TDC Terra-Dynamics Consulting Inc.
404 Queenston Street, St. Catharines, ON L2P 2Y2

October 25, 2018

Michael Paletta
Penta Properties Inc.
4480 Paletta Court
Burlington, ON L7L 5R2

Re: Hydrogeologic Assessment of the Eagle Heights Lands, Burlington, ON

Dear Mr. Paletta,

1.0 Introduction and Background Information

Penta Properties Inc. retained Terra-Dynamics Consulting Inc. (Terra-Dynamics) to complete a hydrogeological assessment of the Eagle Heights property (Figures 1 and 10). The objectives of this hydrogeological assessment are as follows:

1. To assess pre-development hydrologic and hydrogeologic conditions and the inter-relationship of the site's groundwater flow regime on the regulated wetland MAS2-1 Pond located on the former Taylor property near the southern boundary of the Eagle Heights lands (*to address Conservation Halton comment Page 3, Bullet 2, Section E, Ontario Regulation 162/06 per the response matrix*);

2. To provide preliminary information on the hydrologic and hydrogeologic conditions and the inter-relationship of the site's groundwater flow regime on the regulated wetlands MAM2-10(a), MAM2-10(b) and MAS2-1/MAM2-10;

3. To assess pre-development hydrogeologic conditions with respect to identifying any constraints to the use of stormwater management ponds;

4. To complete a hydrogeological impact analysis regarding the construction of sewer mains pertaining to fish habitat (*to address Conservation Halton Comment 6.1.3 Fish Habitat*); and

5. To provide an evaluation of three sections of the site where surficial deposits of silty sand are present for the potential to redirect and infiltrate stormwater using Low Impact Development techniques for enhanced groundwater recharge.

Three previous subsurface investigations of the site, that were completed by others, are listed as follows:

Peto MacCallum Ltd. 2003. Geotechnical Investigation, Eagle Heights and Taylor Property, Waterdown Road, Burlington, Ontario, prepared for Paletta International Corporation (*subsequently Paletta International Corporation changed their name to Penta Properties*), June 16.

Peto MacCallum Ltd. 2006. Stable Top of Bank Assessment, Eagle Heights and Taylor Properties, Waterdown Road, Burlington, Ontario, prepared for Paletta International Corporation (*subsequently Paletta International Corporation changed their name to Penta Properties*), July 7.

Soil Mat Engineers & Consultants. 2017. Slope Stability Assessment, Proposed Residential Development, Eagle Heights and Taylor Property, Waterdown Road, Burlington, Ontario, prepared for Metropolitan Consulting Inc., April 10.

Select borehole logs and infiltration data from these reports are presented herein as background information. In Addition, borehole logs and borehole location maps for these three reports are presented respectfully in Appendices 1 through 3 and referenced in the appropriate sections of this report. Infiltration data are also referenced herein and presented in this report to augment infiltration studies completed as part of this assessment.

2.0 Methodology

2.1 Hydrology, Water Levels and Flows

With reference to Figure 2, a total of six (6) stainless steel drive point (DP) were installed on April 12 and 13, 2018 to act as staff gauges (SG) to assess flow and surface water level/elevations in the ravines associates with Grindstone (GS) Creek Tributary 5 (East and West) and Grindstone Creek Tributary 6 (West) and in the southern MAS2-1 Pond and its outlet. Staff gauge locations are shown on Figure 2. On August 2, 2018 the wetland referenced as MAM2-10(b) in Tributary 6 West was also instrumented with three (3) stainless steel drive point staff gauges at the recommendation of Savanta to better measure inflow, ponded level and outflow from this wetland. Some stream beds were based in shale making drive point installation difficult.

Each staff gauge was instrumented with a water level logger to continuously record fluctuations in water level. Water levels were compensated for barometric pressure with an on-site barometric pressure logger. Flows were manually recorded with a Marsh McBirney Flomate flow meter as best as practical after rain events in order to develop rating curves for the water level hydrographs.

The following is a list of the nine staff gauge locations on-site:

- SG-GS-6, DP-1: this drive point well was installed at the base of a groundwater discharge slope near the base of the slope of the farm field. Seepage and groundwater discharge was evident during an April 11, 2018 site visit
- SG-GS-6-1: this staff gauge was located below the confluence of Grindstone Creek Tributaries 6 (West) and 6 (East);
- SG-GS-5 (West): this staff gauge is in the ravine for the Grindstone Creek Tributary 5 (West) just north of Flatt Road;
  SG-GS-5 (East) A: this staff gauge is in the ravine for Grindstone Creek Tributary 5 (East) just upstream form a significant ravine from the farmland in this area;
- SG-GS-5 (Est) B: this staff gauge is within the significant ravine referenced above and this could be the downstream end of a future stormwater management pond;
- MAS2-1 POND SG-1: this staff gauge records the water level in this southerly pond/wetland;
- MAS2-1 POND OUTLET SG-2: this staff gauge recorded the water level at the southerly pond/wetland outlet;
- SG-MAM2-10(b) Wetland Inlet: this staff gauge is at the inlet to the Grindstone Creek Tributary 6 (West) wetland (b);

- SG-MAM2-10(b) Wetland: this staff gauge is in the middle of the Grindstone Creek Tributary 6 (West) wetland (b);
- SG-MAM2-10(b) Wetland Inlet: this staff gauge is at the outlet to the Grindstone Creek Tributary 6 (West) wetland (b).

2.2 Hydrogeology

2.2.1 Monitoring Well Installations

A total of thirteen (13) monitoring wells were installed on the property from March 20 to 28, 2018 as shown on Figure 2. Six (6) monitoring wells were installed as nested or paired wells to evaluate vertical hydraulic gradients. Monitoring wells MW-4, MW-7 and MW-10 all have a shallow well to measure the elevation of the water table and a deeper piezometer to a general depths of 9 to 11 m to assess vertical gradients. They were labelled MW-4 Shallow (S) and Deep (D), MW-7-S&D and MW-10-S&D.

The objectives of the monitoring well installations program were as follows:

1. Assess groundwater levels in the surficial sand unit located on the western and northern sections of the property from the perspectives of groundwater storage and potential influences on water flow or discharge to the ravines and/or wetlands,

2. Assess the potential for stormwater discharge via LID techniques with respect to permeability and the seasonally high water table; and

3. Assess geology and groundwater conditions for a planned stormwater management pond in the vicinity of Monitoring Well MW-9.

The drilling was completed by Aardvark Drilling Inc. with a track-mounted CME 55 drilling rig with hollow-stem augers. The wells are constructed of 5 cm (2 inch) flush-threaded PVC tubing and pre-cleaned and pre-wrapped PVC 10-slot well screen. Borehole logs and monitoring well details are presented in Appendix 4.

2.2.2 Water Level Measurements

Each monitoring well was instrumented with a Solinst water level logger to continuously record groundwater levels. All water level logger data were corrected for barometric pressure with a barologger. Manual water level measurements were also recorded.

2.2.3 *In Situ* Hydraulic Conductivity (Permeability) Tests

The monitoring wells were subject to bailer withdrawal hydraulic conductivity (permeability) tests in April, 2017. Solinst level loggers were placed in each of the monitoring wells and a volume of water was removed from the well with a disposable plastic bailer. Groundwater recovery was recorded with the level loggers for the purpose of performing hydraulic conductivity analysis with the Hvorslev method. Aquifer-Test software from Schlumberger Inc. was used to create a database of the digitally-acquired data

and assess hydraulic conductivity values at monitoring well locations. Monitoring well data analysis and plots are provided in Appendix 5.

2.3 Infiltration Tests for Low Impact Development Techniques for Stormwater Ianagement

2.3.1 Infiltration Testing

Infiltration testing for preliminary site screening purposes was completed in four stormwater catchment areas identified in the updated Draft Eagle Heights Property Hydrological Study and Stormwater Management Report (MCI, May 2018) as stormwater catchment areas 503, 515, 606 and 621 (see Figure 2). Test pits were excavated to a depth of 1.2 metres (4 feet) below ground surface in order to permit safe entry in accordance with the Occupational Health and Safety Act. Infiltration tests were completed at the bottom elevation of each test pit using a field method and data analysis tool recommended by Credit Valley Conservation (CVC) and the Toronto and Region Conservation Authority (TRCA) for determining infiltration rates for the design of stormwater bioretention systems (CVC et al, 2018; TRCA, 2018). Infiltration tests were completed by Terra-Dynamics at the Eagle Heights property between June 12 and June 15, 2018.

The field method used for this assessment is a falling head percolation test for shallow cylindrical boreholes. Two cylindrical test holes were hand augured to a depth of approximately 21.0 to 25.5 cm (8.25 to 10.0 inches) below the bottom elevation of each test pit using a Dutch auger. The diameter of each test hole was then enlarged to 15.24 cm (6.0 inches) using a soil knife as prescribed in the field method. Test holes completed in fine textured soil (i.e. soil that is predominantly silt and/or clay) were pre-soaked for four hours immediately prior to the percolation test. Percolation test data was then converted to a field saturated hydraulic conductivity reported in mm/hour using a method by Reynolds et al (2015).

2.3.2 Soil Grain Size Analysis

Soil samples were collected from the bottom of each test pit using a Dutch auger and submitted to an accredited lab under chain of custody for grain size analysis using standard screens and hydrometer analysis for fine textured soil. One soil sample was collected from each of the test pits in stormwater catchments 503 and 621. Multiple soil samples were collected from each of the test pits in stormwater catchment areas 515 and 621 due to the variability in soil conditions observed at those locations. Soil texture for each sample was determined using the grain size data and soil description provided by the laboratory.

2.3.3 Soil Profiling

The soil profile in each test pit was examined and the following soil properties were recorded in-situ: soil horizons (including upper and lower boundaries), texture, structure, consistence, colour (including presence of mottling), and the presence of compacted layers and hardpan. Soil properties were determined in accordance with the procedures outlined in the Field Manual for Describing Soils in Ontario, 4th edition (Denholm and Schut, 1993).

3.0 Physiography

The site is located on gently rolling terrain used as farmland east of a large and deep bedrock valley associated with Grindstone Creek and west of Waterdown Road (Figures 2 and 3). There is a predominant steep, approximate 50 m drop in elevation along the western property boundary down to the flood plain of Grindstone Creek. Three tributaries of Grindstone Creek labelled Tributaries 4, 5 and 6 are located on the subject lands. Three of the ravines are steep, varying in depths of 5 to 10 m below the arable rolling hills. The ravines are associated with:

1. Grindstone Creek Tributary 5 (East);
2. Grindstone Creek Tributary 5 (West); and
3. Grindstone Creek Tributary 6 (West).

These three prominent on-site features have eroded down through a sand layer (where present), a dense clay till and a low permeability shale creating water courses that bottom-out on the shale.

The combination of rolling terrain, primarily composed of low permeability clay till and three steep ravines in the low permeability shale have created “flashy” surface water conditions where storm water drains quickly off of the site.

4.0 Hydrology

Staff gauge hydrographs combined with precipitation events as recorded at Environment Canada’s neighbouring Royal Botanical Gardens Weather Station are presented in Appendix 7. Manual water level elevation data are provided in Table 1.

With the exception of very localized flow, very little of the on-site flows drains westward towards the deep valley of Grindstone Creek. For the most part, all flow from the developable sections of the Eagle Heights property flows to Tributaries 4, 5 and 6 of Grindstone Creek which all are primarily oriented in a northwest to southeast direction where flow patterns are dominated by the ravine settings of these three tributaries. Flow measurements at staff gauge locations are presented in Table 2.

5.0 Geology & Hydrogeology Conditions

5.1 Geology

The site is located on a dense clay till (Halton Till) which is defined by Karrow (1963) as a clay or silt till in this section of Burlington. As is shown on Figure 3, the table lands used for farming on the northern and western section of the site are covered with a layer of silty sand that varies in thickness or depth from 1 to 8 m. Thicker areas of the silty sand are prevalent on the topographically higher areas shown on Figure 3. Karrow (1963) describes these sands as shallow lacustrine, kame and outwash sands. The sand layer is for the most part absent where the ravines cut through the local landscape and the drainage channels bottom-out on the clay till in the upper reaches of the ravines and shale in the lower reaches of the ravines.

Armstrong (2001) Armstrong and Carter (2010) document that the Paleozoic rocks beneath the site are composed of red shale from the Queenston Formation from the Upper Ordovician Era. It is laterally extensive across Southern Ontario, New York State and the State of Michigan. Beneath the site it is greater than 120 m thick and forms an extensive low permeability aquitard (Armstrong and Sergerie, 2002).

The vertical sequence of the overburden materials consisting of the sand layer and underlying clay till, and the basal Queenston Shale Formation are shown in cross-section for the main section of the site north of Flatt Road on Figure 4. The area of the MAM2-Pond in the southern section of the property is shown in cross-section on Figure 5. The northern section of the property and the Niagara Escarpment Plan area of the site are shown in cross-section on Figures 6 and 7.

5.2 Hydraulic Conductivity Test Results

Hydraulic conductivity test results are presented in Appendix 4 and summarized below in Table 3.

Table 3. Summary of *In-situ* Hydraulic Conductivity Test Results Subdivided by Geologic Material

Well I.D.	Geologic Formation	Hydraulic Conductivity (m/sec)
MW-2	Silty Sand	3.0×10^{-6}
MW-3	Silty Sand	4.0×10^{-6}
MW-4-S	Medium Sand	1.0×10^{-5}
MW-7-S	Fine Sand	2.0×10^{-6}
MW-8	Silty Sand	3.0×10^{-6}
	Geometric Mean of Sand/Silty Sand	**3.73×10^{-6}**
MW-4	Clay	5.0×10^{-9}
MW-7-D	Clay	6.0×10^{-10}
	Geometric Mean of Clay/Clay Till	**1.73×10^{-9}**
MW-1	Queenston Shale	3.0×10^{-8}
MW-5	Queenston Shale	2.0×10^{-6}
MW-6	Queenston Shale	1.0×10^{-8}
MW-9	Queenston Shale	1.0×10^{-6}
MW-10-S	Queenston Shale	7.0×10^{-9}
MW010-D	Queenston Shale	1.0×10^{-8}
	Geometric Mean of Queenston Shale	**5.90×10^{-8}**

The areas of silty sand found in the western and northern sections of the site form shallow unconfined aquifers providing storage of groundwater in limited areas of the site. The silty sand deposits exhibit hydraulic conductivities or permeabilities of 3.73×10^{-6} m/sec which is approximately two orders of magnitude more than the underlying clay till and shale aquitards. The clay/clay till and shale both exhibit very low hydraulic conductivities with respective geometric means of 1.73×10^{-9} and 5.90×10^{-8} m/sec, indicating that these two geologic materials form an extensive aquitard across most of the site restricting the vertical movement of groundwater to depth and promoting surface water runoff.

5.3 Groundwater Flow Directions and Vertical Hydraulic Gradients

5.3.1 General Groundwater Flow Directions for the Entire Site

Table 4 presents groundwater level and elevation data recorded for 2018. Figure 8 shows the groundwater flow directions for various sections of the site. Groundwater flows from the upland table lands to the ravines as would be anticipated based in this ravine-dominated area of Burlington.

5.3.2 Groundwater Flow Directions, Western Section

A downward vertical hydraulic gradient is present between the shallow monitoring well and the deeper monitoring well at MW-7 in the western section of the property (Table 4). Down-slope of Monitoring Wells MW-7 Shallow and Deep, groundwater was observed to be discharging to surface as an area of seepage in the vicinity of Drive Point 1 (labelled GS-6, DP1 on Figure 2). Groundwater in the western section of the site migrates vertically downwards until it reaches the underlying low permeability clay till and then flows southeasterly and discharges as seepage to surface where the sand layer pinches out or becomes very thin. The resultant water drains into Grindstone Creek Tributary 6 (West) during the spring season based on a review of the hydrograph for GS-6, DP1 presented in Appendix 7.

5.3.3 Groundwater Flow Directions, Middle Section North of Flatt Road Near Proposed SWM Pond at MW-9

Groundwater in the vicinity of a proposed future stormwater management (SWM) pond (Catchment 518, Metropolitan Consulting Inc. SWM Report, 2018) flows very slowly in a radial pattern to the western and eastern section of Tributary 5. The water table is located in the low permeability Queenston Shale at a depth of 5 m (spring season) to 7 m (summer season) below ground surface. A small ravine is located on the western flank of Tributary 5 (East) that is instrumented with a staff gauge to record storm event flows from this farm field at staff gauge location SG-GS-5 (East B).

5.3.4 Groundwater Flow Directions, Southern Property Near MAS2-1 Pond

A downward vertical hydraulic gradient is present at the Monitoring Wells 10 Shallow (S) and 10 Deep (D) as can be seen in cross-section on Figure 5 with supporting data presented in Table 4 and the hydrographs in Appendix 7. The pond bottom is located in the Queenston Shale. A downward hydraulic gradient indicates that the pond is slowly recharging the underlying low permeability shale of the Queenston Formation. No upward gradients were recorded which could be an indicator of groundwater discharge to the pond.

The water level in the pond decreased significantly as can be seen in Appendix 6 for the staff gauge instrumented in the pond (MAS2-1 Pond Staff Gauge-1). An approximate 0.65 m drop was recorded in the pond level until the water level dropped beneath the bottom of the staff gauge. The outlet of the pond was also instrumented with a staff gauge. The outlet is a deep excavated ditch allowing water to flow in an easterly direction to Grindstone Creek Tributary 4.

Based on the above referenced geology, hydrogeology and hydrology data, the MAS2-1 Pond appears to receive water from (i) direct overland runoff snow melt and storm events, and (ii) a very shallow groundwater flow regime during the seasonally high water able in the spring season.

5.3.5 Groundwater Flow Directions, Northern Section of the Property and Niagara Escarpment Plan Area

The groundwater flow directions for the northern section of the property and the Niagara Escarpment Plan (NEP) area is shown on Figure 8. The site geology is shown in cross-section on Figures 6 and 7. This area of the site also exhibits downward gradients indicating the groundwater is slowly recharging the underlying Queenston Shale. The presence of the numerous ravines will dictate localized groundwater flow which is predominantly eastward following topography and away from the steep valley associated with Grindstone Creek.

6.0 Private Water Well Supplies, Groundwater Users in the Study Area

There are limited private water wells within the study area as shown on the Ministry of the Environment, Conservation & Parks web page that is a Provincial inventory of all water well records.

There is no municipally-supplied water reported for the Flatt Road Extension in the middle of the site nor on Horning Road at the absolute north end of the site within the NEP lands (Figure 10). Only one water record is on file for both roads which is Water Well Record 2807969 which is a 6.85 m bored well at the southern-most residence on the Flatt Road Extension. There are only three existing residences on the Flatt Road Extension indication the other two residences rely on cisterns for water supply.

It would appear that all residences (approximately eight) on Horning Road rely on cisterns for water supply.

There is municipal water available to the residences along Flatt Road and Ireson Road (north end of study area off of Waterdown Road). There are three water well records along Flatt Road dating back to the 1950s and 1960s.

7.0 Infiltration Study Results

7.1 2003 Infiltration Study, Peto MacCallum Ltd.

Peto-MacCallum (2003) completed three percolation tests of which one test was located in the silty sand to sandy silt next to Borehole 1 and two tests in the clay till next to Boreholes 11 and 20 (see borehole location map in Appendix 1 and the Base Map (Figure 2 herein)). The percolation test in the sandy silt next to Borehole 1 yielded a permeability of 2.9×10^{-5} cm/sec which indicates moderate permeability or moderate infiltration potential. There was an observed water drop of 47 cm after 150 minutes in a 15 cm diameter test hole that was approximately 120 cm deep. The percolation tests in the clay till exhibited permeabilities of 1.0×10^{-6} cm/sec to 1.1×10^{-6} cm/sec or a water drop of 8 cm and 11 cm after 150 minutes, respectively in a 15 cm diameter test hole that was approximately 120 cm deep. This indicated low permeability or low infiltration potential. Data are presented in Appendix 8.

7.2 Terra-Dynamics Infiltration Test Results

7.2.1. Stormwater Catchment Area 503

7.2.1.1 Infiltration Tests

Stormwater catchment area 503 is situated in the northern portion of the Eagle Heights property (see Figure 2). This area is shown in the surficial geology mapping as an area underlain primarily by lacustrine and outwash sand (Karrow, 1983). Infiltration tests were completed on June 13, 2018. Two cylindrical test holes (503-1 and 503-2) were hand augured below the bottom elevation of the test pit to depths of 24.15 cm (9.5 inches) and 20.1 cm (8.25 inches), respectively. The field saturated hydraulic conductivity was determined to be 15.6 mm/hour for test hole 503-1, and 14.5 mm/hour for test hole 503-2. Refer to Table 5 for a summary of infiltration testing results for the Eagle Heights property and Appendix 9A (see Photos 1 – 4) for photographs of test holes.

7.2.1.2 Soil Grain Size Analysis

A soil sample was collected from the bottom elevation of the test pit and submitted to an accredited lab under chain of custody for grain size analysis using standard screens and hydrometer analysis for fine textured soil. The sample was found to consist of 81% sand, 11.7% silt, and 7.3% clay and is therefore classified as *sand with some silt and trace clay*. Refer to Table 5 for a summary of soil texture based on grain size analysis and Appendix 9B for copies of lab reports.

7.2.1.3 Soil Profiling

The soil profile was observed to consist of *silty sand* in the upper horizon, which transitioned to *sand with some silt and trace clay* at a depth of approximately 0.32 m below ground surface. A discontinuous layer of compacted soil was observed at a depth of approximately 0.80 m below ground surface. Site photographs are provided in Appendix 9A, and test pit logs are provided in Appendix 9C.

