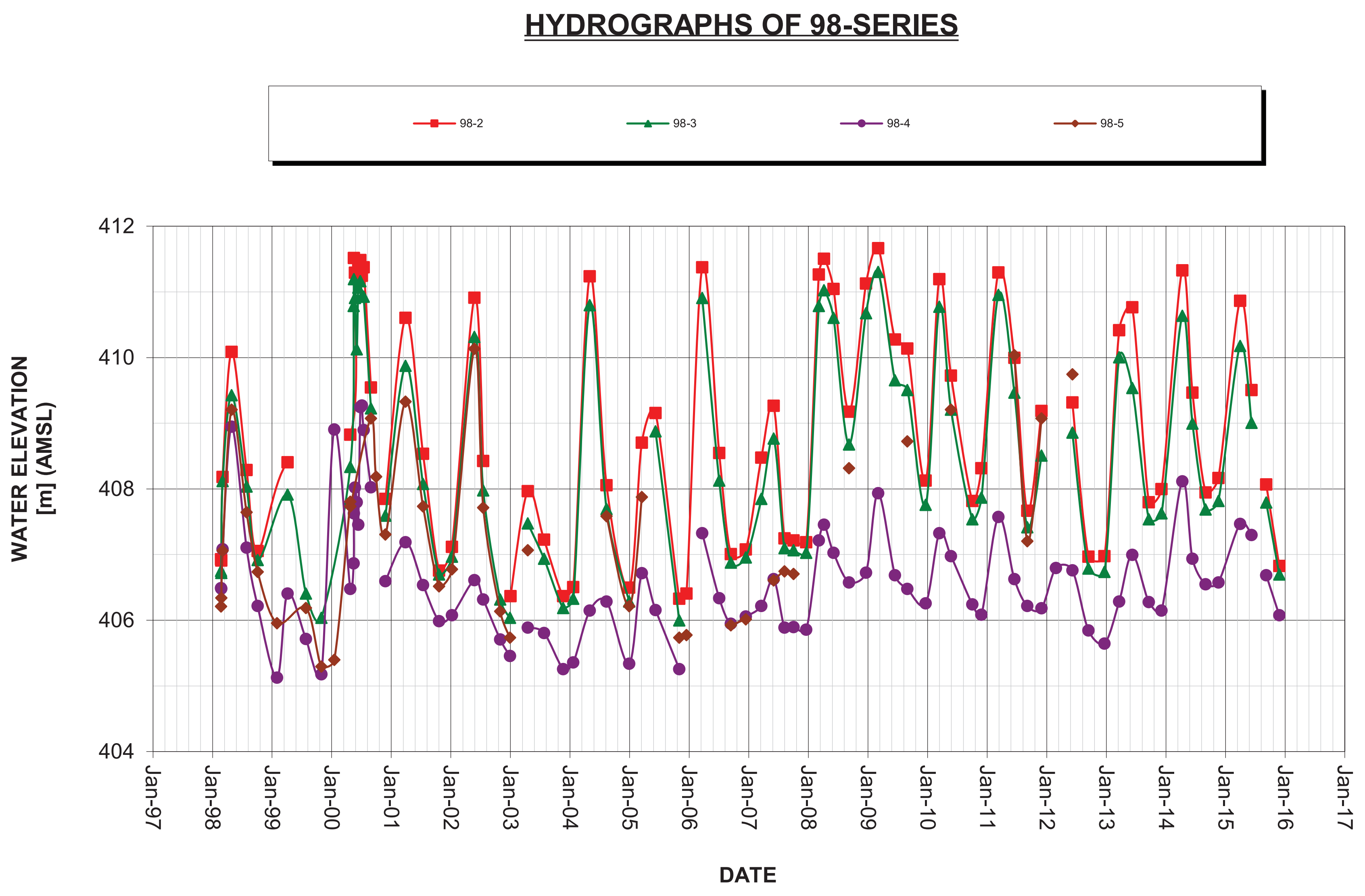
Harden
Environmental
Services Ltd.

Project No: 9401
Date: Jan 2016
Drawn By: AR

2015 Annual Monitoring Report
Caledon Sand and Gravel Inc. – James Dick Construction Ltd.

Lots 12, 13 & PT14, Concessions 1 & 2 EHS
Town of Caledon, Regional Municipality of Peel

Figure 8: Hydrograph of 79-4



Harden
Environmental
Services Ltd.

Project No: 9401

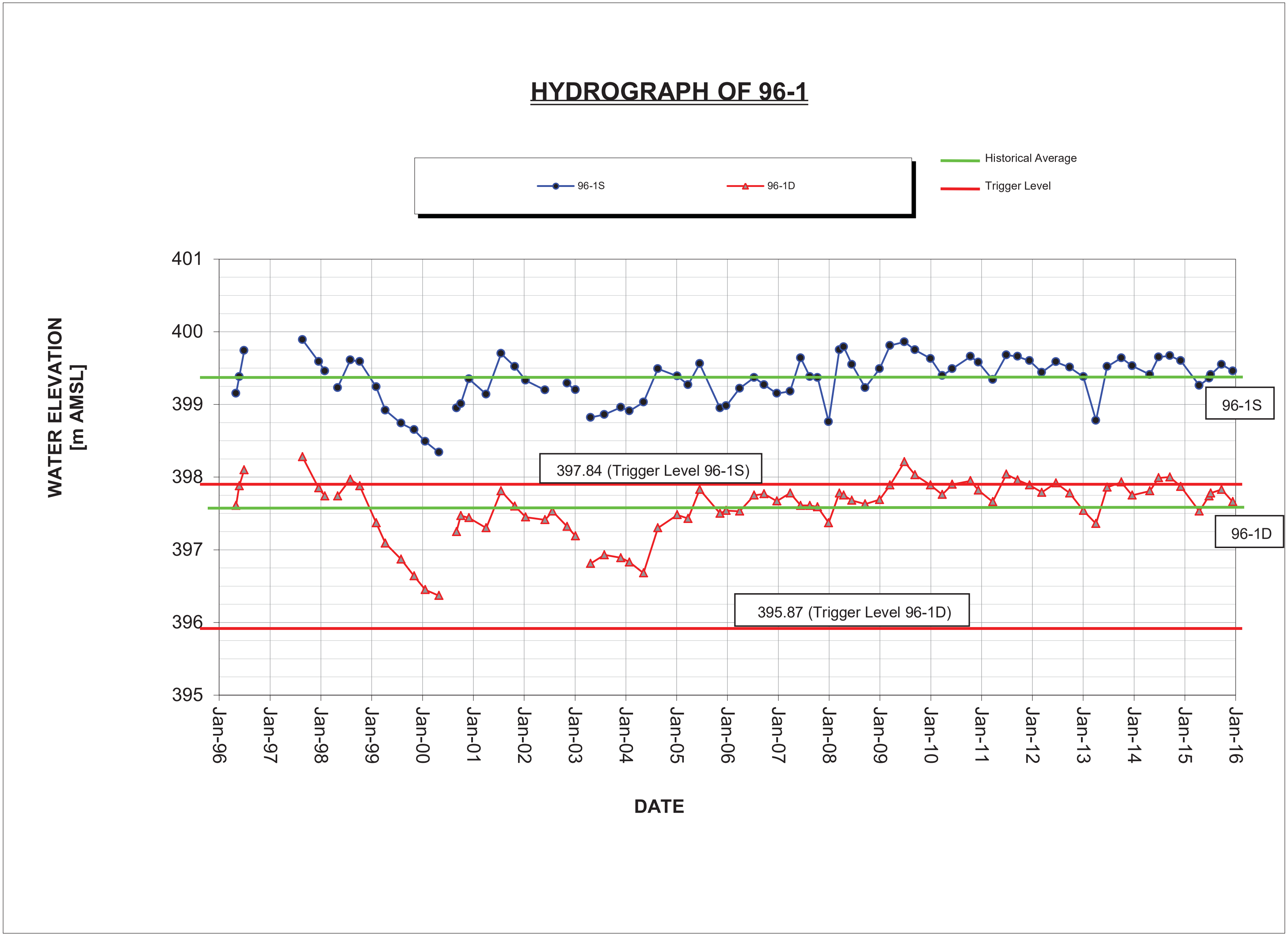
Date: Jan 2016

Drawn By: AR

2015 Annual Monitoring Report
Caledon Sand and Gravel Inc. – James Dick Construction Ltd.

Lots 12, 13 & PT14, Concessions 1 & 2 EHS
Town of Caledon, Regional Municipality of Peel

Figure 9: Hydrographs of 98 Series



Harden Environmental Services Ltd.

Project No: 9401

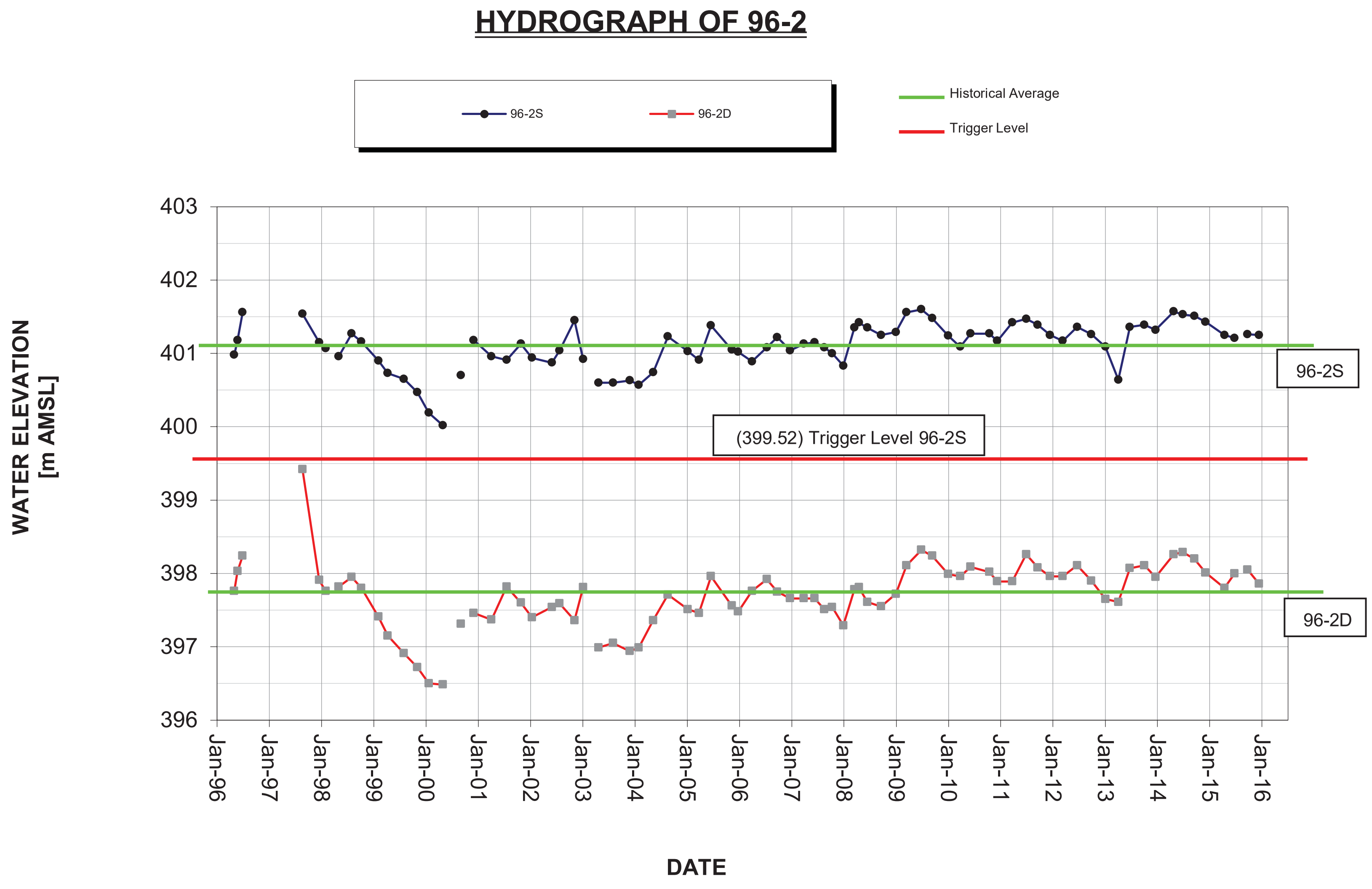
Date: Jan 2016

Drawn By: AR

2015 Annual Monitoring Report
Caledon Sand and Gravel Inc. – James Dick Construction Ltd.

Lots 12, 13 & PT14, Concessions 1 & 2 EHS
Town of Caledon, Regional Municipality of Peel

Figure 10: Hydrograph of 96-1



Harden
Environmental
Services Ltd.

Project No: 9401

Date: Jan 2016

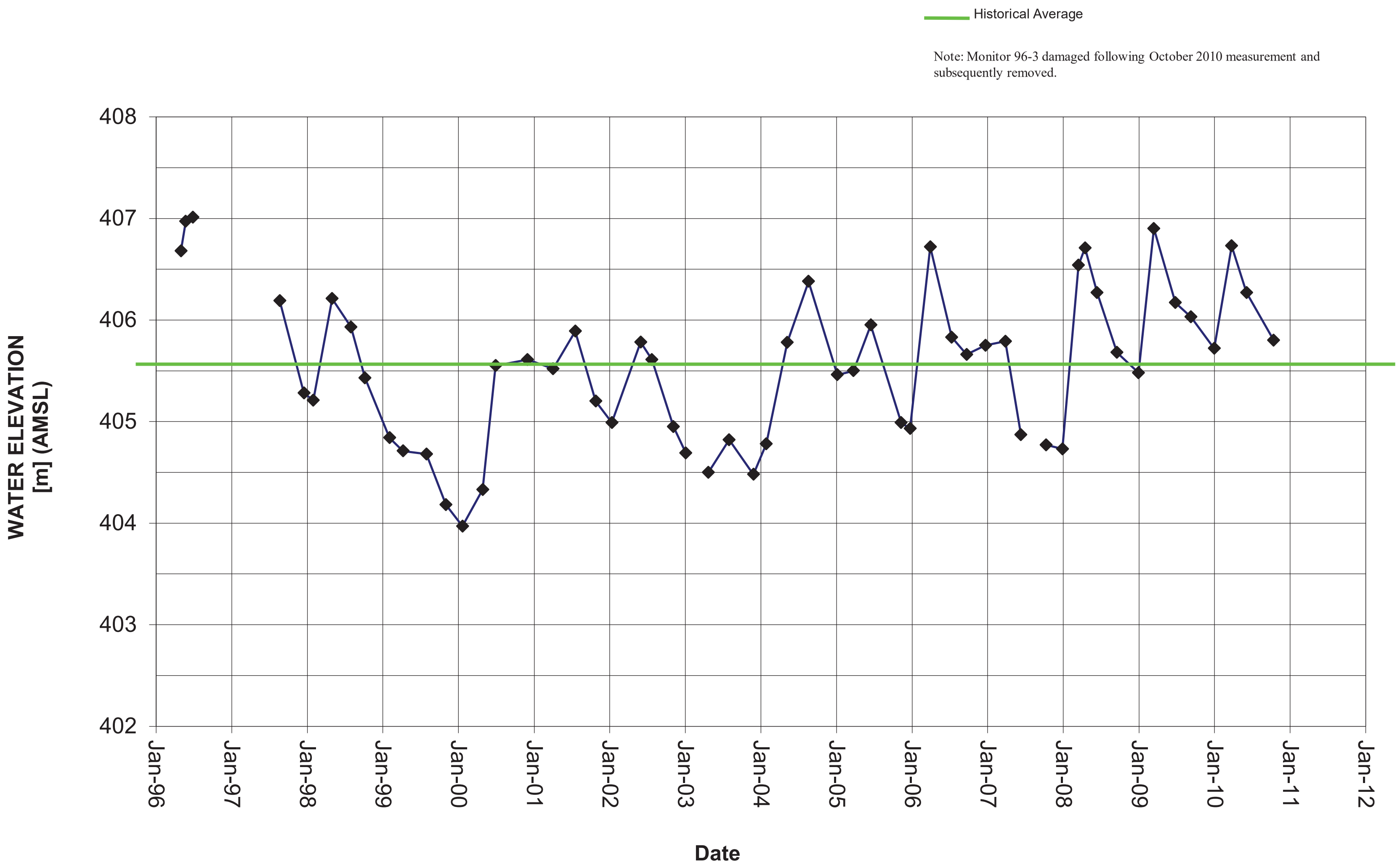
Drawn By: AR

2015 Annual Monitoring Report
Caledon Sand and Gravel Inc. – James Dick Construction Ltd.

Lots 12, 13 & PT14, Concessions 1 & 2 EHS
Town of Caledon, Regional Municipality of Peel

Figure 11: Hydrograph of 96-2

HYDROGRAPH OF 96-3



Note: Monitor 96-3 damaged following October 2010 measurement and subsequently removed.

Harden Environmental Services Ltd.

Project No: 9401

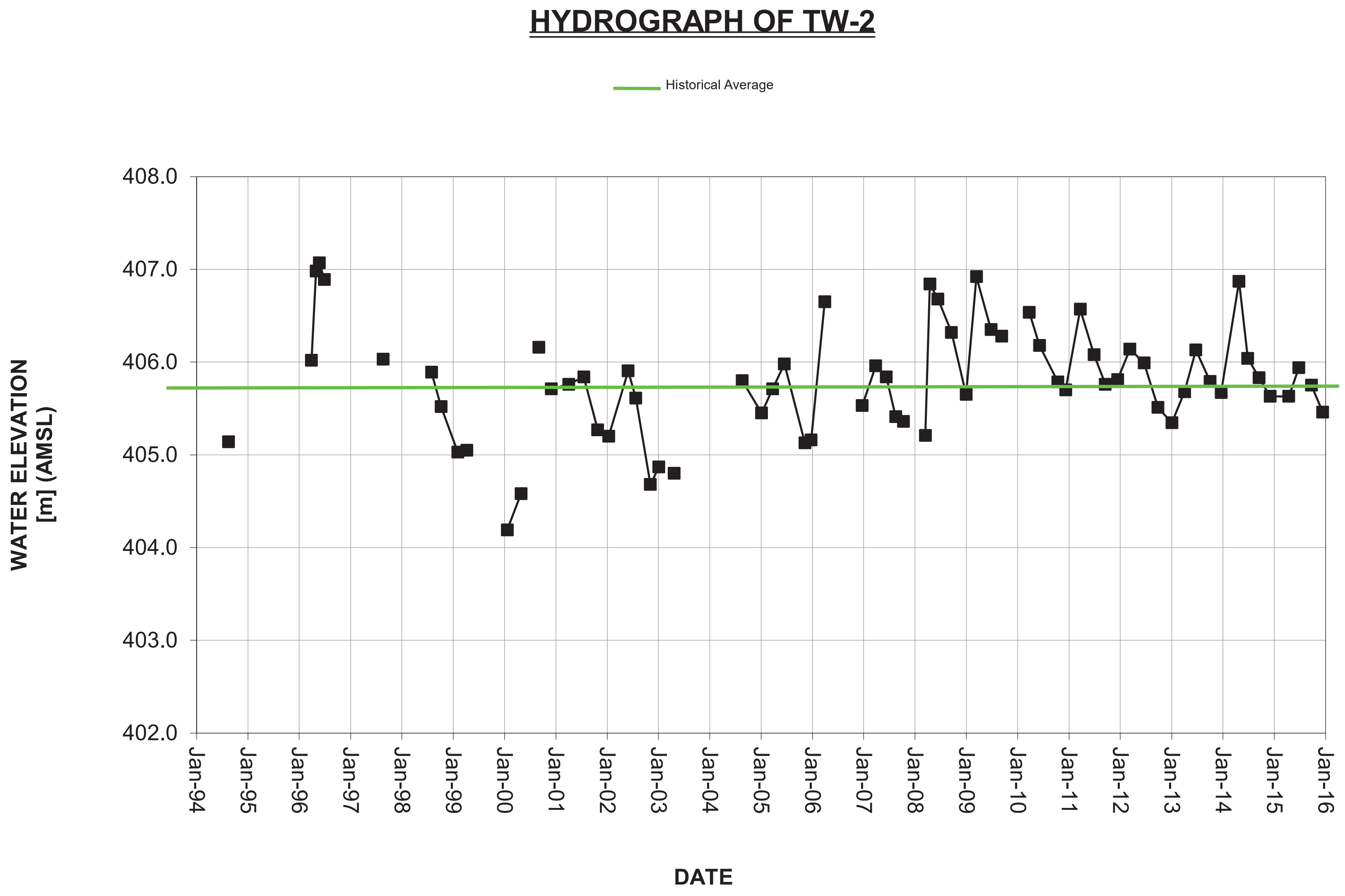
Date: Jan 2016

Drawn By: AR

2015 Annual Monitoring Report
Caledon Sand and Gravel Inc. – James Dick Construction Ltd.

Lots 12, 13 & PT14, Concessions 1 & 2 EHS
Town of Caledon, Regional Municipality of Peel

Figure 12: Hydrograph of 96-3



Harden
Environmental
Services Ltd.

Project No: 9401

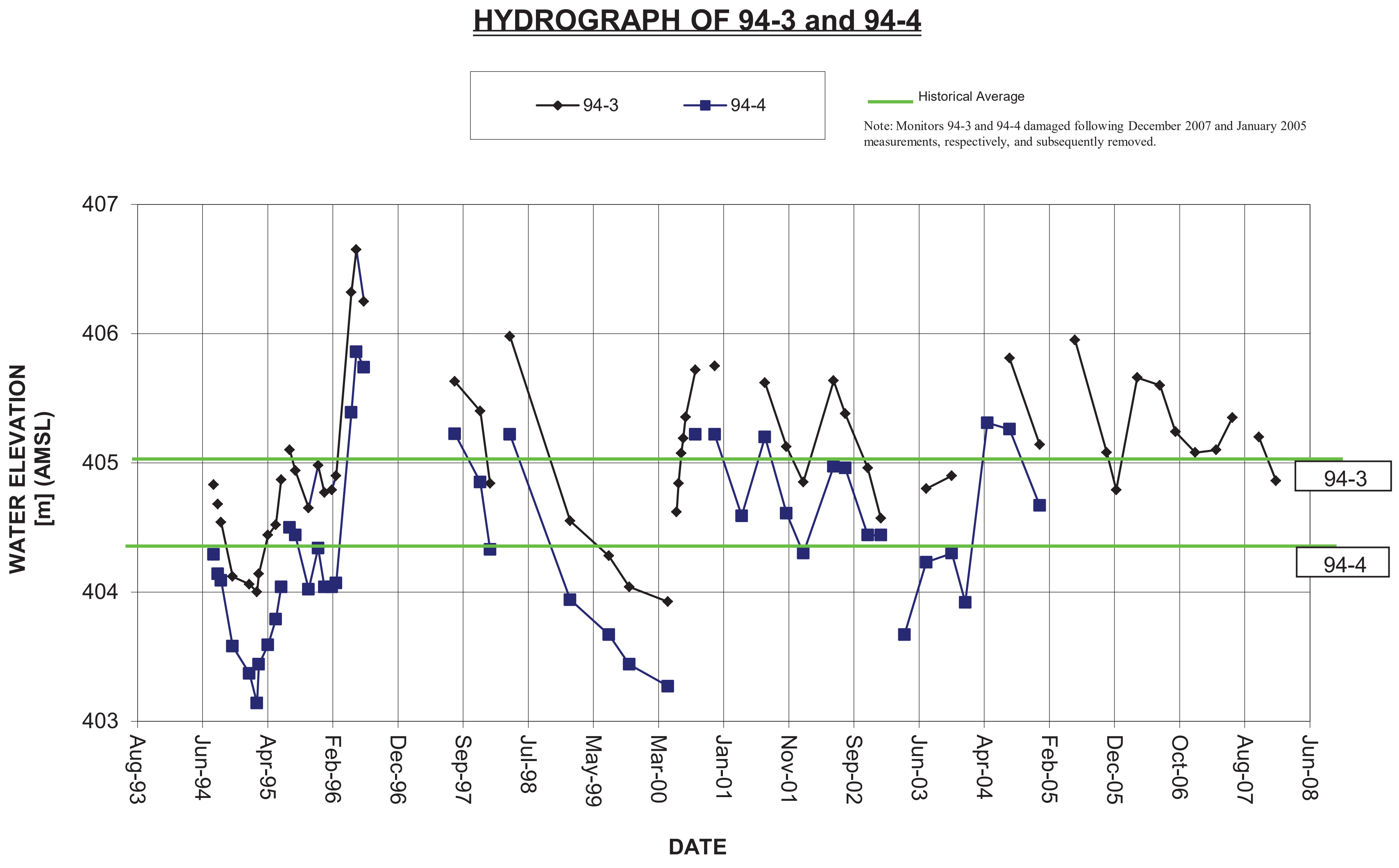
Date: Jan 2016

Drawn By: AR

2015 Annual Monitoring Report
Caledon Sand and Gravel Inc. – James Dick Construction Ltd.

Lots 12, 13 & PT14, Concessions 1 & 2 EHS
Town of Caledon, Regional Municipality of Peel

Figure 13: Hydrograph of TW-2



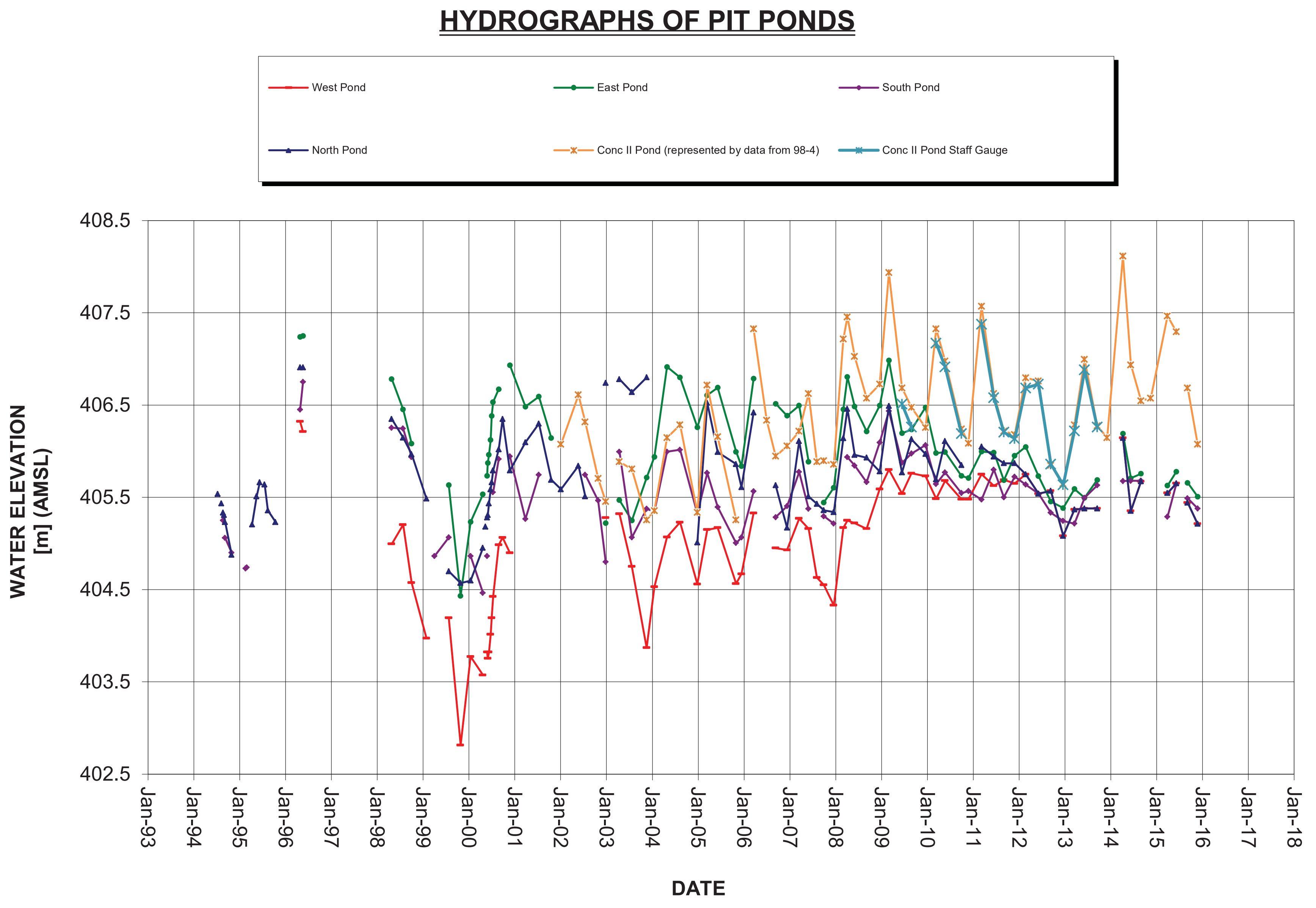
Harden Environmental Services Ltd.

Project No: 9401
Date: Jan 2016
Drawn By: AR

2015 Annual Monitoring Report
Caledon Sand and Gravel Inc. – James Dick Construction Ltd.

Lots 12, 13 & PT14, Concessions 1 & 2 EHS
Town of Caledon, Regional Municipality of Peel

Figure 14: Hydrograph of 94-3 and 94-4



Harden
Environmental
Services Ltd.

Project No: 9401

Date: Jan 2016

Drawn By: AR

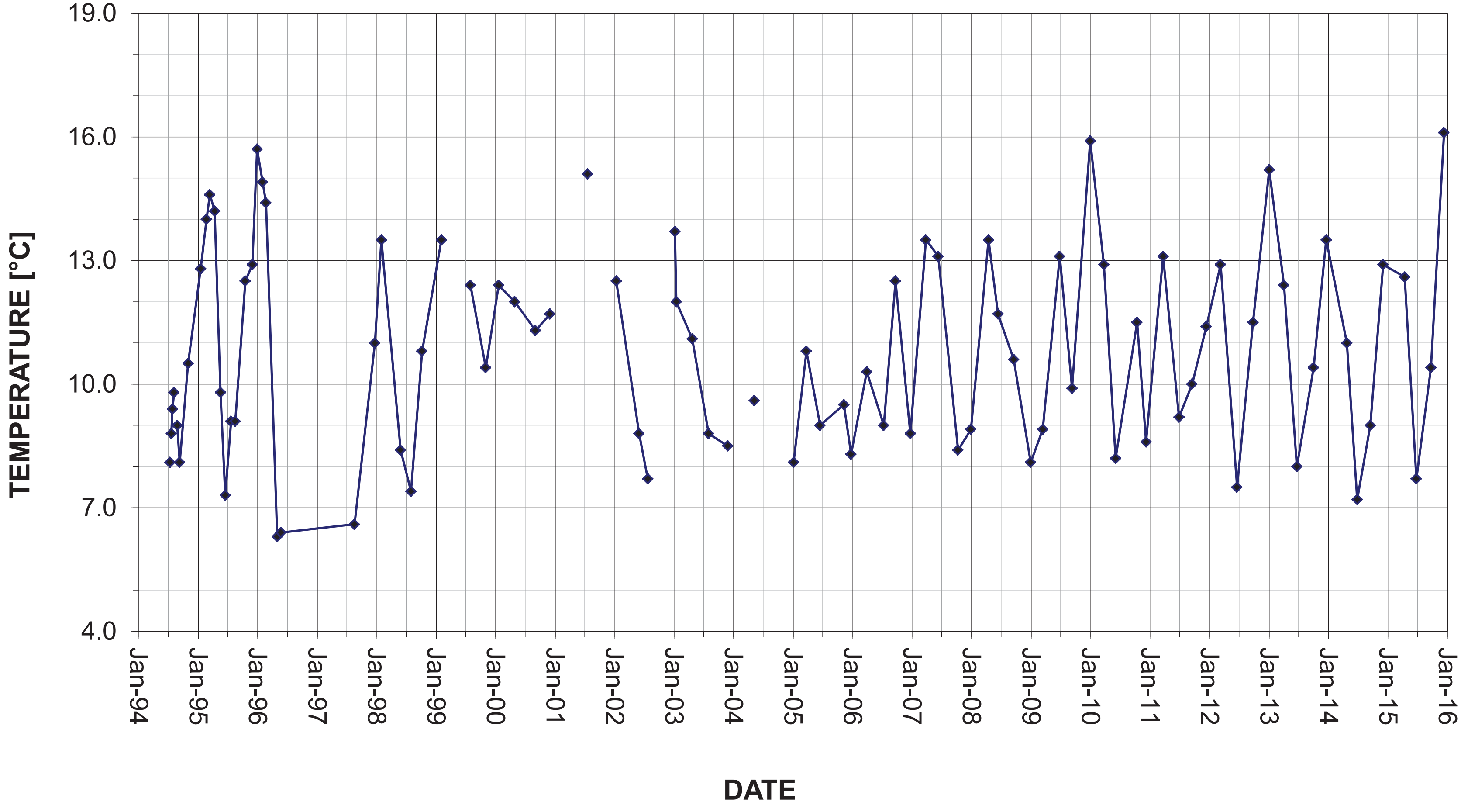
2015 Annual Monitoring Report
Caledon Sand and Gravel Inc. – James Dick Construction Ltd.

Lots 12, 13 & PT14, Concessions 1 & 2 EHS
Town of Caledon, Regional Municipality of Peel

Figure 15: Hydrographs of Pit Ponds

GROUNDWATER TEMPERATURE

- Monitor 79-4 -



Harden
Environmental
Services Ltd.

Project No: 9401

Date: Jan 2016

Drawn By: AR

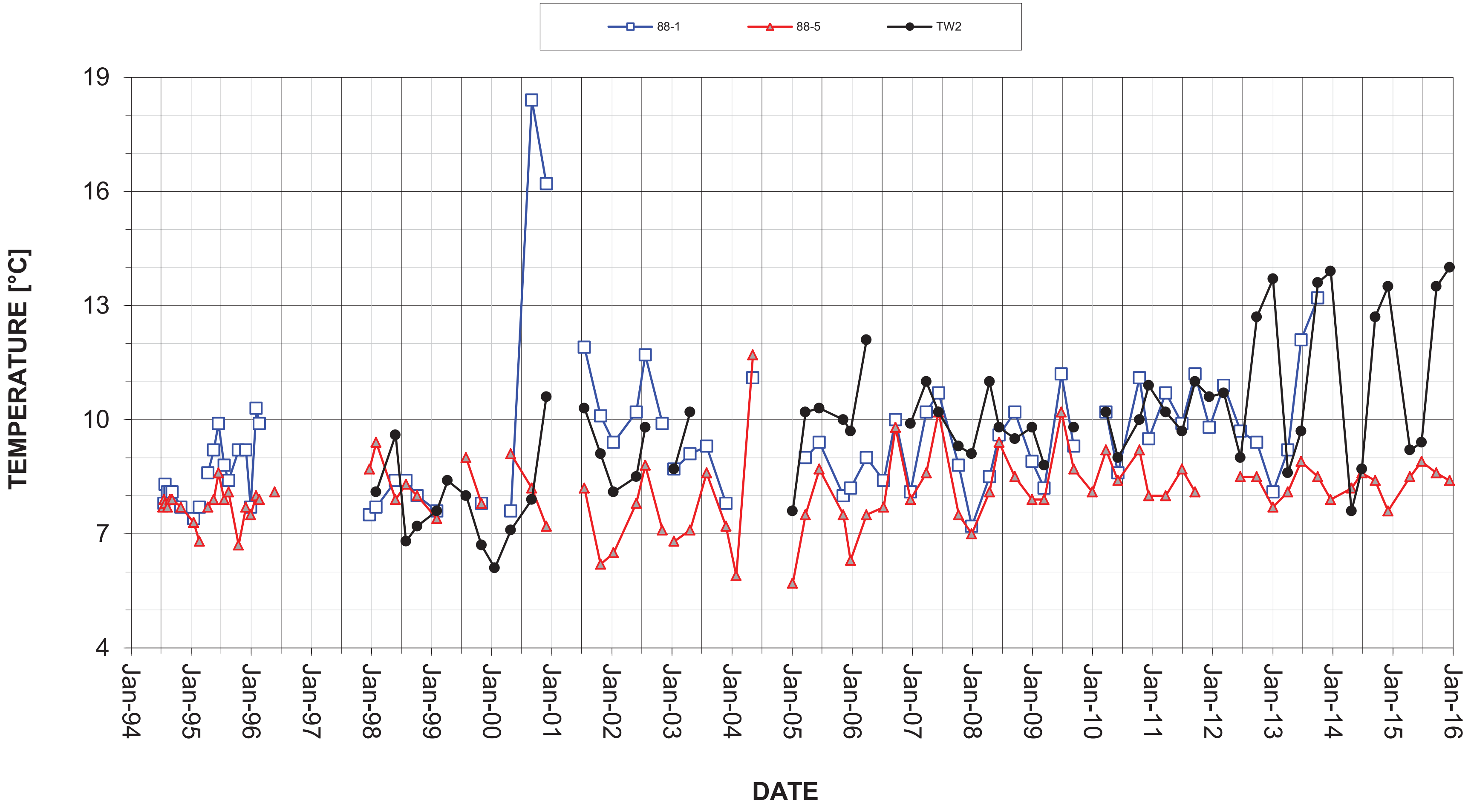
2015 Annual Monitoring Report
Caledon Sand and Gravel Inc. – James Dick Construction Ltd.

Lots 12, 13 & PT14, Concessions 1 & 2 EHS
Town of Caledon, Regional Municipality of Peel

Figure 16: Groundwater Temperature 79-4

GROUNDWATER TEMPERATURES

- Monitors Downgradient of Warnock Lake -



Note: Temperature readings measured from top of water column in 2004 and 2005, creating greater variability in the data.

Harden Environmental Services Ltd.

Project No: 9401

Date: Jan 2016

Drawn By: AR

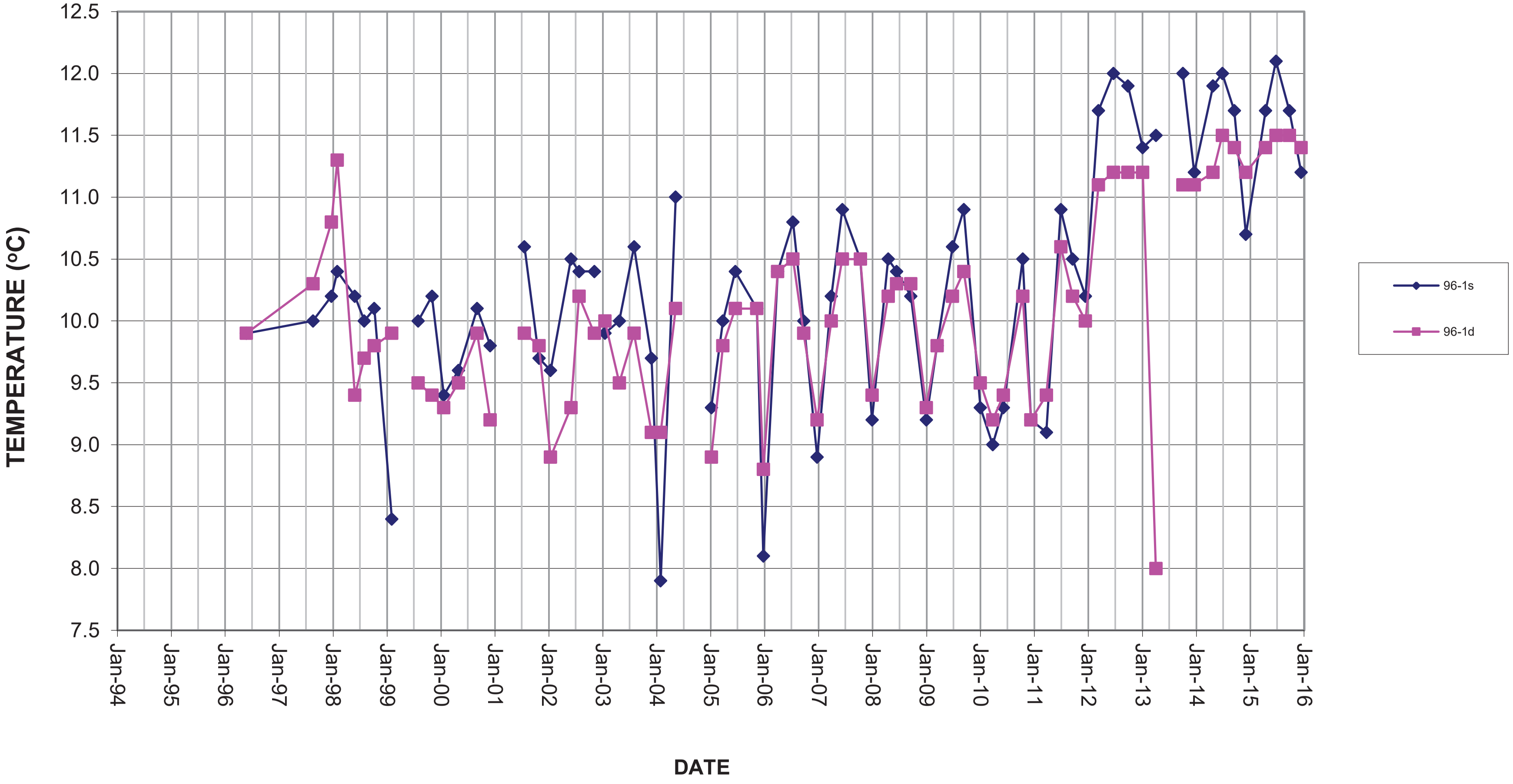
2015 Annual Monitoring Report
Caledon Sand and Gravel Inc. – James Dick Construction Ltd.

Lots 12, 13 & PT14, Concessions 1 & 2 EHS
Town of Caledon, Regional Municipality of Peel

Figure 17: Groundwater Temperatures - Monitors Downgradient of Warnock Lake

GROUNDWATER TEMPERATURES

- Monitor 96-1S & 96-1D -



Note: Temperature readings measured from top of water column in 2004 and 2005, creating greater variability in the data.

Harden Environmental Services Ltd.

Project No: 9401

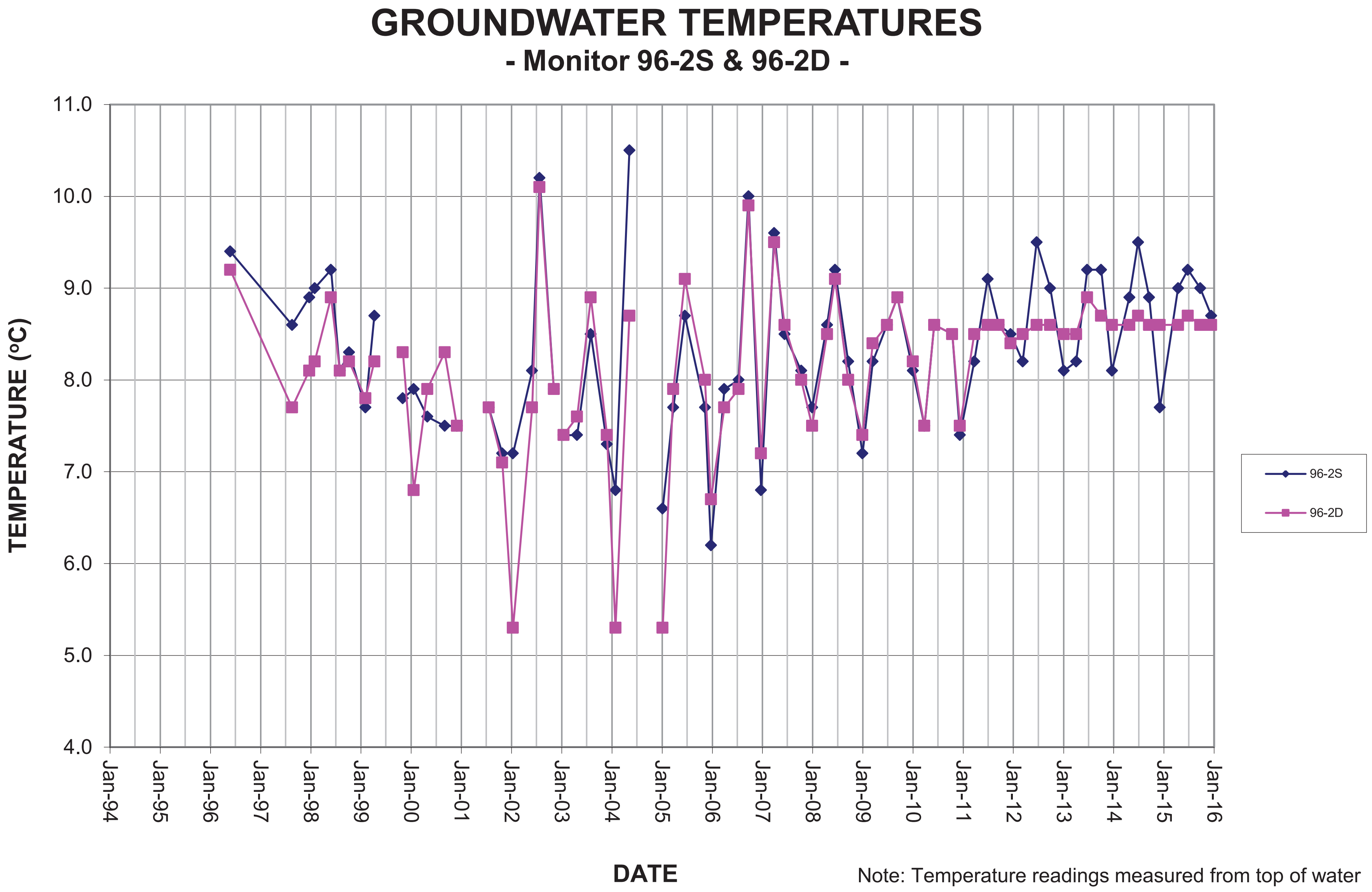
Date: Jan 2016

Drawn By: AR

2015 Annual Monitoring Report
Caledon Sand and Gravel Inc. – James Dick Construction Ltd.

Lots 12, 13 & PT14, Concessions 1 & 2 EHS
Town of Caledon, Regional Municipality of Peel

Figure 18: Groundwater Temperatures - Monitor 96-1S and 96-1D



Note: Temperature readings measured from top of water column in 2004 and 2005, creating greater variability in the data.