7.2.2 Stormwater Catchment Area 515

7.2.2.1 Infiltration Tests

Stormwater catchment area 515 is situated on the east side of Flatt Road Extension in the central portion of the Eagle Heights property (see Figure 2). This area is shown in the surficial geology mapping as an area underlain primarily by Halton Till (clay or silt till) (Karrow, 1983). Infiltration tests were completed on June 12, 2018. Two cylindrical test holes (515-1 and 515-2) were hand augured below the bottom elevation of the test pit to a depth of 22.9 cm (9.0 inches) and pre-soaked for four hours immediately prior to testing. The field saturated hydraulic conductivity was determined to be 6.9 mm/hour for test hole 515-1, and 7.3 mm/hour for test hole 515-2. Refer to Table 5 for a summary of infiltration testing results for the Eagle Heights property and Appendix 9A (see Photos 1 – 4) for photographs of test holes.

7.2.2.2 Soil Grain Size Analysis

A soil sample was collected from the bottom elevation of the test pit and submitted to an accredited lab under chain of custody for grain size analysis using standard screens and hydrometer analysis for fine textured soil. The sample was found to consist of 27.7% sand, 59.4% silt, and 12.9% clay and is therefore classified as *sandy silt with some clay* (see Appendix 9B, sample 515-B). The soil in the test hole was observed to be primarily sand and silt; however, discontinuous seams of clay with varying thicknesses were observed in the soil profile throughout the test pit (see Section 3.2.3). A sample from a clay seam was submitted for grain size analysis and is listed in Appendix 9B as sample 515-A. The sample was found to consist of 11.8% sand, 21.3% silt, and 66.9% clay and is therefore classified as *silty clay with some sand*. Refer to Table 5 for a summary of soil texture based on grain size analysis and Appendix 9B for copies of lab reports.

7.2.2.3 Soil Profiling

The soil profile was observed to consist of *sandy silt* in the upper horizon, which transitioned to *silty clay with some sand* at a depth of approximately 0.18 m below ground surface. *Sandy silt with some clay* was encountered at approximately 0.42 m below ground surface. Discontinuous seams of grey clay were observed at depth below 0.42 m, with seam thickness varying between 2 and 20 cm. Site photographs are provided in Appendix 9A (see Photos 3 and 8) and test pit logs are provided in Appendix 9C.

7.2.3 Stormwater Catchment Area 606

7.2.3.1 Infiltration Tests

Stormwater catchment area 606 is situated on the west side of Flatt Road Extension in the central portion of the Eagle Heights property (see Figure 2). The western portion of this catchment area is shown in the surficial geology mapping as an area underlain primarily by lacustrine and outwash sand, whereas the eastern portion of this catchment area is shown in the surficial geology mapping as an area underlain primarily by Halton Till (clay or silt till) (Karrow, 1983). Infiltration tests were completed on June 12, 2018. Two cylindrical test holes (606-1 and 606-2) were hand augured below the bottom elevation of the test pit to depths of 24.15 cm (9.5 inches) and 25.4 cm (10.0 inches), respectively, and pre-soaked for four hours immediately prior to testing. The field saturated hydraulic conductivities were determined to be 11.9 mm/hour for test hole 606-1, and 2.6 mm/hour for test hole 606-2. Refer to Table 5 for a summary of infiltration testing results for the Eagle Heights property and Appendix 9A (see Photos 1 – 4) for photographs of test holes.

7.2.3.2 Soil Grain Size Analysis

Due to the variability in soil conditions observed in this test pit, two soil samples were collected from the bottom elevation of the test pit and submitted to an accredited lab under chain of custody for grain size analysis using standard screens and hydrometer analysis for fine textured soil. The soil sample collected from test hole 606-1 at the western end of the test pit was found to consist of 47.0% sand, 21.1% silt, and 31.9% clay and is therefore classified as *clayey, silty sand*. The soil sample collected from test hole 606-2 at the eastern end of the test pit was found to consist of 5.9% sand, 30.4% silt, and 63.7% clay and is therefore classified as *clay with silt and trace sand*. It is worth noting that test holes 606-1 and 606-2

were less than two metres apart, indicating that soil conditions in this stormwater catchment area may exhibit a high degree of spatial variability. Refer to Table 5 for a summary of soil texture based on grain size analysis and Appendix 9B for copies of lab reports.

7.2.3.3 Soil Profiling

Due to the variability in soil conditions observed in this test pit, soil profiling was completed at the western end of the test pit adjacent to test hole 606-1, and at the eastern end of the test pit adjacent to test hole 606-2. The soil profile at 606-1 was observed to consist of *sandy silt* in the upper horizon, which transitioned to *silty sand* at a depth of approximately 0.12 m below ground surface. A discontinuous layer of compacted soil and hardpan was observed at a depth between 0.12 and 0.20 m below ground surface. *Clayey silty sand* was encountered at approximately 1.05 m below ground surface and had a moist to wet consistence, which may be indicative of intermittent saturated conditions.

The soil profile at 606-2 was observed to consist of *sandy silt* in the upper horizon, which transitioned to *silty sand* at a depth of approximately 0.08 m below ground surface. *Clay and silt with trace sand* was encountered at approximately 0.87 m below ground surface and mottling was observed throughout, which is indicative of poor drainage and intermittent saturated conditions. Site photographs are provided in Appendix 9A (see Photo 7) and test pit logs are provided in Appendix 9C.

7.2.4 Stormwater Catchment Area 621

7.2.4.1 Infiltration Tests

Stormwater catchment area 621 is situated at the end of Flatt Road near the western boundary of the Eagle Heights property (see Figure 2). This area is shown in the surficial geology mapping as an area underlain primarily by lacustrine and outwash sand (Karrow, 1983). Infiltration tests were completed on June 13, 2018. Two cylindrical test holes (621-1 and 621-2) were hand augured below the bottom elevation of the test pit to depths of 22.9 cm (9.0 inches) and 21.6 cm (8.5 inches), respectively. The field saturated hydraulic conductivity was determined to be 19.6 mm/hour for test hole 621-1, and 12.4 mm/hour for test hole 621-2. Refer to Table 5 for a summary of infiltration testing results for the Eagle Heights property and Appendix 9A (see Photos 1 – 4) for photographs of test holes.

7.2.4.2 Soil Grain Size Analysis

A soil sample was collected from the bottom elevation of the test pit and submitted to an accredited lab under chain of custody for grain size analysis using standard screens and hydrometer analysis for fine textured soil. The sample was found to consist of 42.8% sand, 40.0% silt, and 17.2% clay and is therefore classified as *sand and silt with some clay*. Refer to Table 5 for a summary of soil texture based on grain size analysis and Appendix 9B for copies of lab reports.

7.2.4.3 Soil Profiling

The soil profile was observed to consist of *sandy silt* in the upper horizon, which transitioned to *sand and silt with some clay* at a depth of approximately 0.23 m below ground surface. A discontinuous layer of compacted soil and hardpan was observed at a depth between 0.70 and 0.90 m below ground surface.

Hardpan clods ranging in size from 5 to 15 cm were observed throughout this layer. Site photographs are provided in Appendix 9A (see Photos 5 – 6) and test pit logs are provided in Appendix 9C.

Table 5. Summary of Infiltration and Grain Size Analysis Data for Eagle Heights Stormwater Catchment Areas 503, 515, 606 and 621

Stormwater Catchment Area	Test Hole ID	Soil Texture based on Grain Size Analysis	Field Saturated Hydraulic Conductivity (mm/hour)
503	503-1	Sand with some silt, trace clay	15.6
	503-2		14.5
515	515-1	Sandy silt with some clay	6.9
	515-2		7.3
606	606-1	Clayey, silty sand	11.9
	606-2	Clay and silt,	2.6
621	621-1	Sand and silt with some clay	19.6
	621-2		12.4

8.0 Assessment of Groundwater Influence on Wetlands Mapped by Savanta for the Environmental Impact Assessment

Savanta requested some input to their Environmental Impact Assessment pertaining to potential groundwater influences to four wetlands that they mapped with the study area. A map is presented in Appendix 10.

8.1 MAS2-1 Pond

As is discussed in Section 5.3.4, the MAS2-1 Pond receives localized overland flow and very shallow groundwater inputs and fills-up in the spring season. It is situated in a very low permeability environment of clay till and shale which results in a “bath tub” affect for storing water and slowly recharges the underlying aquitard. The water level of the shallow pond dropped approximately 0.65 m over the summer of 2018 through the combined effects of overflow, evapotranspiration and a minimal amount of leakage (groundwater recharge). It has a man-made outlet that directs overflow to Grindstone Creek Tributary 4. Owing to the very low permeability hydrogeologic conditions, there is a minimal contribution of groundwater to the ecological function of this wetland pond.

8.2 MAM2-10(a) Wetland

The MAM2-10(a) wetland is located within the ravine setting of Grindstone Creek Tributary 6 (West). The base of the wetland is alluvium from the erosion of clay till and shale which underlie the alluvium. The wetland receives a spring season flux of stormwater and snow melt runoff from the up-slope, low permeability clay based soils and shale bedrock. There is likely a small amount of groundwater discharge in the form of seepage from the base of the silty sand layer that would enter the water course

as overland flow in the spring season. A significant amount of the flow originates north of this wetland area in the undevelopable portion of the site identified by Savanta as deciduous forest.

8.3 MAM2-10(b) Wetland

The MAM2-10(b) wetland is also located within the ravine setting of Grindstone Creek Tributary 6 (West) and downstream of the MAM2-10(a) wetland. It was instrumented with drive point staff gauges and water level loggers in the summer of 2018 or the dry season.

The base of the wetland is alluvium from the erosion of clay till and shale which underlie the alluvium. The wetland receives a spring season flux of stormwater and snow melt runoff from the up-slope, low permeability clay based soils and shale bedrock. There is likely a small amount of groundwater discharge in the form of seepage from the base of the silty sand layer that would enter the water course as overland flow in the spring season. A significant amount of the flow originates north of this wetland area in the undevelopable portion of the site identified by Savanta as deciduous forest.

8.4 MAS2-1/MAM2-10 Wetland

This wetland area is at the headwaters of Grindstone Creek Tributary 5 (West). The base of the wetland is alluvium from the erosion of up-slope sandy silt and clay till. The alluvium is underlain by low permeability clay till. The wetland receives a spring season flux of stormwater and snow melt runoff from the up-slope, low permeability clay based soils and the release of groundwater held in storage from silty sand layer that comprises the upper slopes of this ephemeral water course (see Figure 3). The release of groundwater from storage likely creates prolonged flowing water conditions through to the late spring season versus the other wetlands on-site that exhibit flashy flow conditions because they are primarily based on low permeability clay till and shale geologic material. Of the four wetlands on-site, this wetland is the most influenced by groundwater but a significant amount of the flow originates north of this wetland area in the undevelopable portion of the site identified by Savanta as deciduous forest and the forested area on the property northwest of the wetland.

9.0 Assessment of Hydrogeological-based Impact Analysis of Sewer Construction to Fish Habitat

Savanta (2018) report in their Environmental Impact Assessment that Tributaries 4, 5 and 6 to Grindstone Creek were assessed relative to fish habitat and that Tributaries 4 and 6 were determined to provide indirect fish habitat, while Tributary 5 provided direct fish habitat.

The findings of this hydrogeological assessment that are pertinent to fish habitat are as follows:

1. No constraints were identified in the drainage channels within the arable lands; and

2. In the non-arable sections of the property, the tributaries of Grindstone Creek are for the most part in ravine settings that are sloped or bottom-out either on low permeability clay or low permeability shale. Construction for a sewer crossing or the infrastructure for the discharge of stormwater should not release groundwater out of storage that that may potentially alter the quantity or quality of the water in the water course.

10.0 Niagara Escarpment Plan Lands

The Niagara Escarpment Plan Lands at the north end of the development are located on a topographically-high ridge which slopes in an easterly direction. No significant surface water drainage channels are evident and overland drainage flows southeasterly towards an un-named tributary. The western property boundary is located both at Horning Road and a very steep (50 m) cliff face of the Niagara Escarpment associated with the valley of Grindstone Creek. In the immediate vicinity of the cliff face, localized surface water runoff is towards the Grindstone Creek Valley. The northern section of the lands are located on predominantly clay till based soils and the southern two to three lots are located on the north end of a rolling hill comprised of silty sand (see Figures 6 and 7).

The water table is deep as is shown on Figure 6 because of the ridge-like setting and there was no evidence of groundwater seepage or springs. Groundwater flow will mimic topography and flow in a southeasterly direction as is shown on Figure 8.

It is reported that the existing homes on Horning Road are not on municipally-supplied water. There are no water records on file with the Ministry of the Environment, Conservation and Parks indicating that all existing residents rely on cisterns for private water supply.

110 Conclusions & Recommendations

11.1 Conclusions

The following conclusions are provided relative to the five objectives of this assessment listed in Section 1.0:

1. The MAS2-1 Pond receives localized overland flow and very shallow groundwater inputs and fills-up in the spring season. It is situated in a very low permeability environment of clay till and shale which results in a “bath tub” affect for storing water and slowly recharges the underlying aquitard. The water level of the shallow pond dropped approximately 0.65 m over the summer of 2018 through the combined effects of overflow, evapotranspiration and a minimal amount of leakage (groundwater recharge). It has a man-made outlet that directs overflow to Grindstone Creek Tributary 4. Owing to the very low permeability hydrogeologic conditions, there is a minimal contribution of groundwater to the ecological function of this wetland pond.

2. Both the MAM2-10(a) and the MAM2-10(b) wetlands are located within the ravine setting of Grindstone Creek Tributary 6 (West). The base of the wetland is alluvium from the erosion of clay till and shale which underlie the alluvium. The wetland receives a spring season flux of stormwater and snow melt runoff from the up-slope, low permeability clay based soils and shale bedrock. There is likely a small amount of groundwater discharge in the form of seepage from the base of the silty sand layer that would enter the water course as overland flow in the spring season. A significant amount of the flow originates north of this wetland area in the undevelopable portion of the site identified by Savanta (2018) as deciduous forest.

   The MAS2-1/MAM2-10 wetland area is at the headwaters of Grindstone Creek Tributary 5 (West). The base of the wetland is alluvium from the erosion of up-slope sandy silt and clay till.

The alluvium is underlain by low permeability clay till. The wetland receives a spring season flux of stormwater and snow melt runoff from the up-slope, low permeability clay based soils and the release of groundwater held in storage from silty sand layer that comprises the upper slopes of this ephemeral water course (see Figure 3). The release of groundwater from storage likely creates prolonged flowing water conditions through to the late spring season versus the other wetlands on-site that exhibit flashy flow conditions because they are primarily based on low permeability clay till and shale geologic material. Of the four wetlands on-site, this wetland is the most influenced by groundwater but a significant amount of the flow originates north of this wetland area in the undevelopable portion of the site identified by Savanta (2018) as deciduous forest and the forested area on the property northwest of the wetland.

3. No constraints to the development of stormwater management ponds were identified. The developable sections of the property on the down-slope side of each land parcel are located on a 2 to 4 m layer of low permeability glacial clay till which is in turn underlain by a very thick layer of low permeability shale. Both these materials act as an extensive and thick aquitard to the downward movement of groundwater and act as a confining layer for surface water.

4. No hydrogeological-based constraints were identified regarding the construction of sewer mains pertaining to fish habitat in the drainage channels that form the tributaries of Grindstone Creek within the subject lands. In the non-arable sections of the property, the tributaries of Grindstone Creek are for the most part in ravine settings that are sloped or bottom-out either on low permeability clay or low permeability shale. Construction for a sewer crossing or the infrastructure for the discharge of stormwater should not release groundwater out of storage that that may potentially alter the quantity or quality of the water in the water course.

5. Stormwater catchment areas 503 and 621 are suitable for the application of LID technology owing to the presence of sandy soils whereas stormwater catchment areas 515 and 606 are less optimal owing to more clay-based soils. Stormwater catchment area 503 has a relatively deep water table as does the northern and western sections of catchment area 621 making those areas/sub-areas suitable for LID technology. The infiltration information collected in this study in conjunction with the information collected by Peto MacCallum (2003) can be used to assess the other areas of the site for the suitability of LID technology.

The following additional conclusions are also provided:

6. With the exception of localized flow, very little of the on-site flows drains westward towards the deep valley of Grindstone Creek. For the most part, all flow from the developable sections of the Eagle Heights property flows to Tributaries 4, 5 and 6 of Grindstone Creek which all are primarily oriented in a northwest to southeast direction where flow patterns are dominated by the ravine settings of these three tributaries. These prominent on-site ravine features have eroded down through a sand layer (where present), a dense clay till and a low permeability shale creating water courses that bottom-out on the shale. The combination of rolling terrain, primarily composed of low permeability clay till and three steep ravines in the low permeability shale have created “flashy” surface water conditions where storm water drains quickly off of the site.

7. The areas of silty sand found in the western and northern sections of the site form shallow unconfined aquifers providing storage of groundwater in limited areas of the site. The silty sand deposits exhibit hydraulic conductivities or permeabilities of 3.73×10^{-6} m/sec which is approximately two orders of magnitude more than the underlying clay till and shale aquitards. The clay/clay till and shale both exhibit very low hydraulic conductivities with respective geometric means of 1.73×10^{-9} and 5.90×10^{-8} m/sec, indicating that these two geologic materials form an extensive aquitard across most of the site restricting the vertical movement of groundwater to depth and promoting surface water runoff.

8. Down-slope of Monitoring Wells MW-7 Shallow and Deep in the western section of the property, groundwater was observed to be discharging to surface as an area of seepage in the vicinity of Drive Point 1 (labelled GS-6, DP1 on Figure 2). Groundwater in the western section of the site migrates vertically downwards until it reaches the underlying low permeability clay till and then flows southeasterly and discharges as seepage to surface where the sand layer pinches out or becomes very thin. The resultant water drains into Grindstone Creek Tributary 6 (West) as surface water during the spring season. This area of groundwater discharge should not be used for the implementation of LID technology for stormwater if this area of the site is to remain at, or close to, existing grades;

9. Based on the findings of this study, there does not appear to any hydrological or hydrogeological constraints for development of the Niagara Escarpment Plan lands section of the development.

11.2 Recommendations

The following recommendations are provided

1. The MAS2-1/MAM2-10 and MAM2-10(a) wetland areas (see Appendix 10) should be instrumented with drive point staff gauges and water level loggers and a flow monitoring program should be established. Levels and flows should be collected in the early spring season of 2019 until conditions dry-up.

2. The existing monitoring program should continue through to the summer of 2019 similar to the time frame outlined in Recommendation 1; and

3. Additional soil infiltration data relative to the implementation of LID technology for stormwater should be collected after draft plan approval and should be oriented to site specific areas.

We trust this information is sufficient for your present needs. Please do not hesitate to contact the undersigned if you have any questions.

Respectfully submitted,

TERRA-DYNAMICS CONSULTING INC.



David D. Slaine, M.Sc., P. Geo.
Principal Hydrogeologist



c.c. Kevin Gonnsen, Metropolitan Consulting Inc.
Antonette Zimic, Savanta

Attachments

Table 1. Manual Elevation Measurements at Staff Gauge Locations
Table 2. Flow Measurements at Staff Gauge Locations
Table 4. Manual Groundwater Elevation Measurements

Figure 1. Location of Subject Lands
Figure 2. Base Map
Figure 3. Location of Surficial Silty Sand Unit
Figure 4. Geologic Cross-Section A-A'
Figure 5. Geologic Cross-Section B-B'
Figure 6. Geologic Cross-Section C-C'
Figure 7. Geologic Cross-Section D-D'
Figure 8. Groundwater Flow Direction Map
Figure 9. Test Pit Locations, Infiltration Tests
Figure 10. Draft Plan

Appendix 1. 2003 Peto MacCallum Borehole Logs and Borehole Location Map
Appendix 2. 2006 Peto MacCallum Borehole Logs and Borehole Location Map
Appendix 3. 2017 Soil Mat Borehole Logs and Borehole Location Map
Appendix 4. 2018 Terra-Dynamics Monitoring Well Logs and Two MECP Water Well Records Near Ireson Rd
Appendix 5. Hydraulic Conductivity Analyses
Appendix 6. Staff Gauge Hydrographs
Appendix 7. Monitoring Well Hydrographs
Appendix 8. Peto MacCallum 2003 Infiltration Test Results
Appendix 9. Infiltration Test Photographs, Grain Size Data and Test Pit Logs
Appendix 10. Savanta Figure 4 *Ecological Land Classification*

12.0 References

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Table 1. Manual Elevation Measurements at Staff Gauge Locations, Eagle Heights

SG I.D.	TOC Elevation (masl)	Stick-up (m)	Ground Elevation (masl)	May 25/18		June 11/18		July 11/18		Sept 21/18	
				Depth TOC (m)	Elev. (masl)	Depth TOC (m)	Elev. (masl)	Depth TOC (m)	Elev. (masl)	Depth TOC (m)	Elev. (masl)
GS-6, SG-1	133.47	0.57	132.90	0.49	132.98	0.52	132.95	0.52	132.95	Dry	Dry
SG GS-5 (West)	132.66	0.57	132.09	0.55	132.11	0.56	132.10	0.55	132.11	Dry	Dry
SG GS-5 (East) A	133.70	0.54	133.16	0.51	133.19	0.52	133.18	0.53	133.17	Dry	Dry
SG GS-5 (East) B	135.61	0.49	135.12	0.46	135.15	0.47	135.14	Dry	Dry	Dry	Dry
MAS2-1 Pond, SG-1	122.11	0.53	121.58	0.26	121.85	0.33	121.78	0.36	121.75	Dry	Dry
MAS2-1 Pond Outlet, SG-2	122.10	0.62	121.48	0.56	121.54	0.57	121.53	Dry	Dry	Dry	Dry
Tributary 6 MAM2-10-B Wetland	NA	0.74	NA	NA	NA	NA	NA	NA	NA	Dry	Dry
Tributary 6 MAM2-10-B Inlet	NA	0.73	NA	NA	NA	NA	NA	NA	NA	Dry	Dry
Tributary 6 MAM2-10-B Outlet	NA	0.81	NA	NA	NA	NA	NA	NA	NA	Dry	Dry

Notes: NA: Not Available; TOC: Top of Casing; masl: metres above sea level

Table 2. Flow Measurements at Staff Gauge Locations, Eagle Heights

Date	Measurement	Site ID Unit	GS-6, SG-1	SG GS-5 (East) A	SG GS-5 (East) B	SG GS-5 (West)	MAS2-1 Pond Outlet	MAM2-10 (b) Wetland Inlet	MAM2-10 (b) Wetland	MAM2-10 (b) Wetland Outlet
April 12/18	Flow	L/s	4.05	4.62	0.01	0.84	0.25	NA	NA	NA
	Temperature	˚C	NA	NA	NA	7.3	8.4	NA	NA	NA
	Conductivity	µS/cm	NA	NA	NA	521	287	NA	NA	NA
June 11/18	Flow	L/s	0.22	0.50	Dry	NA	0.01	NA	NA	NA
	Temperature	˚C	15.2	15.2	Dry	16.8	16.7	NA	NA	NA
	Conductivity	µS/cm	745	734	Dry	658	420	NA	NA	NA
July 11/18	Flow	L/s	0.06	0.28	Dry	0.16	Dry	NA	NA	NA
	Temperature	˚C	18.5	19.1	Dry	18.5	Dry	NA	NA	NA
	Conductivity	µS/cm	782	748	Dry	689	Dry	NA	NA	NA
Aug 2/18	Flow	L/s	0.05	0.09	Dry	0.04	Dry	Dry	Dry	Dry
	Temperature	˚C	19.9	23.0	Dry	25.7	Dry	Dry	Dry	Dry
	Conductivity	µS/cm	780	734	Dry	594	Dry	Dry	Dry	Dry
Aug 22/18	Flow	L/s	0.01	0.04	Dry	Dry	Dry	Dry	Dry	Dry
	Temperature	˚C	18.5	17.7	Dry	Dry	Dry	Dry	Dry	Dry
	Conductivity	µS/cm	715	703	Dry	Dry	Dry	Dry	Dry	Dry
Sept 21/18	Flow	L/s	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry
	Temperature	˚C	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry
	Conductivity	µS/cm	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry

Notes: NA: Not Available; L/s: Litres per second; µS/cm: Microsiemens per centimeter

Table 4. Manual Groundwater Elevation Measurements, Eagle Heights

Well I.D.	TOC Elevation (masl)	Stick-up (m)	Ground Elevation (masl)	April 4/18		May 25/18		July 9/18		Sept 20/18	
				Depth TOC (m)	Elev. (masl)	Depth TOC (m)	Elev. (masl)	Depth TOC (m)	Elev. (masl)	Depth TOC (m)	Elev. (masl)
MW-1	143.61	0.92	142.69	6.39	137.22	5.85	137.76	6.19	137.42	6.99	136.62
MW-2	145.53	0.97	144.56	3.39	142.14	3.40	142.13	3.55	141.98	Dry	NA
MW-3	151.70	0.80	150.90	4.02	147.68	3.73	147.97	3.85	147.85	4.15	147.55
MW-4-S	156.97	0.99	155.98	Dry	Dry	5.53	151.44	5.65	151.32	Dry	NA
MW-4-D	157.15	1.02	156.13	7.01	150.14	6.66	150.49	6.80	150.35	7.10	150.05
MW-5	147.77	0.99	146.78	4.45	143.32	5.59	142.18	5.77	142.00	7.50	140.27
MW-6	145.72	1.00	144.72	2.23	143.49	2.71	143.01	3.06	142.66	4.54	141.18
MW-7-S	180.00	0.77	179.23	6.28	173.72	5.98	174.02	6.28	173.72	6.68	173.32
MW-7-D	179.93	0.65	179.28	7.04	172.89	8.10	171.83	7.89	172.04	8.21	171.72
MW-8	186.02	0.75	185.27	10.85	175.17	10.70	175.32	10.49	175.53	10.53	175.49
MW-9	148.45	1.04	147.41	6.73	141.72	6.63	141.82	7.00	141.45	8.02	140.43
MW-10-S	124.60	0.62	123.98	1.23	123.37	1.86	122.74	2.89	121.71	4.97	119.63
MW-10-D	124.77	0.81	123.96	3.24	121.53	3.40	121.37	4.32	120.45	5.14	119.63
GS-6, DP-1	146.97	0.55	146.42	NA	NA	0.71	146.26	0.75	146.22	Dry	Dry

Notes: NA: Not Available; TOC: Top of Casing; masl: metres above sea level; D: Deep; S: Shallow





Location of Subject Lands

Eagle Heights
Hydrogeologic Assessment

TDC Terra-Dynamics Consulting Inc.

Project No. 353

Figure 1

Path: H:\TERRA_DYNAMICS\9235 - TD-353 Eagle Heights Hydrogeologic Assessment\gis\mxd\2018 10 24\Figure 1 Location of Subject Lands.mxd Revised: October 24, 2018

Subject Lands
Line of Geologic Cross-section
Hydrography
MAS2 Pond
Borehole (Soil-Mat, 2017)
Borehole (Peto MacCallum, 2003)
Borehole (Peto MacCallum, 2006)
Drive Point / Staff Gauge
Test Pit for Infiltration Study
Staff Gauge
Monitoring Well
Water Well

D
D'
A
A'
B
B'
BH111
BH15
WW6809592
WW2800328
NEP LANDS
BH-SM7
BH107
BH14
503
BH-SM4
MW-8
MW-7-S&D
BH13
GRINDSTONE CREEK
BH6
BH7
BH106
BH109
BH12
WATERDOWN ROAD
BH-SM2
BH4
BH104
606
515
BH8
BH-SM6
BH110
BH108
BH-SM5
MW-5
MW-4-S&D
BH105
BH-SM3
BH3
BH-SM1
MW-3
GS-6, DP1
BH5
MAM2-10(b) SGs
MW-6
BH9
BH11
MW-9
SG GS-5 (East) A
SG GS-5 (East) B
SG GS-5 (West)
BH103
621
MW-1
MW-2
GS-6, SG-1
BH1
BH10
BH2
BH16
FLATT ROAD
BH17
BH18
BH19
BH102
BH101
BH20
MW-10-S&D
MAS2-1 POND, SG-1
MAS2-1 POND OUTLET, SG-2

0
200 Meters
1:5,500
N

Base Map

Eagle Heights
Hydrogeologic Assessment

TDC Terra-Dynamics Consulting Inc.

Project No. 353

Figure 2

Path: H:\TERRA_DYNAMICS\9235 - TD-353 Eagle Heights Hydrogeologic Assessment\gis\mxd\2018 10 24\Figure 2 Base Map.mxd Revised: October 24, 2018

Subject Lands
Hydrography
MAS2 Pond
Borehole (Soil-Mat, 2017)
Borehole (Peto MacCallum, 2003)
Borehole (Peto MacCallum, 2006)
Drive Point / Staff Gauge
Test Pit for Infiltration Study
Staff Gauge
Monitoring Well
Water Well
Approximate Location of Surficial Silty Sand Unit

BH111
BH15
WW6809592
WW2800328
NEP LANDS
BH-SM7
BH107
BH14
503
BH-SM4
MW-8
MW-7-S&D
BH13
WATERDOWN ROAD
BH6
BH7
BH106
BH109
BH12
GRINDSTONE CREEK
BH-SM2
BH4
BH104
606
515
BH8
BH110
BH-SM6
BH108
BH-SM3
BH-SM5
MW-5
MW-4-S&D
BH105
BH3
BH-SM1
BH5
MW-3
GS-6, DP1
MAM2-10(b) SGs
BH9
BH11
MW-6
MW-9
BH103
621
MW-1
SG GS-5 (East) A
SG GS-5 (East) B
GS-6, SG-1
MW-2
BH1
BH10
SG GS-5 (West)
BH2
BH16
FLATT ROAD
BH17
BH18
BH19
BH102
BH101
BH20
MW-10-S&D
MAS2-1 POND, SG-1
MAS2-1 POND OUTLET, SG-2

Location of Surficial Silty Sand Unit

Eagle Heights
Hydrogeologic Assessment

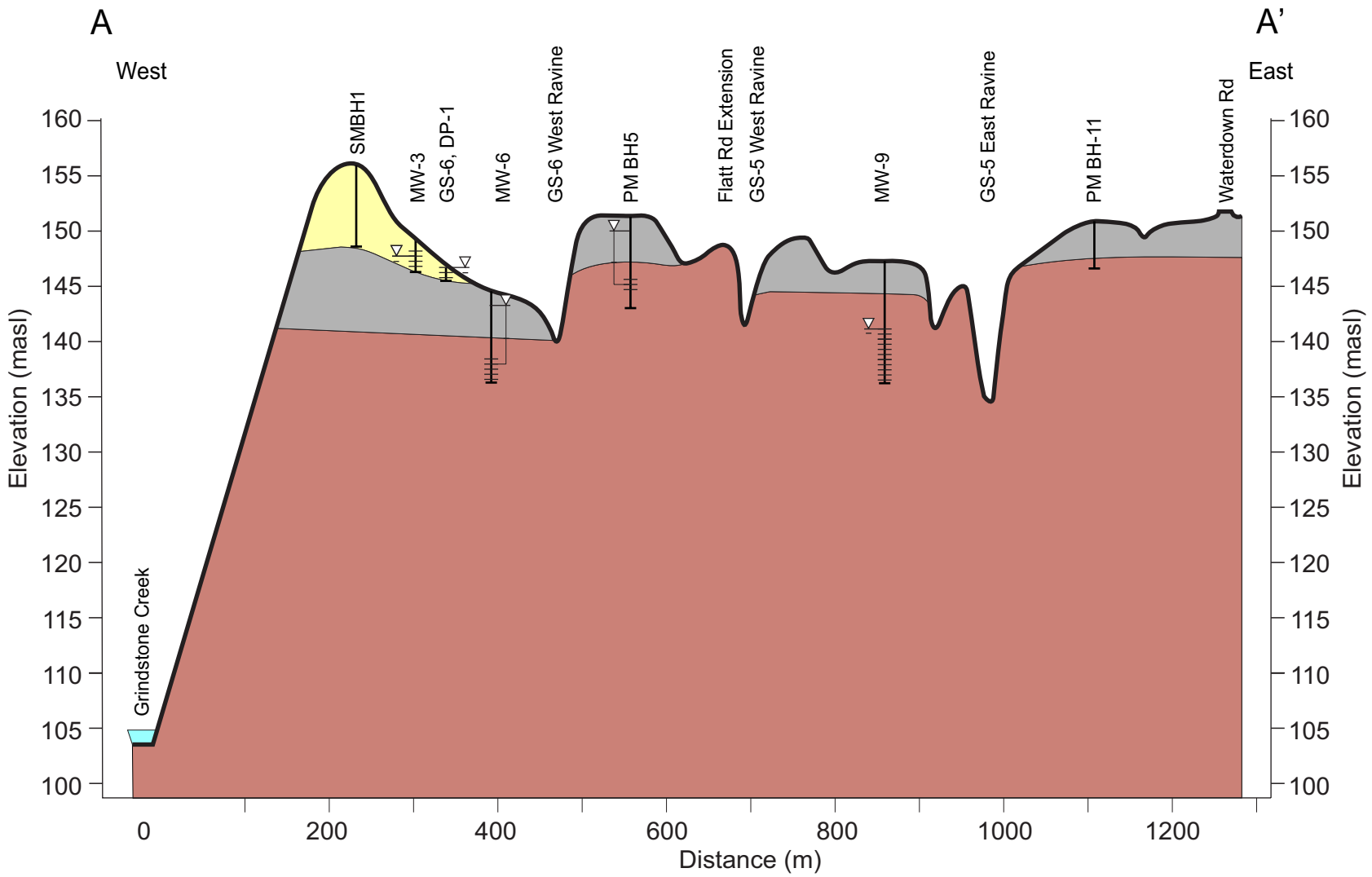
TDC Terra-Dynamics Consulting Inc.

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Figure 3

0 200 Meters
1:5,500
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Path: H:\TERRA_DYNAMICS\9235 - TD-353 Eagle Heights Hydrogeologic Assessment\gis\mxd\2018 10 24\Figure 3 Location of Surficial Silty Sand Unit.mxd Revised: October 25, 2018



Clayey Silt Glacial Till (Halton Till)

Queenston Shale

Sand and Silty Sand

Water Table and Groundwater-Water Level in Water Well

Well Screen

BH/MW Borehole/Monitoring Well ID

Geologic Cross-section A-A'

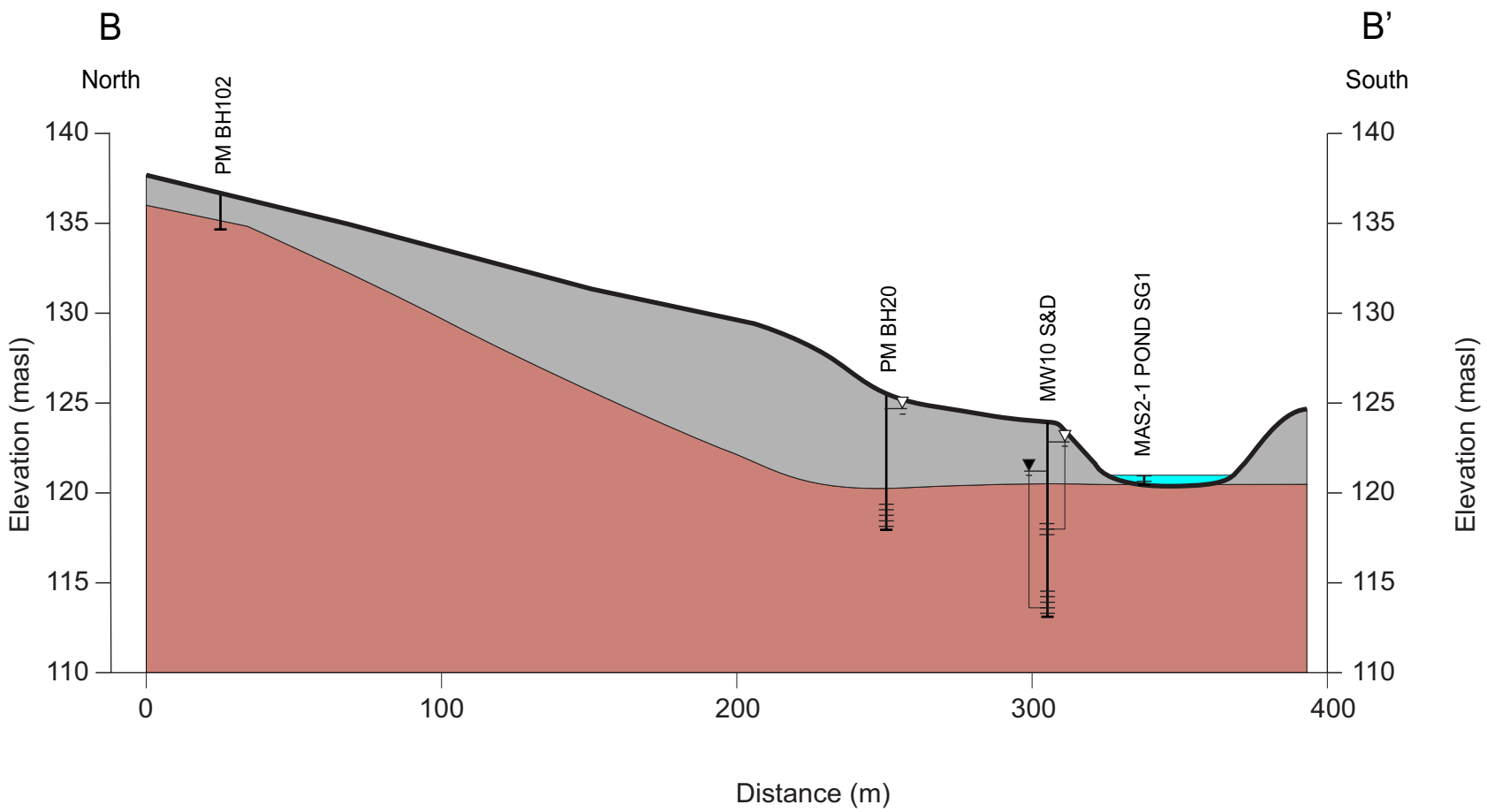
Eagle Heights Hydrogeologic Assessment

TDC Terra-Dynamics Consulting Inc.

Project No. 353

Figure 4

H:\TERRA_DYNAMICS\9235 - TD-353 Eagle Heights Hydrogeologic Assessment\corel\2018 10 24\Figure 4 Geologic Cross-section A-A.cdr Revised: October 25, 2018



Clayey Silt Glacial Till (Halton Till)

Queenston Shale

Water Table and Groundwater-Water Level in Water Well

Potentiometric Groundwater Level

Well Screen

BH/MW Borehole/Monitoring Well ID

Water levels in MWs and Pond recorded May 25, 2018

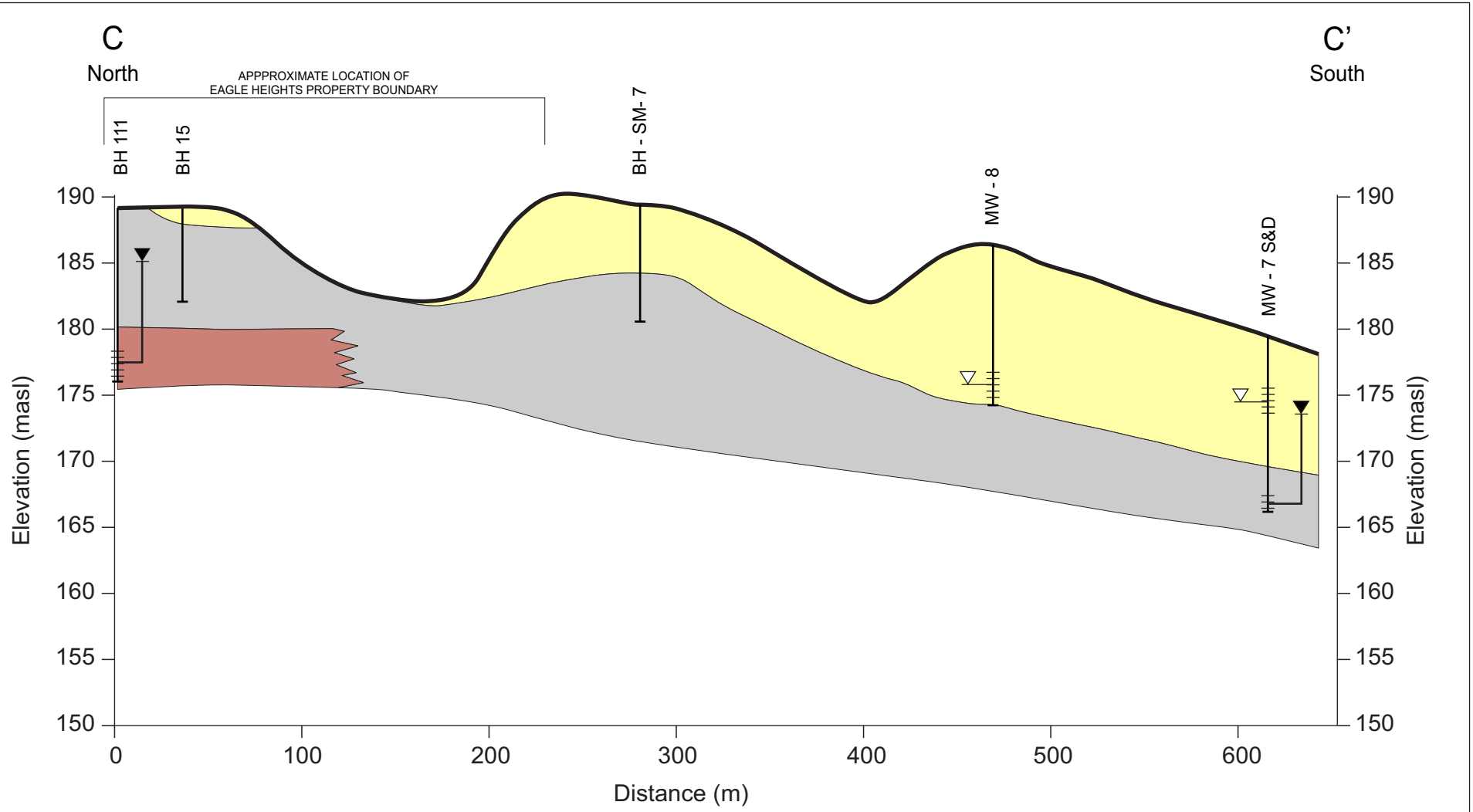
Geologic Cross-section B-B'

Eagle Heights Hydrogeologic Assessment

TDC Terra-Dynamics Consulting Inc.