Harden
Environmental
Services Ltd.

Project No: 9401

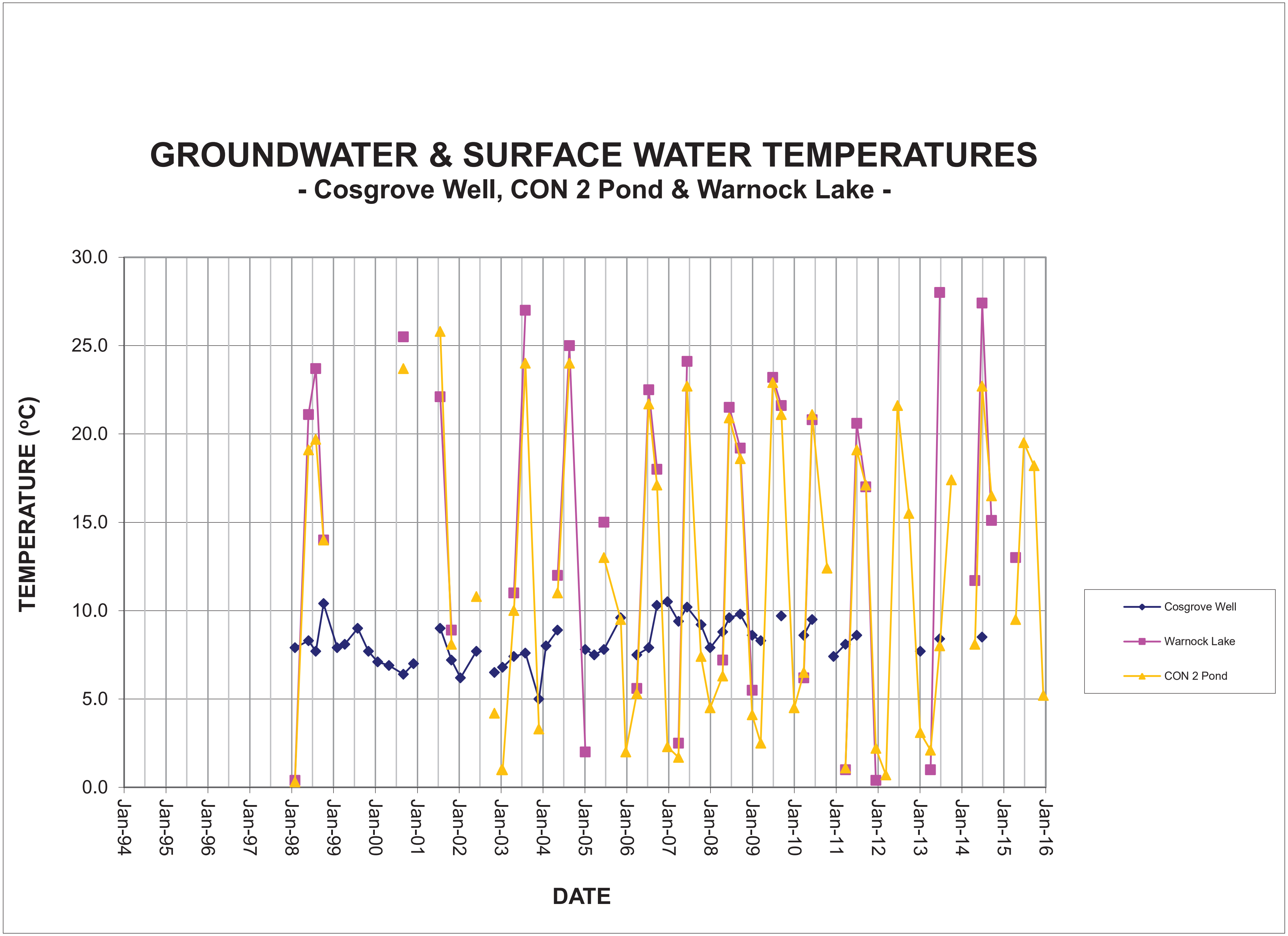
Date: Jan 2016

Drawn By: AR

2015 Annual Monitoring Report
Caledon Sand and Gravel Inc. – James Dick Construction Ltd.

Lots 12, 13 & PT14, Concessions 1 & 2 EHS
Town of Caledon, Regional Municipality of Peel

Figure 19: Groundwater Temperatures – Monitor 96-2S and 96-2D



Harden Environmental Services Ltd.

Project No: 9401
Date: Jan 2016
Drawn By: AR

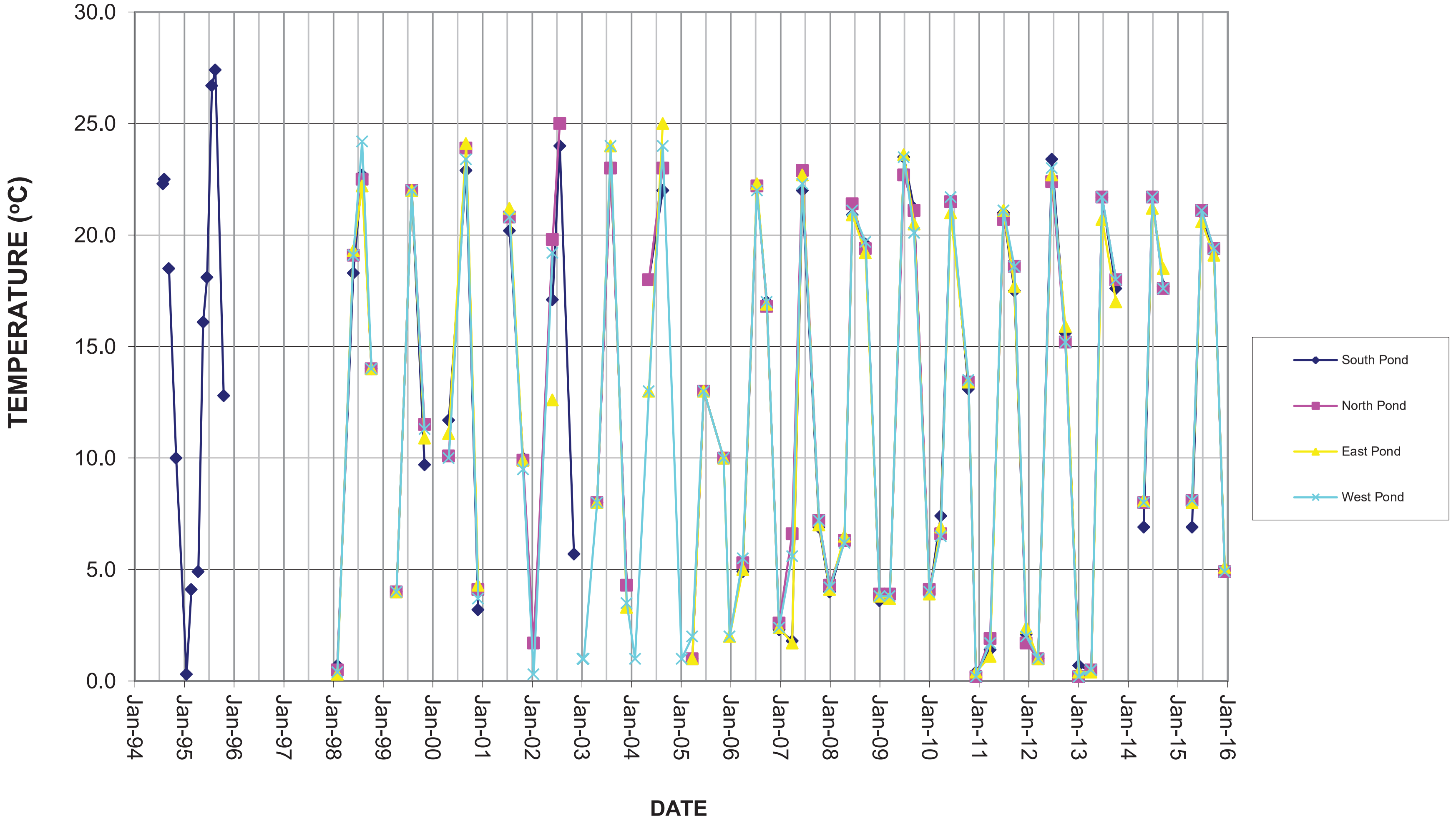
2015 Annual Monitoring Report
Caledon Sand and Gravel Inc. – James Dick Construction Ltd.

Lots 12, 13 & PT14, Concessions 1 & 2 EHS
Town of Caledon, Regional Municipality of Peel

Figure 20: Groundwater and Surface Water Temperatures – Cosgrove Well, Con 2 Pond and Warnock Lake

SURFACE WATER TEMPERATURES

- North, South, East & West Ponds -



Harden Environmental Services Ltd.

Project No: 9401

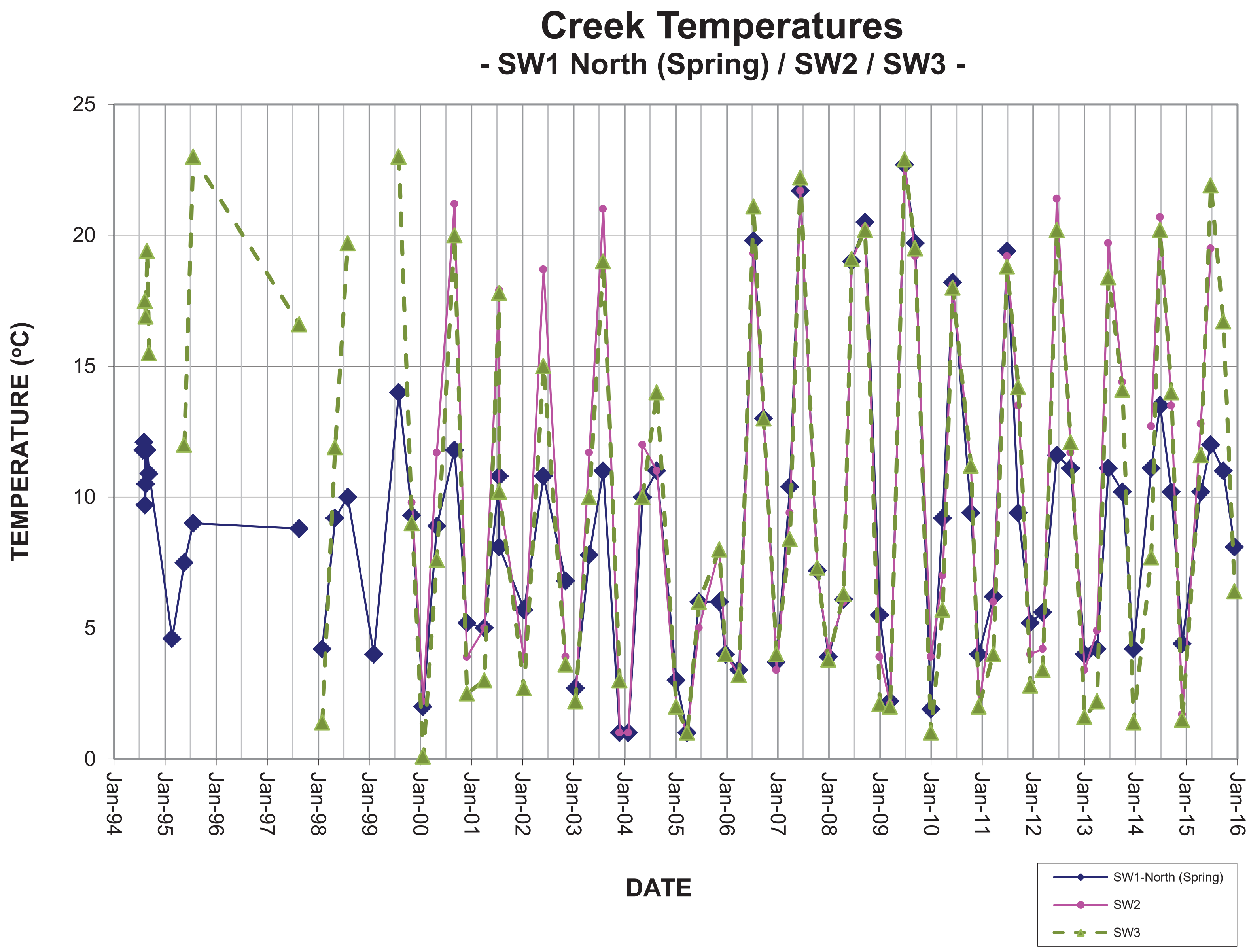
Date: Jan 2016

Drawn By: AR

2015 Annual Monitoring Report
Caledon Sand and Gravel Inc. – James Dick Construction Ltd.

Lots 12, 13 & PT14, Concessions 1 & 2 EHS
Town of Caledon, Regional Municipality of Peel

Figure 21: Surface Water Temperatures – North, South, East and West Ponds



Harden Environmental Services Ltd.

Project No: 9401

Date: Jan 2016

Drawn By: AR

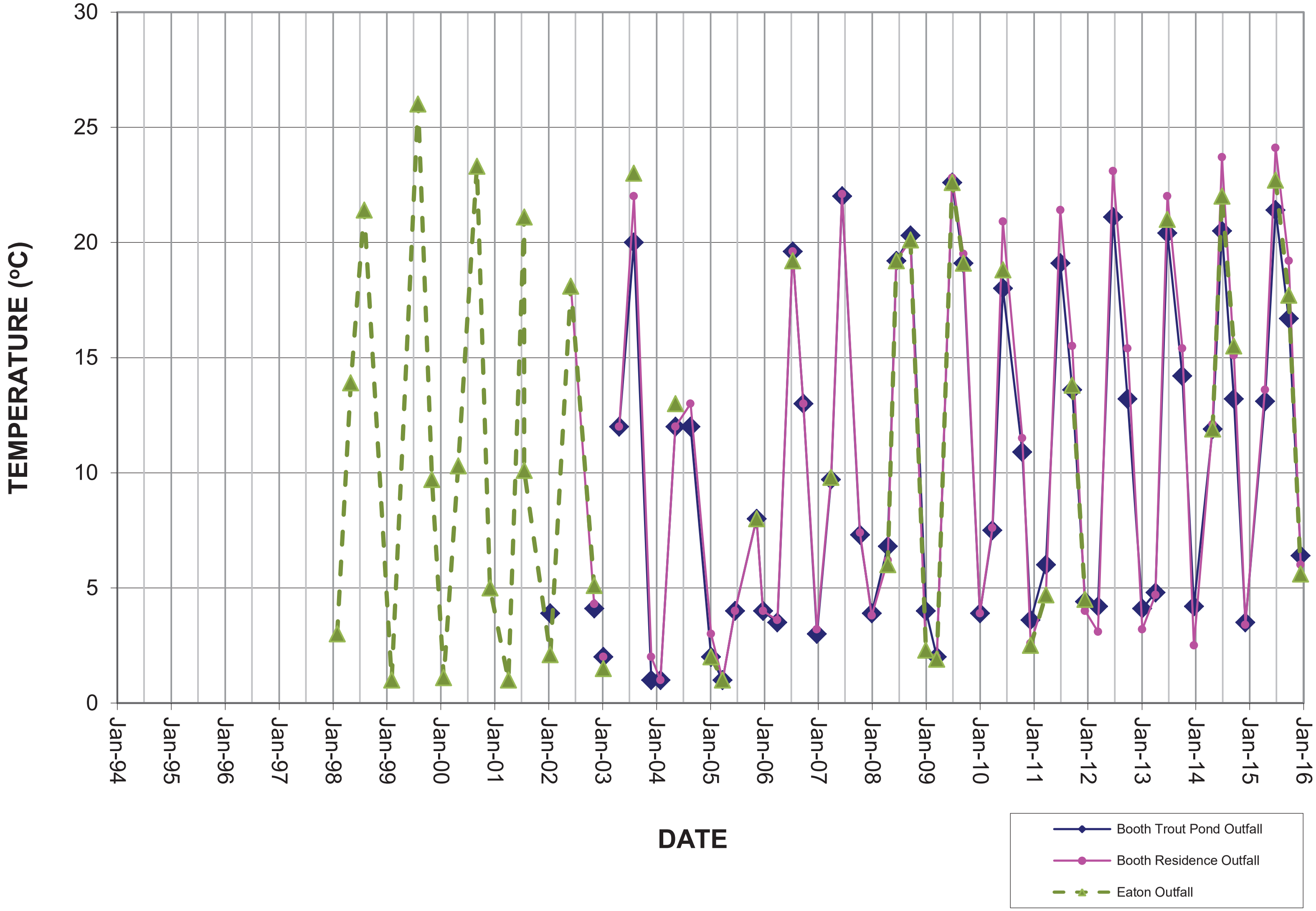
2015 Annual Monitoring Report
Caledon Sand and Gravel Inc. – James Dick Construction Ltd.

Lots 12, 13 & PT14, Concessions 1 & 2 EHS
Town of Caledon, Regional Municipality of Peel

Figure 22: Creek Temperatures - SW1 North (Spring) / SW2 / SW3

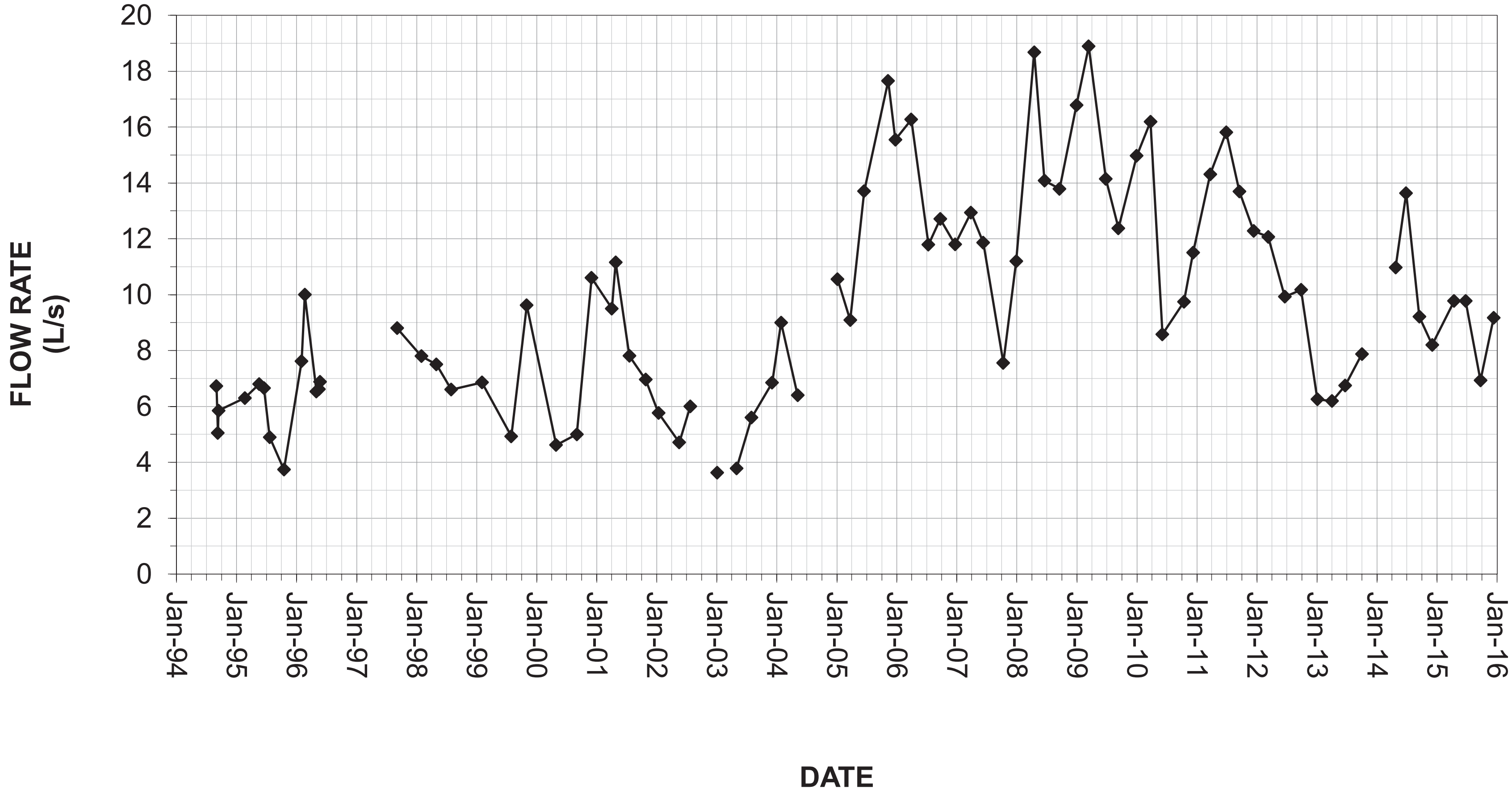
Temperatures

- Booth Trout Pond Outfall / Booth Residence Pond Outfall / Eaton Outfall -



Harden Environmental Services Ltd.	**Project No:** 9401 **Date:** Jan 2016 **Drawn By:** AR	2015 Annual Monitoring Report Caledon Sand and Gravel Inc. – James Dick Construction Ltd. Lots 12, 13 & PT14, Concessions 1 & 2 EHS Town of Caledon, Regional Municipality of Peel	**Figure 23: Temperatures- Booth Trout Pond Outfall / Booth Residence Pond Outfall / Eaton Outfall**

SILVER CREEK STATION SW1 (NORTH) SPRING FLOW RATE



Harden
Environmental
Services Ltd.

Project No: 9401

Date: Jan 2016

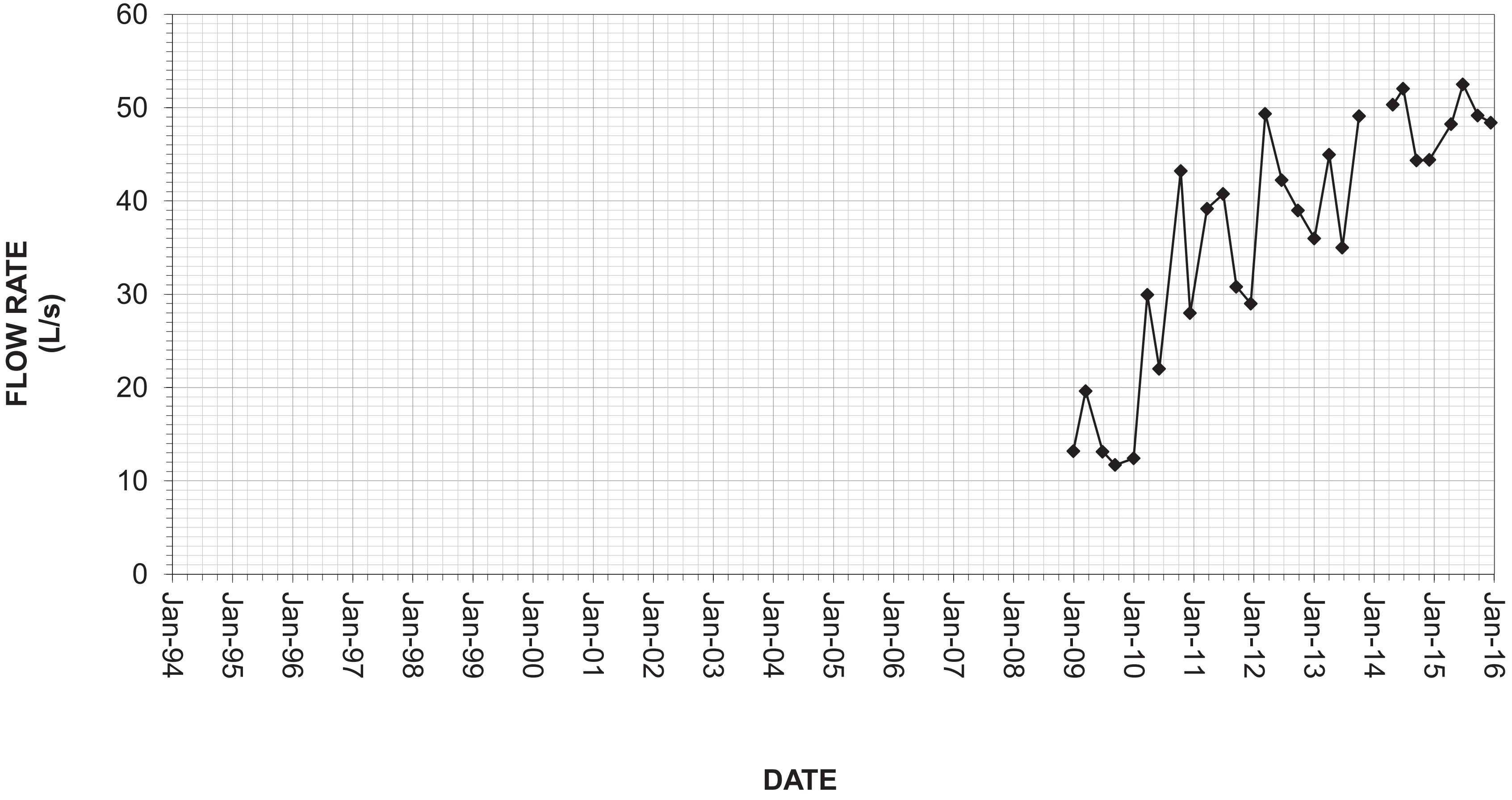
Drawn By: AR

2015 Annual Monitoring Report
Caledon Sand and Gravel Inc. – James Dick Construction Ltd.

Lots 12, 13 & PT14, Concessions 1 & 2 EHS
Town of Caledon, Regional Municipality of Peel

Figure 24: Streamflow SW1 (North) - Spring

SILVER CREEK STATION SW1 (SOUTH) WETLAND FLOW RATE



Harden
Environmental
Services Ltd.

Project No: 9401

Date: Jan 2016

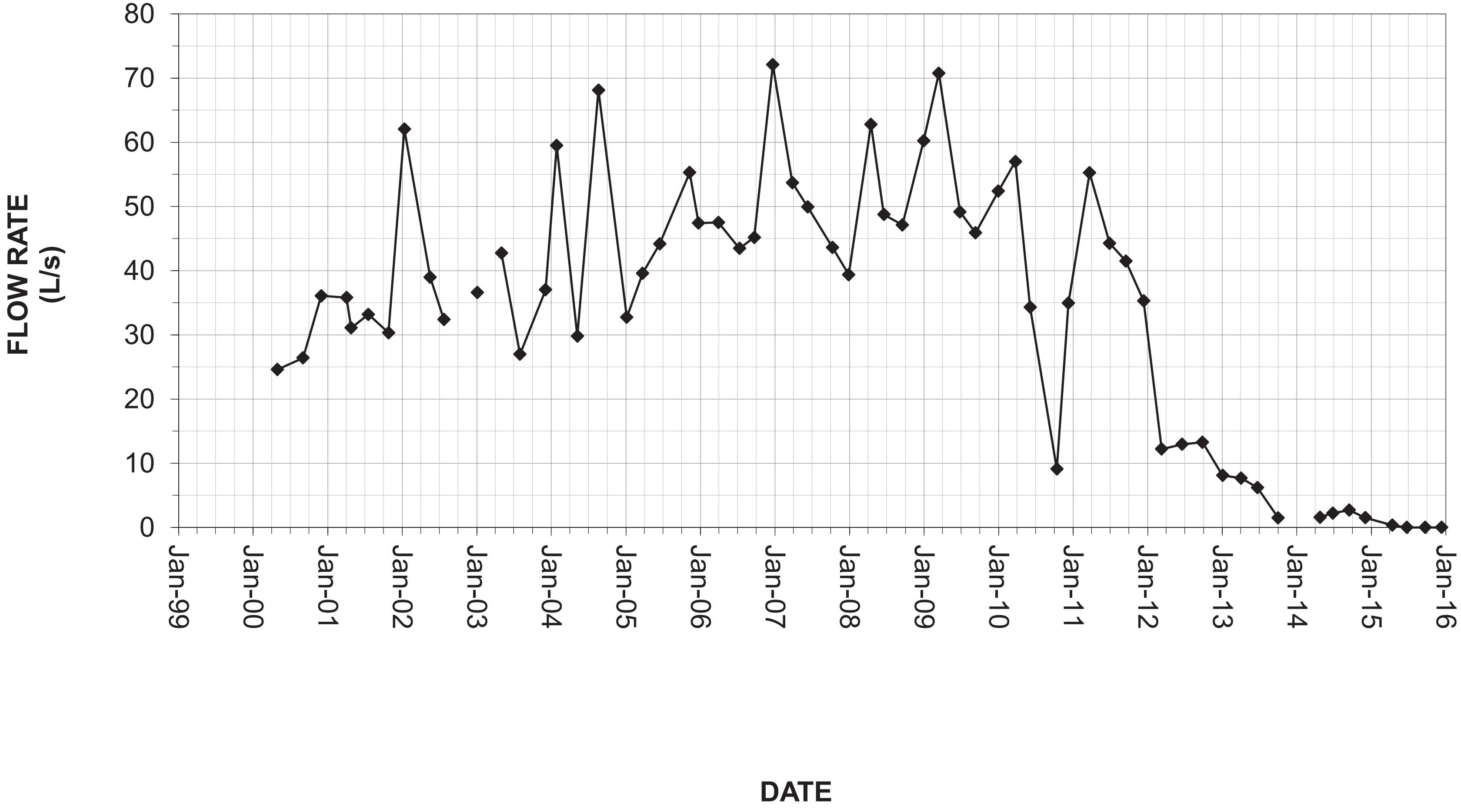
Drawn By: AR

2015 Annual Monitoring Report
Caledon Sand and Gravel Inc. – James Dick Construction Ltd.

Lots 12, 13 & PT14, Concessions 1 & 2 EHS
Town of Caledon, Regional Municipality of Peel

Figure 25: Streamflow SW1 (South) - Wetland

SILVER CREEK STATION SW2 FLOW RATE



Harden Environmental Services Ltd.

Project No: 9401

Date: Jan 2016

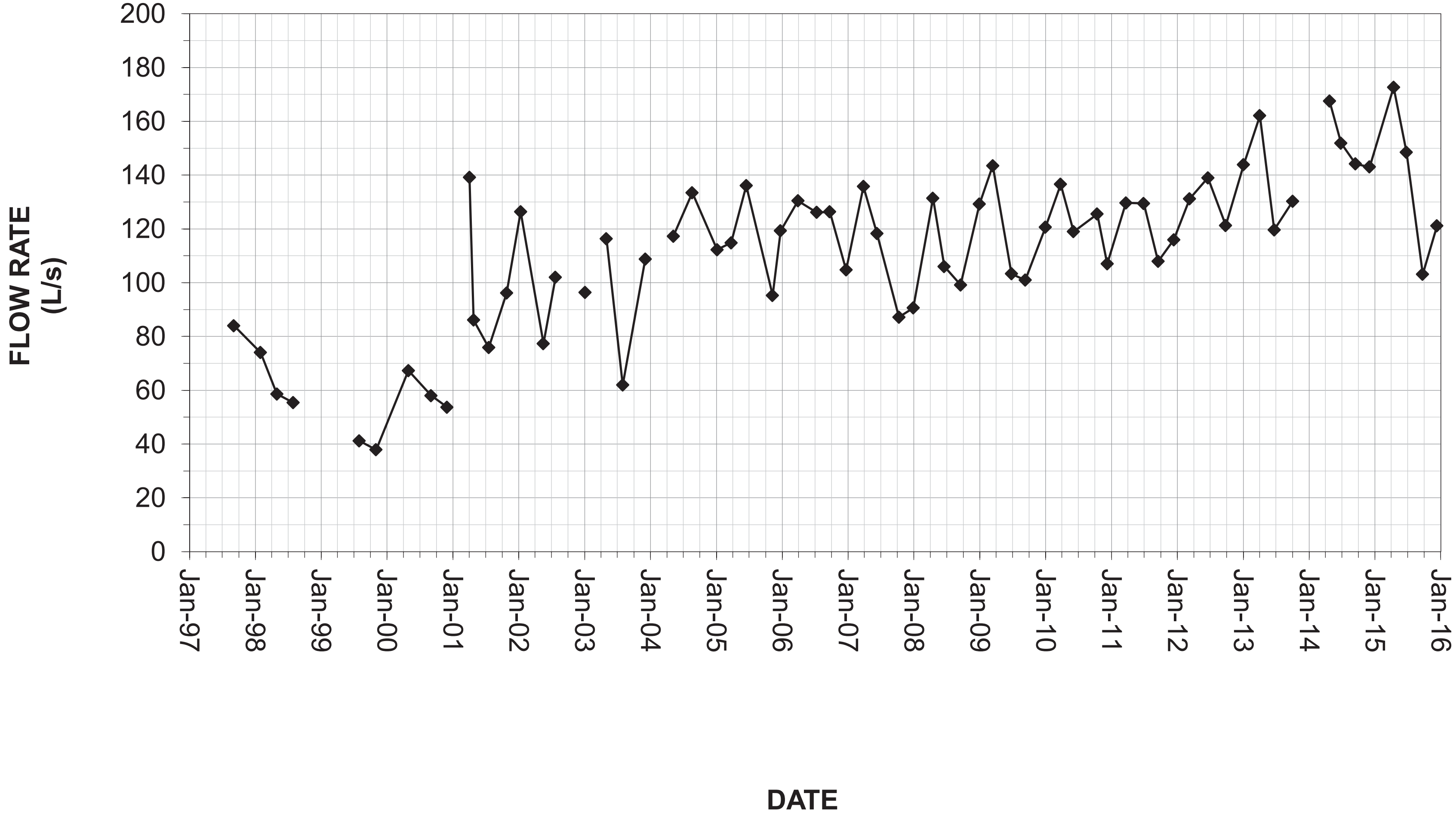
Drawn By: AR

2015 Annual Monitoring Report
Caledon Sand and Gravel Inc. – James Dick Construction Ltd.

Lots 12, 13 & PT14, Concessions 1 & 2 EHS
Town of Caledon, Regional Municipality of Peel

Figure 26: Streamflow SW2

SILVER CREEK STATION SW3 FLOW RATE



Harden
Environmental
Services Ltd.

Project No: 9401

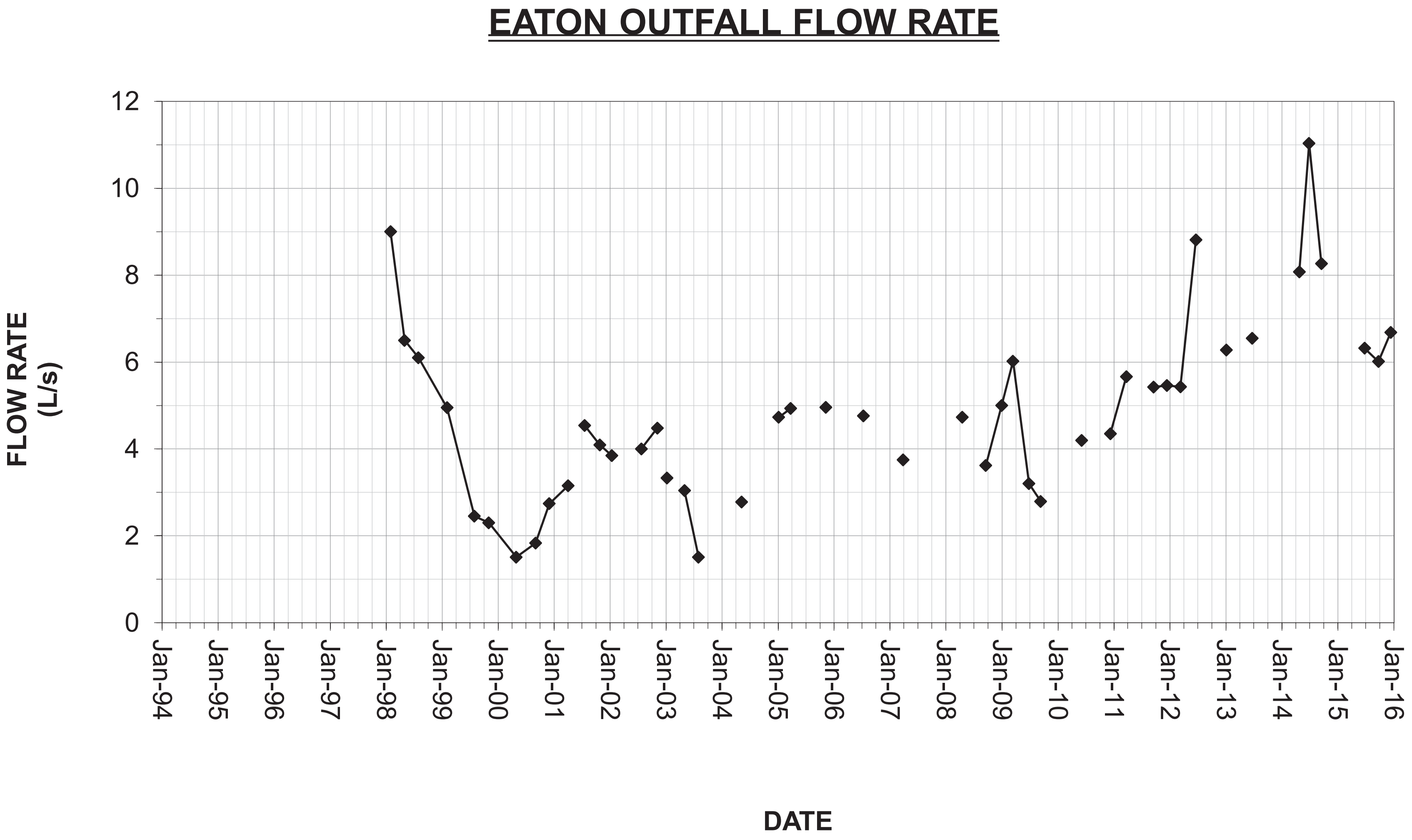
Date: Jan 2016

Drawn By: AR

2015 Annual Monitoring Report
Caledon Sand and Gravel Inc. – James Dick Construction Ltd.

Lots 12, 13 & PT14, Concessions 1 & 2 EHS
Town of Caledon, Regional Municipality of Peel

Figure 27: Streamflow SW3



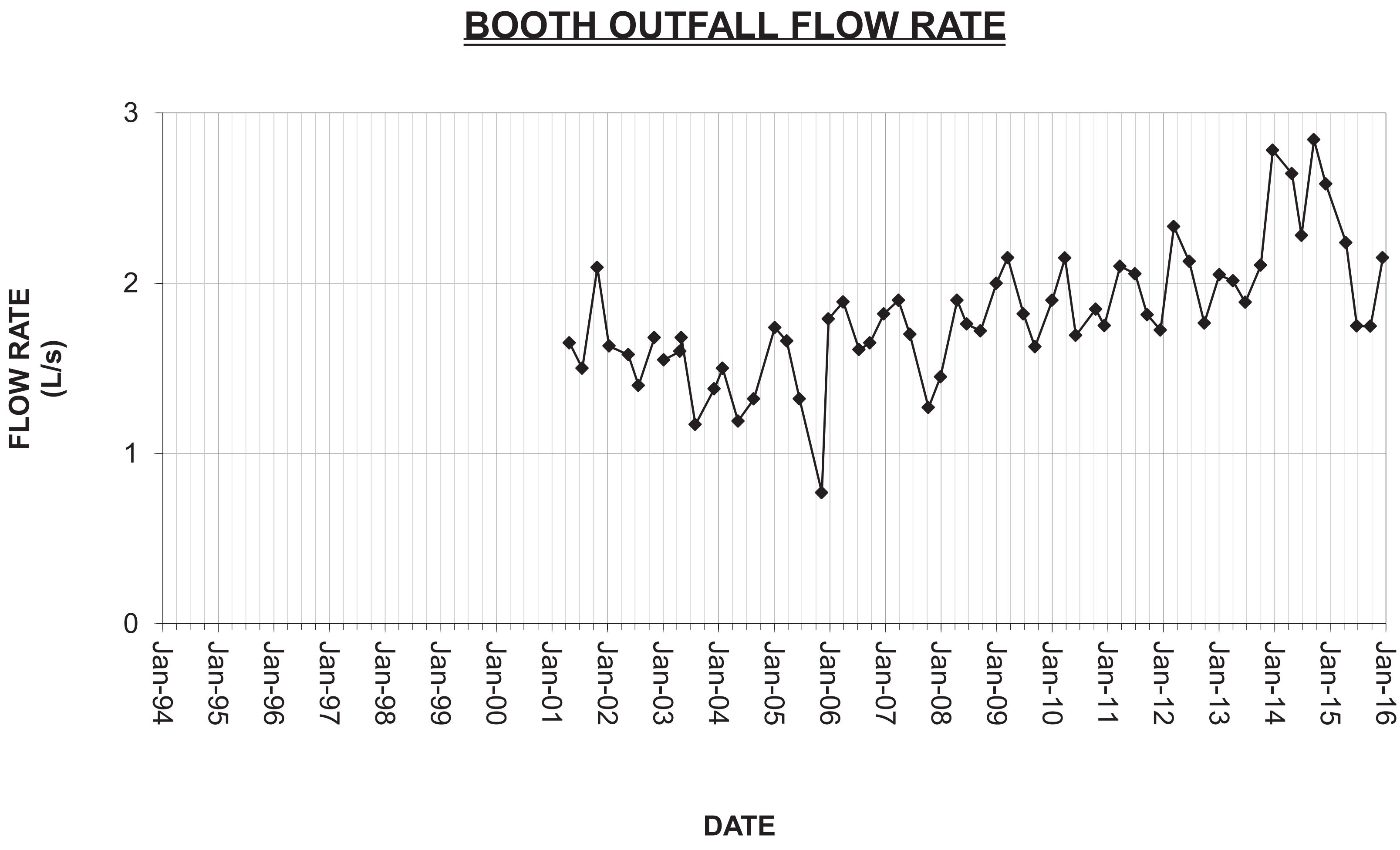
Harden
Environmental
Services Ltd.

Project No: 9401
Date: Jan 2016
Drawn By: AR

2015 Annual Monitoring Report
Caledon Sand and Gravel Inc. – James Dick Construction Ltd.

Lots 12, 13 & PT14, Concessions 1 & 2 EHS
Town of Caledon, Regional Municipality of Peel

Figure 28: Eaton Pond Outflow Flow Rate



Harden
Environmental
Services Ltd.

Project No: 9401

Date: Jan 2016

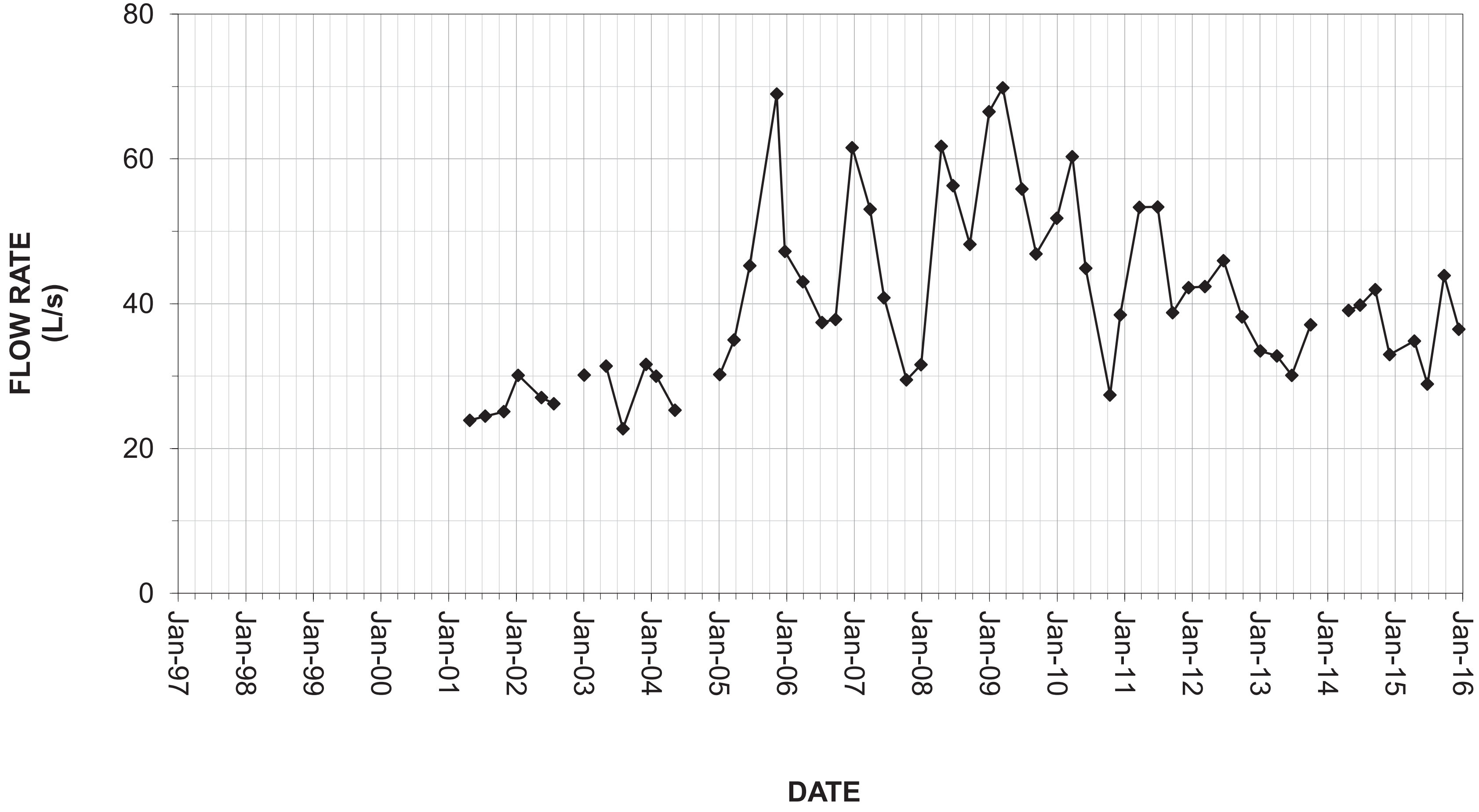
Drawn By: AR

2015 Annual Monitoring Report
Caledon Sand and Gravel Inc. – James Dick Construction Ltd.

Lots 12, 13 & PT14, Concessions 1 & 2 EHS
Town of Caledon, Regional Municipality of Peel

Figure 29: Booth Outfall Flow Rate

BOOTH FISH FARM OUTFALL FLOW RATE



Harden Environmental Services Ltd.

Project No: 9401

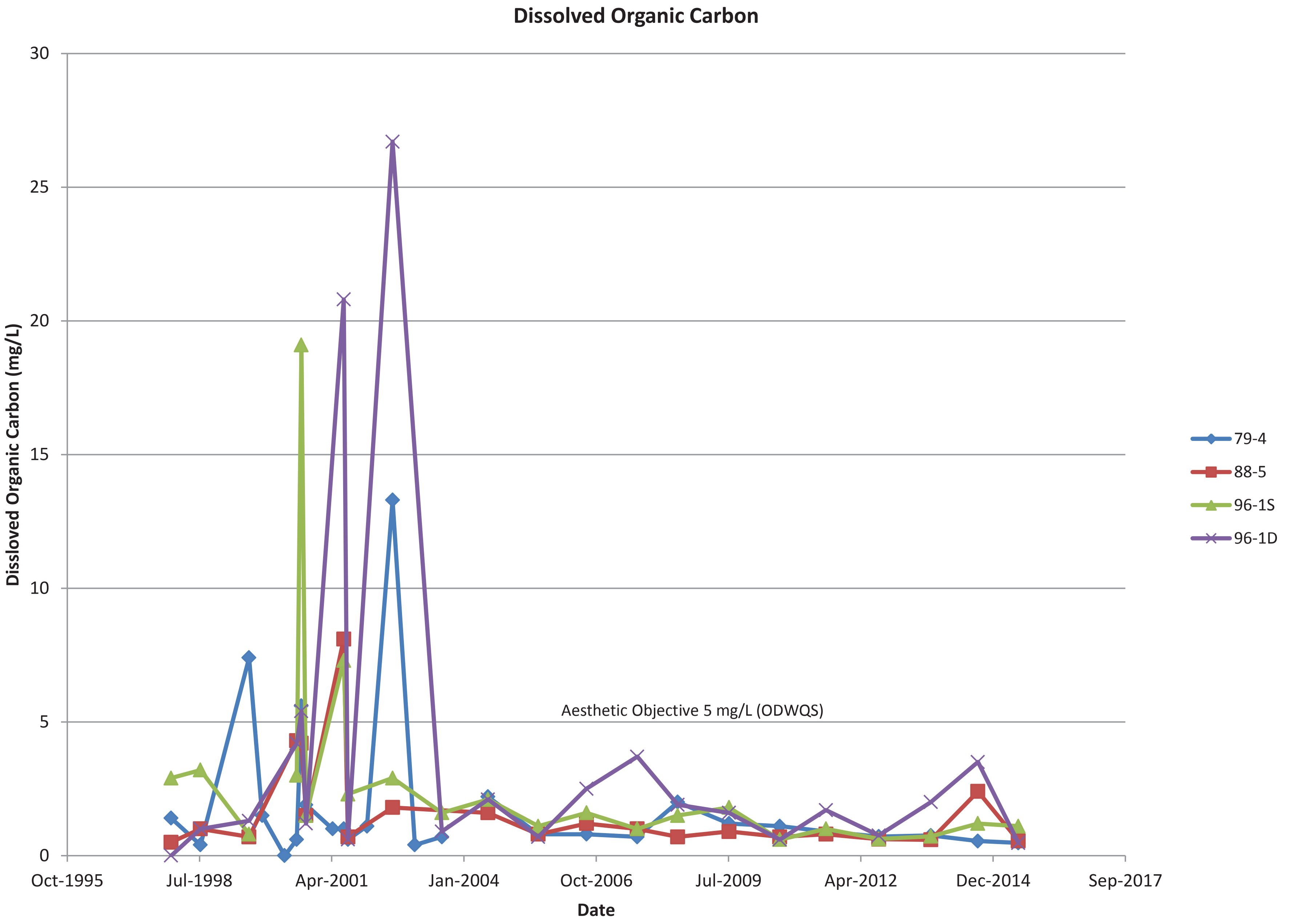
Date: Jan 2016

Drawn By: AR

2015 Annual Monitoring Report
Caledon Sand and Gravel Inc. – James Dick Construction Ltd.

Lots 12, 13 & PT14, Concessions 1 & 2 EHS
Town of Caledon, Regional Municipality of Peel

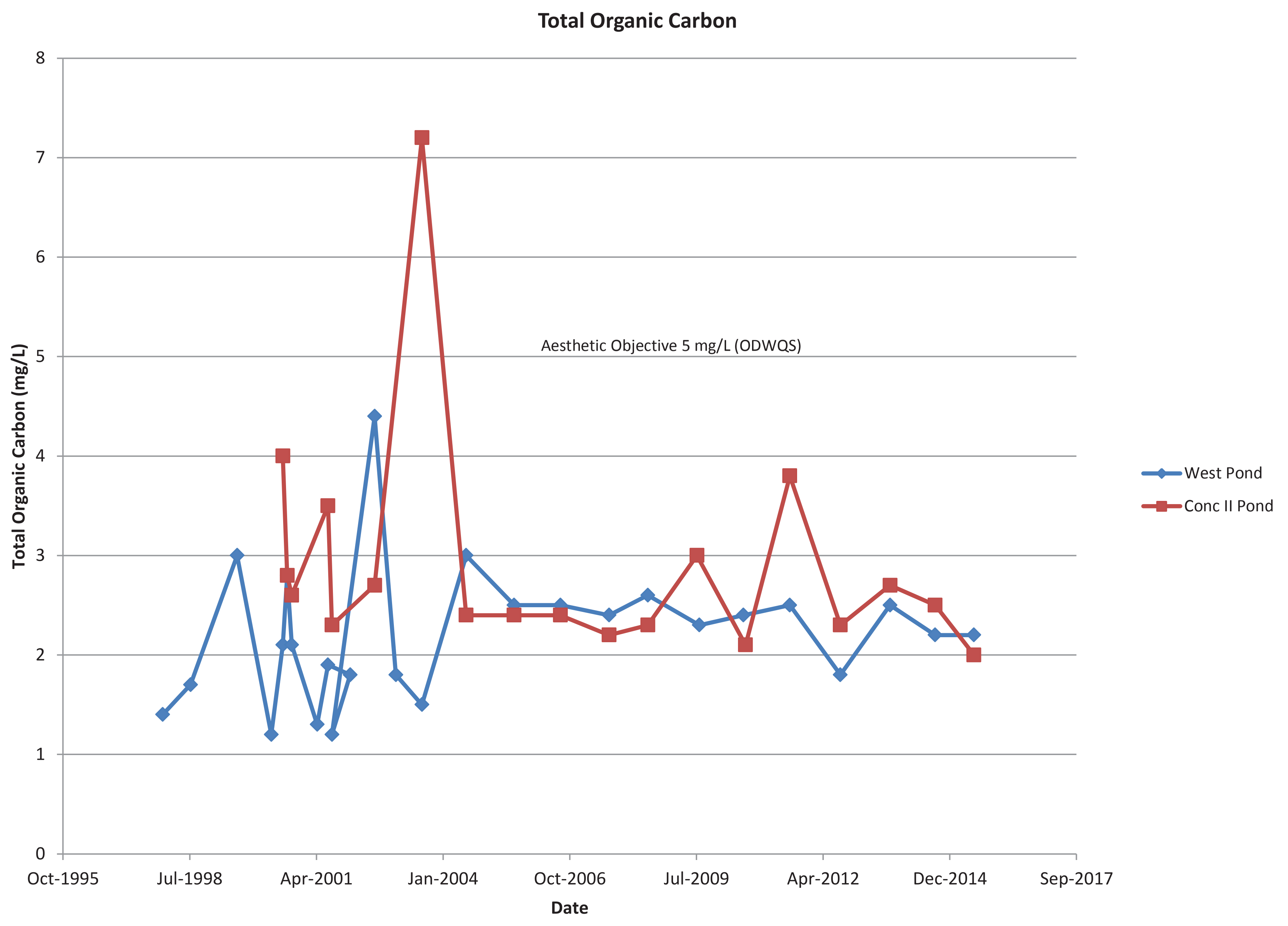
Figure 30: Booth Fish Farm Outfall Flow Rate



Harden
Environmental
Services Ltd.

Project No: 9401	2015 Annual Monitoring Report Caledon Sand and Gravel Inc. – James Dick Construction Ltd.
Date: Jan 2016	Lots 12, 13 & PT14, Concessions 1 & 2 EHS Town of Caledon, Regional Municipality of Peel
Drawn By: AR	

Figure 31: Dissolved Organic Carbon



Harden Environmental Services Ltd.	**Project No:** 9401 **Date:** Jan 2016 **Drawn By:** AR	2015 Annual Monitoring Report Caledon Sand and Gravel Inc. – James Dick Construction Ltd. Lots 12, 13 & PT14, Concessions 1 & 2 EHS Town of Caledon, Regional Municipality of Peel	**Figure 32: Total Organic Carbon**

Table 1: Orangeville Station Monthly Precipitation

Month	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	CLIMATE NORMAL
Jan	129.2	125.5	46.1	11.5	31.5	29.0	72.7	64.0	109.9	48.6	163.7	70.9	58.4	74.5	67.7	79.1	63.0	58.0	64.3
Feb	40.8	40.6	55.7	70.5	45.8	50.5	20.0	78.5	141.0	63.0	178.3	72.9	64.5	86.0	30.5	99.0	64.5	68.5	54.5
Mar	117.8	15.5	40.6	30.5	54.1	38.6	110.0	56.5	62.9	66.3	131.6	64.6	78.7	90.4	38.7	39.8	25.0	18.0	60.9
Apr	39.2	48.2	67.0	41.0	112.5	33.6	71.8	97.1	95.1	73.0	69.0	75.0	41.6	89.1	32.4	101.9	85.3	67.7	70.1
May	56.7	85.0	160.7	79.2	111.4	95.6	117.0	47.2	87.5	57.1	93.8	102.2	99.9	108.8	56.9	102.6	40.3	55.8	86.6
Jun	57.0	68.7	219.0	94.4	74.8	77.3	57.5	32.3	51.5	23.4	117.1	74.9	232.5	46.8	67.2	74.9	70.7	163.6	81.3
Jul	47.8	63.4	91.2	73.6	66.6	38.8	116.7	141.7	84.6	42.9	85.1	93.6	123.2	51.2	68.1	131.8	148.4	26.4	80.8
Aug	96.4	69.8	68.4	48.6	35.0	99.9	60.8	135.8	46.0	30.6	60.0	92.8	71.2	95.0	4.0	58.2	86.9	49.4	88.2
Sep	44.0	71.6	110.6	84.4	52.5	107.8	39.7	49.6	154.3	55.1	94.1	48.8	120.1	62.9	102.0	77.0	82.6	32.0	87.0
Oct	13.6	64.1	29.6	150.3	67.0	95.6	43.6	26.1	122.2	51.0	41.5	95.0	62.8	109.4	158.1	101.3	68.4	92.6	76.6
Nov	45.2	102.4	65.4	63.6	56.0	116.4	73.9	98.7	45.8	94.1	89.4	49.9	80.8	101.5	31.0	42.8	58.6	80.1	87.1
Dec	45.0	55.0	74.7	23.0	33.5	80.6	52.8	83.3	64.6	144.8	131.6	94.1	55.5	64.7	49.5	68.3	49.0	52.8	64.2
Total	**732.7**	**809.8**	**1029.0**	**770.6**	**740.7**	**863.7**	**836.5**	**910.8**	**1065.4**	**749.9**	**1255.2**	**934.7**	**1089.2**	**980.3**	**706.1**	**976.7**	**842.7**	**764.9**	**901.6**

Note: All values given in mm

Table 2: Groundwater and Surface Water Elevations (1994-2015)

Monitor	Ref Elevation (mAMSL)	Mean Water Level Elev (mAMSL)	07-Jul-94 (mAMSL)	12-Jul-94 (mAMSL)	14-Jul-94 (mAMSL)	20-Jul-94 (mAMSL)	27-Jul-94 (mAMSL)	05-Aug-94 (mAMSL)	10-Aug-94 (mAMSL)	16-Aug-94 (mAMSL)	24-Aug-94 (mAMSL)	31-Aug-94 (mAMSL)
LONG TERM MONITORS												
79-4	**418.760**	**400.948**	401.86	401.83		401.70	401.65	401.64			401.36	
83-102	**417.700**	**406.672**		406.73		406.61	406.50		406.30		406.10	
88-1	**416.600**	**407.833**		407.33		407.17	407.03		406.75		406.51	
88-5	**433.100**	**402.254**		401.95		401.96	401.99		401.98		401.97	
96-1D	**419.120**	**397.582**										
96-1S	**419.040**	**399.242**										
96-2D	**427.160**	**397.547**										
96-2S	**427.300**	**400.995**										
Cosgrove Well	**420.000**	**394.561**										
TW-2	**422.190**	**405.672**								405.14		
HYDRAULIC BUFFER MONITORS												
98-1	**411.411**	**407.287**										
98-2	**413.386**	**408.925**										
98-3	**413.216**	**408.541**										
98-4	**410.406**	**406.649**										
98-5	**411.135**	**407.050**										
CC-1 (bridge)	**412.931**	**411.590**										
CC-2	**411.473**	**410.397**										
SURFACE WATER STATIONS												
Warnock Lake (SG1-2013)	**411.280**											
Warnock Lake (1)	**410.116**		408.84		408.65				408.19	408.10	407.97	
Warnock Lake (2)	**409.781**											
Warnock Lake (3)	**408.526**											
North Pond	**407.010**	**405.735**		405.54					405.44		405.33	405.31
East Pond	**407.233**	**406.096**										
West Pond	**405.474**	**405.019**										
South Pond	**406.565**	**405.540**									405.25	
Conc2 Pond	**407.951**											
83-101	**427.200**											
88-2	**419.400**											
88-4S	**432.400**			428.85		428.65	428.56		428.31		428.10	
88-6	**429.000**	**402.051**		401.62	401.63	401.63	401.65		401.66		401.66	
94-1	**412.760**									406.96	406.83	406.68
94-2	**410.430**									406.33	406.20	406.10
94-3	**407.050**							404.83			404.68	
94-4	**409.640**					403.43	404.29	404.29			404.14	
94-5	**407.870**					403.81	404.04	404.05			403.94	
94-6	**407.900**					403.90	403.90	403.90			403.85	
94-7	**409.560**							403.76			403.64	
96-3	**428.880**	**405.465**										
96-4	**413.110**											
96-5	**412.630**											
96-6	**410.213**											
96-7D	**411.450**											
96-7S	**411.340**											
96-8	**411.840**											
96-9												
96-10	**410.597**											
96-11	**411.009**											
96-12	**411.282**											
96-13	**412.110**											
00-1	**395.660**											

NOTE: *Text in italics represent approx. elevations*

Table 2: Groundwater and Surface Water Elevations (1994-2015)

Monitor	Ref Elevation (mAMSL)	08-Sep-94 (mAMSL)	31-Oct-94 (mAMSL)	16-Jan-95 (mAMSL)	20-Feb-95 (mAMSL)	01-Mar-95 (mAMSL)	12-Apr-95 (mAMSL)	18-May-95 (mAMSL)	12-Jun-95 (mAMSL)	16-Jun-95 (mAMSL)	21-Jul-95 (mAMSL)
LONG TERM MONITORS											
79-4	**418.760**	401.26	400.75	400.50		400.62	400.73	400.81		401.16	401.26
83-102	**417.700**	405.88	405.27	404.80	405.70	405.93	406.42	407.19	407.37	407.35	406.73
88-1	**416.600**	406.27	405.55	404.96	406.07	406.28	406.90	407.97	408.20	408.15	407.28
88-5	**433.100**	401.91	401.76	401.36	401.20	401.15	401.15	401.25		401.35	401.58
96-1D	**419.120**										
96-1S	**419.040**										
96-2D	**427.160**										
96-2S	**427.300**										
Cosgrove Well	**420.000**										
TW-2	**422.190**										
HYDRAULIC BUFFER MONITORS											
98-1	**411.411**										
98-2	**413.386**										
98-3	**413.216**										
98-4	**410.406**										
98-5	**411.135**										
CC-1 (bridge)	**412.931**										
CC-2	**411.473**										
SURFACE WATER STATIONS											
Warnock Lake (SG1-2013)	**411.280**										
Warnock Lake (1)	**410.116**	407.77						409.85	409.95		408.88
Warnock Lake (2)	**409.781**										
Warnock Lake (3)	**408.526**										
North Pond	**407.010**	405.23	404.88				405.21	405.51	405.66		405.64
East Pond	**407.233**										
West Pond	**405.474**										
South Pond	**406.565**	405.06	404.90		404.73	404.74					
Conc2 Pond	**407.951**										
83-101	**427.200**										
88-2	**419.400**										
88-4S	**432.400**	427.89	427.26		428.20	431.15	429.73	429.76		429.15	428.51
88-6	**429.000**	401.64	401.44	401.14	401.00	401.10	401.17	401.25		401.35	401.54
94-1	**412.760**	406.55	405.81		406.66	407.91	407.58	408.76	408.83	408.73	407.69
94-2	**410.430**	405.98	405.34	404.88	405.88	406.22	406.63	407.51	407.68	407.60	406.92
94-3	**407.050**	404.54	404.12	404.06	404.00	404.14	404.44	404.52	404.87		405.10
94-4	**409.640**	404.09	403.58	403.37	403.14	403.44	403.59	403.79	404.04		404.50
94-5	**407.870**	403.90	403.55			403.37	403.47	403.62	403.85		404.17
94-6	**407.900**	403.79	403.49	403.25	403.20	403.30	403.38	403.49	403.70		403.95
94-7	**409.560**	403.58	403.16	403.13	402.86	403.08	403.06	403.24	403.46		403.86
96-3	**428.880**										
96-4	**413.110**										
96-5	**412.630**										
96-6	**410.213**										
96-7D	**411.450**										
96-7S	**411.340**										
96-8	**411.840**										
96-9											
96-10	**410.597**										
96-11	**411.009**										
96-12	**411.282**										
96-13	**412.110**										
00-1	**395.660**										

NOTE: *Text in italics represent approx. elevations*

Table 2: Groundwater and Surface Water Elevations (1994-2015)

Monitor	Ref Elevation (mAMSL)	16-Aug-95 (mAMSL)	16-Oct-95 (mAMSL)	29-Nov-95 (mAMSL)	28-Dec-95 (mAMSL)	31-Jan-96 (mAMSL)	20-Feb-96 (mAMSL)	28-Mar-96 (mAMSL)	30-Apr-96 (mAMSL)	23-May-96 (mAMSL)	27-Jun-96 (mAMSL)
LONG TERM MONITORS											
79-4	**418.760**	401.44	400.50	400.21	400.61		401.06	401.56	402.95	403.02	402.63
83-102	**417.700**	406.31	405.61	406.15	406.20	407.36	407.15	407.83	409.22	409.29	409.10
88-1	**416.600**	406.98	405.90	406.50	406.55	407.98	407.71	408.64	410.08	410.31	410.24
88-5	**433.100**	401.68	401.50	401.53	401.51	401.53	401.59	401.79	402.20	402.80	403.55
96-1D	**419.120**								397.61	397.88	398.10
96-1S	**419.040**								399.15	399.38	399.74
96-2D	**427.160**								397.76	398.03	398.24
96-2S	**427.300**								400.98	401.18	401.56
Cosgrove Well	**420.000**										
TW-2	**422.190**							406.02	406.98	407.07	406.89
HYDRAULIC BUFFER MONITORS											
98-1	**411.411**										
98-2	**413.386**										
98-3	**413.216**										
98-4	**410.406**										
98-5	**411.135**										
CC-1 (bridge)	**412.931**										
CC-2	**411.473**										
SURFACE WATER STATIONS											
Warnock Lake (SG1-2013)	**411.280**										
Warnock Lake (1)	**410.116**	408.43		408.61	408.62				411.18	411.24	
Warnock Lake (2)	**409.781**										
Warnock Lake (3)	**408.526**										
North Pond	**407.010**	405.36	405.23						406.91	406.91	
East Pond	**407.233**								407.24	407.25	
West Pond	**405.474**								406.32	406.21	
South Pond	**406.565**								406.45	406.75	
Conc2 Pond	**407.951**										
83-101	**427.200**							407.24	407.49	407.65	407.60
88-2	**419.400**								407.47	407.53	407.30
88-4S	**432.400**	428.14	427.47	427.60	428.07	429.36	429.13	431.13	431.60	431.03	430.06
88-6	**429.000**	401.65	401.55	401.61	401.59	401.56	401.63	401.80	402.13	402.58	403.02
94-1	**412.760**	407.16	406.23	407.13	407.06	409.11	408.31	409.65	410.92	410.94	410.66
94-2	**410.430**	406.39	405.73	406.35	406.35	407.76	407.38	408.20	409.82	409.89	409.57
94-3	**407.050**	404.94	404.65	404.98	404.77	404.79	404.90		406.32	406.65	406.25
94-4	**409.640**	404.44	404.02	404.34	404.04	404.04	404.07		405.39	405.86	405.74
94-5	**407.870**	404.15	403.85	404.01	403.85				404.91	405.37	405.35
94-6	**407.900**	403.95	403.75	403.84	403.91	403.77	403.83	404.06	404.61	405.01	404.99
94-7	**409.560**	403.86	403.50	403.58	403.97	403.46	403.43	403.76	404.49	404.98	405.06
96-3	**428.880**								406.68	406.97	407.01
96-4	**413.110**								411.52	411.53	411.31
96-5	**412.630**								410.33	410.64	410.33
96-6	**410.213**									408.49	407.86
96-7D	**411.450**									411.24	411.10
96-7S	**411.340**									411.24	411.08
96-8	**411.840**									411.24	411.11
96-9											
96-10	**410.597**										409.45
96-11	**411.009**										409.54
96-12	**411.282**										409.61
96-13	**412.110**										
00-1	**395.660**										

NOTE: *Text in italics represent approx. elevations*

Table 2: Groundwater and Surface Water Elevations (1994-2015)

Monitor	Ref Elevation (mAMSL)	08-Jul-96 (mAMSL)	16-Jul-96 (mAMSL)	20-Aug-97 (mAMSL)	15-Dec-97 (mAMSL)	29-Jan-98 (mAMSL)	24-Feb-98 (mAMSL)	25-Feb-98 (mAMSL)	05-Mar-98 (mAMSL)	30-Apr-98 (mAMSL)	30-Jul-98 (mAMSL)
LONG TERM MONITORS											
79-4	**418.760**			401.63	400.65	400.74				401.11	401.56
83-102	**417.700**			407.05	406.00	406.02				407.97	406.76
88-1	**416.600**			407.61	406.19	406.24				408.68	407.30
88-5	**433.100**			403.45	402.60	402.30				402.42	402.86
96-1D	**419.120**			398.28	397.85	397.74				397.74	397.97
96-1S	**419.040**			399.89	399.59	399.46				399.23	399.61
96-2D	**427.160**			399.42	397.91	397.76				397.82	397.95
96-2S	**427.300**			401.54	401.15	401.07				400.96	401.27
Cosgrove Well	**420.000**								395.07		395.08
TW-2	**422.190**			406.03							405.89
HYDRAULIC BUFFER MONITORS											
98-1	**411.411**						406.67	406.71	407.32	409.53	407.18
98-2	**413.386**						406.93	406.91	408.18	410.09	408.29
98-3	**413.216**						406.75	406.72	408.12	409.43	408.04
98-4	**410.406**						406.49	406.48	407.08	408.95	407.11
							0.44	0.43	1.10	1.14	1.18
							0.26	0.24	1.04	0.48	0.93
98-5	**411.135**						406.21	406.34	407.06	409.21	407.65
CC-1 (bridge)	**412.931**						dry	dry	dry	dry	dry
CC-2	**411.473**						dry	dry	dry	dry	dry
SURFACE WATER STATIONS											
Warnock Lake (SG1-2013)	**411.280**										
Warnock Lake (1)	**410.116**								408.79	409.70	
Warnock Lake (2)	**409.781**										408.30
Warnock Lake (3)	**408.526**										
North Pond	**407.010**									406.35	406.15
East Pond	**407.233**									406.78	406.45
West Pond	**405.474**									404.99	405.20
South Pond	**406.565**									406.26	406.25
Conc2 Pond	**407.951**										
83-101	**427.200**									407.30	dry
88-2	**419.400**									406.74	dry
88-4S	**432.400**				426.95	427.13				430.68	428.47
88-6	**429.000**			402.93	402.52	402.22				402.17	402.73
94-1	**412.760**					Removed				Removed	Removed
94-2	**410.430**			407.17		Frozen				407.13	406.81
94-3	**407.050**			405.63	405.40	404.84				405.98	
94-4	**409.640**			405.23	404.85	404.33				405.22	405.27
94-5	**407.870**			404.94	404.61	404.10				404.76	404.95
94-6	**407.900**			403.34		Removed				Removed	Removed
94-7	**409.560**					Removed				Removed	Removed
96-3	**428.880**			406.19	405.28	405.21				406.21	405.93
96-4	**413.110**			408.01						Rep. by 98-2	Rep. by 98-2
96-5	**412.630**			407.45	406.15	406.24				408.67	407.10
96-6	**410.213**			406.57	406.11	406.01				407.11	406.51
96-7D	**411.450**					Removed				Removed	Removed
96-7S	**411.340**					Removed				Removed	Removed
96-8	**411.840**					Removed				Removed	Removed
96-9											
96-10	**410.597**	408.90	408.54	407.14		406.13				407.87	406.83
96-11	**411.009**	409.00	408.62	407.18		406.16				408.60	406.86
96-12	**411.282**	409.07	408.69	407.20		406.24				Removed	Removed
96-13	**412.110**	409.12	408.72	407.57	407.68					Removed	Removed
00-1	**395.660**										

NOTE: *Text in italics represent approx. elevations*

Table 2: Groundwater and Surface Water Elevations (1994-2015)

Monitor	Ref Elevation (mAMSL)	06-Oct-98 (mAMSL)	02-Feb-99 (mAMSL)	08-Apr-99 (mAMSL)	30-Jul-99 (mAMSL)	01-Nov-99 (mAMSL)	20-Jan-00 (mAMSL)	27-Apr-00 (mAMSL)	28-Apr-00 (mAMSL)	18-May-00 (mAMSL)	19-May-00 (mAMSL)
LONG TERM MONITORS											
79-4	**418.760**	400.62	399.91	400.24	400.24	399.85	399.51	399.53		399.77	
83-102	**417.700**	406.08		405.77	405.43	Not Found	Not Found	Not Found	Not Found	Not Found	Not Found
88-1	**416.600**	406.39	409.59		405.73	405.03	404.92	406.34		407.77	
88-5	**433.100**	402.50	401.95	401.66	401.50	401.18					
96-1D	**419.120**	397.88	397.37	397.09	396.87	396.64	396.45	396.37			
96-1S	**419.040**	399.59	399.24	398.92	398.74	398.65	398.49	398.34			
96-2D	**427.160**	397.80	397.41	397.15	396.91	396.72	396.50	396.49			
96-2S	**427.300**	401.16	400.90	400.73	400.65	400.47	400.19	400.02			
Cosgrove Well	**420.000**	394.88	394.65	394.48	393.70	394.02	393.92	393.92			
TW-2	**422.190**	405.52	405.03	405.05			404.19	404.58			
HYDRAULIC BUFFER MONITORS											
98-1	**411.411**	406.31				Not Found	Not Found	Not Found	Not Found	Not Found	Not Found
98-2	**413.386**	407.06		408.41					408.83		411.52
98-3	**413.216**	406.92		407.92	406.41	406.04		408.34		410.79	411.20
98-4	**410.406**	406.22	405.13	406.41	405.72	405.18	408.91	406.48		406.87	407.63
		0.84		2.00							3.89
		0.70		1.51	0.69	0.86		1.86		3.92	3.57
98-5	**411.135**	406.74	405.96		406.19	405.30	405.40	407.81	407.74		
CC-1 (bridge)	**412.931**	dry	dry	dry	dry	dry	dry	dry	dry		411.48
CC-2	**411.473**	dry	dry	dry	dry	dry	dry	dry	dry	410.98	410.54
SURFACE WATER STATIONS											
Warnock Lake (SG1-2013)	**411.280**										
Warnock Lake (1)	**410.116**	dry	dry	dry	dry	dry	dry	dry	dry	*410.89*	
Warnock Lake (2)	**409.781**	dry	dry	409.28	dry	dry	dry				
Warnock Lake (3)	**408.526**	407.33			dry						
North Pond	**407.010**	405.97	405.49		404.70	404.57	404.60	404.95			405.18
East Pond	**407.233**	406.08			405.63	*404.43*	*405.23*	*405.53*			
West Pond	**405.474**	404.57	403.97		404.19	*402.81*	*403.77*	*403.57*			
South Pond	**406.565**	405.94		404.87	405.07		*404.87*	*404.47*			
Conc2 Pond	**407.951**										
83-101	**427.200**	dry									
88-2	**419.400**	dry	dry	dry		Removed	Removed	Removed	Removed	Removed	Removed
88-4S	**432.400**										
88-6	**429.000**	402.52		401.51	401.40	dry	401.03	400.88		400.90	
94-1	**412.760**	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed
94-2	**410.430**	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed
94-3	**407.050**		404.55		404.28	404.04		403.93			
94-4	**409.640**	404.97	403.94	403.81	403.67	403.44	403.16	403.27			
94-5	**407.870**	404.70	403.77	403.65	403.59	403.36	403.11	403.24			
94-6	**407.900**	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed
94-7	**409.560**	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed
96-3	**428.880**	405.43	404.84	404.71	404.68	404.18	403.97	404.33			
96-4	**413.110**	Rep. by 98-2	Rep. by 98-2	Rep. by 98-2	Rep. by 98-2	Rep. by 98-2	Rep. by 98-2	Rep. by 98-2	Rep. by 98-2	Rep. by 98-2	Rep. by 98-2
96-5	**412.630**	406.29				Removed	Removed	Removed	Removed	Removed	Removed
96-6	**410.213**	406.09	405.91	405.91	405.80	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed
96-7D	**411.450**	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed
96-7S	**411.340**	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed
96-8	**411.840**	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed
96-9			dry			Removed	Removed	Removed	Removed	Removed	Removed
96-10	**410.597**	dry	405.58			Removed	Removed	Removed	Removed	Removed	Removed
96-11	**411.009**	406.16	405.67			Removed	Removed	Removed	Removed	Removed	Removed
96-12	**411.282**	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed
96-13	**412.110**	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed
00-1	**395.660**										

NOTE: *Text in italics represent approx. elevations*

Table 2: Groundwater and Surface Water Elevations (1994-2015)

Monitor	Ref Elevation (mAMSL)	26-May-00 (mAMSL)	31-May-00 (mAMSL)	06-Jun-00 (mAMSL)	15-Jun-00 (mAMSL)	28-Jun-00 (mAMSL)	07-Jul-00 (mAMSL)	18-Jul-00 (mAMSL)	01-Sep-00 (mAMSL)	02-Oct-00 (mAMSL)	29-Nov-00 (mAMSL)
LONG TERM MONITORS											
79-4	**418.760**	400.02	400.12		400.35	400.73			401.68	401.50	400.63
83-102	**417.700**	Not Found	Not Found	Not Found	Not Found	Not Found	Not Found	Not Found	Not Found	Not Found	Not Found
88-1	**416.600**	408.25				408.73	408.90	408.83	407.70	407.56	406.94
88-5	**433.100**					400.95	401.01	401.11	401.76	402.07	402.21
96-1D	**419.120**								397.25	397.47	397.44
96-1S	**419.040**								398.95	399.01	399.35
96-2D	**427.160**								397.31		397.46
96-2S	**427.300**								400.70		401.18
Cosgrove Well	**420.000**								394.51		394.59
TW-2	**422.190**								406.16		405.71
HYDRAULIC BUFFER MONITORS											
98-1	**411.411**	Not Found	Not Found	Not Found	Not Found	Not Found	Not Found	Not Found	Not Found	Not Found	Not Found
98-2	**413.386**	411.29			411.47	411.49	411.25	411.38	409.55		407.85
98-3	**413.216**	410.91		410.13	411.07	411.16	410.93	410.93	409.23		407.59
98-4	**410.406**	408.02		407.80	407.46	409.25	409.27	408.90	408.03		406.60
		3.27			4.01	2.24	1.98	2.48	1.52		1.25
		2.88		2.33	3.61	1.92	1.65	2.03	1.20		1.00
98-5	**411.135**								409.08	408.19	407.31
CC-1 (bridge)	**412.931**	411.22			411.38	411.32	411.11	411.27	dry		dry
CC-2	**411.473**	410.89		dry	410.72	410.69	410.94	410.97	dry		dry
SURFACE WATER STATIONS											
Warnock Lake (SG1-2013)	**411.280**										
Warnock Lake (1)	**410.116**			*410.34*						408.73	dry
Warnock Lake (2)	**409.781**										dry
Warnock Lake (3)	**408.526**										408.03
North Pond	**407.010**		405.28	405.31	405.44	405.59	405.66	405.79	406.02	406.35	405.79
East Pond	**407.233**		*405.73*	*405.87*	405.96	406.12	406.38	406.53	406.67		406.93
West Pond	**405.474**		*403.82*	*403.75*	*403.82*	*404.01*	404.19	404.42	404.98	405.06	404.90
South Pond	**406.565**		*404.87*					405.56	405.92		405.95
Conc2 Pond	**407.951**										
83-101	**427.200**										
88-2	**419.400**	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed
88-4S	**432.400**										
88-6	**429.000**	400.97							402.03		402.35
94-1	**412.760**	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed
94-2	**410.430**	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed
94-3	**407.050**			404.62	404.84	405.08	405.19	405.36	405.72		405.75
94-4	**409.640**								405.22		405.22
94-5	**407.870**								404.88		404.79
94-6	**407.900**	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed
94-7	**409.560**	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed
96-3	**428.880**					405.55					405.61
96-4	**413.110**	Rep. by 98-2	Rep. by 98-2	Rep. by 98-2	Rep. by 98-2	Rep. by 98-2	Rep. by 98-2	Rep. by 98-2	Rep. by 98-2	Rep. by 98-2	Rep. by 98-2
96-5	**412.630**	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed
96-6	**410.213**	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed
96-7D	**411.450**	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed
96-7S	**411.340**	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed
96-8	**411.840**	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed
96-9		Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed
96-10	**410.597**	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed
96-11	**411.009**	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed
96-12	**411.282**	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed
96-13	**412.110**	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed
00-1	**395.660**										388.84

NOTE: *Text in italics represent approx. elevations*

Table 2: Groundwater and Surface Water Elevations (1994-2015)

Monitor	Ref Elevation (mAMSL)	02-Apr-01 (mAMSL)	18-Jul-01 (mAMSL)	25-Oct-01 (mAMSL)	11-Jan-02 (mAMSL)	30-May-02 (mAMSL)	23-Jul-02 (mAMSL)	04-Nov-02 (mAMSL)	03-Jan-03 (mAMSL)	06-Jan-03 (mAMSL)	22-Apr-03 (mAMSL)
LONG TERM MONITORS											
79-4	418.760	401.41	401.92		400.54	401.17	400.48			399.62	399.82
83-102	417.700	Not Found	Not Found	Not Found	Not Found	Not Found	Not Found	Not Found	Not Found	Not Found	Not Found
88-1	416.600	408.23	407.60	406.21	406.34	409.32	407.32	405.91	405.53		406.43
88-5	433.100	402.04	402.82	402.37	402.01	402.06	402.35	402.09	402.08		401.38
96-1D	419.120	397.30	397.81	397.60	397.45	397.41	397.53	397.32	397.19		396.81
96-1S	419.040	399.14	399.70	399.52	399.33	399.20		399.29	399.20		398.82
96-2D	427.160	397.37	397.82	397.60	397.40	397.54	397.59	397.36	397.81		396.99
96-2S	427.300	400.96	400.91	401.13	400.94	400.87	401.04	401.45	400.92		400.60
Cosgrove Well	420.000	394.65	394.92	394.18	394.56	394.79	395.10	394.60	394.40		394.29
TW-2	422.190	405.76	405.84	405.27	405.20	405.90	405.61	404.68	404.87		404.80
HYDRAULIC BUFFER MONITORS											
98-1	411.411	Not Found	Not Found	Not Found	Not Found	Not Found	Not Found	Not Found	Not Found	Not Found	Not Found
98-2	413.386	410.61	408.54	406.76	407.12	410.91	408.43			406.37	407.97
98-3	413.216	409.88	408.08	406.70	406.97	410.31	407.98	406.32	406.04		407.48
98-4	410.406	407.19	406.54	405.99	406.08	406.61	406.32	405.71	405.46		405.89
		3.42	2.00	0.77	1.04	4.30	2.11				2.08
		2.69	1.54	0.71	0.89	3.70	1.66	0.61	0.58		1.59
98-5	411.135	409.33	407.74	406.52	406.78	410.14	407.72	406.14	405.74		407.07
CC-1 (bridge)	412.931	411.13	dry	dry	dry	411.00	dry				dry
CC-2	411.473	411.33	dry	dry	dry	dry	dry				dry
SURFACE WATER STATIONS											
Warnock Lake (SG1-2013)	411.280										
Warnock Lake (1)	410.116	Submrgd	dry								dry
Warnock Lake (2)	409.781	Submrgd	409.13								dry
Warnock Lake (3)	408.526	407.94					408.16				407.80
North Pond	407.010	406.10	406.30	405.69	405.59	405.84	405.51		**406.74**		**406.78**
East Pond	407.233	406.48	406.59	406.14					**405.22**		**405.47**
West Pond	405.474								**405.28**		**405.32**
South Pond	406.565	405.27	405.75				405.75	405.47	404.80		406.00
Conc2 Pond	407.951										
83-101	427.200							427.20			Blocked 0.25
88-2	419.400	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed
88-4S	432.400										
88-6	429.000	401.95	402.61	402.27	402.03	402.08	402.30	402.16	401.83		401.34
94-1	412.760	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed
94-2	410.430	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed
94-3	407.050		405.62	405.13	404.85	405.64	405.38	404.96	404.57		
94-4	409.640	404.59	405.20	404.61	404.30	404.97	404.96	404.44	404.44		403.67
94-5	407.870		404.91	404.48	Removed	Removed	Removed	Removed	Removed	Removed	Removed
94-6	407.900	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed
94-7	409.560	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed
96-3	428.880	405.52	405.89	405.20	404.99	405.78	405.61	404.95	404.69		404.50
96-4	413.110	Rep. by 98-2	Rep. by 98-2	Rep. by 98-2	Rep. by 98-2	Rep. by 98-2	Rep. by 98-2	Rep. by 98-2	Rep. by 98-2	Rep. by 98-2	Rep. by 98-2
96-5	412.630	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed
96-6	410.213	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed
96-7D	411.450	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed
96-7S	411.340	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed
96-8	411.840	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed
96-9		Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed
96-10	410.597	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed
96-11	411.009	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed
96-12	411.282	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed
96-13	412.110	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed
00-1	395.660	388.98	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed

NOTE: *Text in italics represent approx. elevations*

Table 2: Groundwater and Surface Water Elevations (1994-2015)