Project No. 353	Figure 5

H:\TERRA_DYNAMICS\9235 - TD-353 Eagle Heights Hydrogeologic Assessment\corel\2018 10 24\Figure 5 Geologic Cross-section B-B.cdr Revised: October 25, 2018



	Sand, Silty Sandy & Sandy Silt
	Clayey Silt Glacial Till (Halton Till)
	Queenston Shale
▽	Water Table
▼	Potentiometric Groundwater Level
	Well Screen
BH/MW	Borehole/Monitoring Well ID

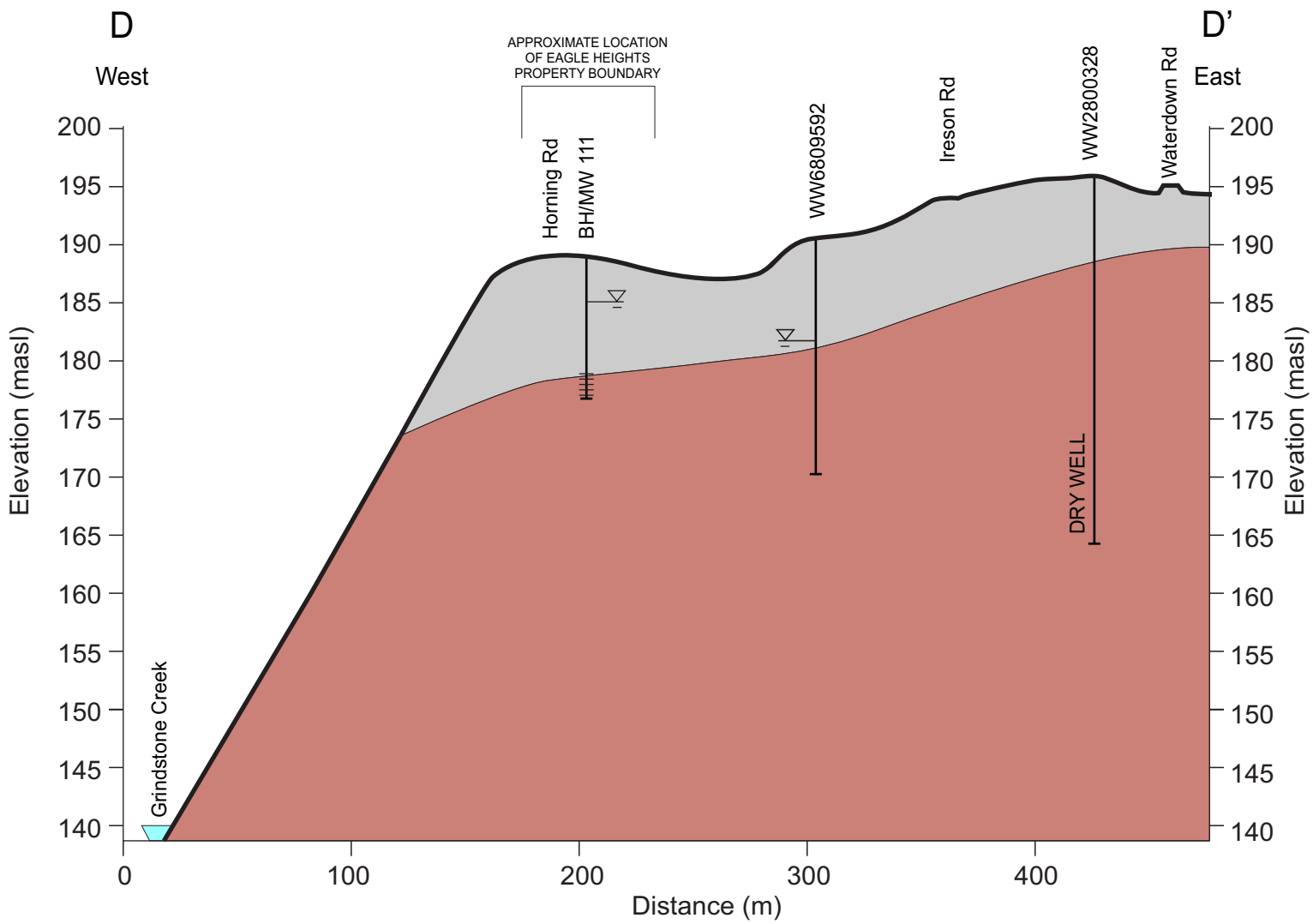
Geologic Cross-section C-C'

Eagle Heights Niagara
Hydrogeologic Assessment

TDC Terra-Dynamics Consulting Inc.

Project No. 353 | Figure 6

H:\TERRA_DYNAMICS\9235 - TD-353 Eagle Heights Hydrogeologic Assessment\corel\2018 10 24\Figure 6 Geologic Cross-section C-C.cdr Revised: October 25,2018



Clayey Silt Glacial Till (Halton Till)

Queenston Shale

Water Table and Groundwater-Water Level in Water Well

Well Screen

BH/MW Borehole/Monitoring Well ID

WW6809592 MECP Water Well Record ID

Geologic Cross-section D-D'

Eagle Heights Hydrogeologic Assessment

TDC Terra-Dynamics Consulting Inc.

Project No. 353

Figure 7

H:\TERRA_DYNAMICS\9235 - TD-353 Eagle Heights Hydrogeologic Assessment\corel\2018 10 24\Figure 7 Geologic Cross-section D-D.cdr Revised: October 25, 2018

Subject Lands
Hydrography
MAS2 Pond
Borehole (Soil-Mat, 2017)
Borehole (Peto MacCallum, 2003)
Borehole (Peto MacCallum, 2006)
Drive Point / Staff Gauge
Test Pit for Infiltration Study
Staff Gauge
Monitoring Well
Water Well
Groundwater Contour (masl)
Groundwater Flow Direction

See Table 3 for Groundwater Elevations, May 25, 2018

See Figure 2 for MW, BW and SG Lables.

NEP LANDS
WATERDOWN ROAD
GRINDSTONE CREEK
FLATT ROAD
176
174
150
148
146
144
142
140
138
136
142
140
124
122
0
200 Meters
1:5,500
N

Groundwater Flow Direction Map

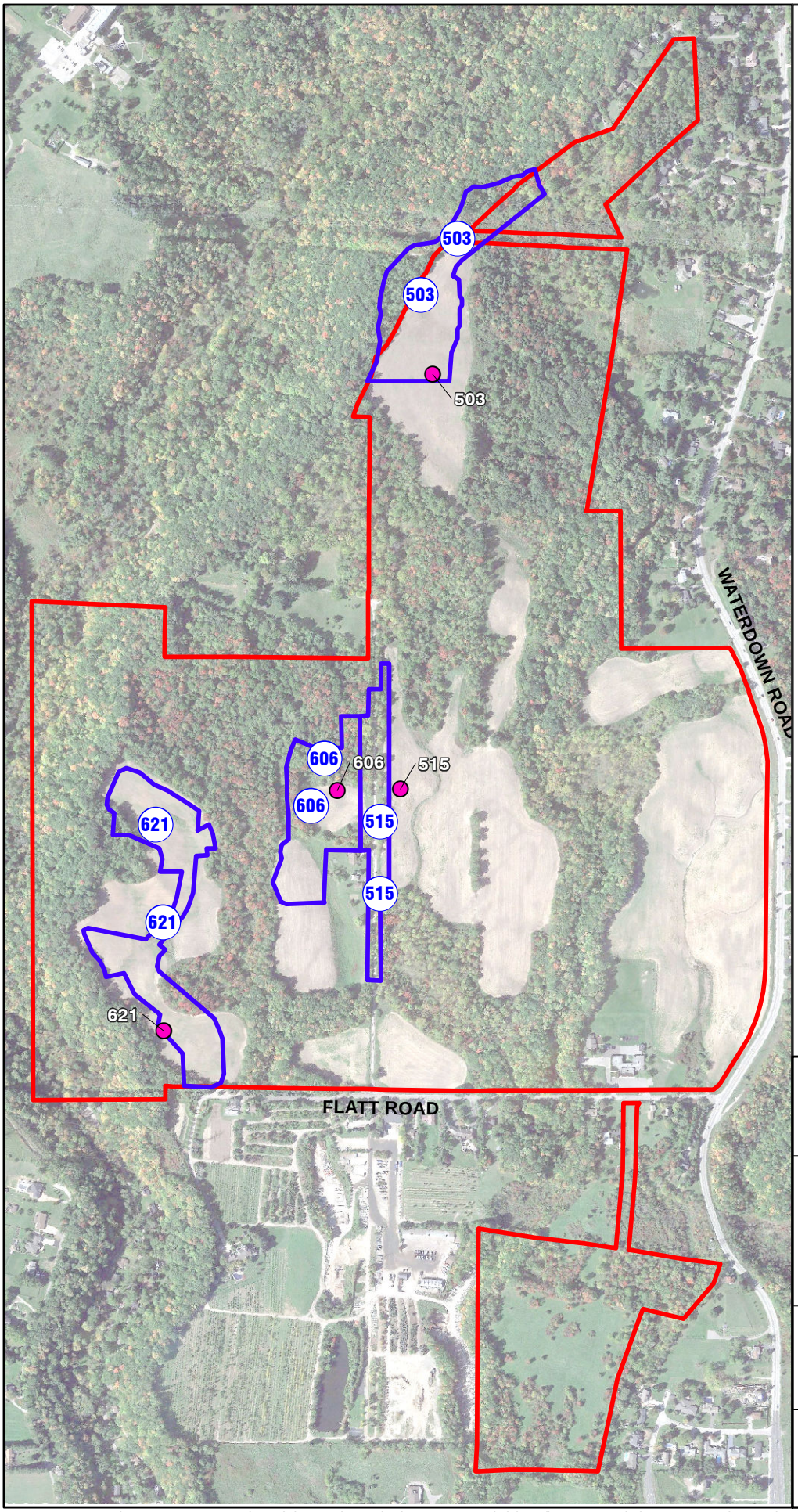
Eagle Heights Hydrogeologic Assessment

TDC Terra-Dynamics Consulting Inc.

Project No. 353

Figure 8

Path: H:\TERRA_DYNAMICS\9235 - TD-353 Eagle Heights Hydrogeologic Assessment\gis\mxd\2018 10 24\Figure 8 Groundwater Flow Direction Map.mxd Revised: October 25, 2018



0 200 Meters

1:9,000

Subject Lands

Stormwater Catchment Area

Test Pit Location

Test Pit Locations, Infiltration Tests

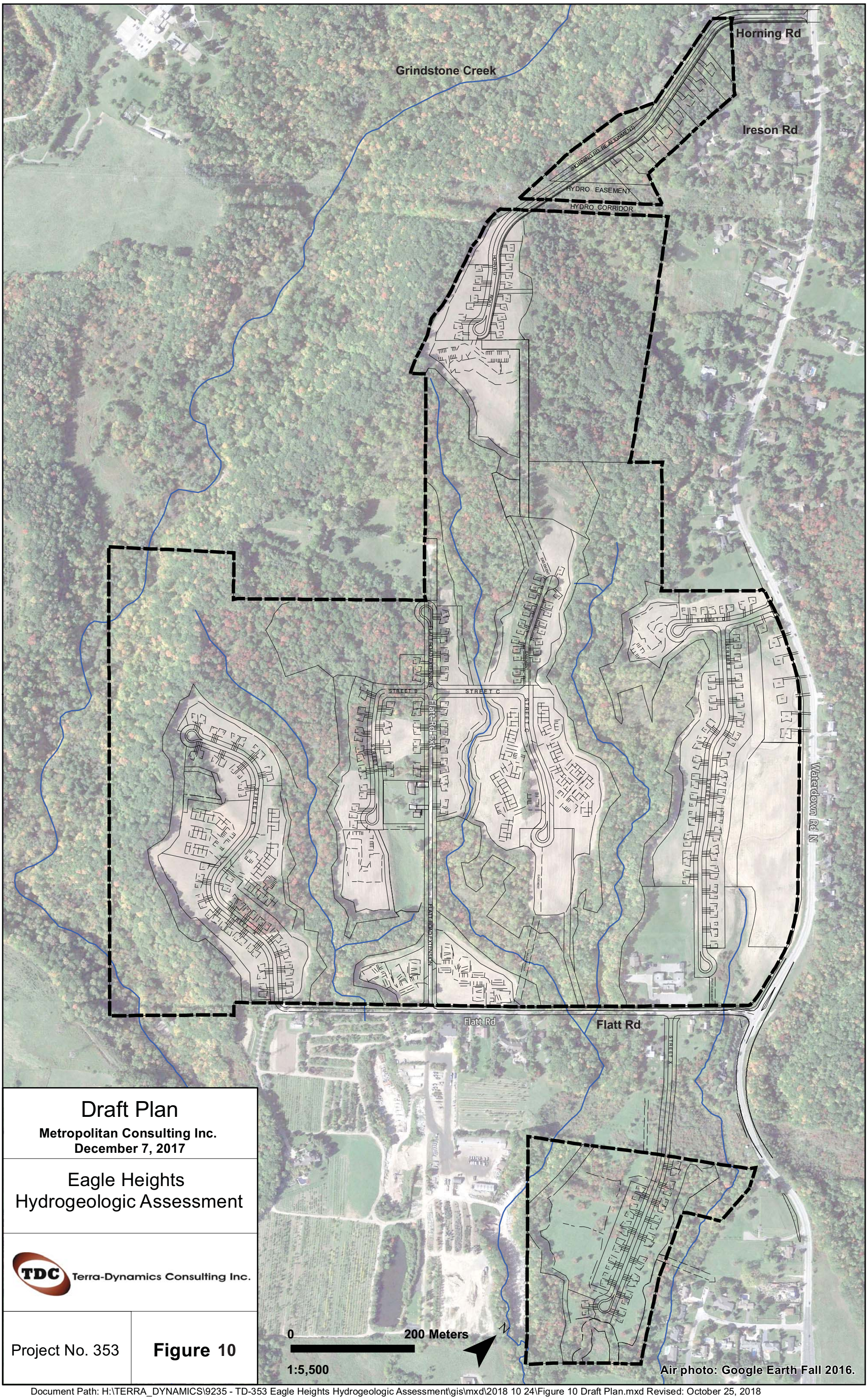
Eagle Heights Hydrologic/Hydrogeologic Assessment

TDC Terra-Dynamics Consulting Inc.

Project No. 353

Figure 9

Path: H:\TERRA_DYNAMICS\9235 - TD-353 Eagle Heights Hydrogeologic Assessment\gis\mxd\2018 10 24\Figure 9 Test Pit Locations Infiltration Tests.mxd Revised: October 24, 2018



Draft Plan

Metropolitan Consulting Inc.
December 7, 2017

Eagle Heights Hydrogeologic Assessment

TDC Terra-Dynamics Consulting Inc.

Project No. 353

Figure 10

Document Path: H:\TERRA_DYNAMICS\9235 - TD-353 Eagle Heights Hydrogeologic Assessment\gis\mxd\2018 10 24\Figure 10 Draft Plan.mxd Revised: October 25, 2018

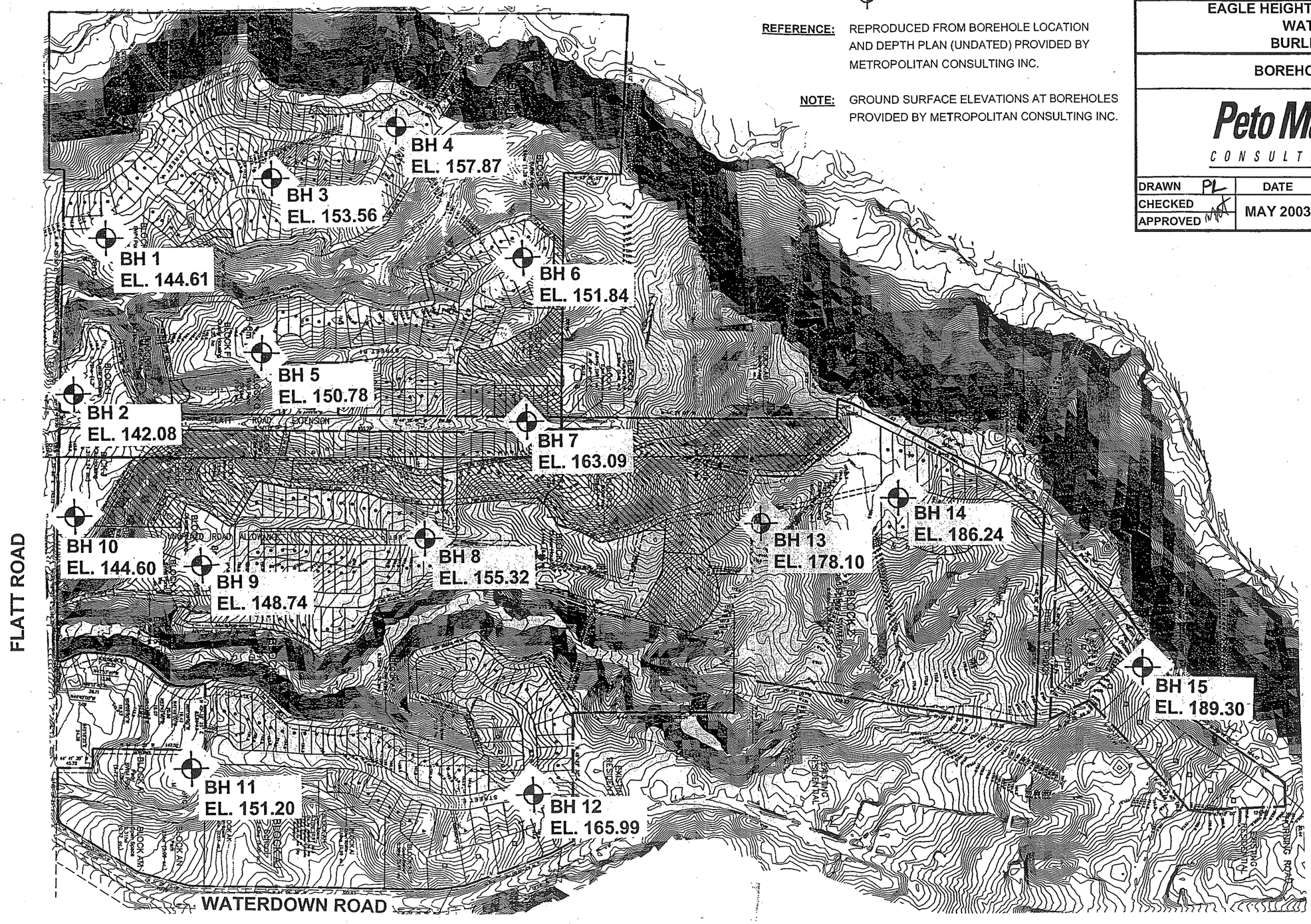
Appendix 1.

2003 Peto MacCallum Borehole Logs and Borehole Location Map

LEGEND: ⊕ BOREHOLE

REFERENCE: REPRODUCED FROM BOREHOLE LOCATION AND DEPTH PLAN (UNDATED) PROVIDED BY METROPOLITAN CONSULTING INC.

NOTE: GROUND SURFACE ELEVATIONS AT BOREHOLES PROVIDED BY METROPOLITAN CONSULTING INC.



PALETTA INTERNATIONAL CORPORATION
c/o METROPOLITAN CONSULTING INC.

EAGLE HEIGHTS AND TAYLOR PROPERTY
WATERDOWN ROAD
BURLINGTON, ONTARIO

BOREHOLE LOCATION PLAN

Peto MacCallum Ltd.
CONSULTING ENGINEERS

DRAWN PL	DATE	SCALE	JOB NO.	DRAWING NO.
CHECKED	MAY 2003	1:5000	02HF094	2
APPROVED MK				

LOG OF BOREHOLE NO. 1

PROJECT EAGLE HEIGHTS AND TAYLOR PROPERTY
LOCATION Waterdown Road, Burlington, Ontario
BORING METHOD Continuous Flight Solid Stem Augers
BORING DATE 2002 12 18
OUR PROJECT NO. 02HF094
ENGINEER M. Anderson
TECHNICIAN M. Rapsey

DEPTH in METRES	DESCRIPTION	LEGEND	ELEVATION	NUMBER	TYPE	BLOWS/0.3m N - VALUES
	GROUND ELEVATION 144.61					
0.20	**TOPSOIL:** Dark brown clayey silt, low organic		144			
1.05	**SILT:** Loose, reddish brown fine sandy silt, moist			1	SS	10
1.5	**CLAY TILL:** Very stiff, brown silty clay, some sand, trace of gravel, low to medium plastic, D.T.P.L., with blueish grey fissures and oxidized stains		143	2	SS	19
			142			
3.0				3	SS	23
3.90			141			
	becoming hard, slightly to low plastic					
4.5			140	4	SS	70
5.10						
	SILT TILL/SHALE COMPLEX: Hard, reddish brown clayey silt/shale		139			
6.0				5	SS	81
			138			
7.5			137	6	SS	98 for 225 mm*
8.00	BOREHOLE TERMINATED AT 8.00 m					

SHEAR STRENGTH C_u ▲ (50 100 150 200)
DYNAMIC CONE PENETRATION ×
STANDARD PENETRATION TEST ●
BLOWS/0.3M (20 40 60 80)

LIQUID LIMIT ____ W_L
PLASTIC LIMIT ____ W_P
WATER CONTENT ____ W
W_P W W_L
WATER CONTENT % (10 20 30)

GROUND WATER OBSERVATIONS AND REMARKS

*50 for last 75 mm

Upon completion of augering, no free water, no cave.