Monitor	Ref Elevation	31-Jul-03	26-Nov-03	27-Jan-04	07-May-04	18-Aug-04	04-Jan-05	23-Mar-05	15-Jun-05	08-Nov-05	22-Dec-05
	(mAMSL)	(mAMSL)	(mAMSL)	(mAMSL)	(mAMSL)	(mAMSL)	(mAMSL)	(mAMSL)	(mAMSL)	(mAMSL)	(mAMSL)
LONG TERM MONITORS											
79-4	418.760	399.77	399.08		400.75	401.94	400.29	400.99	401.63	400.05	400.08
83-102	417.700	Not Found	Not Found	Not Found	Not Found	Not Found	Not Found	Not Found	Not Found	Not Found	Not Found
88-1	416.600	406.31	405.57		408.55	408.47		407.62	408.12	406.07	406.21
88-5	433.100	401.38	401.24	401.13	401.69	402.50	402.13	402.09	403.15	402.34	402.39
96-1D	419.120	396.93	396.89	396.83	396.68	397.30	397.48	397.43	397.83	397.50	397.54
96-1S	419.040	398.86	398.96	398.91	399.03	399.49	399.39	399.27	399.56	398.95	398.98
96-2D	427.160	397.05	396.94	396.99	397.36	397.71	397.51	397.46	397.96	397.56	397.48
96-2S	427.300	400.60	400.63	400.57	400.74	401.23	401.03	400.91	401.38	401.05	401.02
Cosgrove Well	420.000	394.25	393.77	393.98	394.50	394.80	394.11	394.79	394.97	393.89	
TW-2	422.190					405.80	405.45	405.71	405.98	405.13	405.16
HYDRAULIC BUFFER MONITORS											
98-1	411.411	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed
98-2	413.386	407.23	406.37	406.51	411.24	408.06	406.50	408.71	409.16	406.33	406.41
98-3	413.216	406.94	406.19	406.33	410.80	407.70	406.29		408.88	406.00	
98-4	410.406	405.81	405.26	405.36	406.15	406.29	405.34	406.72	406.16	405.26	
		1.42	1.11	1.15	5.09	1.77	1.16		3.00	1.07	
		1.13	0.93	0.97	4.65	1.41	0.95		2.72	0.74	
98-5	411.135					407.59	406.22	407.88		405.74	405.78
CC-1 (bridge)	412.931	dry	dry	dry	412.01	411.81	Covered	411.70	411.83	411.60	411.54
CC-2	411.473	dry	dry	dry	410.05	409.93	Covered	410.02	410.01	409.91	409.87
SURFACE WATER STATIONS											
Warnock Lake (SG1-2013)	411.280										
Warnock Lake (1)	410.116	dry	dry	Not Monitored			Dry	frozen @ 1.02	Inacessible	Dry	Dry
Warnock Lake (2)	409.781	dry	dry	Not Monitored			Dry	frozen @ 1.13	Inacessible	Dry	Dry
Warnock Lake (3)	408.526	dry	dry	Not Monitored			Dry	Removed	Removed	Removed	Removed
North Pond	407.010	**406.64**	**406.80**				405.01	406.52	405.99	405.86	405.61
East Pond	407.233	**405.25**	**405.72**	**405.94**	**406.92**	**406.80**	**406.26**	406.61	406.69	406.00	405.84
West Pond	405.474	**404.75**	**403.87**	**404.53**	**405.07**	**405.23**	**404.56**	405.15	405.17	404.57	404.67
South Pond	406.565	405.07	405.38	405.35	406.00	406.02	405.33	405.77	405.40	405.01	405.07
Conc2 Pond	407.951										
83-101	427.200	Blocked 0.27	Blocked	Blocked	Not Found	Not Found	Not Found	Blocked @ 0.21	Blocked	Blocked	Blocked
88-2	419.400	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed
88-4S	432.400										
88-6	429.000	401.58	401.65	Blocked 0.49	401.98	402.90	401.98	401.81	402.40	401.89	401.82
94-1	412.760	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed
94-2	410.430	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed
94-3	407.050	404.80	404.90			405.81	405.14		405.95	405.08	404.79
94-4	409.640	404.23	404.30	403.92	405.31	405.26	404.67				
94-5	407.870	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed
94-6	407.900	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed
94-7	409.560	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed
96-3	428.880	404.82	404.48	404.78	405.78	406.38	405.46	405.50	405.95	404.99	404.93
96-4	413.110	Rep. by 98-2	Rep. by 98-2	Rep. by 98-2	Rep. by 98-2	Rep. by 98-2	Rep. by 98-2	Rep. by 98-2	Rep. by 98-2	Rep. by 98-2	Rep. by 98-2
96-5	412.630	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed
96-6	410.213	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed
96-7D	411.450	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed
96-7S	411.340	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed
96-8	411.840	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed
96-9		Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed
96-10	410.597	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed
96-11	411.009	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed
96-12	411.282	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed
96-13	412.110	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed
00-1	395.660	Destroyed	Destroyed	Destroyed	Removed	Removed	Removed	Removed	Removed	Removed	Removed

NOTE: *Text in italics represent approx. elevations*

Table 2: Groundwater and Surface Water Elevations (1994-2015)

Monitor	Ref Elevation (mAMSL)	29-Mar-06 (mAMSL)	11-Jul-06 (mAMSL)	21-Sep-06 (mAMSL)	21-Dec-06 (mAMSL)	27-Mar-07 (mAMSL)	10-Jun-07 (mAMSL)	16-Aug-07 (mAMSL)	10-Oct-07 (mAMSL)	28-Dec-07 (mAMSL)	14-Mar-08 (mAMSL)
LONG TERM MONITORS											
79-4	**418.760**	402.73	401.47	400.79	400.64	400.97	400.91	400.31	400.28	399.89	401.77
83-102	**417.700**	Not Found	Not Found	Not Found	Not Found	Not Found	Not Found				
88-1	**416.600**	409.83	407.55	406.62	408.51	409.13	408.20	406.86	406.84	406.01	409.62
88-5	**433.100**	402.20	402.91	402.56	402.67	402.43	402.39	402.64	402.59	402.20	402.61
96-1D	**419.120**	397.53	397.75	397.77	397.67	397.78	397.61	397.61	397.59	397.37	397.78
96-1S	**419.040**	399.22	399.37	399.27	399.15	399.18	399.64	399.38	399.37	398.76	399.75
96-2D	**427.160**	397.76	397.92	397.75	397.66	397.66	397.66	397.51	397.54	397.29	397.78
96-2S	**427.300**	400.89	401.08	401.22	401.04	401.13	401.15	401.08	401.00	400.83	401.35
Cosgrove Well	**420.000**		395.09	394.90	394.95	394.99	394.82		394.75	393.95	394.77
TW-2	**422.190**	406.65			405.53	405.96	405.84	405.41	405.36		405.21
HYDRAULIC BUFFER MONITORS											
98-1	**411.411**	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed
98-2	**413.386**	411.38	408.55	407.01	407.08	408.48	409.27	407.25	407.22	407.19	411.27
98-3	**413.216**	410.91	408.13	406.88	406.96	407.85	408.77	407.10	407.07	407.03	410.79
98-4	**410.406**	407.33	406.34	405.95	406.06	406.22	406.63	405.89	405.90	405.86	407.22
		4.05	2.21	1.06	1.02	2.26	2.64	1.36	1.32	1.33	4.05
		3.58	1.79	0.93	0.90	1.63	2.14	1.21	1.17	1.17	3.57
98-5	**411.135**			405.93	406.02		406.61	406.75	406.71		
CC-1 (bridge)	**412.931**	411.98	411.70		411.68	411.63	411.53	411.51	411.35		
CC-2	**411.473**	410.30	410.09		410.26	410.20	409.86	409.83	409.76		
SURFACE WATER STATIONS											
Warnock Lake (SG1-2013)	**411.280**										
Warnock Lake (1)	**410.116**			Dry	Dry	Inaccessible	Inaccessible	Inaccessible	dry	snow	snow
Warnock Lake (2)	**409.781**			Dry	Dry	Inaccessible	Inaccessible	Inaccessible	dry	snow	snow
Warnock Lake (3)	**408.526**			Removed	Removed	Removed	Removed				
North Pond	**407.010**	406.42		405.63	405.17	406.11	405.51	405.43	405.36	405.34	406.14
East Pond	**407.233**	406.79		406.52	406.39	406.50	405.89		405.45	405.61	406.46
West Pond	**405.474**	405.33		404.95	404.93	405.27	405.16	404.63	404.55	404.33	405.17
South Pond	**406.565**	405.57		405.29	405.41	405.78	405.38		405.30	405.22	
Conc2 Pond	**407.951**										
83-101	**427.200**	Blocked	Blocked	Blocked	Blocked	Blocked	Blocked	Removed	Removed	Removed	Removed
88-2	**419.400**	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed
88-4S	**432.400**										
88-6	**429.000**	402.07	401.85	402.15	402.09	402.12	402.08		402.05	401.80	402.42
94-1	**412.760**	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed
94-2	**410.430**	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed
94-3	**407.050**	405.66	405.60	405.24	405.08	405.10	405.35		405.20	404.86	
94-4	**409.640**										
94-5	**407.870**	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed
94-6	**407.900**	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed
94-7	**409.560**	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed
96-3	**428.880**	406.72	405.83	405.66	405.75	405.79	404.87		404.77	404.73	406.54
96-4	**413.110**	Rep. by 98-2	Rep. by 98-2	Rep. by 98-2	Rep. by 98-2	Rep. by 98-2	Rep. by 98-2	Rep. by 98-2	Rep. by 98-2	Rep. by 98-2	Rep. by 98-2
96-5	**412.630**	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed
96-6	**410.213**	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed
96-7D	**411.450**	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed
96-7S	**411.340**	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed
96-8	**411.840**	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed
96-9		Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed
96-10	**410.597**	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed
96-11	**411.009**	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed
96-12	**411.282**	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed
96-13	**412.110**	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed
00-1	**395.660**	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed

NOTE: *Text in italics represent approx. elevations*

Table 2: Groundwater and Surface Water Elevations (1994-2015)

Monitor	Ref Elevation (mAMSL)	15-Apr-08 (mAMSL)	12-Jun-08 (mAMSL)	16-Sep-08 (mAMSL)	29-Dec-08 (mAMSL)	13-Mar-09 (mAMSL)	25-Jun-09 (mAMSL)	09-Sep-09 (mAMSL)	30-Dec-09 (mAMSL)	24-Mar-10 (mAMSL)	04-Jun-10 (mAMSL)
LONG TERM MONITORS											
79-4	**418.760**	401.98	401.65	401.26	401.15	402.57	401.96	401.73	401.11	401.78	401.02
83-102	**417.700**										
88-1	**416.600**	409.90	409.51	409.19	408.11	409.97	410.06	410.17	408.56	410.81	409.98
88-5	**433.100**	402.83	402.78	402.70	402.33	402.96	402.81	402.75	402.80	402.64	402.59
96-1D	**419.120**	397.75	397.68	397.63	397.69	397.89	398.21	398.03	397.89	397.76	397.90
96-1S	**419.040**	399.79	399.55	399.23	399.49	399.81	399.86	399.75	399.63	399.40	399.49
96-2D	**427.160**	397.81	397.61	397.55	397.72	398.11	398.32	398.24	397.99	397.96	398.09
96-2S	**427.300**	401.42	401.35	401.25	401.29	401.56	401.60	401.48	401.24	401.09	401.27
Cosgrove Well	**420.000**	394.98	394.91	394.82	394.69	395.05		395.59		395.21	395.30
TW-2	**422.190**	406.84	406.68	406.32	405.65	406.92	406.35	406.28		406.54	406.18
HYDRAULIC BUFFER MONITORS											
98-1	**411.411**	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed
98-2	**413.386**	411.51	411.05	409.18	411.13	411.67	410.28	410.14	408.13	411.20	409.73
98-3	**413.216**	411.03	410.61	408.68	410.68	411.31	409.66	409.51	407.76	410.78	409.21
98-4	**410.406**	407.46	407.03	406.58	406.73	407.94	406.69	406.48	406.26	407.33	406.98
		4.05	4.02	2.60	4.40	3.73	3.59	3.66	1.87	3.87	2.75
		3.57	3.58	2.10	3.95	3.37	2.97	3.03	1.50	3.45	2.23
98-5	**411.135**			408.32				408.73			409.21
CC-1 (bridge)	**412.931**	411.85	412.93								
CC-2	**411.473**	410.44	411.47								
SURFACE WATER STATIONS											
Warnock Lake (SG1-2013)	**411.280**										
Warnock Lake (1)	**410.116**	Inaccessible	inaccessible	inaccessible	inaccessible	inaccessible			10 cm of water at base	inaccessible	
Warnock Lake (2)	**409.781**								dry	-	-
Warnock Lake (3)	**408.526**								dry	-	-
North Pond	**407.010**	406.46	405.96	405.93	405.78	406.49	405.77	406.13	405.97	405.70	406.11
East Pond	**407.233**	406.81	406.49	406.22	406.50	406.99	406.20	406.24	406.48	405.98	405.99
West Pond	**405.474**	405.25	405.22	405.16	405.59	405.80	405.54	405.76	405.73	405.49	405.68
South Pond	**406.565**	405.94	405.85	405.67	406.10	406.44	405.88	405.98	406.07	405.65	405.77
Conc2 Pond	**407.951**						406.51	406.26		407.17	406.91
83-101	**427.200**	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed
88-2	**419.400**	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed
88-4S	**432.400**										
88-6	**429.000**	402.68	402.60	402.55	402.32	402.74	402.69	402.55	402.55	402.30	-
94-1	**412.760**	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed
94-2	**410.430**	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed
94-3	**407.050**										
94-4	**409.640**										
94-5	**407.870**	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed
94-6	**407.900**	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed
94-7	**409.560**	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed
96-3	**428.880**	406.71	406.27	405.68	405.48	406.90	406.17	406.03	405.72	406.73	406.27
96-4	**413.110**	Rep. by 98-2	Rep. by 98-2	Rep. by 98-2	Rep. by 98-2	Rep. by 98-2	Rep. by 98-2	Rep. by 98-2	Rep. by 98-2	Rep. by 98-2	Rep. by 98-2
96-5	**412.630**	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed
96-6	**410.213**	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed
96-7D	**411.450**	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed
96-7S	**411.340**	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed
96-8	**411.840**	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed
96-9		Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed
96-10	**410.597**	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed
96-11	**411.009**	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed
96-12	**411.282**	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed
96-13	**412.110**	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed
00-1	**395.660**	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed

NOTE: *Text in italics represent approx. elevations*

Table 2: Groundwater and Surface Water Elevations (1994-2015)

Monitor	Ref Elevation (mAMSL)	13-Oct-10 (mAMSL)	08-Dec-10 (mAMSL)	22-Mar-11 (mAMSL)	28-Jun-11 (mAMSL)	16-Sep-11 (mAMSL)	12-Dec-11 (mAMSL)	09-Mar-12 (mAMSL)	18-Jun-12 (mAMSL)	25-Sep-12 (mAMSL)	02-Jan-13 (mAMSL)
LONG TERM MONITORS											
79-4	**418.760**	400.87	400.48	401.76	401.11	401.04	400.54	401.17	400.74	400.50	399.80
83-102	**417.700**										
88-1	**416.600**	408.48	408.59	410.94	409.99	408.42	408.93	409.66	409.62	407.88	407.71
88-5	**433.100**	402.89	402.69	402.59	403.18	403.02	402.70	402.59	403.21	402.81	402.38
96-1D	**419.120**	397.95	397.82	397.66	398.04	397.96	397.89	397.79	397.92	397.78	397.54
96-1S	**419.040**	399.66	399.58	399.34	399.68	399.66	399.60	399.44	399.59	399.51	399.38
96-2D	**427.160**	398.02	397.89	397.89	398.26	398.08	397.96	397.96	398.11	397.90	397.65
96-2S	**427.300**	401.27	401.17	401.42	401.47	401.39	401.25	401.17	401.36	401.26	401.09
Cosgrove Well	**420.000**		394.24	395.14	392.48			394.98			394.73
TW-2	**422.190**	405.79	405.70	406.57	406.08	405.76	405.81	406.14	405.99	405.51	405.35
HYDRAULIC BUFFER MONITORS											
98-1	**411.411**	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed
98-2	**413.386**	407.82	408.32	411.30	410.00	407.67	409.19		409.32	406.97	406.98
98-3	**413.216**	407.54	407.87	410.96	409.47	407.42	408.51		408.86	406.79	406.74
98-4	**410.406**	406.24	406.09	407.57	406.63	406.22	406.18	406.80	406.76	405.85	405.65
		1.58	2.23	3.73	3.37	1.45	3.01		2.56	1.12	1.33
		1.30	1.78	3.38	2.84	1.20	2.33		2.09	0.94	1.09
98-5	**411.135**				410.04	407.21	409.08		409.75		
CC-1 (bridge)	**412.931**										
CC-2	**411.473**										
SURFACE WATER STATIONS											
Warnock Lake (SG1-2013)	**411.280**										
Warnock Lake (1)	**410.116**	dry	dry	inaccessible			408.67				
Warnock Lake (2)	**409.781**	dry	dry				inaccessible	inaccessible			
Warnock Lake (3)	**408.526**	408.13	rozen lake edge				inaccessible	inaccessible			
North Pond	**407.010**	405.85		406.05	405.94	405.87	405.87	405.75	405.54	405.57	405.08
East Pond	**407.233**	405.73	405.71	406.00	405.99	405.69	405.95	406.05	405.73	405.46	405.39
West Pond	**405.474**	405.48	405.48	405.75	405.63	405.69	405.65	405.75	405.54	405.57	405.08
South Pond	**406.565**	405.55	405.57	405.48	405.80	405.50	405.72	405.64	405.54	405.33	405.24
Conc2 Pond	**407.951**	406.19		407.38	406.58	406.21	406.14	406.69	406.73	405.86	405.64
83-101	**427.200**	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed
88-2	**419.400**	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed
88-4S	**432.400**										
88-6	**429.000**	402.67	402.51	402.26	402.93	402.66	402.58	402.40	402.63	402.48	402.20
94-1	**412.760**	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed
94-2	**410.430**	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed
94-3	**407.050**										
94-4	**409.640**										
94-5	**407.870**	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed
94-6	**407.900**	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed
94-7	**409.560**	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed
96-3	**428.880**	405.80									
96-4	**413.110**	Rep. by 98-2	Rep. by 98-2	Rep. by 98-2	Rep. by 98-2	Rep. by 98-2	Rep. by 98-2	Rep. by 98-2	Rep. by 98-2	Rep. by 98-2	Rep. by 98-2
96-5	**412.630**	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed
96-6	**410.213**	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed
96-7D	**411.450**	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed
96-7S	**411.340**	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed
96-8	**411.840**	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed
96-9		Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed
96-10	**410.597**	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed
96-11	**411.009**	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed
96-12	**411.282**	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed
96-13	**412.110**	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed
00-1	**395.660**	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed

NOTE: *Text in italics represent approx. elevations*

Table 2: Groundwater and Surface Water Elevations (1994-2015)

Monitor	Ref Elevation (mAMSL)	02-Apr-13 (mAMSL)	21-Jun-13 (mAMSL)	01-Oct-13 (mAMSL)	18-Dec-13 (mAMSL)	24-Apr-14 (mAMSL)	26-Jun-14 (mAMSL)	15-Sep-14 (mAMSL)	02-Dec-14 (mAMSL)	14-Apr-15 (mAMSL)	24-Jun-15 (mAMSL)
LONG TERM MONITORS											
79-4	**418.760**	400.48	401.42	400.96	400.51	401.32	401.23	400.99	400.01	400.35	400.66
83-102	**417.700**										
88-1	**416.600**	409.68	410.65	408.55							
88-5	**433.100**	402.34	403.29	403.15	402.89	403.68	403.62	403.28	402.93	402.76	403.11
96-1D	**419.120**	397.36	397.86	397.93	397.75	397.81	397.99	398.00	397.87	397.53	397.74
96-1S	**419.040**	398.78	399.52	399.64	399.53	399.41	399.65	399.67	399.60	399.26	399.36
96-2D	**427.160**	397.61	398.07	398.11	397.95	398.26	398.29	398.20	398.01	397.80	398.00
96-2S	**427.300**	400.64	401.36	401.39	401.32	401.57	401.53	401.51	401.43	401.25	401.21
Cosgrove Well	**420.000**		395.24				395.37				
TW-2	**422.190**	405.68	406.13	405.79	405.67	406.87	406.04	405.83	405.63	405.63	405.94
HYDRAULIC BUFFER MONITORS											
98-1	**411.411**	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed
98-2	**413.386**	410.42	410.77	407.80	408.00	411.33	409.47	407.95	408.17	410.87	409.51
98-3	**413.216**	410.01	409.54	407.54	407.63	410.64	409.00	407.69	407.82	410.18	409.01
98-4	**410.406**	406.29	407.00	406.28	406.15	408.12	406.94	406.55	406.58	407.47	407.30
		4.13	3.77	1.52	1.85	3.21	2.53	1.40	1.59	3.40	2.21
		3.72	2.54	1.26	1.48	2.52	2.06	1.14	1.24	2.71	1.71
98-5	**411.135**										
CC-1 (bridge)	**412.931**										
CC-2	**411.473**										
SURFACE WATER STATIONS											
Warnock Lake (SG1-2013)	**411.280**		410.33							410.18	
Warnock Lake (1)	**410.116**										
Warnock Lake (2)	**409.781**										
Warnock Lake (3)	**408.526**										
North Pond	**407.010**	405.37	405.38	405.38		406.15	405.35	405.67		405.55	405.65
East Pond	**407.233**	405.59	405.50	405.69		406.19	405.71	405.76		405.63	405.78
West Pond	**405.474**	405.37	405.38	405.38		406.15	405.35	405.67		405.55	405.65
South Pond	**406.565**	405.22	405.50	405.63		405.68	405.68	405.68		405.29	405.65
Conc2 Pond	**407.951**	406.22	406.88	406.26							
83-101	**427.200**	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed
88-2	**419.400**	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed
88-4S	**432.400**										
88-6	**429.000**	402.00	402.68	402.72	402.49	402.44	402.81	402.78	402.56	402.10	402.44
94-1	**412.760**	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed
94-2	**410.430**	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed
94-3	**407.050**										
94-4	**409.640**										
94-5	**407.870**	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed
94-6	**407.900**	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed
94-7	**409.560**	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed
96-3	**428.880**										
96-4	**413.110**	Rep. by 98-2	Rep. by 98-2	Rep. by 98-2	Rep. by 98-2	Rep. by 98-2	Rep. by 98-2	Rep. by 98-3	Rep. by 98-4	Rep. by 98-5	Rep. by 98-6
96-5	**412.630**	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed
96-6	**410.213**	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed
96-7D	**411.450**	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed
96-7S	**411.340**	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed
96-8	**411.840**	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed
96-9		Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed
96-10	**410.597**	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed
96-11	**411.009**	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed
96-12	**411.282**	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed
96-13	**412.110**	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed
00-1	**395.660**	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed

NOTE: *Text in italics represent approx. elevations*

Table 2: Groundwater and Surface Water Elevations (1994-2015)

Monitor	Ref Elevation (mAMSL)	06-Jul-15 (mAMSL)	22-Sep-15 (mAMSL)	11-Dec-15 (mAMSL)	18-Dec-15 (mAMSL)	06-Jan-16 (mAMSL)
LONG TERM MONITORS						
79-4	**418.760**	400.84	400.77	399.78	399.77	399.91
83-102	**417.700**					
88-1	**416.600**					
88-5	**433.100**	403.18	403.25	402.83		
96-1D	**419.120**	397.78	397.83	397.66		
96-1S	**419.040**	399.41	399.55	399.46		
96-2D	**427.160**		398.05	397.86		
96-2S	**427.300**		401.26	401.25		
Cosgrove Well	**420.000**					
TW-2	**422.190**		405.75	405.46		
HYDRAULIC BUFFER MONITORS						
98-1	**411.411**	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed
98-2	**413.386**		408.07	406.83		
98-3	**413.216**		407.79	406.70		
98-4	**410.406**		406.69	406.08		
98-5	**411.135**					
CC-1 (bridge)	**412.931**					
CC-2	**411.473**					
SURFACE WATER STATIONS						
Warnock Lake (SG1-2013)	**411.280**					
Warnock Lake (1)	**410.116**					
Warnock Lake (2)	**409.781**					
Warnock Lake (3)	**408.526**					
North Pond	**407.010**		405.44	405.21		
East Pond	**407.233**		405.66	405.51		
West Pond	**405.474**		405.44	405.21		
South Pond	**406.565**		405.49	405.38		
Conc2 Pond	**407.951**					
83-101	**427.200**	Removed	Removed	Removed	Removed	Removed
88-2	**419.400**	Removed	Removed	Removed	Removed	Removed
88-4S	**432.400**					
88-6	**429.000**		402.62	402.38		
94-1	**412.760**	Removed	Removed	Removed	Removed	Removed
94-2	**410.430**	Removed	Removed	Removed	Removed	Removed
94-3	**407.050**					
94-4	**409.640**					
94-5	**407.870**	Removed	Removed	Removed	Removed	Removed
94-6	**407.900**	Removed	Removed	Removed	Removed	Removed
94-7	**409.560**	Removed	Removed	Removed	Removed	Removed
96-3	**428.880**					
96-4	**413.110**	Rep. by 98-7	Rep. by 98-8	Rep. by 98-8	Rep. by 98-8	Rep. by 98-9
96-5	**412.630**	Removed	Removed	Removed	Removed	Removed
96-6	**410.213**	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed
96-7D	**411.450**	Removed	Removed	Removed	Removed	Removed
96-7S	**411.340**	Removed	Removed	Removed	Removed	Removed
96-8	**411.840**	Removed	Removed	Removed	Removed	Removed
96-9		Removed	Removed	Removed	Removed	Removed
96-10	**410.597**	Removed	Removed	Removed	Removed	Removed
96-11	**411.009**	Removed	Removed	Removed	Removed	Removed
96-12	**411.282**	Removed	Removed	Removed	Removed	Removed
96-13	**412.110**	Removed	Removed	Removed	Removed	Removed
00-1	**395.660**	Removed	Removed	Removed	Removed	Removed

NOTE: *Text in italics represent approx. elevations*

Table 2: Groundwater and Surface Water Elevations (1994-2015)

Monitor	Ref Elevation (mAMSL)	02-Apr-01 (mAMSL)	18-Jul-01 (mAMSL)	25-Oct-01 (mAMSL)	11-Jan-02 (mAMSL)	30-May-02 (mAMSL)	23-Jul-02 (mAMSL)	04-Nov-02 (mAMSL)	03-Jan-03 (mAMSL)	06-Jan-03 (mAMSL)	22-Apr-03 (mAMSL)
LONG TERM MONITORS											
79-4	418.760	401.41	401.92		400.54	401.17	400.48			399.62	399.82
83-102	417.700	Not Found	Not Found	Not Found	Not Found	Not Found	Not Found	Not Found	Not Found	Not Found	Not Found
88-1	416.600	408.23	407.60	406.21	406.34	409.32	407.32	405.91	405.53		406.43
88-5	433.100	402.04	402.82	402.37	402.01	402.06	402.35	402.09	402.08		401.38
96-1D	419.120	397.30	397.81	397.60	397.45	397.41	397.53	397.32	397.19		396.81
96-1S	419.040	399.14	399.70	399.52	399.33	399.20		399.29	399.20		398.82
96-2D	427.160	397.37	397.82	397.60	397.40	397.54	397.59	397.36	397.81		396.99
96-2S	427.300	400.96	400.91	401.13	400.94	400.87	401.04	401.45	400.92		400.60
Cosgrove Well	420.000	394.65	394.92	394.18	394.56	394.79	395.10	394.60	394.40		394.29
TW-2	422.190	405.76	405.84	405.27	405.20	405.90	405.61	404.68	404.87		404.80
HYDRAULIC BUFFER MONITORS											
98-1	411.411	Not Found	Not Found	Not Found	Not Found	Not Found	Not Found	Not Found	Not Found	Not Found	Not Found
98-2	413.386	410.61	408.54	406.76	407.12	410.91	408.43			406.37	407.97
98-3	413.216	409.88	408.08	406.70	406.97	410.31	407.98	406.32	406.04		407.48
98-4	410.406	407.19	406.54	405.99	406.08	406.61	406.32	405.71	405.46		405.89
		3.42	2.00	0.77	1.04	4.30	2.11				2.08
		2.69	1.54	0.71	0.89	3.70	1.66	0.61	0.58		1.59
98-5	411.135	409.33	407.74	406.52	406.78	410.14	407.72	406.14	405.74		407.07
CC-1 (bridge)	412.931	411.13	dry	dry	dry	411.00	dry				dry
CC-2	411.473	411.33	dry	dry	dry	dry	dry				dry
SURFACE WATER STATIONS											
Warnock Lake (SG1-2013)	411.280										
Warnock Lake (1)	410.116	Submrgd	dry								dry
Warnock Lake (2)	409.781	Submrgd	409.13								dry
Warnock Lake (3)	408.526	407.94					408.16				407.80
North Pond	407.010	406.10	406.30	405.69	405.59	405.84	405.51		**406.74**		**406.78**
East Pond	407.233	406.48	406.59	406.14					**405.22**		**405.47**
West Pond	405.474								**405.28**		**405.32**
South Pond	406.565	405.27	405.75				405.75	405.47	404.80		406.00
Conc2 Pond	407.951										
83-101	427.200							427.20			Blocked 0.25
88-2	419.400	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed
88-4S	432.400										
88-6	429.000	401.95	402.61	402.27	402.03	402.08	402.30	402.16	401.83		401.34
94-1	412.760	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed
94-2	410.430	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed
94-3	407.050		405.62	405.13	404.85	405.64	405.38	404.96	404.57		
94-4	409.640	404.59	405.20	404.61	404.30	404.97	404.96	404.44	404.44		403.67
94-5	407.870		404.91	404.48	Removed	Removed	Removed	Removed	Removed	Removed	Removed
94-6	407.900	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed
94-7	409.560	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed
96-3	428.880	405.52	405.89	405.20	404.99	405.78	405.61	404.95	404.69		404.50
96-4	413.110	Rep. by 98-2	Rep. by 98-2	Rep. by 98-2	Rep. by 98-2	Rep. by 98-2	Rep. by 98-2	Rep. by 98-2	Rep. by 98-2	Rep. by 98-2	Rep. by 98-2
96-5	412.630	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed
96-6	410.213	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed
96-7D	411.450	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed
96-7S	411.340	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed
96-8	411.840	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed
96-9		Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed
96-10	410.597	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed
96-11	411.009	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed
96-12	411.282	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed
96-13	412.110	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed
00-1	395.660	388.98	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed

NOTE: *Text in italics represent approx. elevations*

Table 2: Groundwater and Surface Water Elevations (1994-2015)

Monitor	Ref Elevation (mAMSL)	31-Jul-03 (mAMSL)	26-Nov-03 (mAMSL)	27-Jan-04 (mAMSL)	07-May-04 (mAMSL)	18-Aug-04 (mAMSL)	04-Jan-05 (mAMSL)	23-Mar-05 (mAMSL)	15-Jun-05 (mAMSL)	08-Nov-05 (mAMSL)	22-Dec-05 (mAMSL)
LONG TERM MONITORS											
79-4	418.760	399.77	399.08		400.75	401.94	400.29	400.99	401.63	400.05	400.08
83-102	417.700	Not Found	Not Found	Not Found	Not Found	Not Found	Not Found	Not Found	Not Found	Not Found	Not Found
88-1	416.600	406.31	405.57		408.55	408.47		407.62	408.12	406.07	406.21
88-5	433.100	401.38	401.24	401.13	401.69	402.50	402.13	402.09	403.15	402.34	402.39
96-1D	419.120	396.93	396.89	396.83	396.68	397.30	397.48	397.43	397.83	397.50	397.54
96-1S	419.040	398.86	398.96	398.91	399.03	399.49	399.39	399.27	399.56	398.95	398.98
96-2D	427.160	397.05	396.94	396.99	397.36	397.71	397.51	397.46	397.96	397.56	397.48
96-2S	427.300	400.60	400.63	400.57	400.74	401.23	401.03	400.91	401.38	401.05	401.02
Cosgrove Well	420.000	394.25	393.77	393.98	394.50	394.80	394.11	394.79	394.97	393.89	
TW-2	422.190					405.80	405.45	405.71	405.98	405.13	405.16
HYDRAULIC BUFFER MONITORS											
98-1	411.411	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed
98-2	413.386	407.23	406.37	406.51	411.24	408.06	406.50	408.71	409.16	406.33	406.41
98-3	413.216	406.94	406.19	406.33	410.80	407.70	406.29		408.88	406.00	
98-4	410.406	405.81	405.26	405.36	406.15	406.29	405.34	406.72	406.16	405.26	
		1.42	1.11	1.15	5.09	1.77	1.16		3.00	1.07	
		1.13	0.93	0.97	4.65	1.41	0.95		2.72	0.74	
98-5	411.135					407.59	406.22	407.88		405.74	405.78
CC-1 (bridge)	412.931	dry	dry	dry	412.01	411.81	Covered	411.70	411.83	411.60	411.54
CC-2	411.473	dry	dry	dry	410.05	409.93	Covered	410.02	410.01	409.91	409.87
SURFACE WATER STATIONS											
Warnock Lake (SG1-2013)	411.280										
Warnock Lake (1)	410.116	dry	dry	Not Monitored			Dry	frozen @ 1.02	Inacessible	Dry	Dry
Warnock Lake (2)	409.781	dry	dry	Not Monitored			Dry	frozen @ 1.13	Inacessible	Dry	Dry
Warnock Lake (3)	408.526	dry	dry	Not Monitored			Dry	Removed	Removed	Removed	Removed
North Pond	407.010	**406.64**	**406.80**				405.01	406.52	405.99	405.86	405.61
East Pond	407.233	**405.25**	**405.72**	**405.94**	**406.92**	**406.80**	**406.26**	406.61	406.69	406.00	405.84
West Pond	405.474	**404.75**	**403.87**	**404.53**	**405.07**	**405.23**	**404.56**	405.15	405.17	404.57	404.67
South Pond	406.565	405.07	405.38	405.35	406.00	406.02	405.33	405.77	405.40	405.01	405.07
Conc2 Pond	407.951										
83-101	427.200	Blocked 0.27	Blocked	Blocked	Not Found	Not Found	Not Found	Blocked @ 0.21	Blocked	Blocked	Blocked
88-2	419.400	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed
88-4S	432.400										
88-6	429.000	401.58	401.65	Blocked 0.49	401.98	402.90	401.98	401.81	402.40	401.89	401.82
94-1	412.760	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed
94-2	410.430	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed
94-3	407.050	404.80	404.90			405.81	405.14		405.95	405.08	404.79
94-4	409.640	404.23	404.30	403.92	405.31	405.26	404.67				
94-5	407.870	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed
94-6	407.900	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed
94-7	409.560	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed
96-3	428.880	404.82	404.48	404.78	405.78	406.38	405.46	405.50	405.95	404.99	404.93
96-4	413.110	Rep. by 98-2	Rep. by 98-2	Rep. by 98-2	Rep. by 98-2	Rep. by 98-2	Rep. by 98-2	Rep. by 98-2	Rep. by 98-2	Rep. by 98-2	Rep. by 98-2
96-5	412.630	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed
96-6	410.213	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed
96-7D	411.450	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed
96-7S	411.340	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed
96-8	411.840	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed
96-9		Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed
96-10	410.597	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed
96-11	411.009	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed
96-12	411.282	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed
96-13	412.110	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed
00-1	395.660	Destroyed	Destroyed	Destroyed	Removed	Removed	Removed	Removed	Removed	Removed	Removed

NOTE: *Text in italics represent approx. elevations*

Table 2: Groundwater and Surface Water Elevations (1994-2015)

Monitor	Ref Elevation (mAMSL)	29-Mar-06 (mAMSL)	11-Jul-06 (mAMSL)	21-Sep-06 (mAMSL)	21-Dec-06 (mAMSL)	27-Mar-07 (mAMSL)	10-Jun-07 (mAMSL)	16-Aug-07 (mAMSL)	10-Oct-07 (mAMSL)	28-Dec-07 (mAMSL)	14-Mar-08 (mAMSL)
LONG TERM MONITORS											
79-4	**418.760**	402.73	401.47	400.79	400.64	400.97	400.91	400.31	400.28	399.89	401.77
83-102	**417.700**	Not Found	Not Found	Not Found	Not Found	Not Found	Not Found				
88-1	**416.600**	409.83	407.55	406.62	408.51	409.13	408.20	406.86	406.84	406.01	409.62
88-5	**433.100**	402.20	402.91	402.56	402.67	402.43	402.39	402.64	402.59	402.20	402.61
96-1D	**419.120**	397.53	397.75	397.77	397.67	397.78	397.61	397.61	397.59	397.37	397.78
96-1S	**419.040**	399.22	399.37	399.27	399.15	399.18	399.64	399.38	399.37	398.76	399.75
96-2D	**427.160**	397.76	397.92	397.75	397.66	397.66	397.66	397.51	397.54	397.29	397.78
96-2S	**427.300**	400.89	401.08	401.22	401.04	401.13	401.15	401.08	401.00	400.83	401.35
Cosgrove Well	**420.000**		395.09	394.90	394.95	394.99	394.82		394.75	393.95	394.77
TW-2	**422.190**	406.65			405.53	405.96	405.84	405.41	405.36		405.21
HYDRAULIC BUFFER MONITORS											
98-1	**411.411**	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed
98-2	**413.386**	411.38	408.55	407.01	407.08	408.48	409.27	407.25	407.22	407.19	411.27
98-3	**413.216**	410.91	408.13	406.88	406.96	407.85	408.77	407.10	407.07	407.03	410.79
98-4	**410.406**	407.33	406.34	405.95	406.06	406.22	406.63	405.89	405.90	405.86	407.22
		4.05	2.21	1.06	1.02	2.26	2.64	1.36	1.32	1.33	4.05
		3.58	1.79	0.93	0.90	1.63	2.14	1.21	1.17	1.17	3.57
98-5	**411.135**			405.93	406.02		406.61	406.75	406.71		
CC-1 (bridge)	**412.931**	411.98	411.70		411.68	411.63	411.53	411.51	411.35		
CC-2	**411.473**	410.30	410.09		410.26	410.20	409.86	409.83	409.76		
SURFACE WATER STATIONS											
Warnock Lake (SG1-2013)	**411.280**										
Warnock Lake (1)	**410.116**			Dry	Dry	Inaccessible	Inaccessible	Inaccessible	dry	snow	snow
Warnock Lake (2)	**409.781**			Dry	Dry	Inaccessible	Inaccessible	Inaccessible	dry	snow	snow
Warnock Lake (3)	**408.526**			Removed	Removed	Removed	Removed				
North Pond	**407.010**	406.42		405.63	405.17	406.11	405.51	405.43	405.36	405.34	406.14
East Pond	**407.233**	406.79		406.52	406.39	406.50	405.89		405.45	405.61	406.46
West Pond	**405.474**	405.33		404.95	404.93	405.27	405.16	404.63	404.55	404.33	405.17
South Pond	**406.565**	405.57		405.29	405.41	405.78	405.38		405.30	405.22	
Conc2 Pond	**407.951**										
83-101	**427.200**	Blocked	Blocked	Blocked	Blocked	Blocked	Blocked	Removed	Removed	Removed	Removed
88-2	**419.400**	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed
88-4S	**432.400**										
88-6	**429.000**	402.07	401.85	402.15	402.09	402.12	402.08		402.05	401.80	402.42
94-1	**412.760**	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed
94-2	**410.430**	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed
94-3	**407.050**	405.66	405.60	405.24	405.08	405.10	405.35		405.20	404.86	
94-4	**409.640**										
94-5	**407.870**	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed
94-6	**407.900**	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed
94-7	**409.560**	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed
96-3	**428.880**	406.72	405.83	405.66	405.75	405.79	404.87		404.77	404.73	406.54
96-4	**413.110**	Rep. by 98-2	Rep. by 98-2	Rep. by 98-2	Rep. by 98-2	Rep. by 98-2	Rep. by 98-2	Rep. by 98-2	Rep. by 98-2	Rep. by 98-2	Rep. by 98-2
96-5	**412.630**	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed
96-6	**410.213**	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed
96-7D	**411.450**	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed
96-7S	**411.340**	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed
96-8	**411.840**	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed
96-9		Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed
96-10	**410.597**	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed
96-11	**411.009**	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed
96-12	**411.282**	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed
96-13	**412.110**	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed
00-1	**395.660**	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed

NOTE: *Text in italics represent approx. elevations*

Table 2: Groundwater and Surface Water Elevations (1994-2015)

Monitor	Ref Elevation (mAMSL)	15-Apr-08 (mAMSL)	12-Jun-08 (mAMSL)	16-Sep-08 (mAMSL)	29-Dec-08 (mAMSL)	13-Mar-09 (mAMSL)	25-Jun-09 (mAMSL)	09-Sep-09 (mAMSL)	30-Dec-09 (mAMSL)	24-Mar-10 (mAMSL)	04-Jun-10 (mAMSL)
LONG TERM MONITORS											
79-4	**418.760**	401.98	401.65	401.26	401.15	402.57	401.96	401.73	401.11	401.78	401.02
83-102	**417.700**										
88-1	**416.600**	409.90	409.51	409.19	408.11	409.97	410.06	410.17	408.56	410.81	409.98
88-5	**433.100**	402.83	402.78	402.70	402.33	402.96	402.81	402.75	402.80	402.64	402.59
96-1D	**419.120**	397.75	397.68	397.63	397.69	397.89	398.21	398.03	397.89	397.76	397.90
96-1S	**419.040**	399.79	399.55	399.23	399.49	399.81	399.86	399.75	399.63	399.40	399.49
96-2D	**427.160**	397.81	397.61	397.55	397.72	398.11	398.32	398.24	397.99	397.96	398.09
96-2S	**427.300**	401.42	401.35	401.25	401.29	401.56	401.60	401.48	401.24	401.09	401.27
Cosgrove Well	**420.000**	394.98	394.91	394.82	394.69	395.05		395.59		395.21	395.30
TW-2	**422.190**	406.84	406.68	406.32	405.65	406.92	406.35	406.28		406.54	406.18
HYDRAULIC BUFFER MONITORS											
98-1	**411.411**	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed
98-2	**413.386**	411.51	411.05	409.18	411.13	411.67	410.28	410.14	408.13	411.20	409.73
98-3	**413.216**	411.03	410.61	408.68	410.68	411.31	409.66	409.51	407.76	410.78	409.21
98-4	**410.406**	407.46	407.03	406.58	406.73	407.94	406.69	406.48	406.26	407.33	406.98
		4.05	4.02	2.60	4.40	3.73	3.59	3.66	1.87	3.87	2.75
		3.57	3.58	2.10	3.95	3.37	2.97	3.03	1.50	3.45	2.23
98-5	**411.135**			408.32				408.73			409.21
CC-1 (bridge)	**412.931**	411.85	412.93								
CC-2	**411.473**	410.44	411.47								
SURFACE WATER STATIONS											
Warnock Lake (SG1-2013)	**411.280**										
Warnock Lake (1)	**410.116**	Inaccessible	inaccessible	inaccessible	inaccessible	inaccessible			10 cm of water at base	inaccessible	
Warnock Lake (2)	**409.781**								dry	-	-
Warnock Lake (3)	**408.526**								dry	-	-
North Pond	**407.010**	406.46	405.96	405.93	405.78	406.49	405.77	406.13	405.97	405.70	406.11
East Pond	**407.233**	406.81	406.49	406.22	406.50	406.99	406.20	406.24	406.48	405.98	405.99
West Pond	**405.474**	405.25	405.22	405.16	405.59	405.80	405.54	405.76	405.73	405.49	405.68
South Pond	**406.565**	405.94	405.85	405.67	406.10	406.44	405.88	405.98	406.07	405.65	405.77
Conc2 Pond	**407.951**						406.51	406.26		407.17	406.91
83-101	**427.200**	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed
88-2	**419.400**	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed
88-4S	**432.400**										
88-6	**429.000**	402.68	402.60	402.55	402.32	402.74	402.69	402.55	402.55	402.30	-
94-1	**412.760**	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed
94-2	**410.430**	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed
94-3	**407.050**										
94-4	**409.640**										
94-5	**407.870**	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed
94-6	**407.900**	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed
94-7	**409.560**	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed
96-3	**428.880**	406.71	406.27	405.68	405.48	406.90	406.17	406.03	405.72	406.73	406.27
96-4	**413.110**	Rep. by 98-2	Rep. by 98-2	Rep. by 98-2	Rep. by 98-2	Rep. by 98-2	Rep. by 98-2	Rep. by 98-2	Rep. by 98-2	Rep. by 98-2	Rep. by 98-2
96-5	**412.630**	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed
96-6	**410.213**	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed
96-7D	**411.450**	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed
96-7S	**411.340**	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed
96-8	**411.840**	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed
96-9		Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed
96-10	**410.597**	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed
96-11	**411.009**	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed
96-12	**411.282**	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed
96-13	**412.110**	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed
00-1	**395.660**	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed

NOTE: *Text in italics represent approx. elevations*

Table 2: Groundwater and Surface Water Elevations (1994-2015)

Monitor	Ref Elevation (mAMSL)	13-Oct-10 (mAMSL)	08-Dec-10 (mAMSL)	22-Mar-11 (mAMSL)	28-Jun-11 (mAMSL)	16-Sep-11 (mAMSL)	12-Dec-11 (mAMSL)	09-Mar-12 (mAMSL)	18-Jun-12 (mAMSL)	25-Sep-12 (mAMSL)	02-Jan-13 (mAMSL)
LONG TERM MONITORS											
79-4	**418.760**	400.87	400.48	401.76	401.11	401.04	400.54	401.17	400.74	400.50	399.80
83-102	**417.700**										
88-1	**416.600**	408.48	408.59	410.94	409.99	408.42	408.93	409.66	409.62	407.88	407.71
88-5	**433.100**	402.89	402.69	402.59	403.18	403.02	402.70	402.59	403.21	402.81	402.38
96-1D	**419.120**	397.95	397.82	397.66	398.04	397.96	397.89	397.79	397.92	397.78	397.54
96-1S	**419.040**	399.66	399.58	399.34	399.68	399.66	399.60	399.44	399.59	399.51	399.38
96-2D	**427.160**	398.02	397.89	397.89	398.26	398.08	397.96	397.96	398.11	397.90	397.65
96-2S	**427.300**	401.27	401.17	401.42	401.47	401.39	401.25	401.17	401.36	401.26	401.09
Cosgrove Well	**420.000**		394.24	395.14	392.48			394.98			394.73
TW-2	**422.190**	405.79	405.70	406.57	406.08	405.76	405.81	406.14	405.99	405.51	405.35
HYDRAULIC BUFFER MONITORS											
98-1	**411.411**	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed
98-2	**413.386**	407.82	408.32	411.30	410.00	407.67	409.19		409.32	406.97	406.98
98-3	**413.216**	407.54	407.87	410.96	409.47	407.42	408.51		408.86	406.79	406.74
98-4	**410.406**	406.24	406.09	407.57	406.63	406.22	406.18	406.80	406.76	405.85	405.65
		1.58	2.23	3.73	3.37	1.45	3.01		2.56	1.12	1.33
		1.30	1.78	3.38	2.84	1.20	2.33		2.09	0.94	1.09
98-5	**411.135**				410.04	407.21	409.08		409.75		
CC-1 (bridge)	**412.931**										
CC-2	**411.473**										
SURFACE WATER STATIONS											
Warnock Lake (SG1-2013)	**411.280**										
Warnock Lake (1)	**410.116**	dry	dry	inaccessible			408.67				
Warnock Lake (2)	**409.781**	dry	dry				inaccessible	inaccessible			
Warnock Lake (3)	**408.526**	408.13	rozen lake edge				inaccessible	inaccessible			
North Pond	**407.010**	405.85		406.05	405.94	405.87	405.87	405.75	405.54	405.57	405.08
East Pond	**407.233**	405.73	405.71	406.00	405.99	405.69	405.95	406.05	405.73	405.46	405.39
West Pond	**405.474**	405.48	405.48	405.75	405.63	405.69	405.65	405.75	405.54	405.57	405.08
South Pond	**406.565**	405.55	405.57	405.48	405.80	405.50	405.72	405.64	405.54	405.33	405.24
Conc2 Pond	**407.951**	406.19		407.38	406.58	406.21	406.14	406.69	406.73	405.86	405.64
83-101	**427.200**	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed
88-2	**419.400**	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed
88-4S	**432.400**										
88-6	**429.000**	402.67	402.51	402.26	402.93	402.66	402.58	402.40	402.63	402.48	402.20
94-1	**412.760**	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed
94-2	**410.430**	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed
94-3	**407.050**										
94-4	**409.640**										
94-5	**407.870**	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed
94-6	**407.900**	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed
94-7	**409.560**	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed
96-3	**428.880**	405.80									
96-4	**413.110**	Rep. by 98-2	Rep. by 98-2	Rep. by 98-2	Rep. by 98-2	Rep. by 98-2	Rep. by 98-2	Rep. by 98-2	Rep. by 98-2	Rep. by 98-2	Rep. by 98-2
96-5	**412.630**	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed
96-6	**410.213**	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed
96-7D	**411.450**	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed
96-7S	**411.340**	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed
96-8	**411.840**	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed
96-9		Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed
96-10	**410.597**	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed
96-11	**411.009**	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed
96-12	**411.282**	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed
96-13	**412.110**	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed
00-1	**395.660**	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed

NOTE: *Text in italics represent approx. elevations*

Table 2: Groundwater and Surface Water Elevations (1994-2015)

Monitor	Ref Elevation (mAMSL)	02-Apr-13 (mAMSL)	21-Jun-13 (mAMSL)	01-Oct-13 (mAMSL)	18-Dec-13 (mAMSL)	24-Apr-14 (mAMSL)	26-Jun-14 (mAMSL)	15-Sep-14 (mAMSL)	02-Dec-14 (mAMSL)	14-Apr-15 (mAMSL)	24-Jun-15 (mAMSL)
LONG TERM MONITORS											
79-4	**418.760**	400.48	401.42	400.96	400.51	401.32	401.23	400.99	400.01	400.35	400.66
83-102	**417.700**										
88-1	**416.600**	409.68	410.65	408.55							
88-5	**433.100**	402.34	403.29	403.15	402.89	403.68	403.62	403.28	402.93	402.76	403.11
96-1D	**419.120**	397.36	397.86	397.93	397.75	397.81	397.99	398.00	397.87	397.53	397.74
96-1S	**419.040**	398.78	399.52	399.64	399.53	399.41	399.65	399.67	399.60	399.26	399.36
96-2D	**427.160**	397.61	398.07	398.11	397.95	398.26	398.29	398.20	398.01	397.80	398.00
96-2S	**427.300**	400.64	401.36	401.39	401.32	401.57	401.53	401.51	401.43	401.25	401.21
Cosgrove Well	**420.000**		395.24				395.37				
TW-2	**422.190**	405.68	406.13	405.79	405.67	406.87	406.04	405.83	405.63	405.63	405.94
HYDRAULIC BUFFER MONITORS											
98-1	**411.411**	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed
98-2	**413.386**	410.42	410.77	407.80	408.00	411.33	409.47	407.95	408.17	410.87	409.51
98-3	**413.216**	410.01	409.54	407.54	407.63	410.64	409.00	407.69	407.82	410.18	409.01
98-4	**410.406**	406.29	407.00	406.28	406.15	408.12	406.94	406.55	406.58	407.47	407.30
		4.13	3.77	1.52	1.85	3.21	2.53	1.40	1.59	3.40	2.21
		3.72	2.54	1.26	1.48	2.52	2.06	1.14	1.24	2.71	1.71
98-5	**411.135**										
CC-1 (bridge)	**412.931**										
CC-2	**411.473**										
SURFACE WATER STATIONS											
Warnock Lake (SG1-2013)	**411.280**		410.33							410.18	
Warnock Lake (1)	**410.116**										
Warnock Lake (2)	**409.781**										
Warnock Lake (3)	**408.526**										
North Pond	**407.010**	405.37	405.38	405.38		406.15	405.35	405.67		405.55	405.65
East Pond	**407.233**	405.59	405.50	405.69		406.19	405.71	405.76		405.63	405.78
West Pond	**405.474**	405.37	405.38	405.38		406.15	405.35	405.67		405.55	405.65
South Pond	**406.565**	405.22	405.50	405.63		405.68	405.68	405.68		405.29	405.65
Conc2 Pond	**407.951**	406.22	406.88	406.26							
83-101	**427.200**	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed
88-2	**419.400**	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed
88-4S	**432.400**										
88-6	**429.000**	402.00	402.68	402.72	402.49	402.44	402.81	402.78	402.56	402.10	402.44
94-1	**412.760**	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed
94-2	**410.430**	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed
94-3	**407.050**										
94-4	**409.640**										
94-5	**407.870**	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed
94-6	**407.900**	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed
94-7	**409.560**	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed
96-3	**428.880**										
96-4	**413.110**	Rep. by 98-2	Rep. by 98-2	Rep. by 98-2	Rep. by 98-2	Rep. by 98-2	Rep. by 98-2	Rep. by 98-3	Rep. by 98-4	Rep. by 98-5	Rep. by 98-6
96-5	**412.630**	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed
96-6	**410.213**	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed
96-7D	**411.450**	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed
96-7S	**411.340**	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed
96-8	**411.840**	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed
96-9		Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed
96-10	**410.597**	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed
96-11	**411.009**	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed
96-12	**411.282**	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed
96-13	**412.110**	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed
00-1	**395.660**	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed

NOTE: *Text in italics represent approx. elevations*

Table 2: Groundwater and Surface Water Elevations (1994-2015)

Monitor	Ref Elevation (mAMSL)	06-Jul-15 (mAMSL)	22-Sep-15 (mAMSL)	11-Dec-15 (mAMSL)	18-Dec-15 (mAMSL)	06-Jan-16 (mAMSL)
LONG TERM MONITORS						
79-4	**418.760**	400.84	400.77	399.78	399.77	399.91
83-102	**417.700**					
88-1	**416.600**					
88-5	**433.100**	403.18	403.25	402.83		
96-1D	**419.120**	397.78	397.83	397.66		
96-1S	**419.040**	399.41	399.55	399.46		
96-2D	**427.160**		398.05	397.86		
96-2S	**427.300**		401.26	401.25		
Cosgrove Well	**420.000**					
TW-2	**422.190**		405.75	405.46		
HYDRAULIC BUFFER MONITORS						
98-1	**411.411**	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed
98-2	**413.386**		408.07	406.83		
98-3	**413.216**		407.79	406.70		
98-4	**410.406**		406.69	406.08		
98-5	**411.135**					
CC-1 (bridge)	**412.931**					
CC-2	**411.473**					
SURFACE WATER STATIONS						
Warnock Lake (SG1-2013)	**411.280**					
Warnock Lake (1)	**410.116**					
Warnock Lake (2)	**409.781**					
Warnock Lake (3)	**408.526**					
North Pond	**407.010**		405.44	405.21		
East Pond	**407.233**		405.66	405.51		
West Pond	**405.474**		405.44	405.21		
South Pond	**406.565**		405.49	405.38		
Conc2 Pond	**407.951**					
83-101	**427.200**	Removed	Removed	Removed	Removed	Removed
88-2	**419.400**	Removed	Removed	Removed	Removed	Removed
88-4S	**432.400**					
88-6	**429.000**		402.62	402.38		
94-1	**412.760**	Removed	Removed	Removed	Removed	Removed
94-2	**410.430**	Removed	Removed	Removed	Removed	Removed
94-3	**407.050**					
94-4	**409.640**					
94-5	**407.870**	Removed	Removed	Removed	Removed	Removed
94-6	**407.900**	Removed	Removed	Removed	Removed	Removed
94-7	**409.560**	Removed	Removed	Removed	Removed	Removed
96-3	**428.880**					
96-4	**413.110**	Rep. by 98-7	Rep. by 98-8	Rep. by 98-8	Rep. by 98-8	Rep. by 98-9
96-5	**412.630**	Removed	Removed	Removed	Removed	Removed
96-6	**410.213**	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed
96-7D	**411.450**	Removed	Removed	Removed	Removed	Removed
96-7S	**411.340**	Removed	Removed	Removed	Removed	Removed
96-8	**411.840**	Removed	Removed	Removed	Removed	Removed
96-9		Removed	Removed	Removed	Removed	Removed
96-10	**410.597**	Removed	Removed	Removed	Removed	Removed
96-11	**411.009**	Removed	Removed	Removed	Removed	Removed
96-12	**411.282**	Removed	Removed	Removed	Removed	Removed
96-13	**412.110**	Removed	Removed	Removed	Removed	Removed
00-1	**395.660**	Removed	Removed	Removed	Removed	Removed

NOTE: *Text in italics represent approx. elevations*

Table 3A: Groundwater and Surface Water Temperatures (1994-2015)

MONITOR	12-Jul-94	14-Jul-94	20-Jul-94	27-Jul-94	05-Aug-94	10-Aug-94	25-Aug-94	08-Sep-94	31-Oct-94	16-Jan-95	20-Feb-95	13-Mar-95	12-Apr-95	18-May-95	16-Jun-95	21-Jul-95	16-Aug-95	16-Oct-95
79-430	8.1		8.8	9.4	9.8		9.0	8.1	10.5	12.8	14.0	14.6	14.2	9.8	7.3	9.1	9.1	12.5
88-1			7.8	8.3		8.1	8.1	8.1	7.7	7.4	7.7		8.6	9.2	9.9	8.8	8.4	9.2
88-5		7.7	7.9	7.8		7.7	7.9	7.9	7.7	7.3	6.8		7.7	7.9	8.6	7.9	8.1	6.7
88-6																		
96-1S																		
96-1D																		
96-2S																		
96-2D																		
TW-2																		
Cosgrove Well																		
South Pond				22.3	22.5			18.5	10.0	0.3	4.1		4.9	16.1	18.1	26.7	27.4	12.8
North Pond																		
East Pond																		
West Pond																		
Warnock Lake																		
Conc. II Pond																		

NOTE:

All values given in °C

"-" No measurement taken

Table 3A: Groundwater and Surface Water Temperatures (1994-2015)

MONITOR	29-Nov-95	28-Dec-95	31-Jan-96	20-Feb-96	30-Apr-96	23-May-96	17-Aug-97	20-Dec-97	29-Jan-98	27-May-98	30-Jul-98	06-Oct-98	02-Feb-99	08-Apr-99	30-Jul-99	01-Nov-99	20-Jan-00	27-Apr-00
79-430	12.9	15.7	14.9	14.4	6.3	6.4	6.6	11.0	13.5	8.4	7.4	10.8	13.5		12.4	10.4	12.4	12.0
88-1	9.2	7.7	10.3	9.9				7.5	7.7	8.4	8.4	8.0	7.6			7.8		7.6
88-5	7.7	7.5	8.0	7.9		8.1		8.7	9.4	7.9	8.3	8.0	7.4		9.0	7.8		9.1
88-6																		
96-1S						9.9	10.0	10.2	10.4	10.2	10.0	10.1	8.4		10.0	10.2	9.4	9.6
96-1D						9.9	10.3	10.8	11.3	9.4	9.7	9.8	9.9		9.5	9.4	9.3	9.5
96-2S						9.4	8.6	8.9	9.0	9.2	8.1	8.3	7.7	8.7		7.8	7.9	7.6
96-2D						9.2	7.7	8.1	8.2	8.9	8.1	8.2	7.8	8.2		8.3	6.8	7.9
TW-2									8.1	9.6	6.8	7.2	7.6	8.4	8.0	6.7	6.1	7.1
Cosgrove Well									7.9	8.3	7.7	10.4	7.9	8.1	9.0	7.7	7.1	6.9
South Pond									0.7	18.3	22.7	14.0		4.0	22.0	9.7		11.7
North Pond									0.5	19.1	22.5	14.0		4.0	22.0	11.5		10.1
East Pond									0.3	19.3	22.2	14.0		4.0	22.0	10.9		11.1
West Pond									0.4	19.1	24.2	14.0		4.0	22.0	11.3		10.0
Warnock Lake									0.4	21.1	23.7	14.0						
Conc. II Pond									0.3	19.1	19.7	14.0						

NOTE:

All values given in °C

"-" No measurement taken

Table 3A: Groundwater and Surface Water Temperatures (1994-2015)

MONITOR	01-Sep-00	29-Nov-00	02-Apr-01	18-Jul-01	25-Oct-01	11-Jan-02	30-May-02	23-Jul-02	04-Nov-02	03-Jan-03	06-Jan-03	14-Jan-03	22-Apr-03	31-Jul-03	26-Nov-03	27-Jan-04	07-May-04	18-Aug-04
79-430	11.3	11.7		15.1		12.5	8.8	7.7			13.7	12.0	11.1	8.8	8.5		9.6	
88-1	18.4	16.2		11.9	10.1	9.4	10.2	11.7	9.9			8.7	9.1	9.3	7.8		11.1	
88-5	8.2	7.2		8.2	6.2	6.5	7.8	8.8	7.1			6.8	7.1	8.6	7.2	5.9	11.7	
88-6																		
96-1S	10.1	9.8		10.6	9.7	9.6	10.5	10.4	10.4			9.9	10.0	10.6	9.7	7.9	11.0	
96-1D	9.9	9.2		9.9	9.8	8.9	9.3	10.2	9.9			10.0	9.5	9.9	9.1	9.1	10.1	
96-2S	7.5	7.5		7.7	7.2	7.2	8.1	10.2	7.9			7.4	7.4	8.5	7.3	6.8	10.5	
96-2D	8.3	7.5		7.7	7.1	5.3	7.7	10.1	7.9			7.4	7.6	8.9	7.4	5.3	8.7	
TW-2	7.9	10.6		10.3	9.1	8.1	8.5	9.8				8.7	10.2					
Cosgrove Well	6.4	7.0		9.0	7.2	6.2	7.7		6.5			6.8	7.4	7.6	5.0	8.0	8.9	
South Pond	22.9	3.2		20.2	10.0		17.1	24.0	5.7				8.0	23.0	4.3		18.0	22.0
North Pond	23.9	4.1		20.8	9.9	1.7	19.8	25.0					8.0	23.0	4.3		18.0	23.0
East Pond	24.1	4.3		21.2	9.9		12.6						8.0	24.0	3.3		13.0	25.0
West Pond	23.4	3.7		20.8	9.5	0.3	19.2				1.0	1.0	8.0	24.0	3.5	1.0	13.0	24.0
Warnock Lake	25.5			22.1	8.9								11.0	27.0			12.0	25.0
Conc. II Pond	23.7			25.8	8.1		10.8		4.2		1.0	1.0	10.0	24.0	3.3		11.0	24.0

NOTE:

All values given in °C

"-" No measurement taken

Table 3A: Groundwater and Surface Water Temperatures (1994-2015)

MONITOR	04-Jan-05	23-Mar-05	15-Jun-05	08-Nov-05	22-Dec-05	29-Mar-06	11-Jul-06	21-Sep-06	21-Dec-06	27-Mar-07	10-Jun-07	10-Oct-07	28-Dec-07	15-Apr-08	12-Jun-08	16-Sep-08	29-Dec-08	13-Mar-09
79-430	8.1	10.8	9.0	9.5	8.3	10.3	9.0	12.5	8.8	13.5	13.1	8.4	8.9	13.5	11.7	10.6	8.1	8.9
88-1		9.0	9.4	8.0	8.2	9.0	8.4	10.0	8.1	10.2	10.7	8.8	7.2	8.5	9.6	10.2	8.9	8.2
88-5	5.7	7.5	8.7	7.5	6.3	7.5	7.7	9.8	7.9	8.6	10.2	7.5	7.0	8.1	9.4	8.5	7.9	7.9
88-6																		
96-1S	9.3	10.0	10.4	10.1	8.1	10.4	10.8	10.0	8.9	10.2	10.9	10.5	9.2	10.5	10.4	10.2	9.2	9.8
96-1D	8.9	9.8	10.1	10.1	8.8	10.4	10.5	9.9	9.2	10.0	10.5	10.5	9.4	10.2	10.3	10.3	9.3	9.8
96-2S	6.6	7.7	8.7	7.7	6.2	7.9	8.0	10.0	6.8	9.6	8.5	8.1	7.7	8.6	9.2	8.2	7.2	8.2
96-2D	5.3	7.9	9.1	8.0	6.7	7.7	7.9	9.9	7.2	9.5	8.6	8.0	7.5	8.5	9.1	8.0	7.4	8.4
TW-2	7.6	10.2	10.3	10.0	9.7	12.1			9.9	11.0	10.2	9.3	9.1	11.0	9.8	9.5	9.8	8.8
Cosgrove Well	7.8	7.5	7.8	9.6		7.5	7.9	10.3	10.5	9.4	10.2	9.2	7.9	8.8	9.6	9.8	8.6	8.3
South Pond		1.0	13.0	10.0		4.9	22.1	17.0	2.3	1.8	22.0	6.9	4.0	6.3	20.9	19.6	3.6	3.7
North Pond		1.0	13.0	10.0		5.3	22.2	16.8	2.6	6.6	22.9	7.2	4.3	6.3	21.4	19.4	3.9	3.9
East Pond		1.0	13.0	10.0	2.0	5.0	22.3	16.9	2.4	1.7	22.7	7.0	4.1	6.5	20.9	19.2	3.8	3.7
West Pond	1.0	2.0	13.0	10.0	2.0	5.5	22.0	17.0	2.4	5.6	22.3	7.2	4.2	6.2	21.1	19.7	3.8	3.8
Warnock Lake	2.0		15.0			5.6	22.5	18.0		2.5	24.1			7.2	21.5	19.2	5.5	
Conc. II Pond			13.0	9.5	2.0	5.3	21.7	17.1	2.3	1.7	22.7	7.4	4.5	6.3	20.9	18.6	4.1	2.5

NOTE:

All values given in °C

"-" No measurement taken

Table 3A: Groundwater and Surface Water Temperatures (1994-2015)

MONITOR	25-Jun-09	09-Sep-09	30-Dec-09	24-Mar-10	04-Jun-10	13-Oct-10	08-Dec-10	22-Mar-11	28-Jun-11	16-Sep-11	12-Dec-11	09-Mar-12	18-Jun-12	25-Sep-12	02-Jan-13	02-Apr-13	21-Jun-13
79-430	13.1	9.9	15.9	12.9	8.2	11.5	8.6	13.1	9.2	10.0	11.4	12.9	7.5	11.5	15.2	12.4	8.0
88-1	11.2	9.3		10.2	8.6	11.1	9.5	10.7	9.9	11.2	9.8	10.9	9.7	9.4	8.1	9.2	12.1
88-5	10.2	8.7	8.1	9.2	8.4	9.2	8.0	8.0	8.7	8.1			8.5	8.5	7.7	8.1	8.9
88-6																	
96-1S	10.6	10.9	9.3	9.0	9.3	10.5	9.2	9.1	10.9	10.5	10.2	11.7	12.0	11.9	11.4	11.5	
96-1D	10.2	10.4	9.5	9.2	9.4	10.2	9.2	9.4	10.6	10.2	10.0	11.1	11.2	11.2	11.2	8.0	
96-2S	8.6	8.9	8.1	7.5	8.6	8.5	7.4	8.2	9.1	8.6	8.5	8.2	9.5	9.0	8.1	8.2	9.2
96-2D	8.6	8.9	8.2	7.5	8.6	8.5	7.5	8.5	8.6	8.6	8.4	8.5	8.6	8.6	8.5	8.5	8.9
TW-2		9.8		10.2	9.0	10.0	10.9	10.2	9.7	11.0	10.6	10.7	9.0	12.7	13.7	8.6	9.7
Cosgrove Well		9.7		8.6	9.5		7.4	8.1	8.6						7.7		8.4
South Pond	23.5	21.2	3.9	7.4	21.5	13.1	0.4	1.4	21.0	17.5	2.1	1.0	23.4	15.6	0.7	0.4	21.7
North Pond	22.7	21.1	4.1	6.6	21.5	13.4	0.2	1.9	20.7	18.6	1.7	1.0	22.4	15.2	0.2	0.5	21.7
East Pond	23.6	20.5	3.9	6.9	21.0	13.4	0.4	1.1	21.1	17.7	2.4	1.0	22.7	15.9	0.4	0.4	20.7
West Pond	23.5	20.1	4.0	6.5	21.7	13.5	0.2	1.7	21.1	18.6	2.0	1.0	23.0	15.2	0.2	0.5	21.7
Warnock Lake	23.2	21.6		6.2	20.8			1.0	20.6	17.0	0.4					1.0	28.0
Conc. II Pond	22.9	21.1	4.5	6.5	21.1	12.4		1.1	19.1	17.1	2.2	0.7	21.6	15.5	3.1	2.1	8.0

NOTE:

All values given in °C

"-" No measurement taken

Table 3A: Groundwater and Surface Water Temperatures (1994-2015)

MONITOR	01-Oct-13	18-Dec-13	24-Apr-14	26-Jun-14	15-Sep-14	02-Dec-14	14-Apr-15	24-Jun-15	22-Sep-15	11-Dec-15
79-430	10.4	13.5	11.0	7.2	9.0	12.9	12.6	7.7	10.4	16.1
88-1	13.2									
88-5	8.5	7.9	8.2	8.6	8.4	7.6	8.5	8.9	8.6	8.4
88-6										
96-1S	12.0	11.2	11.9	12.0	11.7	10.7	11.7	12.1	11.7	11.2
96-1D	11.1	11.1	11.2	11.5	11.4	11.2	11.4	11.5	11.5	11.4
96-2S	9.2	8.1	8.9	9.5	8.9	7.7	9.0	9.2	9.0	8.7
96-2D	8.7	8.6	8.6	8.7	8.6	8.6	8.6	8.7	8.6	8.6
TW-2	13.6	13.9	7.6	8.7	12.7	13.5	9.2	9.4	13.5	14.0
Cosgrove Well				8.5						
South Pond	17.6		6.9	21.7	17.7		6.9	21.0	19.2	4.9
North Pond	18.0		8.0	21.7	17.6		8.1	21.1	19.4	4.9
East Pond	17.0		8.1	21.2	18.5		8.0	20.6	19.1	5.1
West Pond	18.0		8.0	21.7	17.6		8.1	21.1	19.4	4.9
Warnock Lake			11.7	27.4	15.1		13.0			
Conc. II Pond	17.4		8.1	22.7	16.5		9.5	19.5	18.2	5.2

NOTE:

All values given in °C

"-" No measurement taken

Table 3B: Surface Water Temperatures (1994-2015)

MONITOR	27-Jul-94	05-Aug-94	10-Aug-94	15-Aug-94	25-Aug-94	08-Sep-94	20-Feb-95	18-May-95	21-Jul-95	17-Aug-97	20-Dec-97	29-Jan-98	30-Apr-98	30-Jul-98	02-Feb-99	30-Jul-99
Silver Creek Station 1	11.8	12.1	9.7	10.5	11.8	10.9	4.6	7.5	9	8.8		4.2	9.2	10	4	14
Silver Creek Station 2																
Silver Creek Station 3			17.5	16.9	19.4	15.5		12	23	16.6		1.4	11.9	19.7		23
Eaton Outfall												3	13.9	21.4	1	26
Booth - Residence																
Booth - Trout Ponds																

NOTE: All values given in °C

"-" No measurement taken

Table 3B: Surface Water Temperatures (1994-2015)

MONITOR	01-Nov-99	20-Jan-00	27-Apr-00	01-Sep-00	29-Nov-00	02-Apr-01	18-Jul-01	18-Jul-01	11-Jan-02	30-May-02	04-Nov-02	03-Jan-03	06-Jan-03	14-Jan-03	22-Apr-03	31-Jul-03
Silver Creek Station 1	9.3	2.0	8.9	11.8	5.2	5.0	10.8	8.1	5.7	10.8	6.8			2.7	7.8	11
Silver Creek Station 2	9.8	2.2	11.7	21.2	3.9	5.0	17.9	10.1	3.8	18.7	3.9			2.2	11.7	21
Silver Creek Station 3	9.0	0.1	7.6	20.0	2.5	3.0	17.8	10.2	2.7	15.0	3.6			2.2	10.0	19
Eaton Outfall	9.7	1.1	10.3	23.3	5.0	1.0	21.1	10.1	2.1	18.1	5.1		1.5			23
Booth - Residence										18.1	4.3		2		12	22
Booth - Trout Ponds									3.9		4.1		2		12	20

NOTE: All values given in °C

"-" No measurement taken

Table 3B: Surface Water Temperatures (1994-2015)

MONITOR	26-Nov-03	27-Jan-04	07-May-04	18-Aug-04	04-Jan-05	23-Mar-05	15-Jun-05	08-Nov-05	22-Dec-05	29-Mar-06	11-Jul-06	21-Sep-06	21-Dec-06	27-Mar-07	10-Jun-07	10-Oct-07
Silver Creek Station 1	1	1	10	11	3	1	6	6	4	3.4	19.8	13	3.7	10.4	21.7	7.2
Silver Creek Station 2	1	1	12	11	2	1	5	8	4	3.2	19.3	13	3.4	9.4	21.7	7.1
Silver Creek Station 3	3		10	14	2	1	6	8	4	3.2	21.1	13	4	8.4	22.2	7.3
Eaton Outfall			13		2	1		8			19.2			9.8		
Booth - Residence	2	1	12	13	3	1	4	8	4	3.6	19.6	13	3.2	9.8	22.1	7.4
Booth - Trout Ponds	1	1	12	12	2	1	4	8	4	3.5	19.6	13	3	9.7	22	7.3

NOTE: All values given in °C

"-" No measurement taken

Table 3B: Surface Water Temperatures (1994-2015)

MONITOR	28-Dec-07	15-Apr-08	12-Jun-08	16-Sep-08	29-Dec-08	13-Mar-09	25-Jun-09	09-Sep-09	30-Dec-09	24-Mar-10	04-Jun-10	13-Oct-10	08-Dec-10	22-Mar-11	28-Jun-11	16-Sep-11
Silver Creek Station 1	3.9	6.1	19	20.5	5.5	2.2	22.7	19.7	1.9	9.2	18.2	9.4	4.0	6.2	19.4	9.4
Silver Creek Station 2	4.1	6	19	20.3	3.9	2.1	22.8	19.2	3.9	7.0	18.1	11.1	2.0	6.0	19.2	13.5
Silver Creek Station 3	3.8	6.3	19.1	20.2	2.1	2.0	22.9	19.5	1.0	5.7	18.0	11.2	2.0	4.0	18.8	14.2
Eaton Outfall		6	19.2	20.1	2.3	1.9	22.6	19.1			18.8		2.5	4.7		13.8
Booth - Residence	3.8	6.2	19.2	20.1	2.1	2.0	22.8	19.5	3.9	7.6	20.9	11.5	2.6	4.7	21.4	15.5
Booth - Trout Ponds	3.9	6.8	19.2	20.3	4.0	2.0	22.6	19.1	3.9	7.5	18.0	10.9	3.6	6.0	19.1	13.6

NOTE: All values given in °C

"-" No measurement taken

Table 3B: Surface Water Temperatures (1994-2015)

MONITOR	12-Dec-11	09-Mar-12	18-Jun-12	25-Sep-12	02-Jan-13	02-Apr-13	21-Jun-13	01-Oct-13	18-Dec-13	24-Apr-14	26-Jun-14	15-Sep-14	02-Dec-14	14-Apr-15	24-Jun-15	22-Sep-15	11-Dec-15
Silver Creek Station 1	5.2	5.6	11.6	11.1	4.0	4.2	11.1	10.2	4.2	11.1	13.5	10.2	4.4	10.2	12.0	11.0	8.1
Silver Creek Station 2	4.0	4.2	21.4	11.7	3.4	4.9	19.7	14.4		12.7	20.7	13.5	1.7	12.8	19.5		
Silver Creek Station 3	2.8	3.4	20.2	12.1	1.6	2.2	18.4	14.1	1.4	7.7	20.2	14.0	1.5	11.6	21.9	16.7	6.4
Eaton Outfall	4.5						21.0			11.9	22.0	15.5			22.7	17.7	5.6
Booth - Residence	4.0	3.1	23.1	15.4	3.2	4.7	22.0	15.4	2.5	12.1	23.7	15.1	3.4	13.6	24.1	19.2	6.0
Booth - Trout Ponds	4.4	4.2	21.1	13.2	4.1	4.8	20.4	14.2	4.2	11.9	20.5	13.2	3.5	13.1	21.4	16.7	6.4

NOTE: All values given in °C

"-" No measurement taken

Table 4: Streamflow Measurements (1994 - 2015)

Streamflow Monitoring Station	31-Aug-94	08-Sep-94	13-Sep-94	20-Feb-95	18-May-95	16-Jun-95	21-Jul-95	16-Oct-95	31-Jan-96	20-Feb-96	30-Apr-96	15-May-96	23-May-96	03-Sep-97	29-Jan-98	30-Apr-98	30-Jul-98
Station 1 (North) Spring	6.73	5.05	5.85	6.30	6.80	6.66	4.90	3.74	7.62	10.00	6.53	6.61	6.88	8.80	7.80	7.50	6.60
Station 1 (South) Wetland																	
Station 2																	
Station 3			67.00											84.00	74.00	58.60	55.40
Eaton Outfall															9.00	6.50	6.10
Booth - Residence																	
Booth - Trout Ponds																	

NOTE: All values given in L/s

Table 4: Streamflow Measurements (1994 - 2015)

Streamflow Monitoring Station	02-Feb-99	30-Jul-99	01-Nov-99	28-Apr-00	01-Sep-00	29-Nov-00	02-Apr-01	25-Apr-01	18-Jul-01	25-Oct-01	11-Jan-02	17-May-02	23-Jul-02	04-Nov-02	03-Jan-03	06-Jan-03	22-Apr-03
Station 1 (North) Spring	6.86	4.93	9.62	4.62	5.00	10.60	9.50	11.16	7.81	6.96	5.76	4.71	6.00		3.63		
Station 1 (South) Wetland																	
Station 2				24.60	26.42	36.10	35.80	31.08	33.18	30.32	62.06	38.99	32.40		36.58		
Station 3		41.20	37.90	67.30	58.00	53.70	139.15	86.08	75.84	96.13	126.41	77.36	102.00		96.32		
Eaton Outfall	4.95	2.45	2.30	1.51	1.83	2.74	3.15		4.54	4.09	3.85		4.00	4.48		3.33	
Booth - Residence								1.65	1.50	2.09	1.63	1.58	1.40	1.68		1.55	1.60
Booth - Trout Ponds								23.91	24.47	25.08	30.10	27.03	26.20		30.14		

NOTE: All values given in L/s

HARDEN

Table 4: Streamflow Measurements (1994 - 2015)

Streamflow Monitoring Station	01-May-03	31-Jul-03	03-Dec-03	27-Jan-04	07-May-04	19-Aug-04	04-Jan-05	23-Mar-05	15-Jun-05	08-Nov-05	22-Dec-05	29-Mar-06	11-Jul-06	21-Sep-06	21-Dec-06	27-Mar-07	10-Jun-07
Station 1 (North) Spring	3.78	5.60	6.85	9.00	6.40		10.55	9.09	13.70	17.65	15.55	16.27	11.79	12.71	11.80	12.94	11.86
Station 1 (South) Wetland																	
Station 2	42.76	26.97	37.01	59.48	29.81	68.13	32.73	39.60	44.17	55.29	47.40	47.51	43.46	45.17	72.08	53.71	49.94
Station 3	116.34	61.92	108.76		117.30	133.46	112.24	114.81	136.06	95.24	119.26	130.41	126.15	126.32	104.71	135.76	118.32
Eaton Outfall	3.04	1.51			2.78		4.73	4.93		4.96			4.76			3.75	
Booth - Residence	1.68	1.17	1.38	1.50	1.19	1.32	1.74	1.66	1.32	0.77	1.79	1.89	1.61	1.65	1.82	1.90	1.70
Booth - Trout Ponds	31.40	22.74	31.63	29.99	25.30		30.23	35.00	45.23	68.96	47.24	43.02	37.41	37.83	61.56	53.06	40.82

NOTE: All values given in L/s

Table 4: Streamflow Measurements (1994 - 2015)

Streamflow Monitoring Station	10-Oct-07	28-Dec-07	15-Apr-08	17-Jun-08	16-Sep-08	29-Dec-08	13-Mar-09	25-Jun-09	09-Sep-09	30-Dec-09	24-Mar-10	04-Jun-10	13-Oct-10	08-Dec-10	22-Mar-11	28-Jun-11	16-Sep-11
Station 1 (North) Spring	7.56	11.20	18.68	14.08	13.79	16.79	18.89	14.14	12.38	14.97	16.19	8.58	9.74	11.50	14.31	15.82	13.70
Station 1 (South) Wetland						13.19	19.63	13.12	11.70	12.41	29.94	22.01	43.20	27.97	39.17	40.75	30.81
Station 2	43.60	39.39	62.80	48.75	47.12	60.23	70.76	49.17	45.89	52.39	57.01	34.31	9.09	34.96	55.24	44.28	41.51
Station 3	87.17	90.61	131.40	106.04	99.14	129.28	143.51	103.30	100.95	120.63	136.56	118.98	125.52	106.99	129.67	129.47	107.93
Eaton Outfall			4.73		3.62	5.00	6.02	3.20	2.79			4.20		4.35	5.66		5.43
Booth - Residence	1.27	1.45	1.90	1.76	1.72	2.00	2.15	1.82	1.63	1.90	2.15	1.69	1.85	1.75	2.10	2.05	1.82
Booth - Trout Ponds	29.48	31.59	61.74	56.32	48.20	66.53	69.83	55.85	46.89	51.82	60.30	44.89	27.39	38.45	53.34	53.37	38.76

NOTE: All values given in L/s

Table 4: Streamflow Measurements (1994 - 2015)

Streamflow Monitoring Station	12-Dec-11	09-Mar-12	18-Jun-12	25-Sep-12	02-Jan-13	02-Apr-13	21-Jun-13	01-Oct-13	18-Dec-13	24-Apr-14	26-Jun-14	15-Sep-14	02-Dec-14	14-Apr-15	24-Jun-15	22-Sep-15	11-Dec-15
Station 1 (North) Spring	12.28	12.07	9.93	10.17	6.25	6.19	6.75	7.87		10.98	13.64	9.21	8.20	9.77	9.77	6.93	9.17
Station 1 (South) Wetland	29.00	49.34	42.22	38.99	35.99	44.95	35.00	49.1		50.32	52.03	44.34	44.40	48.23	52.51	49.16	48.40
Station 2	35.31	12.22	12.96	13.27	8.10	7.69	6.23	1.51		1.59	2.24	2.70	1.52	0.36	0.00	0.00	0.00
Station 3	115.97	131.20	138.97	121.26	143.84	162.08	119.64	130.22		167.53	151.89	144.15	143.00	172.68	148.46	103.13	121.15
Eaton Outfall	5.46	5.43	8.81		6.28		6.54			8.07	11.03	8.26			6.32	6.01	6.68
Booth - Residence	1.73	2.33	2.13	1.77	2.05	2.01	1.89	2.11	2.78	2.64	2.28	2.84	2.58	2.24	1.75	1.75	2.15
Booth - Trout Ponds	42.22	42.37	45.94	38.16	33.48	32.79	30.12	37.08		39.08	39.80	41.93	32.96	34.85	28.88	43.87	36.47

NOTE: All values given in L/s

Table 5: Water Quality Results

PARAMETER	SYMBOL	STATION		79-4									
		UNITS	ODWS	22-Dec-97	31-Jul-98	03-Aug-99	10-Nov-99	28-Apr-00	28-Jul-00	01-Sep-00	06-Oct-00	26-Apr-01	19-Jul-01
Silver	Ag	mg/L		<0.003	<0.003	<0.003		<0.003	<0.003			<0.005	<0.005
Aluminum	Al	mg/L	0.1	<0.03	<0.03	<0.03		<0.03	<0.03			<0.03	<0.03
Arsenic	As	mg/L	0.025	<0.01	<0.1	<0.1		<0.1	<0.01			<0.2	<0.2
Boron	B	mg/L	5	0.03	0.01	<0.01		0.01	<0.01			0.01	0.02
Barium	Ba	mg/L	1	0.033	0.091	0.03		0.032	0.027			0.034	0.03
Beryllium	Be	mg/L		<0.0005	<0.0005	0.0005		<0.0005	<0.0005			<0.0005	<0.0005
Bismuth	Bi	mg/L		<0.1	<0.1	<0.1		<0.1	<0.1			<0.2	<0.2
Calcium	Ca	mg/L		45.6	49.8	42.5		48.4	46			48.5	45
Cadmium	Cd	mg/L	0.005	<0.005	<0.005	<0.005		<0.005	<0.005			<0.005	<0.005
Cobalt	Co	mg/L		<0.005	<0.005	<0.005		<0.005	<0.005			<0.005	<0.005
Chromium	Cr	mg/L	0.05	<0.005	<0.005	<0.005		<0.005	<0.005			<0.005	<0.005
Copper	Cu	mg/L	1	0.003	<0.003	0.003		<0.003	<0.003			<0.005	<0.005
Iron	Fe	mg/L	0.3	0.015	1.12	0.19		<0.01	<0.01			0.02	0.03
Potassium	K	mg/L		2	1	2		2	1			1	2
Magnesium	Mg	mg/L		17.9	17	15.8		15.9	16.1			17.2	16.1
Mangenese	Mn	mg/L	0.05	0.016	0.066	0.014		0.017	0.016			0.11	0.011
Molybdenum	Mo	mg/L		<0.01	<0.01	<0.02		<0.02	<0.02			<0.02	<0.02
Sodium	Na	mg/L	20	18.4	18.4	21.3		22.1	26			29.6	31
Nickel	Ni	mg/L		<0.02	<0.02	<0.02		<0.02	<0.02			<0.02	<0.02
Phosphorus	P	mg/L		<0.01	<0.1	<0.1		<0.1	<0.1			<0.1	<0.1
Sulphur	S	mg/L		5.4	5	4.7		5.5	5.9			5.5	7.1
Tin	Sn	mg/L		<0.1	<0.1	<0.1		<0.1	<0.1			<0.2	<0.2
Sellenium	Se	mg/L	0.01	<0.1	<0.1	<0.1		<0.1	<0.1			<0.2	<0.2
Silicon	Si	mg/L		2.22	1.94	1.83		2.23	1.72			1.9	1.98
Antimony	Sb	mg/L		<0.05	<0.05	<0.05		<0.05	<0.05			<0.05	<0.05
Strontium	Sr	mg/L		0.107	0.111	0.095		0.103	0.101			0.112	0.109
Titanium	Ti	mg/L		<0.005	0.006	<0.005		<0.005	<0.005			<0.005	<0.005
Vanadium	V	mg/L		<0.005	<0.005	<0.005		<0.005	<0.005			<0.005	<0.005
Zinc	Zn	mg/L	5	<0.005	0.074	<0.005		0.006	<0.005			<0.005	0.008
Fluoride	F	mg/L		<0.1	<0.5	<0.1		0.2	<0.1			<0.1	<0.1
Chloride	Cl	mg/L	250	41.3	47.5	51.5		66.5	60			69.1	65.1
Nitrite as N	NO2 - N	mg/L	1	<0.20	<0.2	<0.2		<0.2	<0.2			<0.2	<0.2
Phosphate	PO4-3	mg/L		<0.1	<1	<1		<1	<1			<1	<1
Bromide	Br	mg/L		<0.05	<0.5	<0.5		<0.5	<0.5			<0.5	<0.5
Nitrate as N	NO3-N	mg/L	10	0.11	<0.2	<0.2		0.3	<0.2			0.3	0.3
Sulphate	SO4	mg/L	500	16.1	12.1	<0.5		16.6	16.5			16.3	15.3
Acidity	pH	pH Units	6.5-8.5	8.17	8.05	8.01		8.17	7.9			7.9	8.09
Alkalinity	Alk 8.3	CaCO3/L		<0.1	<1	<1		<1	<1			<1	<1
Alkalinity	Alk 4.2	CaCO3/L		146	126	130		135	132			146	148
Ammonia as N	NH3-N	mg/L		0.02	0.04	<0.02		<0.03	<0.03			0.05	<0.03
Dissolved Organic Carbon	DOC	mg/L	5	1.4	0.4	7.4	1.5	<0.2	0.6	5.6	1.9	1	1
Total Dissolved Solids	TDS	mg/L	500	229	222	226		252	245			269	263
Hardness		CaCO3/L	80-100	187.7	194.8	171.5		186.6	181.6			192	179.1
Carbonate	CO3	mg/L		0	1	1		1	1			1	1
Bi-carbonate	HCO3	mg/L		177.9	151.3	156.1		162	159			176	178
Colour		TCU	5	6	<1	2		2	40			4	<3
Turbidity		NTU	1	5.2	Not Applicable	Not Applicable		Not Applicable	150				174
Conductivity		umhos/cm		421	388	424		469	458			484	474
Lead	Pb	mg/L	0.01	<0.001	0.001	<0.001		<0.001	0.003			<0.001	<0.001
Total Petroleum Hydrocarbons	TPH - Diesel	ug/L		<100	<100	<100		<100	<100				<100
Volatile Organic Compounds	VOC	ug/L		nd	nd	nd		nd		nd			nd
Cation Sum		eq/L											
Anion Sum		eq/L											
CAB		%											
L.I.		N/A											