NOTES

CHECKED BY

LOG OF BOREHOLE NO. 2

PROJECT EAGLE HEIGHTS AND TAYLOR PROPERTY
LOCATION Waterdown Road, Burlington, Ontario
BORING METHOD Continuous Flight Solid Stem Augers

BORING DATE 2002 12 18

OUR PROJECT NO. 02HF094
ENGINEER M. Anderson
TECHNICIAN M. Rapsey

DEPTH in METRES	DESCRIPTION GROUND ELEVATION 142.08	LEGEND	ELEVATION	SAMPLES NUMBER	SAMPLES TYPE	BLOWS/0.3m N - VALUES
0.15	**TOPSOIL:** Dark brown clayey silt, low organic					
1.5	**CLAY TILL:** Hard, brown silty clay, some sand, trace of gravel, low to medium plastic, D.T.P.L., with blueish grey fissures and oxidized stains		141	1	SS	36
			140	2	SS	46
2.40						
3.0	**SILT TILL:** Hard, reddish brown clayey silt, some sand and gravel, slightly plastic, D.T.P.L.		139	3	SS	71
4.20			138			
4.5	**SILT TILL/SHALE COMPLEX:** Hard, reddish brown clayey silt/shale			4	SS	47
5.40			137			
6.0	**SHALE:** Weathered red and grey shale		136	5	SS	50 for 50 mm
			135			
7.5 7.70				6	SS	50 for 50 mm
	BOREHOLE TERMINATED AT 7.70 m					

SHEAR STRENGTH C_u ▲ (50 100 150 200)
DYNAMIC CONE PENETRATION ×
STANDARD PENETRATION TEST ●
BLOWS/0.3M (20 40 60 80)

LIQUID LIMIT ____ W_L
PLASTIC LIMIT ____ W_P
WATER CONTENT ____ W
W_P — W — W_L
WATER CONTENT % (10 20 30)

GROUND WATER OBSERVATIONS AND REMARKS

Upon completion of augering, free water at 5.40 m.

NOTES

CHECKED BY

LOG OF BOREHOLE NO. 3

PROJECT EAGLE HEIGHTS AND TAYLOR PROPERTY
LOCATION Waterdown Road, Burlington, Ontario
BORING METHOD Continuous Flight Solid Stem Augers

BORING DATE 2002 12 18

OUR PROJECT NO. 02HF094
ENGINEER M. Anderson
TECHNICIAN M. Rapsey

DEPTH in METRES	DESCRIPTION	LEGEND	ELEVATION	SAMPLES NUMBER	SAMPLES TYPE	BLOWS/0.3m N - VALUES	GROUND WATER OBSERVATIONS AND REMARKS
	GROUND ELEVATION 153.56						
0.15	**TOPSOIL:** Dark brown sandy silt, low organic		153				
	SAND: Loose to compact, brown fine sand, trace of silt, dry			1	SS	9	
1.40							
1.5	layer of compact, brown fine to coarse sand and gravel		152	2	SS	10	
2.10							
			151	3	SS	12	
2.90							
3.0	**SAND AND SILT:** Compact, brown fine sand and silt, saturated			4	SS	14	Free water after sample 4.
			150				
4.5			149	5	SS	15	
4.70							
	SILT: Compact, brown sandy silt, stratified, saturated						
5.70			148				
6.0	**CLAY TILL:** Very stiff to stiff, grey silty clay, trace of sand, medium plastic, W.T.P.L., occasional layers of wet silt			6	SS	16	
			147				
7.5			146				
8.10				7	SS	13	
	BOREHOLE TERMINATED AT 8.10 m						Upon completion of augering, free water and cave at 4.00 m.

SHEAR STRENGTH C_u ▲ (50 100 150 200)
DYNAMIC CONE PENETRATION ×
STANDARD PENETRATION TEST ●
BLOWS/0.3M (20 40 60 80)

LIQUID LIMIT W_L
PLASTIC LIMIT W_P
WATER CONTENT W
W_P W W_L
WATER CONTENT % (10 20 30)

NOTES

CHECKED BY

LOG OF BOREHOLE NO. 4

PROJECT EAGLE HEIGHTS AND TAYLOR PROPERTY
LOCATION Waterdown Road, Burlington, Ontario
BORING METHOD Continuous Flight Solid Stem Augers

BORING DATE 2002 12 18

OUR PROJECT NO. 02HF094
ENGINEER M. Anderson
TECHNICIAN M. Rapsey

GROUND ELEVATION 157.87

DEPTH in METRES	DESCRIPTION	ELEVATION	NUMBER	TYPE	BLOWS/0.3m N - VALUES
0.18	**TOPSOIL:** Dark brown clayey silt, low organic				
1.00	**SILT:** Loose, reddish brown silt, some fine sand, trace of clay, damp	157	1	SS	7
1.5	**SAND:** Loose to compact, brown fine sand, trace of silt, stratified, dry to damp	156	2	SS	16
2.90		155	3	SS	13
3.0	**SILT:** Compact, brown silt, trace of sand, saturated		4	SS	11
3.90		154			
4.5	**CLAY TILL:** Very stiff, grey silty clay, trace of sand, medium plastic, W.T.P.L.	153	5	SS	18
6.0		152	6	SS	16
7.5		151			
8.10	BOREHOLE TERMINATED AT 8.10 m	150	7	SS	15

SHEAR STRENGTH C_u ▲ (50 100 150 200)
DYNAMIC CONE PENETRATION ×
STANDARD PENETRATION TEST ●
BLOWS/0.3M (20 40 60 80)

LIQUID LIMIT ____ W_L
PLASTIC LIMIT ____ W_P
WATER CONTENT ____ W
W_P W W_L
WATER CONTENT % (10 20 30)

GROUND WATER OBSERVATIONS AND REMARKS

Free water after sample 4.

Upon completion of augering, no free water, no cave.

NOTES

CHECKED BY

LOG OF BOREHOLE NO. 5

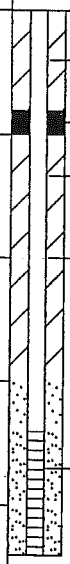
PROJECT EAGLE HEIGHTS AND TAYLOR PROPERTY
LOCATION Waterdown Road, Burlington, Ontario
BORING METHOD Continuous Flight Solid Stem Augers
BORING DATE 2002 12 18
OUR PROJECT NO. 02HF094
ENGINEER M. Anderson
TECHNICIAN M. Rapsey

DEPTH in METRES	DESCRIPTION	LEGEND	ELEVATION	SAMPLES NUMBER	SAMPLES TYPE	BLOWS/0.3m N - VALUES
	GROUND ELEVATION 150.78					
0.15	**TOPSOIL:** Dark brown clayey silt, low organic					
1.40	**LAYERED SILTS AND CLAYS:** Layers of compact, brown silt, trace of clay and sand, and of stiff, brown silty clay, trace of sand, medium plastic, A.P.L.		150	1	SS	11
1.5			149	2	SS	38
3.0	**CLAY TILL:** Hard, brown silty clay, some sand, trace of gravel, low to medium plastic, D.T.P.L., with occasional blueish grey fissures and oxidized stains		148	3	SS	62
3.90	**SHALE:** Weathered red shale		147			
4.5			146	4	SS	50 for 100 mm
6.0			145			
			144			
7.5 7.65	BOREHOLE TERMINATED AT 7.65 m			5	SS	50 for 50 mm

SHEAR STRENGTH C_u ▲ (50 100 150 200)
DYNAMIC CONE PENETRATION ×
STANDARD PENETRATION TEST ●
BLOWS/0.3M (20 40 60 80)

LIQUID LIMIT ____ W_L
PLASTIC LIMIT ____ W_P
WATER CONTENT ____ W
W_P W W_L
WATER CONTENT % (10 20 30)

GROUND WATER OBSERVATIONS AND REMARKS



Upon completion of augering, no free water, no cave.

Depth to water in piezometer measured on 2003 05 12 was 3.75 m.

NOTES

CHECKED BY

LOG OF BOREHOLE NO. 6

PROJECT EAGLE HEIGHTS AND TAYLOR PROPERTY
LOCATION Waterdown Road, Burlington, Ontario
BORING METHOD Continuous Flight Solid Stem Augers

BORING DATE 2002 12 20

OUR PROJECT NO. 02HF094
ENGINEER M. Anderson
TECHNICIAN M. Rapsey

DEPTH in METRES	DESCRIPTION	LEGEND	ELEVATION	SAMPLES NUMBER	SAMPLES TYPE	BLOWS/0.3m N - VALUES	GROUND WATER OBSERVATIONS AND REMARKS
	GROUND ELEVATION 151.84						
0.20	**TOPSOIL:** Dark brown clayey silt, low organic						
	SILT TILL: Hard, brown clayey silt, some sand, trace of gravel, low plastic, D.T.P.L.		151	1	SS	35	
1.5 1.60							
	SILT TILL/SHALE COMPLEX: Hard, reddish brown silt/shale		150	2	SS	57	
2.10	**SHALE:** Weathered red shale						
			149	3	SS	50 for 100 mm	
3.0 3.15	BOREHOLE TERMINATED AT 3.15 m						Upon completion of augering, no free water, no cave.

SHEAR STRENGTH C_u ▲ (50 100 150 200)
DYNAMIC CONE PENETRATION ×
STANDARD PENETRATION TEST ●
BLOWS/0.3M (20 40 60 80)

LIQUID LIMIT ____ W_L
PLASTIC LIMIT ____ W_P
WATER CONTENT ____ W
W_P W W_L
WATER CONTENT % (10 20 30)

NOTES

CHECKED BY

LOG OF BOREHOLE NO. 7

PROJECT EAGLE HEIGHTS AND TAYLOR PROPERTY
LOCATION Waterdown Road, Burlington, Ontario
BORING METHOD Continuous Flight Solid Stem Augers
BORING DATE 2002 12 20
OUR PROJECT NO. 02HF094
ENGINEER M. Anderson
TECHNICIAN M. Rapsey

DEPTH In METRES	DESCRIPTION	LEGEND	ELEVATION	NUMBER	TYPE	BLOWS/0.3m N - VALUES
	GROUND ELEVATION 163.09					
0.23	**SAND FILL:** Dark brown fine to coarse sand, some gravel					
1.40	**LAYERED CLAYS AND SILTS:** Layers of firm, brown silty clay, medium plastic, W.T.P.L.; silt, non-plastic; and clayey silt, slightly plastic, W.T.P.L.		162	1	SS	6
1.5	**CLAY TILL:** Very stiff, brown silty clay, trace of sand, low to medium plastic, D.T.P.L., with silt partings and layers of fine sand		161	2	SS	20
				3	SS	20
3.0			160	4	SS	27
			159			
4.5				6	SS	33
5.20	**SAND:** Compact, brown silty fine sand, wet		158			
6.0			157	7	SS	20
6.50	BOREHOLE TERMINATED AT 6.50 m					

SHEAR STRENGTH C_u ▲ (50 100 150 200)
DYNAMIC CONE PENETRATION ×
STANDARD PENETRATION TEST ●
BLOWS/0.3M (20 40 60 80)

LIQUID LIMIT ____ W_L
PLASTIC LIMIT ____ W_P
WATER CONTENT ____ W
W_P W W_L
WATER CONTENT % (10 20 30)

GROUND WATER OBSERVATIONS AND REMARKS

Upon completion of augering, no free water, no cave.

NOTES

CHECKED BY

LOG OF BOREHOLE NO. 8

PROJECT EAGLE HEIGHTS AND TAYLOR PROPERTY
LOCATION Waterdown Road, Burlington, Ontario
BORING METHOD Continuous Flight Solid Stem Augers

BORING DATE 2002 12 19

OUR PROJECT NO. 02HF094
ENGINEER M. Anderson
TECHNICIAN M. Rapsey

GROUND ELEVATION 155.32

DEPTH in METRES	DESCRIPTION	ELEVATION	NUMBER	TYPE	BLOWS/0.3m N - VALUES
0.15	**TOPSOIL:** Dark brown clayey silt, low organic	155			
	CLAY TILL: Very stiff, brown silty clay, some sand, trace of gravel, low plastic, D.T.P.L., with oxidized stains and fissures		1	SS	17
1.5 / 1.75		154	2	SS	13
	SILT: Compact, brown fine sandy silt, wet	153	3	SS	18
2.70					
3.0	**CLAY TILL:** Very stiff to stiff, grey silty clay, trace of sand and gravel, medium plastic, A.P.L.	152	4	SS	16
3.90					
	becoming slightly to low plastic, with some sand and gravel	151			
4.5			5	SS	12
5.50		150			
	SHALE: Weathered red shale		6	SS	50 for 100 mm
6.0 / 6.20					
	BOREHOLE TERMINATED AT 6.20 m				

SHEAR STRENGTH C_u ▲ (50 100 150 200)
DYNAMIC CONE PENETRATION ×
STANDARD PENETRATION TEST ●
BLOWS/0.3M (20 40 60 80)

LIQUID LIMIT ____ W_L
PLASTIC LIMIT ____ W_P
WATER CONTENT ____ W
W_P W W_L
WATER CONTENT % (10 20 30)

GROUND WATER OBSERVATIONS AND REMARKS

Upon completion of augering, no free water, no cave.

NOTES

CHECKED BY

LOG OF BOREHOLE NO. 9

PROJECT EAGLE HEIGHTS AND TAYLOR PROPERTY
LOCATION Waterdown Road, Burlington, Ontario
BORING METHOD Continuous Flight Solid Stem Augers
BORING DATE 2002 12 19
OUR PROJECT NO. 02HF094
ENGINEER M. Anderson
TECHNICIAN M. Rapsey

DEPTH in METRES	DESCRIPTION	LEGEND	ELEVATION	SAMPLES NUMBER	SAMPLES TYPE	BLOWS/0.3m N - VALUES
	GROUND ELEVATION 148.74					
0.15	**TOPSOIL:** Dark brown clayey silt, low organic					
	CLAY TILL: Hard, brown silty clay, some sand, trace of gravel, low plastic, D.T.P.L., fissured		148	1	SS	37
1.5			147	2	SS	40
			146			
3.0				3	SS	37
3.90			145			
	SILT TILL/SHALE COMPLEX: Hard, reddish brown silt till/shale, with particles of grey shale					
4.5			144	4	SS	75
5.10						
	SHALE: Weathered red shale		143			
6.0				5	SS	50 for 50 mm
6.15	BOREHOLE TERMINATED AT 6.15 m					

SHEAR STRENGTH C_u ▲ (50 100 150 200)
DYNAMIC CONE PENETRATION ×
STANDARD PENETRATION TEST ●
BLOWS/0.3M (20 40 60 80)

LIQUID LIMIT ____ W_L
PLASTIC LIMIT ____ W_P
WATER CONTENT ____ W
W_P W W_L
WATER CONTENT % (10 20 30)

GROUND WATER OBSERVATIONS AND REMARKS

Upon completion of augering, no free water, no cave.

NOTES

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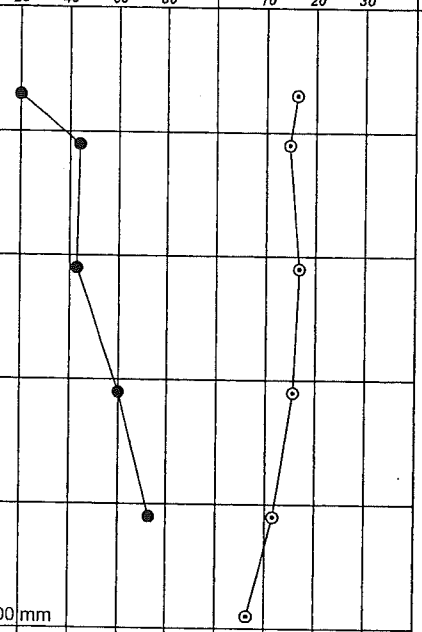
LOG OF BOREHOLE NO. 10

PROJECT EAGLE HEIGHTS AND TAYLOR PROPERTY
LOCATION Waterdown Road, Burlington, Ontario
BORING METHOD Continuous Flight Solid Stem Augers
BORING DATE 2002 12 18
OUR PROJECT NO. 02HF094
ENGINEER M. Anderson
TECHNICIAN M. Rapsey

DEPTH in METRES	DESCRIPTION	LEGEND	ELEVATION	SAMPLES NUMBER	SAMPLES TYPE	BLOWS/0.3m N - VALUES
	GROUND ELEVATION 144.60					
0.15	**TOPSOIL:** Dark brown silty clay, low organic		144			
	CLAY TILL: Very stiff to hard, brown silty clay, some sand, trace of gravel, low to medium plastic, D.T.P.L., with blueish grey fissures			1	SS	20
1.5			143	2	SS	44
			142			
3.0				3	SS	43
			141			
4.5			140	4	SS	60
5.40						
	SILT TILL/SHALE COMPLEX: Hard, reddish brown mottled grey silt/shale		139			
6.0				5	SS	73
6.60			138			
	SHALE: Weathered red shale					
7.5				6	SS	50 for 100 mm
7.70	BOREHOLE TERMINATED AT 7.70 m		137			

SHEAR STRENGTH C_u ▲ (50 100 150 200)
DYNAMIC CONE PENETRATION ×
STANDARD PENETRATION TEST ●
BLOWS/0.3M (20 40 60 80)

LIQUID LIMIT ____ W_L
PLASTIC LIMIT ____ W_P
WATER CONTENT ____ W
W_P W W_L
WATER CONTENT % (10 20 30)



GROUND WATER OBSERVATIONS AND REMARKS

Upon completion of augering, no free water, no cave.

NOTES

CHECKED BY

LOG OF BOREHOLE NO. 11

PROJECT EAGLE HEIGHTS AND TAYLOR PROPERTY
LOCATION Waterdown Road, Burlington, Ontario
BORING METHOD Continuous Flight Solid Stem Augers
BORING DATE 2002 12 20
OUR PROJECT NO. 02HF094
ENGINEER M. Anderson
TECHNICIAN M. Rapsey

DEPTH in METRES	DESCRIPTION	LEGEND	ELEVATION	SAMPLES NUMBER	SAMPLES TYPE	BLOWS/0.3m N - VALUES	GROUND WATER OBSERVATIONS AND REMARKS
	GROUND ELEVATION 151.20						
0.20	**TOPSOIL:** Dark brown clayey silt, low organic		151				
	CLAY TILL: Hard, brown silty clay, some sand, trace of gravel, low plastic, D.T.P.L., with thin silt partings		150	1	SS	36	
1.5				2	SS	63	
			149				
3.0			148	3	SS	61	
3.90							
	SHALE: Weathered red shale		147				
4.5 4.60				4	SS	50 for 60 mm	
	BOREHOLE TERMINATED AT 4.60 m						Upon completion of augering, no free water, no cave.

SHEAR STRENGTH C_u ▲ (50 100 150 200)
DYNAMIC CONE PENETRATION ×
STANDARD PENETRATION TEST ●
BLOWS/0.3M (20 40 60 80)

LIQUID LIMIT ____ W_L
PLASTIC LIMIT ____ W_P
WATER CONTENT ____ W
W_P W W_L
WATER CONTENT % (10 20 30)

NOTES

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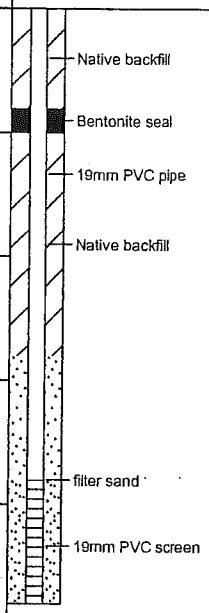
LOG OF BOREHOLE NO. 12

PROJECT EAGLE HEIGHTS AND TAYLOR PROPERTY
LOCATION Waterdown Road, Burlington, Ontario
BORING METHOD Continuous Flight Solid Stem Augers
BORING DATE 2003 01 10
OUR PROJECT NO. 02HF094
ENGINEER M. Anderson
TECHNICIAN A. Abbas

DEPTH in METRES	DESCRIPTION	LEGEND	ELEVATION	SAMPLES NUMBER	SAMPLES TYPE	BLOWS/0.3m N - VALUES
	GROUND ELEVATION 165.99					
0.20	**TOPSOIL:** Dark brown clayey silt, low organic					
	CLAY TILL: Hard to very stiff, brown silty clay, trace of sand and gravel, low to medium plastic, D.T.P.L.		165	1	SS	61
1.5				2	SS	55
			164			
3.0			163	3	SS	41
			162			
4.5				4	SS	27
			161			
6.0			160	5	SS	25
7.20			159			
7.5	**SAND AND SILT:** Compact, brown fine sand and silt, saturated, occasional thin lense of grey silty clay			6	SS	21
8.10	BOREHOLE TERMINATED AT 8.10 m		158			

SHEAR STRENGTH C_u ▲ (50 100 150 200)
DYNAMIC CONE PENETRATION ×
STANDARD PENETRATION TEST ●
BLOWS/0.3M (20 40 60 80)

LIQUID LIMIT W_L
PLASTIC LIMIT W_P
WATER CONTENT W
W_P W W_L
WATER CONTENT % (10 20 30)



GROUND WATER OBSERVATIONS AND REMARKS

Upon completion of augering, no free water, no cave.

Depth to water in piezometer measured on 2003 05 12 was 2.10 m.