Denotes exceedance of ODWS

nd Not Detected

Table 5: Water Quality Results

PARAMETER	SYMBOL	STATION	79-4									
		UNITS	20-Aug-01	11-Jan-02	23-Jul-02	07-Jan-03	31-Jul-03	03-Sep-03	14-Jul-04	28-Jul-05	28-Jul-06	16-Aug-07
Silver	Ag	mg/L		<0.005	<0.005	<0.005	<0.005		<0.005	<0.0005	<0.0001	<0.005
Aluminum	Al	mg/L		<0.03	<0.03	<0.03	<0.05		<0.05	<0.005	<0.005	<0.05
Arsenic	As	mg/L		<0.2	<0.2	<0.2	-		-	<0.001	<0.001	-
Boron	B	mg/L		0.02	<0.01	0.01	<0.01		0.01	0.0026	0.029	<0.01
Barium	Ba	mg/L		0.029	0.03	0.035	0.031		0.037	0.0047	0.036	0.031
Beryllium	Be	mg/L		<0.0005	<0.0005	<0.0005	<0.0005		<0.0005	<0.0005	<0.0005	<0.0005
Bismuth	Bi	mg/L		<0.2	<0.2	<0.2	<0.2		<0.2	<0.001	-	<0.2
Calcium	Ca	mg/L		42.6	44	44.2	45.6		46.6	48	45	47
Cadmium	Cd	mg/L		<0.005	<0.005	<0.005	<0.005		<0.005	<0.0001	<0.0001	<0.005
Cobalt	Co	mg/L		<0.005	<0.005	<0.005	<0.005		<0.005	<0.0005	<0.0005	<0.005
Chromium	Cr	mg/L		<0.005	<0.005	<0.005	<0.005		<0.005	<0.005	<0.005	<0.005
Copper	Cu	mg/L		<0.005	<0.005	<0.005	<0.005		<0.005	<0.001	<0.001	<0.005
Iron	Fe	mg/L		<0.1	<0.1	<0.01	<0.01		<0.1	0.18	<0.05	<0.01
Potassium	K	mg/L		<1	1	3	1		2	1.9	2	2
Magnesium	Mg	mg/L		17.5	16.1	16.5	17.1		16	17	16	17
Mangenese	Mn	mg/L		0.015	0.022	0.021	0.038		0.027	0.015	0.024	0.038
Molybdenum	Mo	mg/L		<0.02	<0.02	<0.02	<0.02		<0.02	<0.001	<0.001	<0.02
Sodium	Na	mg/L		27.3	28.5	30.2	32.8		32.5	35	34	32.8
Nickel	Ni	mg/L		<0.02	<0.02	<0.02	<0.02		<0.02	<0.001	0.001	<0.02
Phosphorus	P	mg/L		<0.1	<0.1	<0.1	<0.1		<0.1	<0.05	<0.05	<0.1
Sulphur	S	mg/L		3.1	5.3	3.8	-		-	-	5	-
Tin	Sn	mg/L		<0.2	<0.05	<0.2	-		-	-	<0.2	-
Sellenium	Se	mg/L		<0.2	<0.2	<0.2	-		-	<0.002	<0.002	-
Silicon	Si	mg/L		1.83	1.71	2.25	1.85		2.13	1.6	1.6	1.8
Antimony	Sb	mg/L		<0.05	<0.2	<0.05	<0.05		<0.05	<0.001	<0.001	<0.05
Strontium	Sr	mg/L		0.098	0.102	0.112	0.121		0.117	0.11	0.12	0.121
Titanium	Ti	mg/L		<0.005	<0.005	<0.005	<0.005		<0.005	<0.005	<0.005	<0.005
Vanadium	V	mg/L		<0.005	<0.005	<0.005	<0.005		<0.005	<0.001	<0.001	<0.005
Zinc	Zn	mg/L		<0.005	0.623	0.033	0.01		0.027	0.008	<0.005	0.01
Fluoride	F	mg/L		<0.1	<0.1		-		-	<0.5	<0.1	-
Chloride	Cl	mg/L		60.6	63.1	63.9	76.8		68.1	66.1	69	76.8
Nitrite as N	NO2 - N	mg/L		<0.2	<0.2	<0.2	<0.2		<0.2	<0.3	<0.01	<0.2
Phosphate	PO4-3	mg/L		<1	<1	<1	<1		<1	<1	<0.01	<1
Bromide	Br	mg/L		<0.5	<0.5	<0.5	-		-	<1	<1	-
Nitrate as N	NO3-N	mg/L		0.2	<0.2	<0.2	<0.2		0.4	0.7	0.1	<0.2
Sulphate	SO4	mg/L		12.6	14.2	10.9	17.7		15.3	16	7	17.7
Acidity	pH	pH Units		7.95	8.04	7.93	8.14		7.83	8.24	8.2	8.14
Alkalinity	Alk 8.3	CaCO3/L		<1	<1	<1	-		-	-	-	-
Alkalinity	Alk 4.2	CaCO3/L		166	137	156	143		143	150	151	143
Ammonia as N	NH3-N	mg/L		<0.03	<0.03	<0.03	<0.03		<0.03	<0.05	0.05	<0.03
Dissolved Organic Carbon	DOC	mg/L	0.6	1.1	13.3	0.4	0.7		2.2	0.8	0.8	0.7
Total Dissolved Solids	TDS	mg/L		261	249	262	277		266	277	265	277
Hardness		CaCO3/L		178.6	176.6	178.6	184.3		182.7	190	180	184.3
Carbonate	CO3	mg/L		1	1	1	1		1	2	2	1
Bi-carbonate	HCO3	mg/L		200	165	188	172		172	148	148	172
Colour		TCU		<3	<3	<3	8		<2	<5	<5	8
Turbidity		NTU		10.9	25	7.2	4.9		34	52.8	379	5
Conductivity		umhos/cm		494	489	509	505		516	492	499	505
Lead	Pb	mg/L		<0.001	<0.001	<0.001	<0.001		<0.001	<0.0002	<0.0005	<0.001
Total Petroleum Hydrocarbons	TPH - Diesel	ug/L		<100		<100	<100		<100	<100	<100	<100
Volatile Organic Compounds	VOC	ug/L		nd	nd	nd	Toluene 0.2	Chloroform 0.1	Chloroform 0.2	Chloroform 0.6	Chloroform 0.2	Chloroform 0.2
Cation Sum		eq/L					5.14		5.11	5.37	5.14	5.14
Anion Sum		eq/L					5.39		5.13	5.25	5.12	5.35
CAB		%					2.42		0.21	1.07	0.253	2.4
L.I.		N/A					0.5		0.2	0.43	0.362	0.5

Denotes exceedance of ODWS

nd Not Detected

Table 5: Water Quality Results

PARAMETER	SYMBOL	STATION	79-4							
		UNITS	17-Jun-08	10-Jul-09	29-Jul-10	13-Jul-11	15-Aug-12	12-Sep-13	03-Sep-14	06-Jul-15
Silver	Ag	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.00010	<0.00010	<0.00010
Aluminum	Al	mg/L	<0.05	<0.005	<0.005	<0.005	<0050	0.013	<0.0050	<0.0050
Arsenic	As	mg/L	<0.001	<0.001	<0.001	<0.001	<0.0010	<0.0010	<0.0010	<0.0010
Boron	B	mg/L	0.017	0.017	0.011	0.02	0.015	0.016	0.011	<0.010
Barium	Ba	mg/L	0.12	0.028	0.033	0.034	0.039	0.037	0.039	0.049
Beryllium	Be	mg/L	<0.0005	<0.0005	<0.0005	<0.0005	<0.00050	<0.00050	<0.00050	<0.00050
Bismuth	Bi	mg/L	-	-	<0.001	<0.001	<0.0010	-	-	<0.0010
Calcium	Ca	mg/L	47	38	45	46	49	47	48	66
Cadmium	Cd	mg/L	0.0039	<0.0001	<0.0001	<0.0001	<0.00010	<0.00010	<0.00010	<0.00010
Cobalt	Co	mg/L	0.0041	<0.0005	<0.0005	<0.0005	<0.00050	<0.00050	<0.00050	<0.00050
Chromium	Cr	mg/L	<0.005	<0.005	<0.005	<0.005	<0.0050	<0.0050	<0.0050	<0.0050
Copper	Cu	mg/L	<0.005	<0.001	<0.001	<0.001	<0.0010	<0.0010	0.0011	<0.0010
Iron	Fe	mg/L	0.066	<0.1	<0.1	<0.1	<0.10	<0.10	<0.10	<0.10
Potassium	K	mg/L	1.5	1.3	1.5	1.4	1.6	1.4	1.6	1.4
Magnesium	Mg	mg/L	17	15	17	18	18	16	17	14
Mangenese	Mn	mg/L	0.016	0.008	0.012	0.018	0.0077	0.0087	0.012	<0.0020
Molybdenum	Mo	mg/L	43	0.001	<0.001	<0.001	<0.00050	0.00078	<0.00050	<0.00050
Sodium	Na	mg/L	34	33	39	39	42	38	42	13
Nickel	Ni	mg/L	0.026	<0.001	0.003	<0.001	<0.0010	<0.0010	<0.0010	<0.0010
Phosphorus	P	mg/L	<0.1	<0.1	<0.1	<0.1	<0.10	<0.10	<0.10	<0.10
Sulphur	S	mg/L	-	-	-	-	-	-	-	-
Tin	Sn	mg/L	-	-	-	-	<0.0010	-	-	-
Sellenium	Se	mg/L	<0.002	<0.002	<0.002	<0.002	<0.002	<0.0020	<0.0020	<0.0020
Silicon	Si	mg/L	1.55	1.3	1.6	1.8	2.2	2.2	2.2	4.6
Antimony	Sb	mg/L	0.0006	0.0007	<0.0005	<0.0005	<0.00050	<0.00050	<0.00050	<0.00050
Strontium	Sr	mg/L	0.16	0.11	0.12	0.11	0.12	0.13	0.14	0.13
Titanium	Ti	mg/L	<0.005	<0.005	<0.005	<0.005	<0.0050	<0.0050	<0.0050	<0.0050
Vanadium	V	mg/L	<0.005	<0.001	<0.001	0.003	0.0011	<0.00050	0.0010	<0.00050
Zinc	Zn	mg/L	0.014	<0.005	<0.005	<0.005	<0.0050	<0.0050	<0.0050	<0.0050
Fluoride	F	mg/L	-	-	-	-	-	-	-	-
Chloride	Cl	mg/L	64	65	67	67	63	58	59	64
Nitrite as N	NO2 - N	mg/L	0.01	<0.01	<0.01	0.02	<0.010	<0.010	<0.010	<0.010
Phosphate	PO4-3	mg/L	<0.01	<0.01	<0.01	<0.01	<0.010	<0.010	<0.010	<0.010
Bromide	Br	mg/L	-	-	-	-	-	-	-	-
Nitrate as N	NO3-N	mg/L	0.2	0.3	0.3	0.2	0.49	0.36	0.53	0.42
Sulphate	SO4	mg/L	21	15	15	15	14	13	12	13
Acidity	pH	pH Units	8.2	8	8.1	8.20	7.93	8.04	8.14	8.01
Alkalinity	Alk 8.3	CaCO3/L	-	-	-	-	-	-	-	-
Alkalinity	Alk 4.2	CaCO3/L	147	142	154	152	170	170	180	170
Ammonia as N	NH3-N	mg/L	0.08	0.05	<0.05	0.07	<0.050	0.29	<0.050	<0.050
Dissolved Organic Carbon	DOC	mg/L	2	1.2	1.1	0.9	0.71	0.75	0.54	0.47
Total Dissolved Solids	TDS	mg/L	279	256	282	283	295	280	290	280
Hardness		CaCO3/L	250	160	180	190	200	180	190	220
Carbonate	CO3	mg/L	2	1	2	2	1.3	1.7	2.3	1.6
Bi-carbonate	HCO3	mg/L	145	140	152	149	170	160	180	170
Colour		TCU	<5	17	<2	<2	<2	-	-	-
Turbidity		NTU	141	410	180	150	24	-	-	-
Conductivity		umhos/cm	522	512	538	550	560	550	550	550
Lead	Pb	mg/L	0.0011	<0.0005	<0.0005	<0.0005	<0.00050	<0.00050	<0.00050	<0.00050
Total Petroleum Hydrocarbons	TPH - Diesel	ug/L	<100	<100	<100	<100	<100	<100	<200	<200
Volatile Organic Compounds	VOC	ug/L	Chloroform 0.1	nd	nd	nd	nd	nd	nd	nd
Cation Sum		eq/L	8.85	4.6	5.41	5.55	5.78	5.39	5.7	5.03
Anion Sum		eq/L	5.2	4.99	5.29	5.26	5.46	5.26	5.52	5.46
CAB		%	2.6	4.11	1.12	2.74	2.88	1.30	1.68	4.02
L.I.		N/A	0.492	0.313	0.497	0.633	0.433	0.519	0.662	0.647

Denotes exceedance of ODWS

nd Not Detected

Table 5: Water Quality Results

PARAMETER	SYMBOL	STATION		88-5								
		UNITS	ODWS	22-Dec-97	31-Jul-98	03-Aug-99	28-Jul-00	01-Sep-00	06-Oct-00	19-Jul-01	20-Aug-01	23-Jul-02
Silver	Ag	mg/L		<0.003	<0.003	0.004	<0.003			<0.005		<0.005
Aluminum	Al	mg/L	0.1	<0.03	<0.03	<0.03	<0.03			<0.03		<0.03
Arsenic	As	mg/L	0.025	<0.01	<0.1	<0.1	<0.01			<0.2		<0.2
Boron	B	mg/L	5	0.02	<0.01	0.01	<0.01			<0.01		<0.01
Barium	Ba	mg/L	1	0.053	0.208	0.092	0.026			0.053		0.044
Beryllium	Be	mg/L		<0.0005	<0.0005	<0.0005	<0.0005			<0.0005		<0.0005
Bismuth	Bi	mg/L		<0.1	<0.1	<0.1	<0.1			<0.2		<0.2
Calcium	Ca	mg/L		85.5	83.8	82	84.2			83.1		77.7
Cadmium	Cd	mg/L	0.005	<0.005	<0.005	<0.005	<0.005			<0.005		<0.005
Cobalt	Co	mg/L		<0.005	<0.005	<0.005	<0.005			<0.005		<0.005
Chromium	Cr	mg/L	0.05	<0.005	<0.005	<0.005	<0.005			<0.005		<0.005
Copper	Cu	mg/L	1	<0.003	<0.003	<0.003	<0.003			<0.005		<0.005
Iron	Fe	mg/L	0.3	<0.01	0.01	<0.04	<0.01			0.08		<0.01
Potassium	K	mg/L		2	1	<1	4			2		2
Magnesium	Mg	mg/L		16.3	14.8	14	16.3			15		14.2
Mangenese	Mn	mg/L	0.05	<0.005	<0.005	<0.005	0.047			0.144		<0.005
Molybdenum	Mo	mg/L		<0.01	0.01	<0.02	<0.02			<0.02		<0.02
Sodium	Na	mg/L	20	5.3	5	3.9	3.1			6		3.6
Nickel	Ni	mg/L		<0.02	<0.02	<0.02	<0.02			<0.02		<0.02
Phosphorus	P	mg/L		<0.01	<0.1	<0.1	0.3			<0.1		<0.1
Sulpher	S	mg/L		7.4	7.4	6.8	7			6.5		6.3
Tin	Sn	mg/L		<0.1	<0.1	<0.1	<0.1			<0.2		<0.2
Sellenium	Se	mg/L	0.01	<0.1	<0.1	<0.1	<0.1			<0.2		<0.2
Silicon	Si	mg/L		6.22	5.98	5.3	5.75			5.43		5.06
Antimony	Sb	mg/L		<0.05	<0.05	<0.05	<0.05			<0.05		<0.05
Strontium	Sr	mg/L		0.161	0.163	0.146	0.149			0.15		0.132
Titanium	Ti	mg/L		<0.005	<0.005	<0.005	<0.005			<0.005		<0.005
Vanadium	V	mg/L		<0.005	<0.005	<0.005	<0.005			<0.005		<0.005
Zinc	Zn	mg/L	5	<0.005	0.047	0.015	<0.005			0.006		<0.005
Fluoride	F	mg/L		<0.1	<0.5	0.1	<0.1			<0.1		<0.1
Chloride	Cl	mg/L	250	9.64	11.2	7.7	7.3			6.9		4.4
Nitrite as N	NO2 - N	mg/L	1	<0.20	<0.2	<0.2	<0.2			<0.2		<0.2
Phosphate	PO4-3	mg/L		<0.1	<1	<1	<1			<1		<1
Bromide	Br	mg/L		<0.05	<0.5	<0.5	2.2			<0.5		<0.5
Nitrate as N	NO3-N	mg/L	10	0.82	0.8	0.6	0.7			0.6		0.7
Sulphate	SO4	mg/L	500	21.1	18.6	20.3	21.5			19.6		17.2
Acidity	pH	pH Units	6.5-8.5	8.18	7.8	8.08	7.64			7.99		7.9
Alkalinity	Alk 8.3	CaCO3/L		<0.1	<1	<1	<1			<1		<1
Alkalinity	Alk 4.2	CaCO3/L		228	241	241	255			269		235
Ammonia as N	NH3-N	mg/L		<0.02	0.06	<0.02	<0.03			<0.03		<0.03
Dissolved Organic Carbon	DOC	mg/L	5	0.5	1	0.7	4.3	4.2	1.5	8.1	0.7	1.8
Total Dissolved Solids	TDS	mg/L	500	276	279	274	290			294		260
Hardness		CaCO3/L	80-100	281.2	270.4	262.6	278			269.6		252.5
Carbonate	CO3	mg/L		0	1	1	1			1		1
Bi-carbonate	HCO3	mg/L		277.8	291.4	291.5	308			326		284
Colour		TCU	5	2	2	1	40			<3		4
Turbidity		NTU	1	0.6			883			56		4.8
Conductivity		umhos/cm		469	493	482	502			487		474
Lead	Pb	mg/L	0.01	<0.001	<0.001	<0.001	0.011			<0.001		<0.001
Total Petroleum Hydrocarbons	TPH - Diesel	ug/L		<100	<100		230			<100		<100
Cation Sum		eq/L										
Anion Sum		eq/L										
CAB		%										
L.I.												

Denotes exceedance of ODWS

Table 5: Water Quality Results

PARAMETER	SYMBOL	STATION	88-5											
		UNITS	14-Jul-04	28-Jul-05	28-Jul-06	16-Aug-07	17-Jun-08	10-Jul-09	29-Jul-10	13-Jul-11	15-Aug-12	12-Sep-13	03-Sep-14	06-Jul-15
Silver	Ag	mg/L	<0.005	<0.0005	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.00010	<0.00010	<0.00010	<0.00010
Aluminum	Al	mg/L	0.08	1.1	<0.005	<0.05	0.005	<0.005	<0.005	<0.005	<0.0050	0.016	<0.0050	<0.0050
Arsenic	As	mg/L	-	0.0011	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.0010	<0.0010	<0.0010	<0.0010
Boron	B	mg/L	<0.01	0.012	0.011	<0.01	<0.01	<0.01	<0.01	0.01	0.010	<0.010	<0.010	0.011
Barium	Ba	mg/L	0.05	0.1	0.054	0.055	0.05	0.052	0.054	0.051	0.050	0.047	0.046	0.039
Beryllium	Be	mg/L	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.00050	<0.00050	<0.00050	<0.00050
Bismuth	Bi	mg/L	<0.2	<0.001	-	<0.001	-	-	<0.001	<0.001	<0.0010	-	-	<0.0010
Calcium	Ca	mg/L	74.2	37	86	84	79	85	82	76	76	66	65	48
Cadmium	Cd	mg/L	<0.005	<0.0002	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.00010	<0.00010	<0.00010	<0.00010
Cobalt	Co	mg/L	<0.005	0.007	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.00050	<0.00050	<0.00050	<0.00050
Chromium	Cr	mg/L	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.0050	<0.0050	<0.0050	<0.0050
Copper	Cu	mg/L	<0.005	0.027	<0.001	<0.001	<0.001	0.002	<0.001	<0.001	<0.0010	0.0013	<0.0010	<0.0010
Iron	Fe	mg/L	0.05	0.0044	<0.05	<0.05	<0.1	<0.1	<0.1	<0.1	<0.10	<0.10	<0.10	0.16
Potassium	K	mg/L	<1	1.8	1.6	1.5	1.3	1.6	1.5	1.5	1.7	1.3	1.5	1.5
Magnesium	Mg	mg/L	14.4	25	16	15	16	15	14	14	14	13	14	17
Mangenese	Mn	mg/L	0.018	0.86	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.0020	<0.0020	<0.0020	0.006
Molybdenum	Mo	mg/L	<0.02	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.00050	<0.00050	<0.00050	0.00063
Sodium	Na	mg/L	4.6	3.1	2.9	3.3	3.4	3.9	7.6	9.6	13	10	15	36
Nickel	Ni	mg/L	<0.02	0.0068	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.0010	<0.0010	<0.0010	<0.0010
Phosphorus	P	mg/L	<0.1	0.46	<0.05	<0.05	<0.1	<0.1	<0.1	<0.1	<0.10	<0.10	<0.10	<0.10
Sulpher	S	mg/L	-	7.2	7.3	-	-	-	-	-	-	-	-	-
Tin	Sn	mg/L	-	<0.001	<0.2	<0.001	-	-	-	-	<0.0010	-	-	-
Sellenium	Se	mg/L	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.0020	<0.0020	<0.0020	<0.0020
Silicon	Si	mg/L	5.12	7.6	5.9	5.7	6	5.7	5.3	5.2	5.2	4.5	5.1	2.0
Antimony	Sb	mg/L	<0.05	<0.001	<0.001	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.00050	<0.00050	<0.00050	<0.00050
Strontium	Sr	mg/L	0.158	0.39	0.17	0.17	0.16	0.17	0.15	0.14	0.14	0.14	0.13	0.12
Titanium	Ti	mg/L	<0.005	0.014	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.0050	<0.0050	<0.0050	<0.0050
Vanadium	V	mg/L	<0.005	0.0046	<0.001	<0.001	0.001	0.001	<0.001	<0.001	0.00077	<0.00050	0.0006	<0.00050
Zinc	Zn	mg/L	0.005	0.029	<0.005	<0.005	<0.005	0.006	<0.005	<0.005	<0.0050	<0.0050	<0.0050	<0.0050
Fluoride	F	mg/L	-	<0.5	<0.1	-	-	-	-	-	-	-	-	-
Chloride	Cl	mg/L	4.9	6	4	6	6	11	18	25	28	20	24	23
Nitrite as N	NO2 - N	mg/L	<0.2	<0.3	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.010	<0.010	<0.010	<0.010
Phosphate	PO4-3	mg/L	<1	<1	<0.01	<0.01	<0.01	<0.01	<0.01	0.01	<0.010	<0.010	<0.010	<0.010
Bromide	Br	mg/L	-	<1	<1	-	-	-	-	-	-	-	-	-
Nitrate as N	NO3-N	mg/L	0.7	0.9	0.4	0.4	0.5	0.6	0.5	0.4	0.41	0.39	0.58	0.60
Sulphate	SO4	mg/L	19.6	21.1	20	21	22	20	19	16	16	15	14	14
Acidity	pH	pH Units	7.76	8.06	8.1	8.1	8.2	7.9	7.9	8.09	7.92	8.02	8.04	7.96
Alkalinity	Alk 8.3	CaCO3/L	-	-	-	-	-	-	-	-	-	-	-	-
Alkalinity	Alk 4.2	CaCO3/L	221	235	252	240	218	239	218	212	210	200	200	210
Ammonia as N	NH3-N	mg/L	<0.03	<0.05	<0.05	0.07	<0.05	<0.05	<0.05	<0.05	0.052	<0.050	<0.050	<0.050
Dissolved Organic Carbon	DOC	mg/L	1.6	0.8	1.2	1	0.7	0.9	0.7	0.8	0.61	0.59	2.4	0.55
Total Dissolved Solids	TDS	mg/L	251	481	283	-	272	294	286	282	286	260	270	270
Hardness		CaCO3/L	244.8	770	280	270	260	270	260	250	250	220	220	190
Carbonate	CO3	mg/L	1	3	3	3	3	2	2	2	1.6	2.0	2.1	1.8
Bi-carbonate	HCO3	mg/L	267	232	249	237	215	237	216	210	200	200	200	210
Colour		TCU	<2	<5	<5	<5	<2	<2	<2	<2	<2	-	-	-
Turbidity		NTU	2.7	223	270	250	360	180	33	49	56	-	-	-
Conductivity		umhos/cm	471	447	466	497	456	510	491	515	510	480	480	490
Lead	Pb	mg/L	<0.001	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.00050	<0.00050	<0.00050	<0.00050
Total Petroleum Hydrocarbons	TPH - Diesel	ug/L	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<200	<200
Cation Sum		eq/L	5.12	16.1	5.75	5.64	5.4	5.7	4.42	5.39	5.59	4.83	5.03	5.39
Anion Sum		eq/L	5.02	5.36	5.59	5.47	5.01	5.54	4.42	5.32	5.28	4.99	5.07	5.15
CAB		%	-1.01	49.9	1.41	1.58	3.7	1.42	0	0.650	2.820	1.580	0.410	2.29
L.I.			0.5	1.16	0.757	0.364	0.752	0.783	0.396	0.882	0.703	0.743	0.748	0.544

Denotes exceedance of ODWS

Table 5: Water Quality Results

PARAMETER	SYMBOL	STATION		96-1S							
		UNITS	ODWS	22-Dec-97	31-Jul-98	03-Aug-99	10-Nov-99	28-Jul-00	01-Sep-00	06-Oct-00	19-Jul-01
Silver	Ag	mg/L		<0.003	<0.003	0.003		<0.003			<0.005
Aluminum	Al	mg/L	0.1	<0.03	0.03	0.1		<0.03			<0.03
Arsenic	As	mg/L	0.025	<0.01	<0.1	<0.1		<0.01			<0.2
Boron	B	mg/L	5	0.04	0.02	0.05		<0.01			0.01
Barium	Ba	mg/L	1	0.054	0.086	0.169		0.049			0.05
Beryllium	Be	mg/L		<0.0005	<0.0005	<0.0005		<0.0005			<0.0005
Bismuth	Bi	mg/L		<0.1	<0.1	<0.1		<0.1			<0.2
Calcium	Ca	mg/L		47.5	49	49.5		52.5			50
Cadmium	Cd	mg/L	0.005	<0.005	<0.005	<0.005		<0.005			<0.005
Cobalt	Co	mg/L		<0.005	<0.005	<0.005		<0.005			<0.005
Chromium	Cr	mg/L	0.05	<0.005	<0.005	<0.005		<0.005			<0.005
Copper	Cu	mg/L	1	0.009	<0.003	0.003		<0.003			<0.005
Iron	Fe	mg/L	0.3	0.04	0.09	0.11		<0.01			0.09
Potassium	K	mg/L		10	4	12		8			3
Magnesium	Mg	mg/L		12	12	7.71		11.1			11.1
Mangenese	Mn	mg/L	0.05	0.359	0.087	0.269		0.117			0.008
Molybdenum	Mo	mg/L		<0.01	<0.01	<0.02		<0.02			<0.02
Sodium	Na	mg/L	20	27.3	17.8	36.8		14.7			21.8
Nickel	Ni	mg/L		<0.02	<0.02	<0.02		<0.02			<0.02
Phosphorus	P	mg/L		0.4	<0.1	<0.1		<0.1			<0.1
Sulpher	S	mg/L		9	7.5	16.1		6.4			6.3
Tin	Sn	mg/L		<0.1	<0.1	<0.1		<0.1			<0.2
Sellenium	Se	mg/L	0.01	<0.1	<0.1	<0.1		<0.1			<0.2
Silicon	Si	mg/L		4.81	4.6	3.67		3.97			4.01
Antimony	Sb	mg/L		<0.05	<0.05	<0.05		<0.05			<0.05
Strontium	Sr	mg/L		0.23	0.177	0.19		0.255			0.226
Titanium	Ti	mg/L		<0.005	<0.005	<0.005		<0.005			<0.005
Vanadium	V	mg/L		<0.005	<0.005	<0.005		<0.005			<0.005
Zinc	Zn	mg/L	5	<0.005	0.046	0.025		<0.005			0.013
Fluoride	F	mg/L		0.1	<0.5	0.2		<0.1			<0.1
Chloride	Cl	mg/L	250	22.1	24.7	28.7		31.7			48.8
Nitrite as N	NO2 - N	mg/L	1	0.08	<0.2	<0.2		<0.2			<0.2
Phosphate	PO4-3	mg/L		<0.1	<1	<1		<1			<1
Bromide	Br	mg/L		0.51	<0.5	<0.5		0.9			<0.5
Nitrate as N	NO3-N	mg/L	10	1.61	0.6	3.8		0.5			0.6
Sulphate	SO4	mg/L	500	26.6	19.5	49.5		18.9			19.5
Acidity	pH	pH Units	6.5-8.5	7.95	7.92	7.81		7.72			8.05
Alkalinity	Alk 8.3	CaCO3/L		<0.1	<1	<1		<1			<1
Alkalinity	Alk 4.2	CaCO3/L		172	157	146		151			138
Ammonia as N	NH3-N	mg/L		0.49	0.15	<0.02		0.75			0.08
Dissolved Organic Carbon	DOC	mg/L	5	2.9	3.2	0.8		3	19.1	1.5	7.3
Total Dissolved Solids	TDS	mg/L	500	249	222	271		227			237
Hardness		CaCO3/L	80-100	168.4	172.2	155.5		177.2			170.9
Carbonate	CO3	mg/L		0	1	1		1			1
Bi-carbonate	HCO3	mg/L		209.5	189	175.6		182			166
Colour		TCU	5	12	<1	3		40			<3
Turbidity		NTU	1	4.3	Not Applicable	Not Applicable		900			173
Conductivity		umhos/cm		442	412	484		409			355
Lead	Pb	mg/L	0.01	<0.001	<0.001	<0.001		0.011			<0.001
Total Petroleum Hydrocarbons	TPH - Diesel	ug/L		<100	<100	620	<100	<100			<100
Cation Sum		eq/L									
Anion Sum		eq/L									
CAB		%									
L.I.		N/A									

🟨 Denotes exceedance of ODWS

Table 5: Water Quality Results

PARAMETER	SYMBOL	STATION		96-1S							
		UNITS	ODWS	20-Aug-01	23-Jul-02	31-Jul-03	14-Jul-04	28-Jul-05	28-Jul-06	16-Aug-07	17-Jun-08
Silver	Ag	mg/L			<0.005	<0.005	0.007	<0.0005	<0.0001	<0.0001	<0.0001
Aluminum	Al	mg/L	0.1		<0.03	<0.05	<0.05	0.0099	0.006	0.006	0.011
Arsenic	As	mg/L	0.025		<0.2	-	-	<0.001	<0.001	<0.001	<0.001
Boron	B	mg/L	5		<0.01	0.01	0.01	0.023	0.014	0.01	0.021
Barium	Ba	mg/L	1		0.041	0.041	0.042	0.49	0.029	0.049	0.057
Beryllium	Be	mg/L			<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Bismuth	Bi	mg/L			<0.2	<0.2	<0.2	<0.001	-	<0.001	-
Calcium	Ca	mg/L			49.5	47.9	47.9	44	46	56	56
Cadmium	Cd	mg/L	0.005		<0.005	<0.005	<0.005	0.0003	<0.0001	<0.0001	<0.0001
Cobalt	Co	mg/L			<0.005	<0.005	<0.005	0.0032	<0.0005	<0.0005	<0.0005
Chromium	Cr	mg/L	0.05		<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Copper	Cu	mg/L	1		<0.005	<0.005	<0.005	0.0076	<0.001	<0.001	<0.001
Iron	Fe	mg/L	0.3		<0.01	<0.01	<0.01	0.065	<0.05	<0.05	<0.1
Potassium	K	mg/L			2	2	2	2.2	1.6	2.3	1.4
Magnesium	Mg	mg/L			11.2	11.4	11.8	30	7.5	9.7	13
Mangenese	Mn	mg/L	0.05		0.007	<0.005	<0.005	1.9	0.011	0.025	0.79
Molybdenum	Mo	mg/L			<0.02	<0.02	<0.02	<0.001	<0.001	<0.001	0.002
Sodium	Na	mg/L	20		14.8	17.4	23.3	24	14	21	25
Nickel	Ni	mg/L			<0.02	<0.02	<0.02	0.012	<0.001	<0.001	0.001
Phosphorus	P	mg/L			<0.1	<0.1	<0.1	0.099	0.098	<0.05	<0.1
Sulpher	S	mg/L			6.3	-	-	13.1	4.4		-
Tin	Sn	mg/L			<0.2	-	-	-	<0.2	<0.001	-
Sellenium	Se	mg/L	0.01		<0.2	-	-	-	<0.002	<0.002	<0.002
Silicon	Si	mg/L			3.46	3.47	3.1	3.45	2	2.7	2.8
Antimony	Sb	mg/L			<0.05	<0.05	<0.05	<0.05	<0.001	<0.0005	<0.0005
Strontium	Sr	mg/L			0.174	0.17	0.142	0.184	0.08	0.1	0.11
Titanium	Ti	mg/L			<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Vanadium	V	mg/L			<0.005	<0.005	<0.005	<0.005	<0.001	<0.001	0.001
Zinc	Zn	mg/L	5		0.009	<0.005	0.015	0.014	<0.005	<0.005	<0.005
Fluoride	F	mg/L			<0.1	-	-	<0.5	<0.1		-
Chloride	Cl	mg/L	250		43	52.4	54.4	54.2	32	41	59
Nitrite as N	NO2 - N	mg/L	1		<0.2	<0.2	<0.2	<0.3	0.2	0.02	0.12
Phosphate	PO4-3	mg/L			<1	<1	<1	<1	0.05	<0.01	<0.01
Bromide	Br	mg/L			<0.5	-	-	<1	<1		-
Nitrate as N	NO3-N	mg/L	10		0.4	<0.2	0.3	0.7	0.5	<0.1	<0.1
Sulphate	SO4	mg/L	500		16	17.7	18.4	19.4	12	16	38
Acidity	pH	pH Units	6.5-8.5		7.98	8.17	8.45	8.11	8.1	8.1	8.1
Alkalinity	Alk 8.3	CaCO3/L			<1	-	-	-	-	-	-
Alkalinity	Alk 4.2	CaCO3/L			130	120	115	118	119	122	134
Ammonia as N	NH3-N	mg/L			0.07	0.04	0.06	<0.05	0.22	0.08	0.07
Dissolved Organic Carbon	DOC	mg/L	5	2.3	2.9	1.6	2.1	1.1	1.6	1	1.5
Total Dissolved Solids	TDS	mg/L	500		214	220	227	1320	189	224	280
Hardness		CaCO3/L	80-100		170.2	166.7	168.7	2900	150	180	190
Carbonate	CO3	mg/L			1	1	1	1	2	1	2
Bi-carbonate	HCO3	mg/L			156	144	138	117	118	120	132
Colour		TCU	5		<3	6	<2	<5	<5	<5	<2
Turbidity		NTU	1		17.7	4	27	1590	434	154	540
Conductivity		umhos/cm			415	406	391	414	345	407	520
Lead	Pb	mg/L	0.01		<0.001	<0.001	<0.001	<0.001	<0.0005	<0.0005	<0.0005
Total Petroleum Hydrocarbons	TPH - Diesel	ug/L			<100	<100	<100	<100	<100	<100	<100
Cation Sum		eq/L				4.13	4.44	59	3.59	4.56	5
Anion Sum		eq/L				4.25	4.22	4.34	3.6	3.91	5.13
CAB		%				1.38	-2.54	86.3	0.0695	7.65	1.24
L.I.		N/A				0.5	0.7	1.39	0.237	0.295	0.338

Denotes exceedance of ODWS

Table 5: Water Quality Results

PARAMETER	SYMBOL	STATION		96-1S						
		UNITS	ODWS	10-Jul-09	29-Jul-10	13-Jul-11	15-Aug-12	12-Sep-13	03-Sep-14	06-Jul-15
Silver	Ag	mg/L		<0.0001	<0.0001	<0.0001	<0.00010	<0.00010	<0.00010	<0.00010
Aluminum	Al	mg/L	0.1	<0.005	<0.005	<0.005	<0.0050	0.022	0.022	<0.0050
Arsenic	As	mg/L	0.025	<0.001	<0.001	<0.001	<0.0010	<0.0010	<0.0010	<0.0010
Boron	B	mg/L	5	0.012	0.017	0.02	0.017	0.013	0.012	0.018
Barium	Ba	mg/L	1	0.016	0.036	0.033	0.031	0.033	0.032	0.034
Beryllium	Be	mg/L		<0.0005	<0.0005	<0.0005	<0.00050	<0.00050	<0.00050	<0.00050
Bismuth	Bi	mg/L		-	<0.001	<0.001	<0.0010	-	-	<0.0010
Calcium	Ca	mg/L		34	45	43	40	39	46	41
Cadmium	Cd	mg/L	0.005	<0.0001	<0.0001	<0.0001	<0.00010	<0.00010	<0.00010	<0.00010
Cobalt	Co	mg/L		<0.0005	<0.0005	<0.0005	<0.00050	<0.00050	<0.00050	<0.00050
Chromium	Cr	mg/L	0.05	<0.005	<0.005	<0.005	<0.0050	<0.0050	<0.0050	<0.0050
Copper	Cu	mg/L	1	<0.001	<0.001	<0.001	<0.0010	<0.0010	<0.0010	<0.0010
Iron	Fe	mg/L	0.3	<0.1	<0.1	<0.1	<0.10	<0.10	<0.10	<0.10
Potassium	K	mg/L		2.9	1.4	1.7	1.2	1.2	1.5	1.3
Magnesium	Mg	mg/L		2.8	12	11	11	11	13	12
Mangenese	Mn	mg/L	0.05	0.035	0.016	0.011	0.044	0.019	0.012	<0.0020
Molybdenum	Mo	mg/L		<0.001	<0.001	<0.001	0.00053	0.00080	0.00086	0.00094
Sodium	Na	mg/L	20	22	27	27	27	27	30	27
Nickel	Ni	mg/L		<0.001	<0.001	<0.001	<0.0010	<0.0010	<0.0010	<0.0010
Phosphorus	P	mg/L		0.12	<0.1	<0.1	<0.10	<0.10	<0.10	<0.10
Sulpher	S	mg/L		-	-	-	-	-	-	-
Tin	Sn	mg/L		-	-	-	<0.0010	-	-	-
Sellenium	Se	mg/L	0.01	<0.002	<0.002	<0.002	<0.0020	<0.0020	<0.0020	<0.0020
Silicon	Si	mg/L		0.68	2.9	2.9	2.6	2.4	3.1	2.6
Antimony	Sb	mg/L		<0.0005	<0.0005	<0.0005	<0.00050	<0.00050	<0.00050	0.00056
Strontium	Sr	mg/L		0.063	0.082	0.080	0.074	0.081	0.10	0.09
Titanium	Ti	mg/L		<0.0001	<0.0001	<0.0001	<0.0050	<0.0050	<0.0050	<0.0050
Vanadium	V	mg/L		<0.001	<0.001	0.002	0.0017	0.0006	0.0012	<0.00050
Zinc	Zn	mg/L	5	<0.005	<0.005	<0.005	<0.0050	<0.0050	<0.0050	<0.0050
Fluoride	F	mg/L		-	-	-	-	-	-	-
Chloride	Cl	mg/L	250	60	48	48	47	49	45	44
Nitrite as N	NO2 - N	mg/L	1	0.05	0.03	<0.01	0.045	<0.010	<0.010	<0.010
Phosphate	PO4-3	mg/L		0.1	<0.01	0.02	<0.01	<0.010	<0.010	<0.010
Bromide	Br	mg/L		-	-	-	-	-	-	-
Nitrate as N	NO3-N	mg/L	10	0.1	0.3	0.1	0.22	0.16	0.28	0.22
Sulphate	SO4	mg/L	500	30	19	16	18	17	17	17
Acidity	pH	pH Units	6.5-8.5	7.7	7.9	8.16	7.78	7.99	8.06	7.93
Alkalinity	Alk 8.3	CaCO3/L		-	-	-	-	-	-	-
Alkalinity	Alk 4.2	CaCO3/L		102	133	119	130	120	140	140
Ammonia as N	NH3-N	mg/L		<0.05	0.32	0.06	0.26	0.063	0.078	<0.050
Dissolved Organic Carbon	DOC	mg/L	5	1.8	0.6	1.0	0.62	0.72	1.20	1.1
Total Dissolved Solids	TDS	mg/L	500	114	239	225	228	220	250	230
Hardness		CaCO3/L	80-100	97	160	150	150	140	170	150
Carbonate	CO3	mg/L		<1	1	2	<1.0	1.1	1.5	1.1
Bi-carbonate	HCO3	mg/L		101	132	117	130	120	140	140
Colour		TCU	5	7	<2	<2	<2	-	-	-
Turbidity		NTU	1	120	5300	300	420	-	-	-
Conductivity		umhos/cm		422	457	443	460	450	460	450
Lead	Pb	mg/L	0.01	<0.0005	<0.0005	<0.0005	<0.00050	<0.00050	<0.00050	<0.00050
Total Petroleum Hydrocarbons	TPH - Diesel	ug/L		<100	<100	<100	<100	<100	<200	<200
Cation Sum		eq/L		2.12	4.42	4.29	4.17	4.04	4.72	4.23
Anion Sum		eq/L		2.27	4.42	4.07	4.25	4.16	4.49	4.39
CAB		%		0	0	2.63	0.97	1.44	2.51	1.88
L.I.		N/A		0.073	0.296	0.478	0.081	0.269	0.473	0.288

Denotes exceedance of ODWS

Table 5: Water Quality Results

PARAMETER	SYMBOL	STATION		96-1D						
		UNITS	ODWS	22-Dec-97	31-Jul-98	03-Aug-99	28-Jul-00	01-Sep-00	06-Oct-00	19-Jul-01
Silver	Ag	mg/L		<0.003	<0.003	<0.003	<0.003			<0.005
Aluminum	Al	mg/L	0.1	<0.03	1.56	0.06	<0.03			<0.03
Arsenic	As	mg/L	0.025	<0.01	<0.1	<0.1	<0.01			<0.2
Boron	B	mg/L	5	0.02	<0.01	0.02	<0.01			<0.01
Barium	Ba	mg/L	1	0.062	0.094	0.115	0.066			0.054
Beryllium	Be	mg/L		<0.0005	<0.0005	<0.0005	<0.0005			<0.0005
Bismuth	Bi	mg/L		<0.1	<0.1	<0.1	<0.1			<0.2
Calcium	Ca	mg/L		68	72.6	72.6	74.9			69.1
Cadmium	Cd	mg/L	0.005	<0.005	<0.005	<0.005	<0.005			<0.005
Cobalt	Co	mg/L		<0.005	<0.005	<0.005	<0.005			<0.005
Chromium	Cr	mg/L	0.05	<0.005	<0.005	<0.005	<0.005			<0.005
Copper	Cu	mg/L	1	<0.003	<0.003	<0.003	<0.003			<0.005
Iron	Fe	mg/L	0.3	<0.01	0.98	0.04	<0.01			0.03
Potassium	K	mg/L		2	2	1	3			1
Magnesium	Mg	mg/L		18.2	20.7	19	19.7			18.9
Mangenese	Mn	mg/L	0.05	0.028	0.021	0.021	0.022			0.013
Molybdenum	Mo	mg/L		<0.01	<0.01	<0.02	<0.02			<0.02
Sodium	Na	mg/L	20	3.8	3.4	3.9	3.1			3.6
Nickel	Ni	mg/L		<0.02	<0.02	<0.02	<0.02			<0.02
Phosphorus	P	mg/L		<0.01	<0.1	<0.1	<0.1			<0.1
Sulpher	S	mg/L		10.7	7.7	12.9	10.8			10.6
Tin	Sn	mg/L		<0.1	<0.1	<0.1	<0.1			<0.2
Sellenium	Se	mg/L	0.01	<0.1	<0.1	<0.1	<0.1			<0.2
Silicon	Si	mg/L		5.14	9.07	5.18	5.09			5.17
Antimony	Sb	mg/L		<0.05	<0.05	<0.05	<0.05			<0.05
Strontium	Sr	mg/L		0.147	0.148	0.133	0.138			0.121
Titanium	Ti	mg/L		<0.005	0.088	<0.005	<0.005			<0.005
Vanadium	V	mg/L		<0.005	<0.005	<0.005	<0.005			<0.005
Zinc	Zn	mg/L	5	<0.005	<0.005	0.013	<0.005			0.008
Fluoride	F	mg/L		<0.1	<0.5	0.1	<0.1			<0.1
Chloride	Cl	mg/L	250	10.1	12.9	12.7	13.9			15.5
Nitrite as N	NO2 - N	mg/L	1	<0.20	<0.2	<0.2	<0.2			<0.2
Phosphate	PO4-3	mg/L		<0.1	<1	<1	<1			2
Bromide	Br	mg/L		<0.05	<0.5	<0.5	<0.5			<0.5
Nitrate as N	NO3-N	mg/L	10	<0.02	<0.2	<0.2	<0.2			<0.2
Sulphate	SO4	mg/L	500	31.8	35.1	39.3	32.3			31.6
Acidity	pH	pH Units	6.5-8.5	8.23	7.91	8.13	7.73			8.02
Alkalinity	Alk 8.3	CaCO3/L		<0.1	<1	<1	<1			<1
Alkalinity	Alk 4.2	CaCO3/L		195	207	203	217			218
Ammonia as N	NH3-N	mg/L		0.11	0.1	<0.02	0.13			0.04
Dissolved Organic Carbon	DOC	mg/L	5	<0.2	1	1.3	4.2	5.4	1.2	20.8
Total Dissolved Solids	TDS	mg/L	500	251	271	271	277			271
Hardness		CaCO3/L	80-100	244.8	267	259.9	268.4			250.4
Carbonate	CO3	mg/L		0	1	1	1			1
Bi-carbonate	HCO3	mg/L		237.6	250	245.2	262			263
Colour		TCU	5	2	2	1	30			<3
Turbidity		NTU	1	0.6	Not Applicable	Not Applicable	6560			160
Conductivity		umhos/cm		426	468	468	471			367
Lead	Pb	mg/L	0.01	<0.001	0.009	<0.001	0.013			0.001
Total Petroleum Hydrocarbons	TPH - Diesel	ug/L		<100	<100	<100	<100			<100
Cation Sum		eq/L								
Anion Sum		eq/L								
CAB		%								
L.I.										