NOTES

CHECKED BY

LOG OF BOREHOLE NO. 13

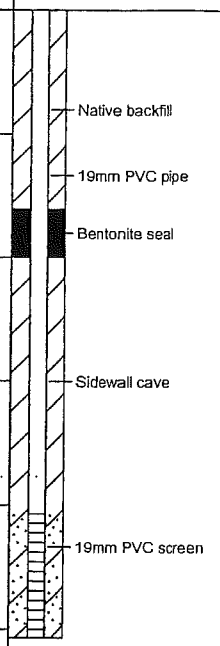
PROJECT EAGLE HEIGHTS AND TAYLOR PROPERTY
LOCATION Waterdown Road, Burlington, Ontario
BORING METHOD Continuous Flight Solid Stem Augers
BORING DATE 2002 12 19
OUR PROJECT NO. 02HF094
ENGINEER M. Anderson
TECHNICIAN M. Rapsey

DEPTH in METRES	DESCRIPTION	LEGEND	ELEVATION	NUMBER	TYPE	BLOWS/0.3m N - VALUES
	GROUND ELEVATION 178.10					
0.20	**TOPSOIL:** Dark brown clayey silt, low organic					
	SAND: Loose, reddish brown silty fine sand, damp		177	1	SS	4
1.5				2	SS	4
2.10			176			
	SILT: Loose, brown mottled rusty brown silt, some fine sand, moist, with layers of brown silty clay, medium plastic			3	SS	9
2.90						
3.0	**SILT AND SAND:** Loose to compact, brown silt and fine sand, saturated		175	4	SS	8
			174	5	SS	18
4.5				6	SS	17
5.60			173			
6.0	**CLAY TILL:** Stiff, grey silty clay, trace of sand and gravel, medium plastic, W.T.P.L.		172	7	SS	14
			171			
7.5						
8.10	BOREHOLE TERMINATED AT 8.10 m		170	8	SS	14

SHEAR STRENGTH C_u ▲ (50, 100, 150, 200)
DYNAMIC CONE PENETRATION ×
STANDARD PENETRATION TEST ●
BLOWS/0.3M (20, 40, 60, 80)

LIQUID LIMIT ____ W_L
PLASTIC LIMIT ____ W_P
WATER CONTENT ____ W
W_P W W_L
WATER CONTENT % (10, 20, 30)

GROUND WATER OBSERVATIONS AND REMARKS



Upon completion of augering, free water and cave at 3.10 m.

Depth to water in piezometer measured on 2003 05 12 was 3.00 m.

NOTES Ground surface elevation interpolated from contour plan.

CHECKED BY

LOG OF BOREHOLE NO. 14

PROJECT EAGLE HEIGHTS AND TAYLOR PROPERTY
LOCATION Waterdown Road, Burlington, Ontario
BORING METHOD Continuous Flight Solid Stem Augers
BORING DATE 2002 12 19
OUR PROJECT NO. 02HF094
ENGINEER M. Anderson
TECHNICIAN M. Rapsey

DEPTH in METRES	DESCRIPTION	LEGEND	ELEVATION	SAMPLES NUMBER	SAMPLES TYPE	BLOWS/0.3m N - VALUES
	GROUND ELEVATION 186.24					
0.20	**TOPSOIL:** Dark brown clayey silt, low organic		186			
	SAND: Loose, brown fine to medium sand, trace of silt, stratified, dry to damp		185	1	SS	6
1.5				2	SS	6
			184			
				3	SS	9
3.0			183	4	SS	9
3.90						
	becoming compact with occasional thin layers of silt		182			
4.5				5	SS	14
5.35			181			
	CLAY TILL: Hard, brown silty clay, some sand, trace of gravel, low plastic, D.T.P.L.					
6.0			180	6	SS	38
7.00						
	SAND: Dense, brown fine to coarse sand, some rounded gravel, some silt, wet		179			
7.5				7	SS	40
8.10	BOREHOLE TERMINATED AT 8.10 m					

SHEAR STRENGTH C_u ▲ (50 100 150 200)
DYNAMIC CONE PENETRATION ×
STANDARD PENETRATION TEST ●
BLOWS/0.3M (20 40 60 80)

LIQUID LIMIT W_L
PLASTIC LIMIT W_P
WATER CONTENT W
W_P W W_L
WATER CONTENT % (10 20 30)

GROUND WATER OBSERVATIONS AND REMARKS

Upon completion of augering, free water and cave at 7.00 m.

NOTES

CHECKED BY

LOG OF BOREHOLE NO. 15

PROJECT EAGLE HEIGHTS AND TAYLOR PROPERTY
LOCATION Waterdown Road, Burlington, Ontario
BORING METHOD Continuous Flight Solid Stem Augers
BORING DATE 2002 12 19
OUR PROJECT NO. 02HF094
ENGINEER M. Anderson
TECHNICIAN M. Rapsey

DEPTH in METRES	DESCRIPTION	LEGEND	ELEVATION	SAMPLES NUMBER	SAMPLES TYPE	BLOWS/0.3m N - VALUES
	GROUND ELEVATION 189.30					
0.20	**TOPSOIL:** Dark brown clayey silt, low organic		189			
0.90	**SILT:** Very soft, brown clayey sandy silt, slightly plastic, W.T.P.L.					
1.5 1.65	**SAND:** Loose, brown silty fine to coarse sand, trace of gravel and clay, wet		188	1	SS	6
				2	SS	7
	SILT TILL: Firm to hard, brown to grey clayey silt, some sand and gravel, slightly to low plastic, D.T.P.L.		187	3	SS	16
3.0			186	4	SS	34
4.5			185	5	SS	21
			184			
6.0			183	6	SS	17
7.00	BOREHOLE TERMINATED UPON REFUSAL TO AUGER AT 7.00 m. POSSIBLE BOULDER.					

SHEAR STRENGTH C_u ▲ (50 100 150 200)
DYNAMIC CONE PENETRATION ×
STANDARD PENETRATION TEST ●
BLOWS/0.3M (20 40 60 80)

LIQUID LIMIT ____ W_L
PLASTIC LIMIT ____ W_P
WATER CONTENT ____ W
W_P W W_L
WATER CONTENT % (10 20 30)

GROUND WATER OBSERVATIONS AND REMARKS

Upon completion of augering, no free water, no cave.

NOTES Ground surface elevation interpolated from contour plan.

CHECKED BY

LOG OF BOREHOLE NO. 16

PROJECT EAGLE HEIGHTS AND TAYLOR PROPERTY
LOCATION Waterdown Road, Burlington, Ontario
BORING METHOD Continuous Flight Solid Stem Augers

BORING DATE 2003 01 10

OUR PROJECT NO. 02HF094
ENGINEER M. Anderson
TECHNICIAN A. Abbas

DEPTH in METRES	DESCRIPTION	LEGEND	ELEVATION	SAMPLES NUMBER	SAMPLES TYPE	BLOWS/0.3m N - VALUES
	GROUND ELEVATION 140.54					
	TOPSOIL/FILL: Dark brown clayey silt, trace of sand, low organic, concrete chunk at 0.8 m.		140			
0.90						
	CLAY TILL: Very stiff to hard, brown silty clay, some sand and gravel, low plastic, D.T.P.L.		139	1	SS	18
1.5				2	SS	55
2.50			138			
3.0	**SILT TILL/SHALE COMPLEX:** Hard, reddish brown silt/shale, trace of gravel					
3.30				3	SS	72
	SHALE: Weathered red shale		137			
4.5			136	4	SS	50 for 100 mm
			135			
6.0				5	SS	50 for 75 mm
6.20	BOREHOLE TERMINATED AT 6.20 m					

SHEAR STRENGTH C_u ▲ (50 100 150 200)
DYNAMIC CONE PENETRATION ×
STANDARD PENETRATION TEST ●
BLOWS/0.3M (20 40 60 80)

LIQUID LIMIT ____ W_L
PLASTIC LIMIT ____ W_P
WATER CONTENT ____ W
W_P W W_L
WATER CONTENT % (10 20 30)

GROUND WATER OBSERVATIONS AND REMARKS

Upon completion of augering, no free water, no cave.

NOTES

CHECKED BY

LOG OF BOREHOLE NO. 17

PROJECT EAGLE HEIGHTS AND TAYLOR PROPERTY
LOCATION Waterdown Road, Burlington, Ontario
BORING METHOD Continuous Flight Solid Stem Augers

BORING DATE 2003 01 10

OUR PROJECT NO. 02HF094
ENGINEER M. Anderson
TECHNICIAN A. Abbas

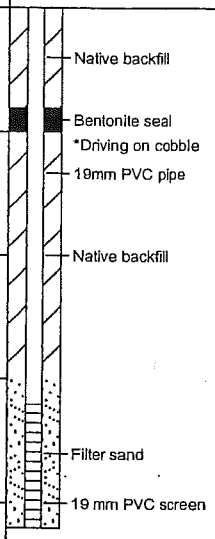
GROUND ELEVATION 139.12

DEPTH in METRES	DESCRIPTION	ELEVATION	NUMBER	TYPE	BLOWS/0.3m N - VALUES
0.20	**TOPSOIL:** Dark brown clayey silt, trace of sand, low organic				
	CLAY TILL: Hard, brown silty clay, some sand and gravel, low to medium plastic, D.T.P.L.	138	1	SS	35
1.5			2	SS	50 for 125 mm*
2.40		137			
	SILT TILL/SHALE COMPLEX: Hard, reddish brown silt/shale, trace of gravel	136	3	SS	55
3.0					
4.00					
	SHALE: Weathered red shale	135			
4.5			4	SS	50 for 75 mm
		134			
6.0			5	SS	50 for 75 mm
6.20		133			
	BOREHOLE TERMINATED AT 6.20 m				

SHEAR STRENGTH C_u ▲ (50 100 150 200)
DYNAMIC CONE PENETRATION ×
STANDARD PENETRATION TEST ●
BLOWS/0.3M (20 40 60 80)

LIQUID LIMIT ____ W_L
PLASTIC LIMIT ____ W_P
WATER CONTENT ____ W
W_P W W_L
WATER CONTENT % (10 20 30)

GROUND WATER OBSERVATIONS AND REMARKS



Upon completion of augering, free water encountered at 7.00 m, no cave.

Depth to water in piezometer measured on 2003 05 12 was 3.80 m.

NOTES

CHECKED BY

LOG OF BOREHOLE NO. 18

PROJECT EAGLE HEIGHTS AND TAYLOR PROPERTY
LOCATION Waterdown Road, Burlington, Ontario
BORING METHOD Continuous Flight Solid Stem Augers

BORING DATE 2003 01 10

OUR PROJECT NO. 02HF094
ENGINEER M. Anderson
TECHNICIAN M. Rapsey

DEPTH In METRES	DESCRIPTION	LEGEND	ELEVATION	SAMPLES NUMBER	SAMPLES TYPE	BLOWS/0.3m N - VALUES
	GROUND ELEVATION 141.22					
	SAND AND GRAVEL FILL: Grey crushed limestone		141			
0.70						
	TOPSOIL/FILL: Dark brown silty clay, some sand, trace of gravel, low organic, with decayed wood and roots		140	1	SS	34
1.5				2	SS	15
2.10			139			
	CLAY TILL: Hard, brown silty clay, some sand, trace of gravel, low plastic, D.T.P.L., blueish grey fissures			3	SS	50
3.0			138	4	SS	75
3.80	BOREHOLE TERMINATED UPON REFUSAL TO AUGER AT 3.80 m					

SHEAR STRENGTH C_u ▲ (50 100 150 200)
DYNAMIC CONE PENETRATION ×
STANDARD PENETRATION TEST ●
BLOWS/0.3M (20 40 60 80)

LIQUID LIMIT ____ W_L
PLASTIC LIMIT ____ W_P
WATER CONTENT ____ W
W_P W W_L
WATER CONTENT % (10 20 30)

GROUND WATER OBSERVATIONS AND REMARKS

Upon completion of augering, no free water, no cave.

NOTES

CHECKED BY

LOG OF BOREHOLE NO. 19

PROJECT EAGLE HEIGHTS AND TAYLOR PROPERTY
LOCATION Waterdown Road, Burlington, Ontario
BORING METHOD Continuous Flight Solid Stem Augers

BORING DATE 2003 01 13

OUR PROJECT NO. 02HF094
ENGINEER M. Anderson
TECHNICIAN M. Rapsey

DEPTH In METRES	DESCRIPTION	LEGEND	ELEVATION	SAMPLES NUMBER	SAMPLES TYPE	BLOWS/0.3m N - VALUES	GROUND WATER OBSERVATIONS AND REMARKS
	GROUND ELEVATION 136.26						
0.20	**TOPSOIL:** Dark brown clayey silt, low organic		136				
	CLAY TILL: Very stiff to hard, brown silty clay, some sand, trace of gravel, low plastic, D.T.P.L., fissured			1	SS	28	
1.40			135				
1.5	**SHALE:** Weathered red and grey shale			2	SS	88	
			134				
3.0 3.10				3	SS	50 for 100 mm	
	BOREHOLE TERMINATED AT 3.10 m						Upon completion of augering, no free water, no cave.

SHEAR STRENGTH C_u ▲ (50 100 150 200)
DYNAMIC CONE PENETRATION ×
STANDARD PENETRATION TEST ●
BLOWS/0.3M (20 40 60 80)

LIQUID LIMIT ____ W_L
PLASTIC LIMIT ____ W_P
WATER CONTENT ____ W
W_P W W_L
WATER CONTENT % (10 20 30)

NOTES

CHECKED BY MNA

LOG OF BOREHOLE NO. 20

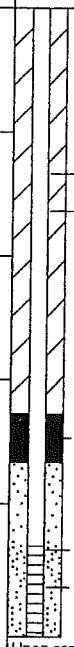
PROJECT EAGLE HEIGHTS AND TAYLOR PROPERTY
LOCATION Waterdown Road, Burlington, Ontario
BORING METHOD Continuous Flight Solid Stem Augers
BORING DATE 2003 01 13
OUR PROJECT NO. 02HF094
ENGINEER M. Anderson
TECHNICIAN M. Rapsey

DEPTH in METRES	DESCRIPTION	LEGEND	ELEVATION	SAMPLES NUMBER	SAMPLES TYPE	BLOWS/0.3m N - VALUES
	GROUND ELEVATION 125.39					
0.18	**TOPSOIL:** Dark brown clayey silt, low organic		125			
1.5	**CLAY TILL:** Very stiff to hard, brown silty clay, some sand, trace of gravel, low plastic, D.T.P.L., fissures infilled with silt		124	1	SS	26
				2	SS	45
2.70			123			
3.0	**SAND TILL/SHALE COMPLEX:** Very dense, reddish brown silty sand/shale, trace gravel		122	3	SS	50 for 100 mm
3.90	becoming a silt till/shale complex					
4.5			121	4	SS	100
5.40	**SHALE:** Weathered red shale		120			
6.0	6.20			5	SS	50 for 75 mm
	BOREHOLE TERMINATED AT 6.20 m					

SHEAR STRENGTH C_u ▲ (50 100 150 200)
DYNAMIC CONE PENETRATION ×
STANDARD PENETRATION TEST ●
BLOWS/0.3M (20 40 60 80)

LIQUID LIMIT ____ W_L
PLASTIC LIMIT ____ W_P
WATER CONTENT ____ W
W_P W W_L
WATER CONTENT % (10 20 30)

GROUND WATER OBSERVATIONS AND REMARKS



Upon completion of augering, no free water, no cave.

Depth to water in piezometer measured on 2003 05 12 was 0.90 m.

NOTES

CHECKED BY

LOG OF BOREHOLE NO. 21

PROJECT EAGLE HEIGHTS AND TAYLOR PROPERTY
LOCATION Waterdown Road, Burlington, Ontario
BORING METHOD Continuous Flight Solid Stem Augers

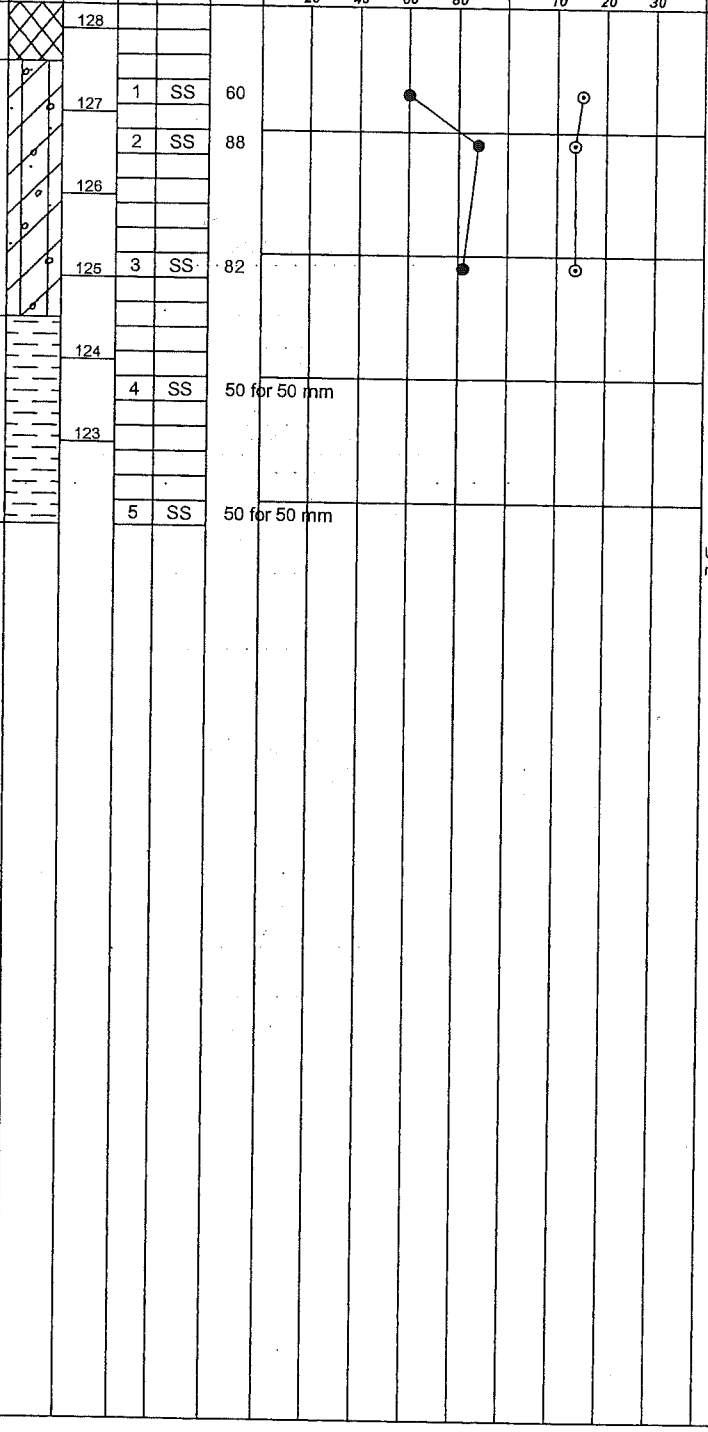
BORING DATE 2003 01 10

OUR PROJECT NO. 02HF094
ENGINEER M. Anderson
TECHNICIAN M. Rapsey

DEPTH in METRES	DESCRIPTION	LEGEND	ELEVATION	SAMPLES NUMBER	SAMPLES TYPE	BLOWS/0.3m N - VALUES	GROUND WATER OBSERVATIONS AND REMARKS
	GROUND ELEVATION 128.30						
	SAND AND GRAVEL FILL: Grey crushed limestone		128				
0.70							
	CLAY TILL: Hard, brown silty clay, some sand, low plastic, D.T.P.L., with blueish grey fissures		127	1	SS	60	
1.5				2	SS	88	
			126				
3.0							
			125	3	SS	82	
3.80							
	SHALE: Weathered red shale		124				
4.5				4	SS	50 for 50 mm	
			123				
6.0							
6.30				5	SS	50 for 50 mm	
	BOREHOLE TERMINATED AT 6.30 m						Upon completion of augering, no free water, no cave.

SHEAR STRENGTH C_u ▲ (50 100 150 200)
DYNAMIC CONE PENETRATION ×
STANDARD PENETRATION TEST ●
BLOWS/0.3M (20 40 60 80)

LIQUID LIMIT W_L
PLASTIC LIMIT W_P
WATER CONTENT W
W_P — W — W_L
WATER CONTENT % (10 20 30)

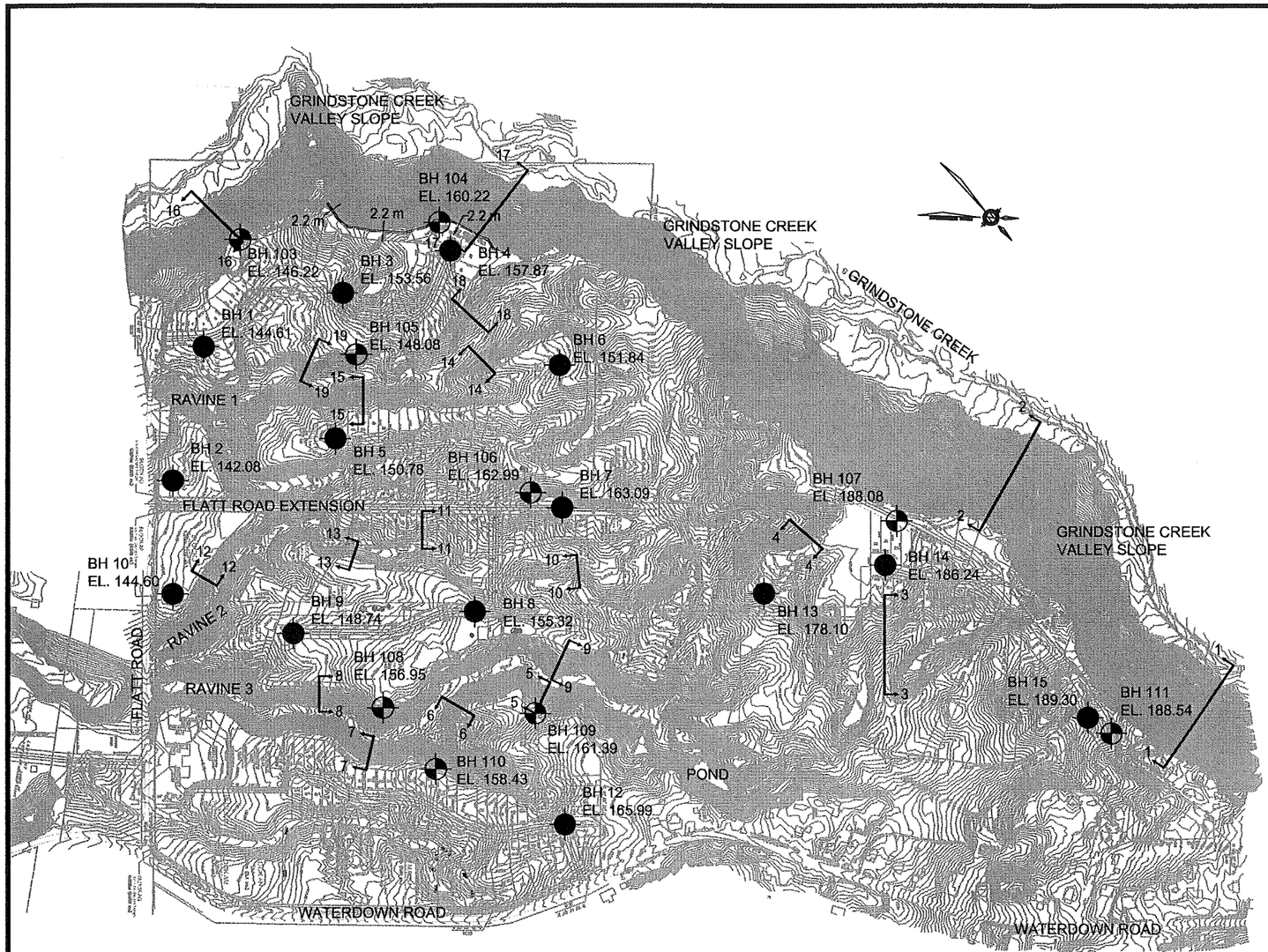


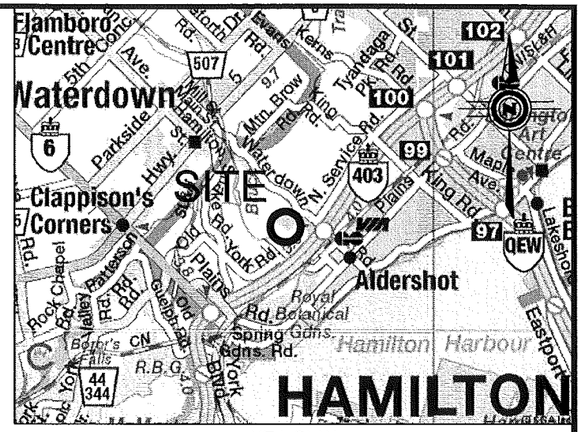
NOTES

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Appendix 2.

2006 Peto MacCallum Borehole Logs and Borehole Location Map





KEY PLAN
BURLINGTON, ONTARIO

LEGEND:

- BOREHOLES DRILLED FOR CURRENT STUDY
- BOREHOLES DRILLED FOR 2002 STUDY
- 3 / 3 CROSS-SECTION (TYPICAL)
- STABLE SLOPE LINE
- APPROVED TOP OF BANK

STABLE TOP OF SLOPE IS APPROVED TOP OF BANK EXCEPT AT LOCATIONS DEFINED BY STABLE SLOPE LINE.

STABLE TOP OF SLOPE WAS DEFINED BY 1) OR 2) WHICHEVER IS GREATER OR 3) IF APPLICABLE:

1) STABLE SLOPE ANGLE AND EROSION ALLOWANCE

	SOIL	SHALE BEDROCK
SLOPE INCLINATION	2h:1V	1.25h:1V
EROSION ALLOWANCE*	GRINDSTONE CREEK 6 m	GRINDSTONE CREEK 3 m
	RAVINE CREEKS 3 m	RAVINE CREEKS 1.5 m

*WHERE CREEK IS SITUATED LESS THAN THE NOTED DISTANCE FROM THE TOE OF SLOPE

2) PHYSICAL TOP OF SLOPE UNLESS CONDITION 3 APPLIES

3) EXISTING SLOPE INCLINATION LESS THAN 3h:1V IN SOIL AND 1.5h:1V IN BEDROCK

2h:1V DENOTES SLOPE ANGLE (2 HORIZONTAL TO 1 VERTICAL)

2.2 m DENOTES DISTANCE BETWEEN APPROVED TOP OF BANK AND STABLE TOP OF SLOPE

REFERENCE:

PLAN PRODUCED FROM AN UNTITLED AND UNDATED SITE PLAN, DRAWN AND PROVIDED BY METROPOLITAN CONSULTING INC. IN AN EMAIL DATED JUNE 22, 2006.

NOTES:

1) REFER TO DRAWINGS E-1 TO E-19 FOR CROSS-SECTIONS.
2) GROUND SURFACE ELEVATIONS AT THE BOREHOLES PROVIDED BY METROPOLITAN CONSULTING INC.
3) THE INFERRED STRATIGRAPHY REFERRED TO IN THE REPORT IS BASED ON DATA FROM THESE BOREHOLES, SUPPLEMENTED BY GEOLOGIC EVIDENCE. THE ACTUAL STRATIGRAPHY MAY VARY FROM THAT SHOWN, AT OTHER POINTS BETWEEN THE BORINGS.

EAGLE HEIGHTS PROPERTY

REFER TO DRAWINGS 2A TO 2L FOR 1:500 SCALE MAPPING AND 2-2 FOR 1:500 SCALE MAPPING REFERENCE PLAN

PALETTA INTERNATIONAL CORPORATION

EAGLE HEIGHTS PROPERTY
Waterdown Road, Burlington, Ontario

BOREHOLE AND CROSS-SECTION LOCATION PLAN

Peto MacCallum Ltd.
CONSULTING ENGINEERS

		DATE	SCALE	PML REF.	DRAWING NO.
DRAWN	PL	2006-07	1:7500	05HF073	2-1
CHECKED	PL				
APPROVED	DK				

Peto MacCallum Ltd.
CONSULTING ENGINEERS

LOG OF BOREHOLE NO. 101

PROJECT Eagle Heights and Taylor Property
OUR PROJECT NO. 05HF073
LOCATION Waterdown Road, Burlington, Ontario
BORING DATE 2006 01 13
ENGINEER P. Lyall
BORING METHOD Continuous Flight Solid Stem Augers
TECHNICIAN M. Rapsey

DEPTH in METRES	DESCRIPTION	LEGEND	ELEVATION	NUMBER	TYPE	BLOWS/0.3m N - VALUES
	GROUND ELEVATION 129.04					
0.15	**TOPSOIL:** Brown silty clay, low organic					
	CLAY TILL: Very stiff to hard, brown silty clay, some sand, trace of gravel, low plastic, D.T.P.L., with occasional fissures filled with rootlets		128	1	SS	27
1.5				2	SS	48
			127			
2.45				3	SS	65
2.90	**SILT TILL/SHALE COMPLEX:** Hard, reddish brown clayey silt till/shale complex			4	SS	50/25mm
3.0 3.10			126			
	SHALE: Weathered grey shale					
	BOREHOLE TERMINATED AT 3.10 m					

SHEAR STRENGTH C_u (kPa) ▲ 50 100 150 200 ■
DYNAMIC CONE PENETRATION ×
STANDARD PENETRATION TEST ●
BLOWS/0.3M 20 40 60 80

LIQUID LIMIT ____ W_L
PLASTIC LIMIT ____ W_P
WATER CONTENT ____ W
W_P W W_L
WATER CONTENT % 10 20 30

GROUND WATER OBSERVATIONS AND REMARKS

bentonite seal
native backfill
filter sand
0.90 m slotted

Upon completion of augering, no free water, no cave. Installed 19 mm piezometer at 3.10 m.

Measured Water Levels:

Date	Depth (m)
2006 01 20	dry
2006 04 17	0.40

NOTES

CHECKED BY PL

Peto MacCallum Ltd.
CONSULTING ENGINEERS

LOG OF BOREHOLE NO. 102

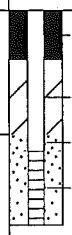
PROJECT Eagle Heights and Taylor Property
OUR PROJECT NO. 05HF073
LOCATION Waterdown Road, Burlington, Ontario
BORING DATE 2006 01 13
ENGINEER P. Lyall
BORING METHOD Continuous Flight Solid Stem Augers
TECHNICIAN M. Rapsey

DEPTH in METRES	DESCRIPTION	LEGEND	ELEVATION	SAMPLES NUMBER	SAMPLES TYPE	BLOWS/0.3m N - VALUES
	GROUND ELEVATION 136.69					
0.15	**TOPSOIL:** Brown silty clay, low organic					
	SILT TILL/SHALE COMPLEX:		136			
1.35	Compact, reddish brown silt till/shale complex			1	SS	26
1.5	**SHALE:** Weathered red and grey shale		135	2	SS	50
2.00	BOREHOLE TERMINATED AT 2.00 m					

SHEAR STRENGTH C_u (kPa) ▲ ■ (50 100 150 200)
DYNAMIC CONE PENETRATION ×
STANDARD PENETRATION TEST ●
BLOWS/0.3M (20 40 60 80)

LIQUID LIMIT ____ W_L
PLASTIC LIMIT ____ W_P
WATER CONTENT ____ W
W_P W W_L
WATER CONTENT % (10 20 30)

GROUND WATER OBSERVATIONS AND REMARKS



Upon completion of augering, no free water, no cave. Power augered and installed 19 mm piezometer at 2.60 m.

Measured Water Levels:

Date	Depth (m)
2006 01 20	dry
2006 04 17	2.55

NOTES

CHECKED BY PL

Peto MacCallum Ltd.
CONSULTING ENGINEERS

LOG OF BOREHOLE NO. 103

PROJECT Eagle Heights and Taylor Property
OUR PROJECT NO. 05HF073
LOCATION Waterdown Road, Burlington, Ontario
BORING DATE 2006 01 09
ENGINEER P. Lyall
BORING METHOD Continuous Flight Hollow Stem Augers
TECHNICIAN M. Rapsey

DEPTH in METRES	DESCRIPTION	LEGEND	ELEVATION	NUMBER	TYPE	BLOWS/0.3m N - VALUES
	GROUND ELEVATION 146.22					
0.15	**TOPSOIL:** Dark brown silty sand topsoil, low organic		146			
	LAYERED SILTS AND SANDS: Layers of firm to very stiff reddish brown clayey silt, slightly plastic, A.P.L., and of loose to compact brown silty fine sand, dry to damp		145	1	SS	6
1.5						
1.80				2	SS	36
	CLAY TILL: Very stiff to hard, brown silty clay, some sand, low plastic, D.T.P.L. to A.P.L. with blueish grey fissures		144			
3.0			143	3	SS	23
			142			
4.5				4	SS	35
			141			
6.0			140	5	SS	62
6.90						
	SILT TILL: Very dense, reddish brown silt, some sand, trace of clay, trace of gravel, non-plastic, damp, with occasional small particles of grey shale		139			
7.5				6	SS	50/150mm
			138			
9.0			137	7	SS	50/150mm
			136			
10.5						
11.30			135			
	SHALE: Weathered red and grey shale					
12.0			134	8	SS	50/75mm
			133			
13.5						
13.80				9	SS	50/100mm
	BOREHOLE TERMINATED AT 13.80 m					

SHEAR STRENGTH C_u (kPa) ▲ 50 100 150 200 ■
DYNAMIC CONE PENETRATION ×
STANDARD PENETRATION TEST ●
BLOWS/0.3M 20 40 60 80

LIQUID LIMIT ____ W_L
PLASTIC LIMIT ____ W_P
WATER CONTENT ____ W
W_P W W_L
WATER CONTENT % 10 20 30

GROUND WATER OBSERVATIONS AND REMARKS

bentonite seal
native backfill
filter sand
0.90 m slotted

Upon completion of augering, no free water, no cave. Installed 19 mm piezometer at 13.80 m.

Measured Water Levels:

Date	Depth (m)
2006 01 20	11.95
2006 04 17	10.35

NOTES

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CONSULTING ENGINEERS

LOG OF BOREHOLE NO. 104

PROJECT Eagle Heights and Taylor Property
LOCATION Waterdown Road, Burlington, Ontario
BORING METHOD Continuous Flight Solid Stem Augers
BORING DATE 2006 01 10
OUR PROJECT NO. 05HF073
ENGINEER P. Lyall
TECHNICIAN M. Rapsey

GROUND ELEVATION 160.22

DEPTH In METRES	DESCRIPTION	ELEVATION	NUMBER	TYPE	BLOWS/0.3m N - VALUES
0.25	**TOPSOIL:** Dark brown sandy silt, low organic	160			
	SAND: Loose to compact, brown fine to coarse sand, some silt, some gravel, damp to dry	159	1	SS	6
1.5			2	SS	14
		158	3	SS	16
2.90					
3.0	**SILT AND SAND:** Compact, brown to light brown, fine sand and silt, dry	157	4	SS	14
4.00					
	SILT: Compact, brown silt, some fine sand, damp	156			
4.5			5	SS	11
4.70	becoming wet				
4.90	**CLAY TILL:** Stiff, brown silty clay, some sand, low plastic, A.P.L.	155			
5.55	becoming very stiff				
6.0		154	6	SS	23
7.10		153			
7.5	becoming low to medium plastic, W.T.P.L.		7	SS	18
8.00		152			
	becoming grey, with lenses of wet silt				
9.0		151	8	SS	22
		150			
10.5			9	SS	21
		149			
12.0		148	10	SS	11
		147			
13.5					
14.30		146			
	SILT TILL/SHALE COMPLEX: Very dense, reddish brown silt till/shale complex				
15.0		145	11	SS	50/100mm
		144			
16.5					
16.90					

SHEAR STRENGTH C_u (kPa) ▲ ■ (50 100 150 200)
DYNAMIC CONE PENETRATION ×
STANDARD PENETRATION TEST ●
BLOWS/0.3M (20 40 60 80)

LIQUID LIMIT ____ W_L
PLASTIC LIMIT ____ W_P
WATER CONTENT ____ W
W_P W W_L
WATER CONTENT % (10 20 30)

GROUND WATER OBSERVATIONS AND REMARKS

bentonite seal
native backfill
filter sand
0.90 m slotted
bentonite seal
native backfill
filter sand

NOTES

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LOG OF BOREHOLE 05HF073.GPJ PETOMAC.GDT 2006 07 07

Peto MacCallum Ltd.
CONSULTING ENGINEERS

LOG OF BOREHOLE NO. 104 (continued)

PROJECT Eagle Heights and Taylor Property
OUR PROJECT NO. 05HF073
LOCATION Waterdown Road, Burlington, Ontario
BORING DATE 2006 01 10
ENGINEER P. Lyall
BORING METHOD Continuous Flight Solid Stem Augers
TECHNICIAN M. Rapsey

DEPTH In METRES	DESCRIPTION	LEGEND	ELEVATION	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS/0.3m N - VALUES	SHEAR STRENGTH C_u (kPa) 50 100 150 200 ▲ ■ / DYNAMIC CONE PENETRATION × / STANDARD PENETRATION TEST ● / BLOWS/0.3M 20 40 60 80	LIQUID LIMIT W_L / PLASTIC LIMIT W_P / WATER CONTENT W / W_P W W_L / WATER CONTENT % 10 20 30	GROUND WATER OBSERVATIONS AND REMARKS
	CONTINUED FROM PREVIOUS PAGE								
	SHALE: Weathered red shale, with a thin layer of gypsum *(continued)*								
18.0									0.90 m slotted
18.35			142	12	SS	50/75mm			
	BOREHOLE TERMINATED AT 18.35 m								

Upon completion of augering, no free water, no cave. Installed 19 mm piezometer at 18.35 m.

Measured Water Levels:

Date	Depth (m)
2006 01 20	dry (shallow)
2006 01 20	16.90 (deep)
2006 04 17	4.90 (shallow)
2006 04 17	12.05 (deep)

NOTES

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CONSULTING ENGINEERS

LOG OF BOREHOLE NO. 105

PROJECT Eagle Heights and Taylor Property
OUR PROJECT NO. 05HF073
LOCATION Waterdown Road, Burlington, Ontario
BORING DATE 2006 01 11
ENGINEER P. Lyall
BORING METHOD Continuous Flight Solid Stem Augers
TECHNICIAN M. Rapsey

DEPTH in METRES	DESCRIPTION	LEGEND	ELEVATION	SAMPLES NUMBER	SAMPLES TYPE	BLOWS/0.3m N - VALUES
	GROUND ELEVATION 148.08					
0.15	**TOPSOIL:** Brown clayey silt topsoil, low organic					
	CLAY TILL: Firm, reddish brown silty clay, low plastic W.T.P.L., with particles of red and grey shale		147	1	SS	7
1.35						
1.5	**SILT TILL/SHALE COMPLEX:** Hard, reddish brown clayey silt till/shale complex		146	2	SS	39
2.50						
	SHALE: Weathered red shale		145	3	SS	50/125mm
3.0						
3.30	BOREHOLE TERMINATED AT 3.30 m					

SHEAR STRENGTH C_u (kPa) ▲ ■ (50 100 150 200)
DYNAMIC CONE PENETRATION ×
STANDARD PENETRATION TEST ●
BLOWS/0.3M (20 40 60 80)

LIQUID LIMIT ____ W_L
PLASTIC LIMIT ____ W_P
WATER CONTENT ____ W
W_P W W_L
WATER CONTENT % (10 20 30)

GROUND WATER OBSERVATIONS AND REMARKS

bentonite seal
filter sand
0.90 m slotted

Upon completion of augering, no free water, no cave. Installed 19 mm piezometer at 3.30 m.

Measured Water Levels:

Date	Depth (m)
2006 01 20	2.70
2006 04 17	2.65

NOTES

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CONSULTING ENGINEERS

LOG OF BOREHOLE NO. 106

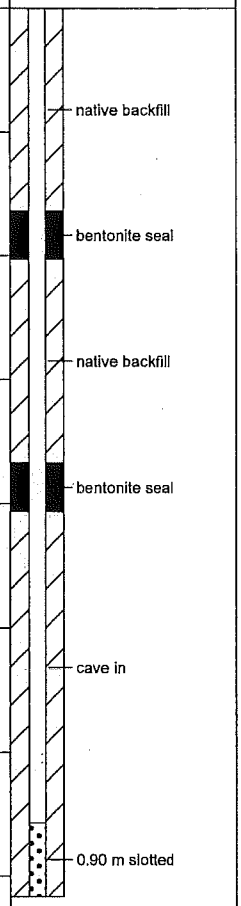
PROJECT Eagle Heights and Taylor Property
LOCATION Waterdown Road, Burlington, Ontario
BORING METHOD Continuous Flight Solid Stem Augers
BORING DATE 2006 01 13
OUR PROJECT NO. 05HF073
ENGINEER P. Lyall
TECHNICIAN M. Rapsey

DEPTH in METRES	DESCRIPTION	LEGEND	ELEVATION	NUMBER	TYPE	BLOWS/0.3m N - VALUES
	GROUND ELEVATION 162.99					
0.20	**TOPSOIL:** Dark brown sandy silt, low organic					
	SAND: Compact, brown fine sand, some silt, damp		162	1	SS	12
1.5				2	SS	10
2.15	**CLAY TILL:** Hard, brown silty clay, low plastic, D.T.P.L., with thin partings of silt		161			
				3	SS	40
3.0			160	4	SS	32
4.05	**LAYERED SILTS AND CLAYS:** Layers of very stiff grey silty clay, medium plastic W.T.P.L., and of compact brown sandy silt, moist		159			
4.5				5	SS	21
5.55	becoming predominantly silt, saturated		158			
6.0			157	6	SS	23
7.5			156	7	SS	18
			155			
9.0			154	8	SS	53
9.45	**CLAY TILL:** Hard, grey silty clay, some sand and gravel, low plastic, D.T.P.L.					
9.90	**SHALE:** Weathered red shale		153	9	SS	60/75mm
10.5						
10.75	BOREHOLE TERMINATED AT 10.75 m					

SHEAR STRENGTH C_u (kPa) ▲ 50 100 150 200 ■
DYNAMIC CONE PENETRATION ×
STANDARD PENETRATION TEST ●
BLOWS/0.3M 20 40 60 80

LIQUID LIMIT ____ W_L
PLASTIC LIMIT ____ W_P
WATER CONTENT ____ W
W_P W W_L
WATER CONTENT % 10 20 30

GROUND WATER OBSERVATIONS AND REMARKS



Upon completion of augering, no free water, cave at 6.10 m. Installed 19 mm piezometer at 10.75 m.