Denotes exceedance of ODWS

Table 5: Water Quality Results

PARAMETER	SYMBOL	STATION		96-1D						
		UNITS	ODWS	20-Aug-01	23-Jul-02	31-Jul-03	14-Jul-04	28-Jul-05	28-Jul-06	16-Aug-07
Silver	Ag	mg/L			<0.005	<0.005	0.005	<0.0005	<0.0001	<0.0001
Aluminum	Al	mg/L	0.1		<0.03	<0.05	<0.05	0.5	0.05	<0.005
Arsenic	As	mg/L	0.025		<0.2	-	-	<0.001	<0.001	<0.001
Boron	B	mg/L	5		<0.01	<0.01	<0.01	<0.01	<0.01	0.01
Barium	Ba	mg/L	1		0.044	0.05	0.038	0.041	0.006	0.008
Beryllium	Be	mg/L			<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Bismuth	Bi	mg/L			<0.2	<0.2	<0.2	<0.001	-	<0.001
Calcium	Ca	mg/L			69.8	67.5	63.2	89	23	20
Cadmium	Cd	mg/L	0.005		<0.005	<0.005	<0.005	0.0031	<0.0001	<0.0001
Cobalt	Co	mg/L			<0.005	<0.005	<0.005	0.001	<0.0005	<0.0005
Chromium	Cr	mg/L	0.05		<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Copper	Cu	mg/L	1		<0.005	<0.005	<0.005	0.11	0.001	0.001
Iron	Fe	mg/L	0.3		<0.01	<0.01	<0.01	0.042	0.082	0.13
Potassium	K	mg/L			1	1	2	1.2	1.2	3.1
Magnesium	Mg	mg/L			18.3	18.3	17.4	18	1	2.4
Mangenese	Mn	mg/L	0.05		0.01	0.006	<0.005	0.087	<0.002	<0.002
Molybdenum	Mo	mg/L			<0.02	<0.02	<0.02	<0.001	<0.001	<0.001
Sodium	Na	mg/L	20		3.1	3.2	3.8	3.1	0.87	1.9
Nickel	Ni	mg/L			<0.02	<0.02	<0.02	<0.001	<0.001	<0.001
Phosphorus	P	mg/L			<0.1	<0.1	<0.1	0.13	<0.05	0.13
Sulpher	S	mg/L			10.3	-	-	-	1.8	
Tin	Sn	mg/L			<0.2	-	-	-	<0.2	
Sellenium	Se	mg/L	0.01		<0.2	-	-	-	<0.002	<0.002
Silicon	Si	mg/L			5.27	5.15	5.04	5.21	0.47	0.47
Antimony	Sb	mg/L			<0.05	<0.05	<0.05	<0.001	<0.001	<0.0005
Strontium	Sr	mg/L			0.117	0.127	0.123	0.121	0.036	0.032
Titanium	Ti	mg/L			<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Vanadium	V	mg/L			<0.005	<0.005	<0.005	<0.005	<0.001	<0.001
Zinc	Zn	mg/L	5		<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Fluoride	F	mg/L			<0.1	-	-	-	<0.1	
Chloride	Cl	mg/L	250		15.2	18.8	19.7	19.1	3	3
Nitrite as N	NO2 - N	mg/L	1		<0.2	<0.2	<0.2	<0.3	0.01	0.03
Phosphate	PO4-3	mg/L			<1	<1	<1	<1	<0.01	0.1
Bromide	Br	mg/L			<0.5	-	-	-	<1	-
Nitrate as N	NO3-N	mg/L	10		<0.2	<0.2	<0.2	<0.2	0.5	<0.1
Sulphate	SO4	mg/L	500		28.6	30.1	28	27.8	4	3
Acidity	pH	pH Units	6.5-8.5		7.95	8.11	8.22	8.19	8.1	7.9
Alkalinity	Alk 8.3	CaCO3/L			<1	-	-	-	-	-
Alkalinity	Alk 4.2	CaCO3/L			207	196	194	195	60	54
Ammonia as N	NH3-N	mg/L			<0.03	<0.03	0.17	<0.05	0.07	1.13
Dissolved Organic Carbon	DOC	mg/L	5	0.6	26.7	0.9	2.1	0.7	2.5	3.7
Total Dissolved Solids	TDS	mg/L	500		260	257	251	280	72	69
Hardness		CaCO3/L	80-100		249.9	244.4	229.7	300	62	60
Carbonate	CO3	mg/L			1	1	1	3	<1	<1
Bi-carbonate	HCO3	mg/L			250	237	234	192	60	54
Colour		TCU	5		<3	<3	<2	<5	9	5
Turbidity		NTU	1		6.2	2.2	3.6	64.8	20.7	16.1
Conductivity		umhos/cm			475	454	355	436	128	127
Lead	Pb	mg/L	0.01		0.001	<0.001	<0.001	0.0011	<0.0005	<0.0005
Total Petroleum Hydrocarbons	TPH - Diesel	ug/L			<100	<100	<100	<100	<100	<100
Cation Sum		eq/L				5.07	4.82	6.24	1.32	1.45
Anion Sum		eq/L				5.08	5.02	5.01	1.41	1.24
CAB		%				0.11	1.97	10.9	3.19	2.85
L.I.						0.8	0.9	0.764	-0.323	-0.679

Denotes exceedance of ODWS

Table 5: Water Quality Results

PARAMETER	SYMBOL	STATION		96-1D							
		UNITS	ODWS	17-Jun-08	10-Jul-09	29-Jul-10	13-Jul-11	15-Aug-12	12-Sep-13	03-Sep-14	06-Jul-15
Silver	Ag	mg/L		<0.0001	<0.0001	<0.0001	<0.0001	<0.00010	<0.00010	<0.00010	<0.00010
Aluminum	Al	mg/L	0.1	0.016	<0.005	<0.005	0.006	<0.0050	0.019	<0.0050	<0.0050
Arsenic	As	mg/L	0.025	<0.001	<0.001	<0.001	0.001	<0.0010	<0.0010	<0.0010	<0.0010
Boron	B	mg/L	5	<0.01	0.011	<0.01	0.01	0.019	<0.010	<0.010	0.011
Barium	Ba	mg/L	1	0.01	0.013	0.037	0.061	0.041	0.048	0.042	0.044
Beryllium	Be	mg/L		<0.0005	<0.0005	<0.0005	<0.0005	<0.00050	<0.00050	<0.00050	<0.00050
Bismuth	Bi	mg/L		-	-	<0.001	<0.001	<0.0010	-	-	<0.0010
Calcium	Ca	mg/L		21	32	65	58	64	56	62	64
Cadmium	Cd	mg/L	0.005	<0.0001	<0.0001	<0.0001	<0.0001	<0.00010	<0.00010	<0.00010	<0.00010
Cobalt	Co	mg/L		<0.0005	<0.0005	<0.0005	<0.0005	<0.00050	<0.00050	<0.00050	<0.00050
Chromium	Cr	mg/L	0.05	<0.005	<0.005	<0.005	<0.005	<0.0050	<0.0050	<0.0050	<0.0050
Copper	Cu	mg/L	1	0.001	<0.001	<0.001	<0.001	<0.0010	<0.0010	<0.0010	<0.0010
Iron	Fe	mg/L	0.3	0.39	<0.1	<0.1	<0.1	0.13	<0.10	<0.10	<0.10
Potassium	K	mg/L		2.5	2.9	1.1	3.4	2.2	5.6	3.3	2.1
Magnesium	Mg	mg/L		2	2.8	17	14	17	10	15	16
Mangenese	Mn	mg/L	0.05	0.059	0.062	0.013	0.048	0.040	0.067	0.053	0.031
Molybdenum	Mo	mg/L		<0.001	<0.001	<0.001	<0.001	0.00066	0.00059	0.00058	0.00061
Sodium	Na	mg/L	20	1.7	2	4.3	4.0	5.2	4.2	5.8	6.3
Nickel	Ni	mg/L		0.001	<0.001	<0.001	<0.001	<0.0010	<0.0010	<0.0010	<0.0010
Phosphorus	P	mg/L		0.14	0.11	<0.1	<0.1	<0.10	<0.10	<0.10	<0.10
Sulpher	S	mg/L		-	-	-	-	-	-	-	-
Tin	Sn	mg/L		-	-	-	-	<0.0010	-	-	-
Sellenium	Se	mg/L	0.01	<0.002	<0.002	<0.002	<0.002	<0.0020	<0.0020	<0.0020	<0.0020
Silicon	Si	mg/L		0.51	0.68	5.2	3.1	4.2	3.1	4.3	4.3
Antimony	Sb	mg/L		<0.0005	<0.0005	<0.0005	<0.0005	<0.00050	<0.00050	<0.00050	<0.00050
Strontium	Sr	mg/L		0.036	0.057	0.12	0.11	0.13	0.095	0.11	0.12
Titanium	Ti	mg/L		<0.005	<0.005	<0.005	<0.005	<0.0050	<0.0050	<0.0050	<0.0050
Vanadium	V	mg/L		0.002	<0.001	<0.001	0.001	0.00062	0.00059	0.001	<0.00050
Zinc	Zn	mg/L	5	<0.005	<0.005	<0.005	<0.005	<0.0050	<0.0050	<0.0050	<0.0050
Fluoride	F	mg/L		-	-	-	-	-	-	-	-
Chloride	Cl	mg/L	250	4	5	33	19	34	31	35	44
Nitrite as N	NO2 - N	mg/L	1	0.03	0.04	<0.01	<0.01	0.010	0.017	0.038	<0.010
Phosphate	PO4-3	mg/L		0.13	0.1	<0.01	0.02	<0.010	<0.010	0.017	<0.10
Bromide	Br	mg/L		-	-	-	-	-	-	-	-
Nitrate as N	NO3-N	mg/L	10	<0.1	<0.1	<0.1	<0.1	<0.10	<0.10	0.14	<0.10
Sulphate	SO4	mg/L	500	<1	3	24	10	21	14	16	21
Acidity	pH	pH Units	6.5-8.5	8	7.7	8	8.04	7.79	7.89	8.03	7.94
Alkalinity	Alk 8.3	CaCO3/L		-	-	-	-	-	-	-	-
Alkalinity	Alk 4.2	CaCO3/L		66	98	171	130	170	140	160	160
Ammonia as N	NH3-N	mg/L		1.2	1.8	0.11	0.79	0.20	0.40	0.86	0.12
Dissolved Organic Carbon	DOC	mg/L	5	1.9	1.6	0.6	1.7	0.75	2.0	3.5	0.47
Total Dissolved Solids	TDS	mg/L	500	74	111	259	193	253	210	240	260
Hardness		CaCO3/L	80-100	60	92	240	200	230	180	210	220
Carbonate	CO3	mg/L		<1	<1	2	1	<1.0	1	1.5	1.3
Bi-carbonate	HCO3	mg/L		66	97	169	128	170	140	150	160
Colour		TCU	5	10	16	<2	9	2	-	-	-
Turbidity		NTU	1	34	25	270	3700	420	-	-	-
Conductivity		umhos/cm		140	213	476	335	470	410	440	500
Lead	Pb	mg/L	0.01	<0.0005	<0.0005	<0.0005	<0.0005	<0.00050	<0.00050	<0.00050	<0.00050
Total Petroleum Hydrocarbons	TPH - Diesel	ug/L		<100	<100	<100	270	<100	<100	210 (F3)	<200
Cation Sum		eq/L		1.43	2.13	4.92	4.31	4.87	3.97	4.67	4.81
Anion Sum		eq/L		1.44	2.16	4.86	3.33	4.76	4.02	4.44	4.84
CAB		%		-	0	0.67	12.8	1.16	0.6	2.56	0.300
L.I.				-0.448	-0.118	0.657	0.525	0.414	0.4	0.606	0.536

Denotes exceedance of ODWS

Table 5: Water Quality Results

PARAMETER	SYMBOL	STATION		WEST POND							
		UNITS	PWQO	22-Dec-97	31-Jul-98	03-Aug-99	28-Apr-00	28-Jul-00	01-Sep-00	06-Oct-00	26-Apr-01
Silver	Ag	mg/L	0.0001	<0.003	<0.003	0.004	<0.003	<0.003			<0.005
Aluminum	Al	mg/L	0.075	<0.03	<0.03	0.07	0.17	0.04			0.2
Arsenic	As	mg/L	0.005	<0.01	<0.1	<0.1	<0.1	<0.01			<0.2
Boron	B	mg/L	0.2	0.03	<0.01		<0.01	0.01			0.02
Barium	Ba	mg/L		0.025	0.029	0.028	0.034	0.021			0.034
Beryllium	Be	mg/L	0.011	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005			<0.0005
Bismuth	Bi	mg/L		<0.1	<0.1	<0.1	<0.1	<0.1			<0.2
Calcium	Ca	mg/L		34	34.1	33.2	40.1	35.8			52.4
Cadmium	Cd	mg/L	0.0002	<0.005	<0.005	<0.005	<0.005	<0.005			<0.005
Cobalt	Co	mg/L	0.0009	<0.005	<0.005	<0.005	<0.005	<0.005			<0.005
Chromium	Cr	mg/L	0.0089	<0.005	<0.005	<0.005	<0.005	<0.005			<0.005
Copper	Cu	mg/L	0.005	<0.003	<0.003	0.004	<0.003	<0.003			<0.005
Iron	Fe	mg/L	0.3	<0.01	0.03	0.1	0.31	0.04			0.29
Potassium	K	mg/L		1	2	2	1	1			2
Magnesium	Mg	mg/L		14.1	14.3	17	16.6	16.9			18.2
Mangenese	Mn	mg/L		<0.005	0.009	0.013	0.023	<0.005			0.02
Molybdenum	Mo	mg/L	0.04	<0.01	<0.01	<0.02	<0.02	<0.02			<0.02
Sodium	Na	mg/L		18.2	19.4	24.7	27.3	28.6			29.8
Nickel	Ni	mg/L	0.025	<0.02	<0.02	<0.02	<0.02	<0.02			<0.02
Phosphorus	P	mg/L		<0.1	<0.1	<0.1	<0.1	<0.1			<0.1
Sulpher	S	mg/L		4.9	4.4	5.1	5.5	5.6			5.4
Tin	Sn	mg/L		<0.1	<0.1	<0.1	<0.1	<0.1			<0.2
Sellenium	Se	mg/L	0.1	<0.1	<0.1	<0.1	<0.1	<0.1			<0.2
Silicon	Si	mg/L		0.55	0.4		0.36	0.31			1.25
Antimony	Sb	mg/L	0.02	<0.05	<0.05		<0.05	<0.05			<0.05
Strontium	Sr	mg/L		0.088	0.091	0.088	0.105	0.076			0.114
Titanium	Ti	mg/L		<0.005	<0.005	<0.005	0.008	<0.005			0.008
Vanadium	V	mg/L	0.006	<0.005	<0.005	<0.005	<0.005	<0.005			<0.005
Zinc	Zn	mg/L	0.03	<0.005	0.038	<0.005	0.005	<0.005			0.009
Fluoride	F	mg/L		<0.1	<0.5	<0.1	<0.1	<0.1			<0.1
Chloride	Cl	mg/L		45.1	50.7	54.4	67.3	61.4			62.7
Nitrite as N	NO2 - N	mg/L		<0.2	<0.2	<0.2	<0.2	<0.2			<0.2
Phosphate	PO4-3	mg/L		<0.1	<1	<1	<1	<1			<1
Bromide	Br	mg/L		<0.05	<0.5	<0.5	<0.5	<0.5			<0.5
Nitrate as N	NO3-N	mg/L		0.04	<0.2	<0.2	<0.2	<0.2			0.3
Sulphate	SO4	mg/L		16.1	11.4	14.5	17.5	17.2			15.2
Acidity	pH	pH Units	6.5-8.5	8.28	8.28	8.34	8.28	8.37			8.13
Alkalinity	Alk 8.3	CaCO3/L		<0.1	<1	<1	<1	<1			<1
Alkalinity	Alk 4.2	CaCO3/L		120	111	113	137	121			159
Ammonia as N	NH3-N	mg/L	0.5	<0.02	0.04	<0.02	0.03	<0.03			<0.03
Total Organic Carbon	DOC	mg/L		1.4	1.7	3	1.2	2.1	2.8	2.1	1.3
Total Dissolved Solids	TDS	mg/L		201	198	213	252	485.5			279
Hardness		CaCO3/L		143	144.3	153.1	168.8	159.1			206
Carbonate	CO3	mg/L		0	1	1	1	1			1
Bi-carbonate	HCO3	mg/L		146.2	133	135.5	165	145			192
Colour		TCU		2	2	6	<1	20			4
Turbidity		NTU		1.9	Not Applicable	5.1	12.1	1.8			6.8
Conductivity		umhos/cm		386	366	346	465	435			495
Lead	Pb	mg/L	0.005	<0.0001	<0.001	<0.001	<0.001	<0.001			<0.001
Total Petroleum Hydrocarbons	TPH - Diesel	ug/L		<100	<100	<100	<100	<100			
Volatile Organic Compounds	VOC	ug/L									
Cation Sum		eq/L									
Anion Sum		eq/L									
CAB		%									
L.I.											

Denotes exceedance of PWQO

nd Not Detected

Table 5: Water Quality Results

PARAMETER	SYMBOL	STATION	WEST POND							
		UNITS	19-Jul-01	11-Jan-02	20-Aug-01	23-Jul-02	07-Jan-03	31-Jul-03	14-Jul-04	28-Jul-05	28-Jul-06
Silver	Ag	mg/L	<0.005	<0.005		<0.005	<0.005	<0.005	<0.005	<0.0005	<0.0001
Aluminum	Al	mg/L	0.13	0.06		0.19	<0.03	<0.05	<0.05	0.026	0.008
Arsenic	As	mg/L	<0.2	<0.2		<0.2	<0.2	-	-	<0.001	<0.001
Boron	B	mg/L	0.01			0.02	0.02	0.01	0.01	0.014	0.011
Barium	Ba	mg/L	0.021	0.026		0.031	0.035	0.027	0.026	0.025	0.026
Beryllium	Be	mg/L	<0.0005	<0.0005		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Bismuth	Bi	mg/L	<0.2	<0.2		<0.2	<0.2	<0.2	<0.2	<0.2	-
Calcium	Ca	mg/L	40.6	41.8		42.3	48.1	33.5	39.9	35	38
Cadmium	Cd	mg/L	<0.005	<0.005		<0.005	<0.005	<0.005	<0.005	<0.0001	<0.0001
Cobalt	Co	mg/L	<0.005	<0.005		<0.005	<0.005	<0.005	<0.005	<0.0005	<0.0005
Chromium	Cr	mg/L	<0.005	<0.005		<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Copper	Cu	mg/L	<0.005	<0.005		<0.005	<0.005	<0.005	<0.005	0.0021	<0.001
Iron	Fe	mg/L	0.17	0.16		0.35	0.03	0.04	0.06	0.083	<0.05
Potassium	K	mg/L	2	3		1	1	2	2	1.7	1.7
Magnesium	Mg	mg/L	17.3	16.6		16.5	17.3	16.2	15.9	17	16
Mangenese	Mn	mg/L	0.01	0.015		0.038	0.006	0.01	0.006	0.0069	0.003
Molybdenum	Mo	mg/L	<0.02	<0.02		<0.02	<0.02	<0.02	<0.02	<0.001	<0.001
Sodium	Na	mg/L	27.9	29.4		30.2	33.8	32.6	31.6	35	35
Nickel	Ni	mg/L	<0.02	<0.02		<0.02	<0.02	<0.02	<0.02	<0.001	<0.001
Phosphorus	P	mg/L	<0.1	<0.1		<0.1	<0.1	<0.1	<0.1	<0.1	<0.05
Sulpher	S	mg/L	5.2	5.4		5.3	5.3	-	-	-	4.8
Tin	Sn	mg/L	<0.2	<0.2		<0.2	<0.2	-	-	-	<0.2
Sellenium	Se	mg/L	<0.2	<0.2		<0.2	<0.2	-	-	-	<0.002
Silicon	Si	mg/L	0.57					0.62	0.29	-	0.75
Antimony	Sb	mg/L	<0.05			<0.2	<0.05	<0.05	<0.05	<0.05	<0.001
Strontium	Sr	mg/L	0.086	0.114		0.107	0.116	0.092	0.102	0.09	0.11
Titanium	Ti	mg/L	<0.005	<0.005		0.007	<0.005	<0.0005	<0.005	<0.01	-
Vanadium	V	mg/L	<0.005	<0.005		<0.005	<0.005	<0.005	<0.005	<0.005	<0.001
Zinc	Zn	mg/L	<0.005	0.005		0.069	0.015	<0.005	0.016	0.015	<0.005
Fluoride	F	mg/L	<0.1	<0.1		<0.1		-	-	-	<0.1
Chloride	Cl	mg/L	64.8	61.8		63.3	73.6	70.8	66.3	67.9	67
Nitrite as N	NO2 - N	mg/L	<0.2	<0.2		<0.2	<0.2	<0.2	<0.2	<0.3	<0.01
Phosphate	PO4-3	mg/L	<1	<1		<1	<1	<1	<1	<1	<0.01
Bromide	Br	mg/L	<0.5	<0.5		<0.5	<0.5	-	-	-	<1
Nitrate as N	NO3-N	mg/L	<0.2	0.3		<0.2	0.2	<0.2	0.2	<0.2	<0.1
Sulphate	SO4	mg/L	15.7	17.5		14.6	15.2	13.4	15.7	15.2	13
Acidity	pH	pH Units	8.27	8.13		8.33	7.97	8.25	8.36	8.32	8.2
Alkalinity	Alk 8.3	CaCO3/L	<1	<1		<1	<1	-	-	-	-
Alkalinity	Alk 4.2	CaCO3/L	135	130		121	160	114	137	118	132
Ammonia as N	NH3-N	mg/L	<0.03	<0.03		<0.03	0.06	<0.03	<0.03	<0.05	<0.05
Total Organic Carbon	DOC	mg/L	1.9	1.8	1.2	4.4	1.8	1.5	3	2.5	2.5
Total Dissolved Solids	TDS	mg/L	250	248		241	285	-	254	265	-
Hardness		CaCO3/L	172.8	173.2		173.8	191.6	150.6	165.6	160	160
Carbonate	CO3	mg/L	1	1		1	1	1	1	2	2
Bi-carbonate	HCO3	mg/L	162	156		145	193	137	165	116	130
Colour		TCU	<3	<3		10	6	<3	6	<5	<5
Turbidity		NTU	7.5	3.1		7.2	1.9	1.5	2.3	0.6	0.4
Conductivity		umhos/cm	448	470		465	551	452	489	430	461
Lead	Pb	mg/L	0.001	<0.001		<0.001	<0.001	<0.001	<0.001	<0.0002	<0.0005
Total Petroleum Hydrocarbons	TPH - Diesel	ug/L	<100	<100		<100	<100	<100	<100	<100	<100
Volatile Organic Compounds	VOC	ug/L		nd		nd	nd	0.1 Chloroform	nd	Chloroform 0.5	Chloroform 0.3
Cation Sum		eq/L						4.49	4.74	4.53	-
Anion Sum		eq/L						4.56	4.94	4.84	-
CAB		%						0.75	2	0.95	-
L.I.								0.4	0.6	0.267	0.236

Denotes exceedance of PWQO

nd Not Detected

Table 5: Water Quality Results

PARAMETER	SYMBOL	STATION	WEST POND								
		UNITS	16-Aug-07	17-Jun-08	29-Jul-09	11-Jul-10	13-Jul-11	15-Aug-12	12-Sep-13	03-Sep-14	06-Jul-15
Silver	Ag	mg/L	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.00010	<0.00010	<0.00010	<0.00010
Aluminum	Al	mg/L	0.005	0.016	0.055	0.094	0.045	0.086	0.15	0.056	0.031
Arsenic	As	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	<0.0010	<0.0010	<0.0010	<0.0010
Boron	B	mg/L	<0.01	<0.01	0.012	0.013	0.02	<0.010	0.012	0.013	0.013
Barium	Ba	mg/L	0.027	0.027	0.021	0.026	0.026	0.030	0.033	0.030	0.028
Beryllium	Be	mg/L	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.00050	<0.00050	<0.00050	<0.00050
Bismuth	Bi	mg/L	<0.001	-	-	-	-	-	-	-	-
Calcium	Ca	mg/L	36	42	42	42	42	35	41	37.5	40
Cadmium	Cd	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.00010	<0.00010	<0.00010	<0.00010
Cobalt	Co	mg/L	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.00050	<0.00050	<0.00050	<0.00050
Chromium	Cr	mg/L	<0.005	<0.005	<0.005	<0.005	<0.005	<0.0050	<0.0050	<0.0050	<0.0050
Copper	Cu	mg/L	0.001	0.002	<0.002	0.001	0.001	0.0023	0.0018	0.0016	0.0011
Iron	Fe	mg/L	<0.05	<0.1	<0.1	0.11	<0.1	<0.10	0.22	<0.10	<0.10
Potassium	K	mg/L	1.7	1.6	2.1	1.8	1.9	1.9	2.0	2.0	1.8
Magnesium	Mg	mg/L	16	15	15	16	15	15	16	16	16
Mangenese	Mn	mg/L	<0.002	0.004	0.006	0.008	0.004	0.0063	0.017	0.0055	0.0046
Molybdenum	Mo	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	<0.00050	0.00053	0.00087	<0.00050
Sodium	Na	mg/L	36	33	36	40	38	38	38	34.7	36
Nickel	Ni	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	0.0019	<0.0010	<0.0010	<0.0010
Phosphorus	P	mg/L	<0.05	<0.05	<0.05	<0.05	<0.05	0.002	0.02	0.008	0.008
Sulpher	S	mg/L	-	-	-	-	-	-	-	-	-
Tin	Sn	mg/L	<0.001	-	-	-	-	-	-	-	-
Sellenium	Se	mg/L	<0.002	<0.002	<0.002	<0.002	<0.002	<0.0020	<0.0020	<0.0020	<0.0020
Silicon	Si	mg/L	0.94	0.45	0.19	0.51	0.55	1.0	0.63	0.71	0.72
Antimony	Sb	mg/L	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.00050	<0.00050	<0.00050	<0.00050
Strontium	Sr	mg/L	0.11	0.09	0.11	0.11	0.12	0.11	0.12	0.11	0.10
Titanium	Ti	mg/L	<0.005	<0.005	<0.005	<0.005	<0.005	<0.0050	0.0061	<0.0050	<0.0050
Vanadium	V	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	<0.00050	0.00078	<0.00050	<0.00050
Zinc	Zn	mg/L	<0.005	0.018	<0.005	<0.005	<0.005	<0.0050	<0.0050	<0.0050	<0.0050
Fluoride	F	mg/L	-	-	-	-				-	-
Chloride	Cl	mg/L	76	62	64	69	66	64	58	57	62
Nitrite as N	NO2 - N	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01	<0.010	<0.010	<0.010	<0.010
Phosphate	PO4-3	mg/L	<0.01	<0.01	<0.01	<0.01	0.01	<0.010	<0.010	<0.010	<0.010
Bromide	Br	mg/L	-	-	-	-				-	-
Nitrate as N	NO3-N	mg/L	<0.3	0.2	0.2	<0.1	0.1	<0.10	<0.10	0.11	0.14
Sulphate	SO4	mg/L	14	16	16	14	13	13	12	11	12
Acidity	pH	pH Units	8.4	8.3	8.2	8.2	8.37	8.18	8.35	8.36	8.25
Alkalinity	Alk 8.3	CaCO3/L	-	-	-	-	-	-	-	-	-
Alkalinity	Alk 4.2	CaCO3/L	128	136	135	136	136	130	130	140	140
Ammonia as N	NH3-N	mg/L	0.05	<0.05	<0.05	<0.05	<0.05	<0.050	<0.050	<0.050	<0.050
Total Organic Carbon	DOC	mg/L	2.4	2.6	2.3	2.4	2.5	1.8	2.5	2.2	2.2
Total Dissolved Solids	TDS	mg/L	257	-	247	259	254	-	-	240	260
Hardness		CaCO3/L	150	160	150	160	160	150	160	150	170
Carbonate	CO3	mg/L	3	3	2	2	3	1.8	2.6	2.8	2.3
Bi-carbonate	HCO3	mg/L	125	133	132	133	133	120	130	130	140
Colour		TCU	<5	<2	12	<2	<2	<2	-	-	-
Turbidity		NTU	0.5	0.7	1.6	0.5	2.8	2.6	-	1.3	0.7
Conductivity		umhos/cm	470	485	489	498	504	480	460	460	490
Lead	Pb	mg/L	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.00050	<0.00050	<0.00050	<0.00050
Total Petroleum Hydrocarbons	TPH - Diesel	ug/L	<100	<100	<100	<100	<100	<100	<100	<200	<200
Volatile Organic Compounds	VOC	ug/L	Chloroform 0.2	nd	nd	nd	nd	nd	Chloroform 0.10	Chloroform 0.11	nd
Cation Sum		eq/L	4.68	4.45	4.28	4.87	4.81	4.52	4.88		5.07
Anion Sum		eq/L	4.98	4.78	4.39	4.95	4.85	4.60	4.47		4.82
CAB		%	3.11	2.98	0.62	0.75	0.470	0.820	4.34		2.47
L.I.			0.364	0.443	0.56	0.546	0.701	0.421	0.645	0.662	0.612

Denotes exceedance of PWQO

nd Not Detected

Table 5: Water Quality Results

PARAMETER	SYMBOL	STATION		CONC II POND							
		UNITS	PWQO	28-Jul-00	01-Sep-00	06-Oct-00	19-Jul-01	20-Aug-01	23-Jul-02	31-Jul-03	14-Jul-04
Silver	Ag	mg/L	0.0001	0.004			<0.005		<0.005	<0.005	<0.005
Aluminum	Al	mg/L	0.075	0.09			0.15		0.09	0.23	0.2
Arsenic	As	mg/L	0.005	<0.1			<0.2		<0.2	-	-
Boron	B	mg/L	0.2	0.02			0.01		0.02	0.01	0.02
Barium	Ba	mg/L		0.026			0.03		0.036	0.03	0.032
Beryllium	Be	mg/L	0.011	<0.0005			<0.0005		<0.0005	<0.0005	<0.0005
Bismuth	Bi	mg/L		<0.1			<0.2		<0.2	<0.2	<0.2
Calcium	Ca	mg/L		62.3			47.7		50.6	33.5	58.5
Cadmium	Cd	mg/L	0.0002	<0.005			<0.005		<0.005	<0.005	<0.005
Cobalt	Co	mg/L	0.0009	<0.005			<0.005		<0.005	<0.005	<0.005
Chromium	Cr	mg/L	0.0089	<0.005			<0.005		<0.005	<0.005	<0.005
Copper	Cu	mg/L	0.005	0.007			<0.005		<0.005	<0.005	<0.005
Iron	Fe	mg/L	0.3	0.08			0.22		0.14	0.04	0.24
Potassium	K	mg/L		1			<1		<1	2	2
Magnesium	Mg	mg/L		13.6			16.2		15.1	16.5	14.9
Mangenese	Mn	mg/L		0.008			0.017		0.013	0.023	0.023
Molybdenum	Mo	mg/L	0.04	<0.02			<0.02		<0.02	<0.02	<0.02
Sodium	Na	mg/L		20.3			25		30.3	35.4	31.7
Nickel	Ni	mg/L	0.025	<0.02			<0.02		<0.02	<0.02	<0.02
Phosphorus	P	mg/L		<0.1			<0.1		<0.1	<0.1	<0.1
Sulpher	S	mg/L		3.9			4.7		5.3	-	-
Tin	Sn	mg/L		<0.1			<0.2		<0.2	-	-
Sellenium	Se	mg/L	0.1	<0.1			<0.2		<0.2	-	-
Silicon	Si	mg/L		2.03			1.4			1.17	2.08
Antimony	Sb	mg/L	0.02	<0.05			<0.05		<0.2	<0.05	<0.05
Strontium	Sr	mg/L		0.105			0.11		0.107	0.104	0.12
Titanium	Ti	mg/L		<0.005			0.006		0.007	0.01	0.009
Vanadium	V	mg/L	0.006	<0.005			<0.005		<0.005	<0.005	<0.005
Zinc	Zn	mg/L	0.03	<0.005			<0.005		<0.005	0.022	0.011
Fluoride	F	mg/L		<0.1			<0.1		<0.1	-	-
Chloride	Cl	mg/L		40.7			57.7		62.9	78.6	61.8
Nitrite as N	NO2 - N	mg/L		<0.2			<0.2		<0.2	<0.2	<0.2
Phosphate	PO4-3	mg/L		<1			<1		<1	<1	<1
Bromide	Br	mg/L		<0.5			<0.5		<0.5	-	-
Nitrate as N	NO3-N	mg/L		0.4			<0.2		0.3	<0.2	0.3
Sulphate	SO4	mg/L		11			14.7		14.1	18.9	15.8
Acidity	pH	pH Units	6.5-8.5	8.19			8.23		8.26	8.24	8.1
Alkalinity	Alk 8.3	CaCO3/L		<1			<1		<1	-	-
Alkalinity	Alk 4.2	CaCO3/L		181			150		158	136	177
Ammonia as N	NH3-N	mg/L	0.5	<0.03			<0.03		<0.03	0.04	<0.03
Total Organic Carbon	DOC	mg/L		4	2.8	2.6	3.5	2.3	2.7	7.2	2.4
Total Dissolved Solids	TDS	mg/L		258			252		269	-	291
Hardness		CaCO3/L		212.1			186.2		188.8	187.9	207.6
Carbonate	CO3	mg/L		1			1		1	1	1
Bi-carbonate	HCO3	mg/L		218			181		191	163	213
Colour		TCU		40			5		11	13	16
Turbidity		NTU		3.7			3.4		3	13.1	7.2
Conductivity		umhos/cm		465			452		529	525	541
Lead	Pb	mg/L	0.005	<0.001			0.001		<0.001	<0.001	<0.001
Total Petroleum Hydrocarbons	TPH - Diesel	ug/L		<100			<100		<100	<100	<100
Cation Sum		eq/L								5.36	5.58
Anion Sum		eq/L								5.33	5.61
CAB		%								-0.25	0.29
L.I.										0.6	0.7

Denotes exceedance of PWQO

Table 5: Water Quality Results

PARAMETER	SYMBOL	STATION	CONC II POND										
		UNITS	28-Jul-05	28-Jul-06	16-Aug-07	17-Jun-08	10-Jul-09	29-Jul-10	13-Jul-11	15-Aug-12	12-Sep-13	03-Sep-14	06-Jul-15
Silver	Ag	mg/L	<0.0005	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.00010	<0.00010	<0.00010	<0.00010
Aluminum	Al	mg/L	0.092	0.056	<0.005	0.12	0.094	0.19	0.11	0.23	0.22	0.11	0.073
Arsenic	As	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.0010	<0.0010	<0.0010	<0.0010
Boron	B	mg/L	0.012	<0.01	0.013	<0.01	<0.01	0.011	0.01	<0.010	0.012	<0.010	0.012
Barium	Ba	mg/L	0.029	0.032	0.025	0.025	0.025	0.028	0.030	0.031	0.031	0.027	0.028
Beryllium	Be	mg/L	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.00050	<0.00050	<0.00050	<0.00050
Bismuth	Bi	mg/L	<0.001	-	<0.001	-	-	-				-	-
Calcium	Ca	mg/L	56	52	36	55	59	53	58	50	51	48.5	49
Cadmium	Cd	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.00010	<0.00010	<0.00010	<0.00010
Cobalt	Co	mg/L	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.00050	<0.00050	<0.00050	<0.00050
Chromium	Cr	mg/L	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.0050	<0.0050	<0.0050	<0.0050
Copper	Cu	mg/L	0.0023	0.002	0.001	0.005	0.002	0.003	0.002	0.0028	0.0019	0.0015	0.0012
Iron	Fe	mg/L	0.17	<0.05	<0.05	0.14	<0.1	0.25	0.1	0.20	0.21	0.15	<0.10
Potassium	K	mg/L	1.7	1.6	1.6	1.4	1.6	1.7	1.5	1.7	1.6	2	1.5
Magnesium	Mg	mg/L	16	15	17	13	14	15	15	16	15	14	15
Mangenese	Mn	mg/L	0.023	0.003	<0.002	0.018	0.013	0.024	0.014	0.023	0.021	0.023	0.0086
Molybdenum	Mo	mg/L	<0.001	<0.001	<0.001	0.004	<0.001	<0.001	<0.001	<0.00050	0.00053	<0.00050	<0.00050
Sodium	Na	mg/L	33	31	38	28	31	33	31	31	29	26.7	29
Nickel	Ni	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.0010	0.0014	<0.0010	<0.0010
Phosphorus	P	mg/L	<0.1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.011	0.022	0.011	0.007
Sulpher	S	mg/L	-	5.2	-	-	-	-					
Tin	Sn	mg/L	-	<0.2	-	-	-	-					
Sellenium	Se	mg/L	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.0020	<0.0020	<0.0020	<0.0020
Silicon	Si	mg/L	1.1	1.4	1.8	1.7	0.58	1.2	1.6	1.7	1.9	1.1	0.85
Antimony	Sb	mg/L	<0.001	<0.001	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.00050	<0.00050	<0.00050	<0.00050
Strontium	Sr	mg/L	0.12	0.12	0.11	0.1	0.12	0.12	0.12	0.11	0.12	0.1	0.11
Titanium	Ti	mg/L	<0.005	-	<0.005	<0.005	<0.005	0.006	<0.005	0.0051	0.0058	<0.0050	0.0051
Vanadium	V	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.00075	0.0022	<0.00050	<0.00050
Zinc	Zn	mg/L	<0.005	<0.005	<0.005	0.008	<0.005	<0.005	0.005	<0.0050	<0.0050	<0.0050	<0.0050
Fluoride	F	mg/L	-	<0.1	-	-	-	-					
Chloride	Cl	mg/L	59.5	59	72	54	61	55	46	43	41	39	42
Nitrite as N	NO2 - N	mg/L	<0.3	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.010	<0.010	0.01	<0.010
Phosphate	PO4-3	mg/L	<1	<0.01	<0.01	<0.01	<0.01	<0.01	0.02	<0.010	<0.010	<0.010	<0.010
Bromide	Br	mg/L	-	<1	-	-	-	-					
Nitrate as N	NO3-N	mg/L	0.7	0.3	0.3	0.5	0.3	0.2	0.4	0.48	0.55	0.72	0.95
Sulphate	SO4	mg/L	14.6	15	14	18	12	12	9	12	10	10	12
Acidity	pH	pH Units	8.28	8.2	8.3	8.4	8.3	8.2	8.37	8.19	8.25	8.29	8.26
Alkalinity	Alk 8.3	CaCO3/L	-	-	-	-	-	-					
Alkalinity	Alk 4.2	CaCO3/L	168	168	131	165	182	159	177	160	160	150	150
Ammonia as N	NH3-N	mg/L	<0.05	0.06	<0.05	<0.05	<0.05	<0.05	<0.05	0.060	<0.050	0.063	<0.050
Total Organic Carbon	DOC	mg/L	2.4	2.4	2.2	2.3	3	2.1	3.8	2.3	2.7	2.5	2.0
Total Dissolved Solids	TDS	mg/L	278	253	263	-	282	264	264	-	-	240	250
Hardness		CaCO3/L	200	190	160	190	190	180	190	170	190	180	180
Carbonate	CO3	mg/L	3	2	2	3	3	2	4	2.2	2.6	2.8	2.6
Bi-carbonate	HCO3	mg/L	165	165	129	161	179	157	173	150	160	150	150
Colour		TCU	<5	<5	<5	<2	9	<2	4	2	-	-	-
Turbidity		NTU	2.7	1.8	2.2	3.5	2.3	2.5	4.2	6.0	-	-	2.2
Conductivity		umhos/cm	491	502	516	509	537	501	522	470	470	440	470
Lead	Pb	mg/L	0.0003	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.00050	<0.00050	<0.00050	<0.00050
Total Petroleum Hydrocarbons	TPH - Diesel	ug/L	<100	<100	<100	<100	<100	<100	<100	<100	<100	<200	<200
Cation Sum		eq/L	5.47	5.42	4.91	5.31	5.15	5.09	5.13	4.64	5.00		4.86
Anion Sum		eq/L	5.28	5.5	4.98	5.4	5.29	5.02	5.06	4.58	4.57		4.59
CAB		%	-0.31	0.27	0.71	0.31	0.28	0.67	0.750	0.620	4.550		2.85
L.I.			0.561	0.472	0.526	0.66	0.885	0.69	0.940	0.641	0.765	0.760	0.724

Denotes exceedance of PWQO

Appendix E

Water Balance Calculations

Thornthwaite Analysis

SMR = Soil Moisture Retention (mm)

Soil Type	Vegetation Type					McCormick Geologic Classification
	Shallow Rooted Crops (e.g. beans)	Moderately Deep Rooted Crops (e.g. corn)	**Deep Rooted Crops (e.g. pasture)**	Orchards	**Closed Mature Forest**	
Fine Sand	50	75	**100**	150	**250**	**Outwash**
Fine Sandy Loam	75	150	**150**	250	**300**	**Outwash and Ice Contact**
Silt Loam	125	200	**250**	300	**400**	**Moraine (till)**
Clay Loam	100	200	250	250	400	-
Clay	75	50	200	200	350	-

Source: *Instructions and Tables For Computing Potential Evapotranspiration And The Water Balance,* C.W. Thornthwaite and J.R. Mather, 1957

Table E1: SMR Values

Estimated Evapotranspiration Values (mm) using Environment Canada Orangeville MOE Weather Station 1981 to 2010 Climate Normals

Month	Daily Average Temperature (C.)	Average Monthly Precipitation (mm)	PET	AET (100 mm SMR)	AET (150 mm SMR)	AET (250 mm SMR)	AET (300 mm SMR)	AET (400 mm SMR)
January	-7.5	64.3	0	0	0.0	0.0	0	0.0
February	-6.5	54.5	0	0	0.0	0.0	0	0.0
March	-2.1	60.9	0	0	0.0	0.0	0	0.0
April	5.3	70.1	30.2	30.2	30.2	30.2	30.2	30.2
May	11.7	86.6	72.4	72.4	72.4	72.4	72.4	72.4
June	16.9	81.3	112.2	107.3	109.3	109.3	110.3	110.3
July	19.4	80.8	128.7	109.8	114.8	120.8	120.8	123.8
August	18.4	88.2	111.6	98.2	101.2	104.2	106.2	107.2
September	14.3	87.0	74.9	74.9	74.9	74.9	74.9	74.9
October	7.8	76.6	37.1	37.1	37.1	37.1	37.1	37.1
November	2.0	87.1	7.2	7.2	7.2	7.2	7.2	7.2
December	-4.1	64.2	0	0	0.0	0.0	0	0.0
Annual Total (mm):		**901.5**	**574.29**	**537.1**	**547.1**	**556.1**	**559.1**	**563.1**

Source: *Computer Program for Estimating Evapotranspiration Using the Thornthwaite Method*, United States Department of Commerce, National Oceanic and Atmosphere Administration (NOAA) Technical Memorandum ERL GLERL-101 (November 1996)

Table E2: Thornthwaite Calculation Results

MOECC Infiltration Factors

Topography Factor

Classification	Criteria					Slope (%)	Value of Infiltration Factor
Flat land	Average Slope Not Exceeding:	0.6	m per	1	km	0.06	0.3
Rolling land	Average slope of:	2.8	m per	1	km	0.28	0.2
	to:	3.8	m per	1	km	0.38	
Hilly land	Average slope of:	28	m per	1	km	2.8	0.1
	to:	47	m per	1	km	4.7	

Soil Factor

Soil Type	Value of Infiltration Factor
Tight impervious clay	0.1
Medium combinations of clay and loam	0.2
Open sandy loam	0.4

Cover Factor

Classification	Value of Infiltration Factor
Cultivated lands	0.1
Woodland	0.2

Source:
MOEE Hydrogeological Technical Information Requirements for Land Development Applications,
Ontario Ministry of the Environment and Energy, April 1995

McCormick Site Runoff Area Infiltration Factors

Characteristic	Individual Factor Value
Site Topography = Hilly Land	0.1
Moraine Soils = Medium Combinations of Clay and Loam	0.2
Outwash + Ice-Contact Soils = Open Sandy Loam	0.4
Pasture	0.1
Woodland	0.2

Classification	Infiltration Factor
Pasture on Moraine (till)	**0.4**
Woodland on Moraine (till)	**0.5**
Pasture on Outwash or Outwash + Ice-Contact	**0.6**
Woodland on Outwash or Outwash + Ice-Contact	**0.7**

Table E3: Infiltration Factors

Unit Value Summary

Evapotranspiration Rates (mm/yr)

From Thornthwaite Analysis

Geologic Classification (soil type)	Internally Drained Catchment Area		Catchments Where Runoff Can Leave Site			
			North East To Warnock Lake		East To Wetland 4	
	Woodland	Pasture	Woodland	Pasture	Woodland	Pasture
Outwash	556.06	537.06	556.06	537.06	-	-
Outwash + Ice-Contact	559.06	547.06	559.06	547.06	559.06	547.06
Moraine (till)	563.06	556.06	563.06	556.06	563.06	556.06

Surplus Rates (mm/yr)

Annual Precipitation = 901.5 mm

Geologic Classification (soil type)	Internally Drained Catchment Area		Catchments Where Runoff Can Leave Site			
			North East To Warnock Lake		East To Wetland 4	
	Woodland	Pasture	Woodland	Pasture	Woodland	Pasture
Outwash	345.44	364.44	345.44	364.44	-	-
Outwash + Ice-Contact	342.44	354.44	342.44	354.44	342.44	354.44
Moraine (till)	338.44	345.44	338.44	345.44	338.44	345.44

Infiltration Factor

From MOECC Guidelines for runoff areas

Geologic Classification (soil type)	Internally Drained Catchment Area		Catchments Where Runoff Can Leave Site			
			North East To Warnock Lake		East To Wetland 4	
	Woodland	Pasture	Woodland	Pasture	Woodland	Pasture
Outwash	1	1	0.7	0.6	-	-
Outwash + Ice-Contact	1	1	0.7	0.6	0.7	0.6
Moraine (till)	1	1	0.5	0.4	0.5	0.4

Infiltration Rates (mm/yr)

Infiltration Rate = Surplus x Infiltration Factor

Geologic Classification (soil type)	Internally Drained Catchment Area		Catchments Where Runoff Can Leave Site			
			North East To Warnock Lake		East To Wetland 4	
	Woodland	Pasture	Woodland	Pasture	Woodland	Pasture
Outwash	345.44	364.44	241.81	218.66	-	-
Outwash + Ice-Contact	342.44	354.44	239.71	212.66	239.71	212.66
Moraine (till)	338.44	345.44	169.22	138.18	169.22	138.18

Runoff Rates (mm/yr)

Runoff Rate = Surplus - Infiltration Rate

Geologic Classification (soil type)	Internally Drained Catchment Area		Catchments Where Runoff Can Leave Site			
			North East To Warnock Lake		East To Wetland 4	
	Woodland	Pasture	Woodland	Pasture	Woodland	Pasture
Outwash	0	0	103.63	145.78	-	-
Outwash + Ice-Contact	0	0	102.73	141.78	102.73	141.78
Moraine (till)	0	0	169.22	207.26	169.22	207.26

Area and Volume Summary

Land Areas (ha) Analysis Area = Proposed Extraction Area = 20.75 ha

Geologic Classification (soil type)	Internally Drained Catchment Area		Catchments Where Runoff Can Leave Site			
			North East To Warnock Lake		East To Wetland 4	
	Woodland	Pasture	Woodland	Pasture	Woodland	Pasture
Outwash	0.01	4.17	0.26	0.65	-	-
Outwash + Ice-Contact	1.87	1.22	1.32	1.07	0.06	0.07
Moraine (till)	5.62	2.75	0.05	0.07	0.61	0.95

Annual Recharge Volumes (m^3) Recharge = Area x Recharge Rate

Geologic Classification (soil type)	Internally Drained Catchment Area		Catchments Where Runoff Can Leave Site			
			North East To Warnock Lake		East To Wetland 4	
	Woodland	Pasture	Woodland	Pasture	Woodland	Pasture
Outwash	35	15,197	629	1,421	-	-
Outwash + Ice-Contact	6,404	4,324	3,164	2,276	144	149
Moraine (till)	19,020	9,500	85	97	1,032	1,313

Annual Runoff Volumes (m^3) Runoff = Area x Runoff Rate

Geologic Classification (soil type)	Internally Drained Catchment Area		Catchments Where Runoff Can Leave Site			
			North East To Warnock Lake		East To Wetland 4	
	Woodland	Pasture	Woodland	Pasture	Woodland	Pasture
Outwash	0	0	269	948	-	-
Outwash + Ice-Contact	0	0	1,356	1,517	62	99
Moraine (till)	0	0	85	145	1,032	1,969

Existing Water Balance Summary	Average Rate m/yr	Volumes		
		m^3	L	L/s
Extraction Area Total Recharge	0.312	64,788	64,788,020	2.05
Extraction Area Total Runoff	0.036	7,482	7,481,880	0.24

Evapotranspiration and Evaporation Rates (mm/yr)

Geologic Classification (soil type)	Internally Drained Catchment Area		
	Woodland	Pasture	Lake
Outwash	556.06	537.06	682.4

Annual Precipitation Rate (mm/yr)
901.5

Land Areas (ha)

Internally Drained Catchment Area		
Woodland	Pasture	Lake
0.34	6.41	14.00

Site Extraction Area (ha)
20.75

Evapotranspiration and Evaporation Volumes (m^3)

Internally Drained Catchment Area		
Woodland	Pasture	Lake
1,891	34,426	95,536

Site Precipitation Volume (m^3)
187,061

Future Site Recharge = Site Rainfall - Site Evapotranspiration - Lake Evaporation
Runoff = 0

Future Water Balance Summary	Average Rate m/yr	Volumes		
		m^3	L	L/s
Extraction Area Total Recharge	0.266	55,209	55,209,100	1.75
Extraction Area Total Runoff	0.000	0	0	0.00

Wetland 4 Existing Condition Water Balance

Evapotranspiration Rates (mm/yr)

From Thornthwaite Analysis

Geologic Classification (soil type)	Wetland	Wetland 4 Catchment			
		Within Extraction Area		Outside of Extraction Area	
		Woodland	Pasture	Woodland	Pasture
Outwash + Ice-Contact	-	559.06	547.06	-	-
Moraine (till)	574.29	563.06	556.06	563.06	556.06

Surplus Rates (mm/yr)

Annual Precipitation = 901.5 mm

Geologic Classification (soil type)	Wetland	Wetland 4 Catchment			
		Within Extraction Area		Outside of Extraction Area	
		Woodland	Pasture	Woodland	Pasture
Outwash + Ice-Contact	-	342.44	354.44	-	-
Moraine (till)	327.21	338.44	345.44	338.44	345.44

Infiltration Factor

From MOECC Guidelines for runoff areas

Geologic Classification (soil type)	Wetland	Wetland 4 Catchment			
		Within Extraction Area		Outside of Extraction Area	
		Woodland	Pasture	Woodland	Pasture
Outwash + Ice-Contact	-	0.7	0.6	-	-
Moraine (till)	1	0.5	0.4	0.5	0.4

Infiltration Rates (mm/yr)

Infiltration Rate = Surplus x Infiltration Factor

Geologic Classification (soil type)	Wetland	Wetland 4 Catchment			
		Within Extraction Area		Outside of Extraction Area	
		Woodland	Pasture	Woodland	Pasture
Outwash + Ice-Contact	-	239.71	212.66	-	-
Moraine (till)	327.21	169.22	138.18	169.22	138.18

Runoff Rates (mm/yr)

Runoff Rate = Surplus - Infiltration Rate

Geologic Classification (soil type)	Wetland	Wetland 4 Catchment			
		Within Extraction Area		Outside of Extraction Area	
		Woodland	Pasture	Woodland	Pasture
Outwash + Ice-Contact	-	102.73	141.78	-	-
Moraine (till)	0	169.22	207.26	169.22	207.26

Land Areas (ha)

Geologic Classification (soil type)	Wetland	Wetland 4 Catchment			
		Within Extraction Area		Outside of Extraction Area	
		Woodland	Pasture	Woodland	Pasture
Outwash + Ice-Contact	-	0.06	0.07	-	-
Moraine (till)	0.2	0.61	0.95	1.75	0.72

Annual Runoff Volumes (m^3)

Runoff = Area x Runoff Rate

Geologic Classification (soil type)	Wetland	Wetland 4 Catchment			
		Within Extraction Area		Outside of Extraction Area	
		Woodland	Pasture	Woodland	Pasture
Outwash + Ice-Contact	-	62	99	-	-
Moraine (till)	0	1,032	1,969	2,961	1,492
Runoff Contribution to Wetland 4 :		**3,162**		**4,454**	
Total Runoff Entering Wetland 4 :		**7,616**			

Annual Precipitation (m^3):	**1,803**	Annual Evapotrans. (m^3):	**1,149**
Total Water Input (m^3):	**9,419**	Recharge (m^3):	**8,270**

Wetland 4 Future Condition Water Balance - Catchment Addition

Evapotranspiration Rates (mm/yr) From Thornthwaite Analysis

Geologic Classification (soil type)	Wetland	Wetland 4 Catchment			
		New Catchment		Original Catchment	
		Woodland	Pasture	Woodland	Pasture
Outwash	-	556.06	537.06	-	-
Moraine (till)	574.29	-	-	563.06	556.06

Surplus Rates (mm/yr) Annual Precipitation = 901.5 mm

Geologic Classification (soil type)	Wetland	Wetland 4 Catchment			
		New Catchment		Original Catchment	
		Woodland	Pasture	Woodland	Pasture
Outwash	-	345.44	364.44	-	-
Moraine (till)	327.21	-	-	338.44	345.44

Infiltration Factor From MOECC Guidelines for runoff areas

Geologic Classification (soil type)	Wetland	Wetland 4 Catchment			
		New Catchment		Original Catchment	
		Woodland	Pasture	Woodland	Pasture
Outwash	-	0.7	0.6	-	-
Moraine (till)	1	-	-	0.5	0.4

Infiltration Rates (mm/yr) Infiltration Rate = Surplus x Infiltration Factor

Geologic Classification (soil type)	Wetland	Wetland 4 Catchment			
		New Catchment		Original Catchment	
		Woodland	Pasture	Woodland	Pasture
Outwash	-	241.81	218.66	-	-
Moraine (till)	327.21	-	-	169.22	138.18

Runoff Rates (mm/yr) Runoff Rate = Surplus - Infiltration Rate

Geologic Classification (soil type)	Wetland	Wetland 4 Catchment			
		New Catchment		Original Catchment	
		Woodland	Pasture	Woodland	Pasture
Outwash	-	103.63	145.78	-	-
Moraine (till)	0	-	-	169.22	207.26

Land Areas (ha)

Geologic Classification (soil type)	Wetland	Wetland 4 Catchment			
		New Catchment		Original Catchment	
		Woodland	Pasture	Woodland	Pasture
Outwash	-	0.41	1.36	-	-
Moraine (till)	0.2	-	-	1.75	0.72

Annual Runoff Volumes (m^3) Runoff = Area x Runoff Rate

Geologic Classification (soil type)	Wetland	Wetland 4 Catchment			
		New Catchment		Original Catchment	
		Woodland	Pasture	Woodland	Pasture
Outwash	-	425	1,983	-	-
Moraine (till)	0	-	-	2,961	1,492
Runoff Contribution to Wetland 4 :		**2,407**		**4,454**	
Total Runoff Entering Wetland 4 :		**6,861**			

Annual Precipitation (m^3):	**1,803**
Total Water Input (m^3):	**8,664**

Annual Evapotrans. (m^3):	**1,149**
Recharge (m^3):	**7,516**

Wetland 4 Future Condition Water Balance - Catchment Addition and Soil Amendment

Evapotranspiration Rates (mm/yr)

From Thornthwaite Analysis

Geologic Classification (soil type)	Wetland	Wetland 4 Catchment			
		New Catchment		Original Catchment	
		Woodland	Pasture	Woodland	Pasture
Moraine (till)	574.29	563.06	556.06	563.06	556.06

Surplus Rates (mm/yr)

Annual Precipitation = 901.5 mm

Geologic Classification (soil type)	Wetland	Wetland 4 Catchment			
		New Catchment		Original Catchment	
		Woodland	Pasture	Woodland	Pasture
Moraine (till)	327.21	338.44	345.44	338.44	345.44

Infiltration Factor

From MOECC Guidelines for runoff areas

Geologic Classification (soil type)	Wetland	Wetland 4 Catchment			
		New Catchment		Original Catchment	
		Woodland	Pasture	Woodland	Pasture
Moraine (till)	1	0.5	0.4	0.5	0.4

Infiltration Rates (mm/yr)

Infiltration Rate = Surplus x Infiltration Factor

Geologic Classification (soil type)	Wetland	Wetland 4 Catchment			
		New Catchment		Original Catchment	
		Woodland	Pasture	Woodland	Pasture
Moraine (till)	327.21	169.22	138.18	169.22	138.18

Runoff Rates (mm/yr)

Runoff Rate = Surplus - Infiltration Rate

Geologic Classification (soil type)	Wetland	Wetland 4 Catchment			
		New Catchment		Original Catchment	
		Woodland	Pasture	Woodland	Pasture
Moraine (till)	0	169.22	207.26	169.22	207.26

Land Areas (ha)

Geologic Classification (soil type)	Wetland	Wetland 4 Catchment			
		New Catchment		Original Catchment	
		Woodland	Pasture	Woodland	Pasture
Moraine (till)	0.2	0.41	1.36	1.75	0.72

Annual Runoff Volumes (m^3)

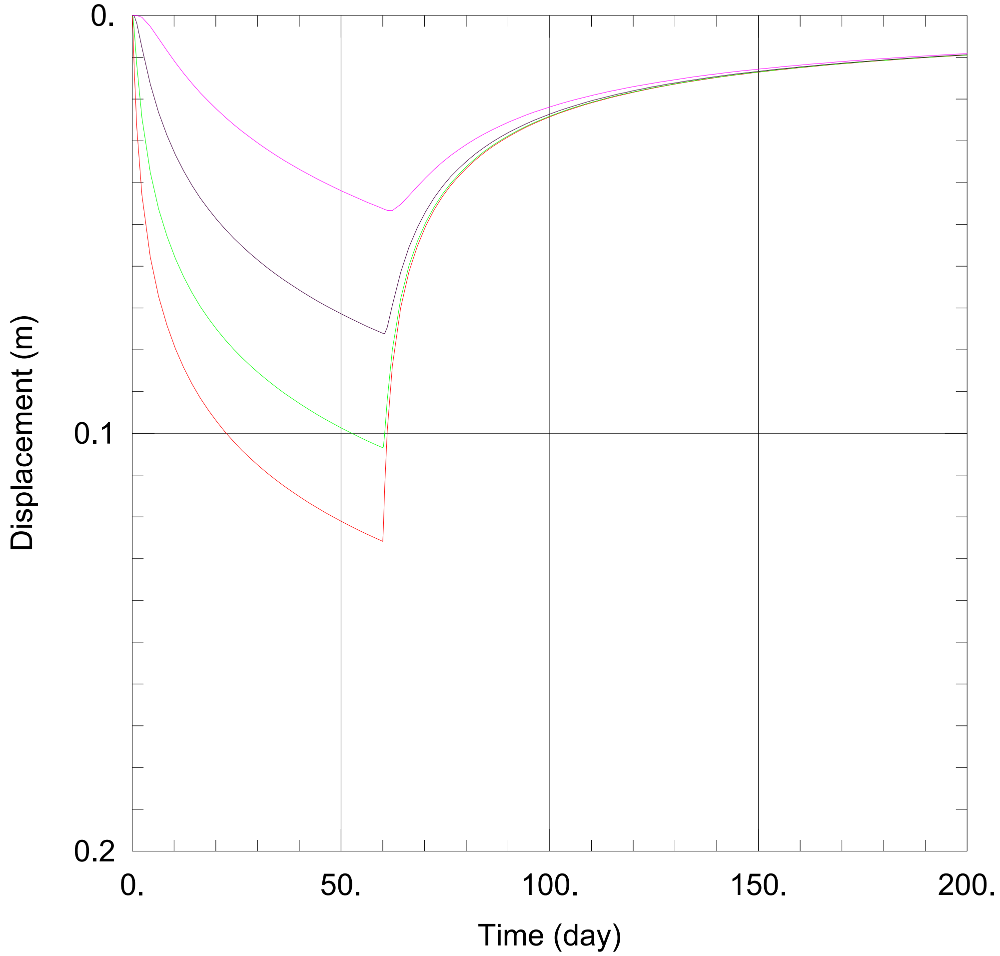
Runoff = Area x Runoff Rate

Geologic Classification (soil type)	Wetland	Wetland 4 Catchment			
		New Catchment		Original Catchment	
		Woodland	Pasture	Woodland	Pasture
Moraine (till)	0	694	2,819	2,961	1,492
Runoff Contribution to Wetland 4 :		**3,513**		**4,454**	
Total Runoff Entering Wetland 4 :		**7,966**			

Annual Precipitation (m^3):	**1,803**		Annual Evapotrans. (m^3):	**1,149**
Total Water Input (m^3):	**9,769**		Recharge (m^3):	**8,621**

Appendix F

Drawdown Analysis



EXTRACTION RELATED DRAWDOWN PROJECTION

PROJECT INFORMATION

Company: Groundwater Science Corp.
Client: Blueland Farms
Location: McCormick Pit
Test Well: Extraction Simulation

WELL DATA

Pumping Wells

Well Name	X (m)	Y (m)
1	0	45
2	13.2	76.8
3	45	90
4	76.8	76.8
5	90	45
6	76.8	13.2
7	45	0
8	13.2	13.2

Observation Wells

Well Name	X (m)	Y (m)
□ 50 m	140	45
□ 100 m	190	45
□ 200 m	290	45
□ 400 m	490	45

SOLUTION

Aquifer Model: Unconfined

Solution Method: Neuman

T = 0.03024 m^2/sec

Sy = 0.1

S = 0.25

Kz/Kr = 0.1

Appendix G
Subwatershed Target Analysis

Subcatchment Summary

Comparison of Environmental Targets/Objectives and Best Management Practices with the McCormick Pit Application

Warnock Lake Subcatchment 1609

	Environmental Targets/Objectives [1]	Key Best Management Practices [1]	Site Implementation
General Information	- No development in floodplain - Use appropriate setback guidelines	- Existing policies and regulations should be enforced - Environmental Farm Plan and Canada-Ontario Agricultural Green Plan BMPs	- There will be no development in the floodplain - The subwatershed study identifies the PSW's closest to the site as high priority wetlands with a recommended natural area buffer width of 120 m - At its closest point, the post-extraction pond boundary is approximately; - 80 m from Warnock Lake - 115 m from Pond A and Caledon Creek - 300 m from the wetland 6 PSW - The buffers areas for the PSW north of the site are narrower than recommended in the subwatershed study, however the proposed hydraulic barrier will mitigate water level change such that the ecological function of the PSW areas will be maintained - There are no other PSW or surface water features within 120 m of the site boundaries - The Site Plans show appropriate setbacks from private property and roadways as specified under the Aggregate Resources Act.
Ground Water	- No decrease in water table - No decrease in aquifer yield - No decrease in baseflow	- If extraction below the water table occurs, maintain physical barrier between aggregate ponds - Maintain water balance and flow paths	- There will be a decrease in the water table in the northern portion of the property due to post-extraction pond levelling (Section 5.2) that will be mitigated off-site to the north with the installation of the hydraulic barrier - There will be no decrease in aquifer yield since there is no water taking associated with below-water extraction - There will be a need for a water supply for the wash plant but a separate hydrogeological study will be required with the submission of the PTTW application that will examine the impacts of the water taking on current water well users as well as significant surface water features in the area - A physical barrier between the site and the pit ponds on the adjacent Caledon Sand and Gravel property will be maintained such that independent post-extraction pond levels will be maintained - A hydraulic barrier will be constructed (Section 7.1.4) such that upgradient water levels in Warnock Lake and Caledon Creek will be maintained - There will be negligable affects on baseflow to the reach of Caledon Creek that is closest to the site with the implementation of the hydraulic barrier

Comparison of Environmental Targets/Objectives and Best Management Practices with the McCormick Pit Application

Warnock Lake Subcatchment 1609

	Environmental Targets/Objectives [1]	Key Best Management Practices [1]	Site Implementation
Ground Water (con't)			- Locally, there will be an area of less than a few hundred meters surrounding the site that will experience a change in shallow water levels due to post-extraction pond levelling - Regional direction of shallow groundwater flow will remain the same as current conditions - In terms of the water balance, there will be no post-extraction off-site runoff since runoff will be internalized on the site. There will be a net loss to the subwatershed of 0.4 L/s upon completion of extraction (Appendix I).
Surface Water	- No increase in peak flow rates	- Structural approaches (I.e. a stormwater management pond) could be constructed at the site level unless a large block were to be developed at the same time - Pretreatment required if Warnock Lake will be used as a SWM facility. Pollutants can potentially contaminate groundwater	- There will be no increase in peak flow rates as a result of below-water pit development - There will be minimal impervious surface coverage to promote peak flow conditions - runoff will be internalized on the site
Stream Morphology	- No reduction in channel length - Channel migration < 10 cm/yr - Inter-pool gradient +/- 10% of bankfull gradient - Pavement/sub pavement ratio = 3-7	- Maintain current hydrological regime to minimize stream bank erosion and channel down cutting - Maintain/enhance riparian vegetation	- There will be no impacts to the hydrological regime in terms of creek morphology
Terrestrial	- Minimize change to current depth to water table - Maintain and enhance riparian zone/ buffer strip width Target: 30 m minimum - Minimize edge and maximize interior and shape of terrestrial areas - Increase forest cover Target: 30% - Maintain and enhance large natural patches - Minimize change to current hydrologic regime - target <10% change - maintain large swamps and variety of marsh sizes	- Preserve high priority terreastrial areas - Enhance buffer zones - Work with local landowners for preservation, enhancement and stewardship - Update Town of Caledon Environmental Protection Strategy to include high priority terrestrial areas - Maintain/improve the area as a terrestrial/wildlife corridor to connect the Humber River system	- The current depth to the water table in the vicinity of Warnock Lake and Caledon Creek will be maintained with the construction of the proposed hydraulic barrier - The water table within the site area and within a few hundred meters surrounding the post-extraction pond will experience some change as a result of pond levelling - The impacts of these changes will be minimized by maintaining a physical separation beteen the on-site pond and the Caledon Sand and Gravel ponds as will as the construction of the hydraulic barrier along the northern property boundary - There will be no impacts to the hydrological regime in terms of creek morphology

Comparison of Environmental Targets/Objectives and Best Management Practices with the McCormick Pit Application

Warnock Lake Subcatchment 1609

	Environmental Targets/Objectives [1]	Key Best Management Practices [1]	Site Implementation
Terrestrial (con't)	- Maintain wetland buffers Target: 30 to 50 metres - Preserve riparian zone - Preserve and enhance wetland, forest and corridor linkages - No development in PSW, development discouraged in all other wetlands - Development discouraged in ESAs		
Water Quality	- Biotic index < 8.5 - Total phosphorus < 0.10 mg/L - Temperature < 28 degrees C - Suspended solids: <10% increase - Substrate: no additional fines		- water quality in Warnock Lake and Caledon Creek will not be impacted by below-water pit development for the following reasons: - both are hydraulically upgradient/cross-gradient of the site - aggregate operations do not typically involve the use, storage or handling of significant quantities of potential contaminants (Section 5.4.2) - groundwater temperature equilibrates within 50 m to 100 m of an open pond (Section 5.5.4)
Aquatic Resources	- Minimize temperature impacts Target: < 28 degrees C - Minimize loss/maintain riparian Target: 50% - Minimize baseflow loss and maintain refuge pools/wetlands		- the water temperature in Warnock Lake and Caledon Creek will not be impacted - water temperatures equilabrate within 50 to 100 m of an open pond (Section 5.5.4) - baseflow does not sustain the wetland 3 PSW as its water levels indicate that it is perched above the main water table

Notes: 1. *Environmental Targets/Objectives and Key Best Management Practices reproduced from Phase III Report, Study Implementation (CVC, 2001).*

Appendix H
Qualifications

328 Daleview Place
Waterloo, ON   N2L 5M5

Office: (519) 746-6916
Mobile: (519) 580-7325

apentney@rogers.com
groundwaterscience.ca

Groundwater
Science Corp.

Andrew Pentney, B.Sc., P.Geo.

Employment

1999 – Present   Groundwater Science Corp.   Waterloo, Ontario

Principal, Hydrogeologist

- Consultant providing hydrogeological expertise to regulatory agencies, environmental consultants and industry. Services include individual consulting assignments, project support for larger study teams, and, expert testimony at Ontario Municipal Board hearings.

1998   Stanley Consulting Group Ltd.   Kitchener, Ontario

Senior Hydrogeologist, Project Manager

- Responsibilities as a project consultant / manager during corporate transition from small groundwater consulting group to large engineering firm (now Stantec Consulting Limited).

1988 – 1997   Terraqua Investigation Ltd.   Waterloo, Ontario

Project Hydrogeologist

- Gained hydrogeological consulting experience on a wide variety of assignments at various levels of project involvement. Responsibilities ranged from data gathering (field work) and analysis to reporting and project management.

Education

B.Sc.   University of Waterloo   Waterloo, Ontario

Complemented degree with practical experience as a laboratory and environmental technician working for the University and private consultants.

Professional memberships

Registered Professional Geoscientist in Ontario
NGWA, IAH and OGWA member
Licenced MOE Well Contractor and Technician

Watershed Scale

Mr. Pentney has extensive experience in planning and completing groundwater assessments on a watershed and subwatershed scale. He has provided input at the data gathering, assimilation, interpretation and reporting stages for:

- The Laurel Creek Subwatershed Study (Grand River).
- The Eramosa River – Blue Springs Creek subwatershed Study (Grand River).
- The Torrance Creek Subwatershed Study (Grand River).
- The Subwatershed 19 Study (Credit River).
- The Subwatershed 15 Study (Credit River).
- The Subwatersheds 16 and 18 Study (Credit River).
- The Brampton and Milton Subwatershed Studies (Credit River).
- The Mayfield Subwateshed Study (Credit River, Toronto and Region).

Each of these large-scale studies examined existing conditions, including detailed assessments of regional groundwater flow systems and surface water interactions at numerous streams and wetlands in a wide variety of settings. Stream and wetland characterization included the use of streamflow measurement, drive-point piezometer installation and monitoring along with water balance assessments to examine the relationship and dependence of these features on groundwater input, or through-flow.

Peer Review and Watershed Planning

Mr. Pentney was retained by Credit Valley Conservation in 1999 and 2000, and on an as-needed basis from 2001 to present, to provide technical consulting expertise for research projects, watershed monitoring and day-to-day planning approval and environmental review for project proposals within the Credit River Valley.

The position also included subwatershed and local scale groundwater assessments, integrated with simultaneous biologic (fisheries, terrestrial) and water quality studies, to assess linkages and sensitivities for local and regional planning and management purposes. In addition, new initiatives, such as watershed wide groundwater / surface water / fisheries monitoring program and Watershed and Subwatershed scale water balance assessments were supported.

The assignment included review of development projects for site specific to subwatershed and watershed scale impacts related to the natural environment, including streams and wetlands. The agency used fish habitat as a major indicator of both local sensitivities and potential for impact. During each review emphasis was placed on examining the potential for groundwater quantity, flow pattern or quality related impacts to fish habitat. In addition, wetland sensitivity and assimilative capacity was another primary focus of assessment and review. Credit Valley Conservation provided the Department of Fisheries and Oceans with technical input and initial review services for each project reviewed with regard to the Federal Fisheries Act, specifically related to HADD sensitivity determination.

Issues examined for each project included maintenance of water balance, maintenance of baseflow to local stream and wetland systems, maintenance of site-specific up-welling areas for trout spawning; maintenance (or improvement of) groundwater quality; and, monitoring / mitigation of potential impacts.

Typically the following types of projects were regularly reviewed:

- Quarry and gravel pit impact assessments - including below water table extraction and dewatering effects, water balance effects, monitoring and mitigation plans. Focus on streams and wetlands.
- Water taking (Municipal or Commercial) impact assessments - including pumping test review, monitoring and mitigation plans, examination of impacts on streams and wetlands.
- Proposed residential development impact assessments - including water balance and stormwater management effects, water taking impacts, septic system or communal sewage treatment (groundwater quality) effects - primary focus on streams and wetland impacts.

Water Supply / Well-Head Protection

Mr. Pentney has assisted at various levels in the development, testing, upgrade and approval process stage for the following water supply, source water protection or well head protection studies:

Long Point Region Tier 3 Study (in association with AquaResouces Inc.). Included installation and sampling of groundwater monitors within municipal well fields, streams and wetlands to assess groundwater quality, groundwater-surface water interactions and aquifer testing to assess pumping response.

Region of Waterloo IUS Groundwater Supply Optimization and Expansion Project (in association with Blackport Hydrogeology Inc. and Golder Associates). Included installation of new municipal, sentry and observations wells, aquifer testing and analysis. Characterization of pumping effects on private wells, streams, wetlands.

Town of Erin Groundwater Protection Study and Permit To Take Water Monitoring (in association with Blackport Hydrogeology). Included GUDI Municipal Well assessments with respect to ponds, streams and wetlands, in addition to sentry well installation and monitoring.

Center Wellington Groundwater Protection Study (in association with Blackport Hydrogeology) – included GUDI Municipal Well assessments.

An upgrade and expansion of municipal water supplies at Conostogo, West Montrose, and New Hamburg, Regional Municipality of Waterloo, Ontario.

The upgrade and expansion of the water supply for Hillsburg, Ontario. Definition of groundwater-surface water interactions, and, assessment of pumping effects on private wells, streams, wetlands.

Water supply and nitrate loading assessments for proposed subdivisions in Aberfoyle, Bayfield, Bright, Drumbo, King City and Morriston, Ontario. Characterization of hydrogeolgic conditions and pumping effects on private wells, streams, wetlands.

The development and testing of industrial water supply in Breslau, Ontario.

Irrigation water supply development for golf courses in Brantford, Elmira and Holmesville, Ontario. Assessment of hydrogeologic conditions and pumping effects on private wells, streams, and wetlands.

Installation and testing of water supply wells for Planning and Permit To Take Water applications for the Devil's Den Golf Course, Whitby, Ontario. Includes historical PTTW compliance monitoring and examining effects of the proposed increased pumping on private wells, streams, wetlands.

The Kilbride Groundwater Study, an assessment of the current water supply conditions and future water supply potential with the hamlet (Region of Halton).

Supervised multiple drilling programs for water supply assessment within buried bedrock valley systems for the Region of Halton in the Georgetown and Milton areas.

Community Impact and Planning

Under contract to of Credit Valley Conservation, The Town of Caledon and The Region of Peel, Mr. Pentney has completed two community scale servicing assessments for the villages of Alton and Cheltenham. In addition, a third study for the Town of Erin in association with Blackport Hydrogeology Inc. was completed. The assessments are part of the Environmental Component of the Village Study for each of the settlements. The Village Studies are intended to guide future development and ensure best management practices are in place for community planning, environmental planning, servicing and community design principals.

The Septic System Impact Studies identified the extent and degree of groundwater impact associated with existing residential development serviced by private individual septic systems. The assessments also included a detailed examination of local groundwater / surface water interactions, focussing on the potential for septic system impact to natural environment features including both river and wetland systems. The potential for additional groundwater impact, and related implications for surface water features, is then assessed based on the hydrogeologic setting of settlement expansion areas. Environmentally based recommendations for servicing future development are also provided.

Aggregate Assessments

Mr. Pentney has completed environmental impact assessments, baseline studies and on-going compliance monitoring for many sites in Southern Ontario. He has acted as project hydrogeologist in many successful License applications, including above and below water table extraction.

As part of each License application or compliance monitoring study he has dealt extensively with regulatory agencies, including the Ministry of Natural Resources, The Ministry of the Environment, the Federal Department of Fisheries and Oceans, Conservation Authorities (GRCA, CVC, LSRCA, GSCA, HRCA, UTRCA, GSC), Regional and Municipal governments, and local citizens groups.

Mr. Pentney is familiar with site characterization and impact assessments and has designed and implemented environmental monitoring, action threshold and mitigation response programs. Mitigation measures proposed, implemented and monitored include several hydraulic barriers to minimize impacts related to below water extraction. The impact assessments he has completed have examined groundwater quantity, groundwater quality (including thermal impacts of below water table extraction) and the relationships of the groundwater systems to a variety of natural features including wetlands, cold water streams and fish habitat.

Andrew is responsible for on-going groundwater and surface water monitoring at one of the most extensively monitored gravel pits in Southwestern Ontario (Puslinch Township), which includes both manual and automated (datalogger) measurement of groundwater levels, surface water levels, water and air temperature, water quality sampling, monthly and annual reporting, thresholds and a complete action response / mitigation program.

His direct experience includes:

The groundwater assessment for the successful license amendment (above water table expansion) and compliance monitoring for the Capital Paving Inc. (former) Wellington Pit No. 2, Puslinch Township, Ontario. Included water balance and groundwater interaction assessments at Irish Creek and associated wetland area.

The groundwater impact assessment for the successful below water table License application and ongoing compliance monitoring at the CBM Nigro Pit, Puslinch Township, Ontario. Included impact assessments for local water supply wells in addition to water balance and groundwater interaction at three adjacent ephemeral pond/wetlands.

The groundwater impact assessments for the successful below water table Licence application and subsequent above water table expansion for the Capital Paving Inc. Wellington Pit No. 5, Puslinch Township, Ontario. Included water balance and groundwater interaction assessments at Provincially Significant wetland areas both on-site and adjacent to the site.

The groundwater assessment and monitoring for the successful Licence application at the CBM Neubauer Pit, Puslinch Townhsip, Ontario. Included both site specific and cumulative water balance and groundwater-surface water interaction studies.

The Licence reinstatement and monitoring program upgrade, agency liaison and compliance monitoring for the Reid's Heritage Homes Ltd. (former) Heritage Lake Pit, Puslinch Township, Ontario. The pit area is located next to Mill Creek and was subject to extensive review by the MNR, MOE, DFO, and the Township, related to Provincially Significant wetland and cold water fisheries concerns, and, water supply well impacts. A hydraulic barrier was implemented to mitigation potential impacts on surface water features and habitat. The program made extensive use of automated equipment (dataloggers) to monitor surface or groundwater levels and temperatures, air temperatures, streamflow, and, temperatures within trout spawning (Redd) areas. The work included cooperation and exchange of data with adjacent operators as well as the assessment of both local and semi-regional groundwater systems changes related to the interaction and cumulative effect of several adjacent below water extraction sites.

The groundwater impact assessment for the Rama quarry expansion and Licence application near Orillia, Ontario. Included water balance and groundwater-surface water interaction assessments at a large system of adjacent streams and wetlands.

The groundwater impact assessment for the successful below water table License amendment (expansion) at the Brock Aggregates Ltd. Sunderland Pit, between Sunderland and Blackwater, Ontario. The expansion was a complex major amendment that incorporates four former separate Licenced areas into one and includes both expansion and additional below water table extraction. Included both water supply well impact assessment; and, water balance and groundwater-surface water interaction assessments at the Beaver River and a large system of associated Provincially Significant wetlands. Includes ongoing compliance monitoring.

The groundwater impact assessment for the successful above water table License at the Lafarge Canada Inc. Lawford Pit near Caledon Village, Ontario. Included water balance and groundwater-surface water interaction studies for the Credit Rived and associated Provincially Significant wetlands located adjacent to the site, and, two other isolated tributary and wetland-ephemeral pond systems on-site.

On-going compliance monitoring at the Lafarge Canada Inc. below water table McMillan Pit, Puslinch Township, Ontario.

On-going compliance monitoring at the Brock Aggregates Inc. below water table Tottenham Pit, Town of Caledon, Ontario.

The groundwater impact assessment for the successful below water table License amendment and ongoing compliance monitoring at the CBM Puslinch Pit, Puslinch Township, Ontario.

The groundwater impact assessment for the successful below water table License amendment and expansion application, and, ongoing compliance monitoring at the Blueland Farms Ltd. Markdale Pit (now CBM Chatsworth Pit), Municipality of Chatworth, Ontario. Included water balance and surface-water interaction assessments two separate adjacent cold water stream and Provincially Significant wetland systems.

The groundwater impact assessment for the successful below water table License application at the Demar Aggregates Inc. McGuffin Pit, Municipality of Thames Centre, Ontario.

The groundwater impact assessment for the successful above water License application at the Demar Aggregates Inc. Fallon Pit, Middlesex Township, Ontario.

The groundwater impact assessment for the successful below water table License application at the Demar Aggregates Inc. Hill Pit, Township of West Nissouri, Ontario Included characterization and impact assessment of both on-site and off- site wetland and stream systems.

The groundwater impact assessment for the successful below water table License application at the Demar Aggregates Inc. Granger Property, Township of Zorra, Ontario. Includes detailed examination and assessment of potential impact to on-site wetlands, off-site stream systems, local water wells and cumulative impacts.

The groundwater impact assessment for the successful below water table License application at the Demar Aggregates Inc. Lagrou Property, Township of West Nissouri, Ontario. Includes detailed examination and potential impact to adjacent Provincially Significant wetlands and stream systems.

The groundwater impact assessment and ongoing compliance monitoring for the successful above water table License at the Voisin Pit (now Steed and Evans Ltd. Witmer Road Pit), Region of Waterloo, Ontario. Includes assessment of potential impacts to an adjacent wetland.

The groundwater study and ongoing compliance monitoring for the successful above water table License application at the Thames Valley Aggregates Baigent Pit, Township of Zorra, Ontario. Included impact assessment related to on-site and adjacent streams and wetlands.

The groundwater impact assessment of the on-going below water Licence (expansion) application at the Cox Construction Puslinch Pit, Puslinch Township, Ontario. Includes assessment of impacts to water wells, adjacent Provincially Significant wetlands, and ,the Speed River.

The groundwater and extraction pond level assessment for the Unimin Badgely Island Quarry, Manitoulin, Ontario.

The groundwater assessment and ongoing compliance monitoring for the successful A. Dawn Forbes Quarry Major Site Plan and License Amendment allowing below water extraction, Township of Georgian Bluffs, Ontario. Included detailed groundwater characterization and impact assessments related to adjacent wetlands and water supply wells.

The groundwater assessment for the successful below water Licence at the Bedrock Gravel & Sand Inc. Boniface Pit Township of Zorra, Ontario. Includes assessment of impacts to water wells, adjacent wetlands and creeks, and, cumulative impacts.

The groundwater assessment for the successful below water Licence at the Forest City Aggregates Arnold Pit Township of Zorra, Ontario. Includes assessment of impacts to water wells, adjacent wetlands and creeks, and, cumulative impacts.

Groundwater consulting and OMB hearing support for the successful above water Licence at the Preson Sand and Gravel Company Limited Jigs Hollow Pit, Township c Woolwich, Region of Waterloo, Ontario.

Permit To Take Water applications and associated studies at numerous sites, including Capital Paving Pit 1, CBM Putnam Pit, Murray Group Murphy and Mulmur Pits, Schwartz Pit, Brock Aggregates Sunderland Pit, CBM Chatsworth Pit, Schwartz Pit, Heritage Lake Pit, and, Lafarge Caledon Pit.

Groundwater studies for the small above water table applications at the Matheson Property, Kemp Property, Bell Property, Robinson Property, Steve Smith Pit, Horley Pit, Schwartz Pit, Bentink Pit, Walker Pit, Strickland Pit, Holstien Pit, Mulmur Pit, Olalondo Road Pit, Palmerston Pit, Legge Pit, Town of Caledon McLaren Road Allowance Pit and Brown Road Wayside Pit. Each included establishing water table elevation and potential impacts to surface water systems (wetlands, creeks, ponds).

Other Studies

Mr. Pentney also has completed various other studies, including environmental impact assessments, baseline studies and regional water quality monitoring programs. He has acted as project hydrogeologist for the following studies:

- Shallow groundwater / surface water quality sampling in Trout spawning areas: Grand River near Elora as part of the Large Cover Placement program, and, at a road salt storage facility along Credit River.
- The groundwater interference monitoring program for a dewatering operation at the Pioneer Tower Development in Kitchener, Ontario.
- Soils and groundwater assessments for proposed large-scale septic treatment and disposal systems in: Sutton, Hawkestone, Kirkfield, Breslau, Arva, Nairn, Ilderton, Keene, Fort Erie, Bala, and Niagara-On-The-Lake, Ontario.
- Groundwater / Surface water interaction study for the Red Hill Creek expressway (in association with Blackport and Associates).

Papers

Imhof, J., W.J.Snodgrass, B.Kilgour, A.Pentney, C.T.Johnston, B.Morber, 2000. Measurement of potential impact of salty groundwater seepage on riverine fish habitat contained in a valley segment management unit. Environment Canada, Canadian Environmental Protection Act Priority Substances List Assessment Report, Road Salts.