Measured Water Levels:

Date	Depth (m)
2006 01 20	7.50
2006 04 17	5.00

NOTES

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Peto MacCallum Ltd.
CONSULTING ENGINEERS

LOG OF BOREHOLE NO. 107

PROJECT Eagle Heights and Taylor Property
LOCATION Waterdown Road, Burlington, Ontario
BORING METHOD Continuous Flight Solid Stem Augers
BORING DATE 2006 01 11
OUR PROJECT NO. 05HF073
ENGINEER P. Lyall
TECHNICIAN M. Rapsey

GROUND ELEVATION 188.08

DEPTH in METRES	DESCRIPTION	ELEVATION	NUMBER	TYPE	BLOWS/0.3m N - VALUES
0.25	**TOPSOIL:** Dark brown sandy silt, low organic				
1.00	**SILT:** Loose, reddish brown fine sandy silt, trace of clay moist	187	1	SS	13
1.5	**SAND:** Compact, light brown fine sand, some silt, trace of clay, moist				
2.15	becoming stratified	186	2	SS	17
			3	SS	14
3.0		185	4	SS	12
		184			
4.5			5	SS	16
5.55	becoming light brownish grey	183			
6.0		182	6	SS	21
		181			
7.5			7	SS	32
8.85		180			
9.0	**LAYERED SANDS, SILTS, AND CLAYS:** Layers of dense to very dense, brown silt, trace of sand, and brown silty fine to coarse sand, some gravel, moist to wet, and of hard brown silty clay, trace of sand, low plastic, W.T.P.L.	179	8	SS	48
		178			
10.5			9	SS	50/150mm
11.65		177			
12.0	**CLAY TILL:** Hard, grey silty clay, some sand and gravel, low plastic, D.T.P.L.	176	10	SS	50/125mm
		175			
13.5		174			
15.0		173	11	SS	33
		172			
16.5		171			

SHEAR STRENGTH C_u (kPa) ▲ ■ (50 100 150 200)
DYNAMIC CONE PENETRATION ×
STANDARD PENETRATION TEST ●
BLOWS/0.3M (20 40 60 80)

LIQUID LIMIT ____ W_L
PLASTIC LIMIT ____ W_P
WATER CONTENT ____ W
W_P W W_L
WATER CONTENT % (10 20 30)

GROUND WATER OBSERVATIONS AND REMARKS

native backfill
bentonite seal
native backfill
0.90 m slotted

NOTES

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Peto MacCallum Ltd.
CONSULTING ENGINEERS

LOG OF BOREHOLE NO. 107 (continued)

PROJECT Eagle Heights and Taylor Property
OUR PROJECT NO. 05HF073
LOCATION Waterdown Road, Burlington, Ontario
BORING DATE 2006 01 11
ENGINEER P. Lyall
BORING METHOD Continuous Flight Solid Stem Augers
TECHNICIAN M. Rapsey

DEPTH in METRES	DESCRIPTION	LEGEND	ELEVATION	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES BLOWS/0.3m N - VALUES	SHEAR STRENGTH C_u (kPa) 50 100 150 200 / DYNAMIC CONE PENETRATION / STANDARD PENETRATION TEST / BLOWS/0.3M 20 40 60 80	LIQUID LIMIT W_L / PLASTIC LIMIT W_P / WATER CONTENT W / WATER CONTENT % 10 20 30	GROUND WATER OBSERVATIONS AND REMARKS
	CONTINUED FROM PREVIOUS PAGE								
	CLAY TILL: Hard, grey silty clay, some sand and gravel, low plastic, D.T.P.L. *(continued)*								
18.0			170	12	SS	53			
			169						
19.5			168						
21.0			167	13	SS	58			
			166						
22.5			165						
	23.10								
	SILT TILL: Hard, reddish brown clayey silt, some sand and gravel, slightly plastic D.T.P.L.								
24.0			164	14	SS	60/125mm			
			163						
25.5			162						
27.0	27.15		161	15	SS	60/75mm			
	27.50 **SHALE:** Weathered red shale								
	BOREHOLE TERMINATED AT 27.50 m								

Free water encountered at 11.15 m during augering.

Upon completion of augering, cave at 8.85 m. Installed 19 mm piezometer at 11.75 m adjacent to borehole location.

Measured Water Levels:

Date	Depth (m)
2006 01 20	9.85
2006 04 17	9.65

NOTES

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Peto MacCallum Ltd.
CONSULTING ENGINEERS

LOG OF BOREHOLE NO. 108

PROJECT Eagle Heights and Taylor Property
LOCATION Waterdown Road, Burlington, Ontario
BORING METHOD Continuous Flight Solid Stem Augers
BORING DATE 2006 01 12
OUR PROJECT NO. 05HF073
ENGINEER P. Lyall
TECHNICIAN M. Rapsey

GROUND ELEVATION 156.95

DEPTH in METRES	DESCRIPTION	ELEVATION	NUMBER	TYPE	BLOWS/0.3m N - VALUES
0.15	**TOPSOIL:** Brown silty clay, low organic				
	CLAY TILL: Hard, brown silty clay, some sand, trace of gravel, low plastic D.T.P.L., with fissures infilled with silt	156	1	SS	31
1.5		155	2	SS	45
3.0		154	3	SS	38
		153			
4.5			4	SS	65
4.90	**SILT TILL/SHALE COMPLEX:** Very dense, reddish brown silt till/shale complex	152			
5.55					
6.0 6.15	**SHALE:** Weathered red shale	151	5	SS	60/50mm
	BOREHOLE TERMINATED AT 6.15 m				

SHEAR STRENGTH C_u (kPa) ▲ 50 100 150 200 ■
DYNAMIC CONE PENETRATION ×
STANDARD PENETRATION TEST ●
BLOWS/0.3M 20 40 60 80

LIQUID LIMIT ____ W_L
PLASTIC LIMIT ____ W_P
WATER CONTENT ____ W
W_P W W_L
WATER CONTENT % 10 20 30

GROUND WATER OBSERVATIONS AND REMARKS

bentonite seal
native backfill
filter sand
0.90 m slotted

Upon completion of augering, no free water, no cave. Installed 19 mm piezometer at 6.15 m.

Measured Water Levels:

Date	Depth (m)
2006 01 20	3.60
2006 04 17	1.40

NOTES

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Peto MacCallum Ltd.
CONSULTING ENGINEERS

LOG OF BOREHOLE NO. 109

PROJECT Eagle Heights and Taylor Property
LOCATION Waterdown Road, Burlington, Ontario
BORING METHOD Continuous Flight Solid Stem Augers
BORING DATE 2006 01 12
OUR PROJECT NO. 05HF073
ENGINEER P. Lyall
TECHNICIAN M. Rapsey

DEPTH in METRES	DESCRIPTION (GROUND ELEVATION 161.39)	LEGEND	ELEVATION	NUMBER	TYPE	BLOWS/0.3m N - VALUES	GROUND WATER OBSERVATIONS AND REMARKS
0.15	**TOPSOIL:** Brown silty clay, low organic		161				native backfill
	CLAY TILL: Hard, brown silty clay, some sand and gravel, low plastic, D.T.P.L., with occasional fissures infilled with silt			1	SS	34	bentonite seal
1.5			160	2	SS	36	
2.50	with fissures infilled with rootlets		159				
3.0				3	SS	35	
4.05	becoming very stiff, with oxidized stains		158				native backfill
4.5			157	4	SS	16	
5.55	**CLAY:** Stiff, grey silty clay, medium plastic, W.T.P.L. with layers of brown fine to coarse sandy silt, some clay, and of brown silt, wet		156				
6.0			155	5	SS	11	filter sand
7.10	**SHALE:** Weathered red shale		154	6	SS	50/75mm	0.90 m slotted
7.5 7.70	BOREHOLE TERMINATED AT 7.70 m						

SHEAR STRENGTH C_u (kPa) ▲ 50 100 150 200 ■
DYNAMIC CONE PENETRATION ×
STANDARD PENETRATION TEST ●
BLOWS/0.3M 20 40 60 80

LIQUID LIMIT ____ W_L
PLASTIC LIMIT ____ W_P
WATER CONTENT ____ W
W_P W W_L
WATER CONTENT % 10 20 30

Upon completion of augering, no free water, no cave. Installed 19 mm piezometer at 7.70 m.

Measured Water Levels:

Date	Depth (m)
2006 01 20	2.20
2006 04 17	2.00

NOTES

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CONSULTING ENGINEERS

LOG OF BOREHOLE NO. 110

PROJECT Eagle Heights and Taylor Property
LOCATION Waterdown Road, Burlington, Ontario
BORING METHOD Continuous Flight Solid Stem Augers
BORING DATE 2006 01 12
OUR PROJECT NO. 05HF073
ENGINEER P. Lyall
TECHNICIAN M. Rapsey

GROUND ELEVATION 158.43

DEPTH in METRES	DESCRIPTION	ELEVATION	NUMBER	TYPE	BLOWS/0.3m N - VALUES
0.15	**TOPSOIL:** Brown silty clay, low organic	158			
	CLAY TILL: Hard, brown silty clay, some sand, trace of gravel, low plastic D.T.P.L.		1	SS	30
1.5		157	2	SS	40
		156	3	SS	32
3.0			4	SS	46
4.05	becoming very stiff	155			
4.5		154	5	SS	27
		153			
6.0 6.15	**SILT TILL/SHALE COMPLEX:** Very dense, reddish brown silt till/shale complex	152	6	SS	50/150mm
7.10	**SHALE:** Weathered red shale, with layers of grey shale	151			
7.5 7.90	BOREHOLE TERMINATED AT 7.90 m		7	SS	50/100mm

SHEAR STRENGTH C_u (kPa) ▲ 50 100 150 200 ■
DYNAMIC CONE PENETRATION ×
STANDARD PENETRATION TEST ●
BLOWS/0.3M 20 40 60 80

LIQUID LIMIT ____ W_L
PLASTIC LIMIT ____ W_P
WATER CONTENT ____ W
W_P W W_L
WATER CONTENT % 10 20 30

GROUND WATER OBSERVATIONS AND REMARKS

native backfill
bentonite seal
native backfill
filter sand
0.90 m slotted

Upon completion of augering, no free water, no cave. Installed 19 mm piezometer at 7.90 m.

Measured Water Levels:

Date	Depth (m)
2006 01 20	1.55
2006 04 17	1.70

NOTES

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Peto MacCallum Ltd.
CONSULTING ENGINEERS

LOG OF BOREHOLE NO. 111

PROJECT Eagle Heights and Taylor Property
LOCATION Waterdown Road, Burlington, Ontario
BORING METHOD Continuous Flight Solid Stem Augers
BORING DATE 2006 01 11
OUR PROJECT NO. 05HF073
ENGINEER P. Lyall
TECHNICIAN M. Rapsey

GROUND ELEVATION 188.54

DEPTH in METRES	DESCRIPTION	ELEVATION
0.15	**TOPSOIL:** Dark brown sandy silt, low organic	188
	CLAY TILL: Very stiff, brown silty clay, some sand and gravel, low plastic, D.T.P.L., with particles of shale	
1.35	becoming hard	187
1.5		
		186
3.0		
		185
4.5		184
5.55	becoming very stiff, grey, A.P.L.	183
6.0		
		182
7.10	becoming D.T.P.L.	
7.5		181
8.60	**SILT TILL:** Hard, reddish brown clayey silt, some sand and gravel, slightly to low plastic, D.T.P.L.	180
9.0		
		179
10.05	**SHALE:** Weathered red shale	
10.5		178
		177
12.0		
12.25	BOREHOLE TERMINATED AT 12.25 m	

NUMBER	TYPE	BLOWS/0.3m N - VALUES
1	SS	15
2	SS	49
3	SS	39
4	SS	51
5	SS	23
6	SS	27
7	SS	68
8	SS	50/50mm

SHEAR STRENGTH C_u (kPa) ▲ ■ (50, 100, 150, 200)
DYNAMIC CONE PENETRATION ×
STANDARD PENETRATION TEST ●
BLOWS/0.3M (20, 40, 60, 80)

LIQUID LIMIT ____ W_L
PLASTIC LIMIT ____ W_P
WATER CONTENT ____ W
W_P W W_L
WATER CONTENT % (10, 20, 30)

GROUND WATER OBSERVATIONS AND REMARKS

bentonite seal
native backfill
filter sand
0.90 m slotted

Upon completion of augering, no free water, no cave. Installed 19 mm piezometer at 12.25 m.

Measured Water Levels:

Date	Depth (m)
2006 01 20	dry
2006 04 17	3.90

NOTES

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Appendix 3.

2017 Soil Mat Borehole Logs and Borehole Location Map



LEGEND

Borehole Location (BH#)

Slope Profile

NOTES

1. This drawing should be read in conjunction with Soil-Mat Engineers & Consultants Ltd. Report No. SM 167182-G.

2. Borehole and Slope Profile locations are approximate.

3. Creek Locations superimposed on aerial image.

SOIL-MAT

ENGINEERS & CONSULTANTS LTD.

Slope Stability Assessment
Proposed Residential Development
Eagle Heights, Waterdown Road
Burlington, Ontario

Borehole and Slope Profile Location Plan

Project No. SM 167182-G

Date: February 2017

Drawn: ML	Checked: IS

SM 167182-G Borehole Location Plan.vsdx

Drawing No. 1

Project No: SM 167182-G

Project: Eagle Heights and Taylor Property

Location: Waterdown Road, Burlington, ON

Client: Metropolitan Consulting Inc.

Log of Borehole No. 1

Project Manager: Ian Shaw, P. Eng.

Borehole Location: See Drawing No. 1

Soil-Mat

SUBSURFACE PROFILE

Depth (ft)	Depth (m)	Elevation [m]	Symbol	Description
0	0	155.44		Ground Surface
				Topsoil Approximately 50 millimeters of overlying topsoil.
				Silty Sand Brown, fine to medium in gradation, very loose to compact.
		148.70		End of Borehole

NOTES:

1. Borehole was advanced using solid stem auger equipment on January 24, 2017 to termination at a depth of 6.7 metres.

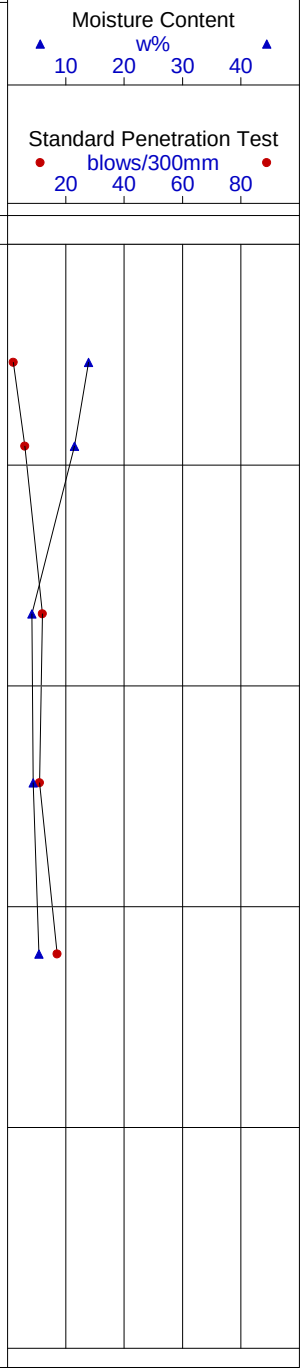
2. Borehole was recorded as 'open and dry' upon completion of drilling and backfilled as per Ontario Regulation 903.

3. Soil samples will be discarded after 3 months unless otherwise directed by our client.

SAMPLE

Type	Number	Blow Counts	Blows/300mm	Recovery	PP (kgf/cm2)	U.Wt.(kN/m3)
SS	1	2,1,1,1	2			
SS	2	2,3,3,3	6			
SS	3	6,5,7,8	12			
SS	4	4,5,6,9	11			
SS	5	6,8,9,10	17			

Well Data



Drill Method: Solid Stem Augers

Drill Date: January 24, 2017

Hole Size: 150mm

SOIL-MAT ENGINEERS & CONSULTANTS LTD.
130 Lancing Drive, Hamilton, ON L8W 3A1
Phone: (905) 318-7440 Fax: (905) 318-7455
e-mail: info@soil-mat.on.ca

Datum: Geodetic

Checked by: IS

Sheet: 1 of 1

Project No: SM 167182-G

Project: Eagle Heights and Taylor Property

Location: Waterdown Road, Burlington, ON

Client: Metropolitan Consulting Inc.

Log of Borehole No. 2

Project Manager: Ian Shaw, P. Eng.

Borehole Location: See Drawing No. 1

: ::

Soil-Mat

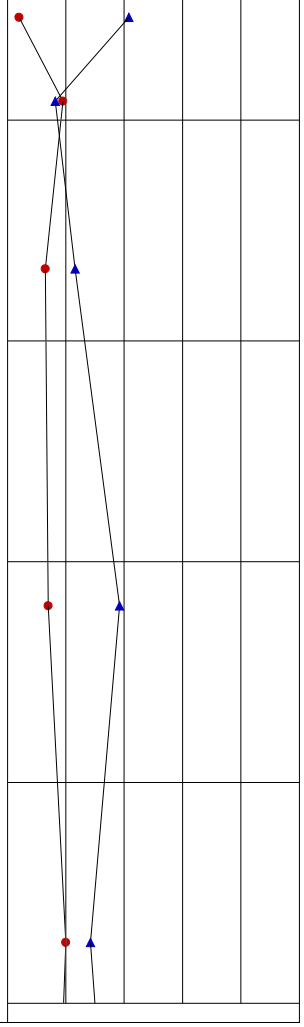
SUBSURFACE PROFILE

SAMPLE

Depth (ft)	Depth (m)	Elevation [m]	Symbol	Description	Well Data	Type	Number	Blow Counts	Blows/300mm	Recovery	PP (kgf/cm2)	U.Wt.(kN/m3)
		158.13		Ground Surface								
0	0			**Topsoil** Approximately 50 millimeters of overlying topsoil.								
2				**Silty Sand** Brown, fine to medium in gradation, very loose to compact.								
4						SS	1	3,2,2,3	4			
6	2					SS	2	8,9,10,12	19			
8												
10						SS	3	5,6,7,4	13			
12												
14	4											
		153.30										
16				**Silty Clay** Grey, trace fine gravel, stiff to hard.								
18												
20	6					SS	4	4,8,6,12	14			
22												
24												
26	8											
28												
30						SS	5	5,9,11,15	20			
32												

Moisture Content w% 10 20 30 40

Standard Penetration Test blows/300mm 20 40 60 80



Drill Method: Hollow Stem Augers

Drill Date: January 24, 2017

Hole Size: 200mm

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e-mail: info@soil-mat.on.ca

Datum: Geodetic

Checked by: IS

Project No: SM 167182-G

Project: Eagle Heights and Taylor Property

Location: Waterdown Road, Burlington, ON

Client: Metropolitan Consulting Inc.

Log of Borehole No. 2

Project Manager: Ian Shaw, P. Eng.

Borehole Location: See Drawing No. 1

Soil-Mat

SUBSURFACE PROFILE

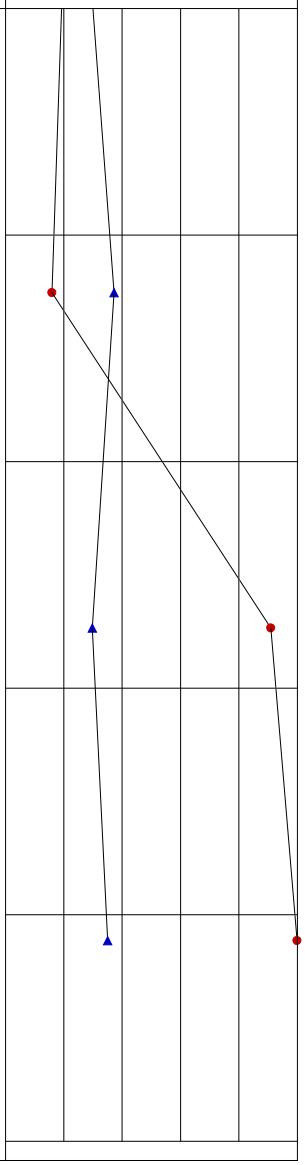
Depth	Elevation [m]	Symbol	Description
34, 36, 38, 40, 42, 44, 46, 48, 50, 52, 54, 56, 58, 60, 62, 64	12, 14, 16, 18		NOTES: 1. Borehole was advanced using hollow stem auger equipment on January 24, 2017 to termination at a depth of 18.3 metres. 2. Borehole was recorded as 'dry' upon completion of drilling and backfilled as per Ontario Regulation 903. 3. Soil samples will be discarded after 3 months unless otherwise directed by our client.
	141.30		***Queenston Shale*** Red, highly weathered in the upper level, becoming more sound with depth, hard in terms of soil.
	139.80		End of Borehole

SAMPLE

Type	Number	Blow Counts	Blows/300mm	Recovery	PP (kgf/cm2)	U.Wt.(kN/m3)
SS	6	5,7,9,11	16			
SS	7	23,41,50	91			
SS	8	50/1"	100			

Moisture Content
w%
10 20 30 40

Standard Penetration Test
blows/300mm
20 40 60 80



Drill Method: Hollow Stem Augers

Drill Date: January 24, 2017

Hole Size: 200mm

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Datum: Geodetic

Checked by: IS

Project No: SM 167182-G

Project: Eagle Heights and Taylor Property

Location: Waterdown Road, Burlington, ON

Client: Metropolitan Consulting Inc.

Log of Borehole No. 3

Project Manager: Ian Shaw, P. Eng.

Borehole Location: See Drawing No. 1

Soil-Mat

SUBSURFACE PROFILE

Depth (ft)	Depth (m)	Elevation [m]	Description
0	0	150.74	Ground Surface
			Topsoil Approximately 100 millimeters of overlying topsoil.
			Silty Clay Brown, trace fine gravel,firm to hard.
	2	148.10	Transitioning to grey.
	4		
	6	144.24	End of Borehole
	8		

NOTES:

1. Borehole was advanced using solid stem auger equipment on January 24, 2017 to termination at a depth of 6.5 metres.

2. Borehole was recorded as 'open and dry' upon completion of drilling and backfilled as per Ontario Regulation 903.

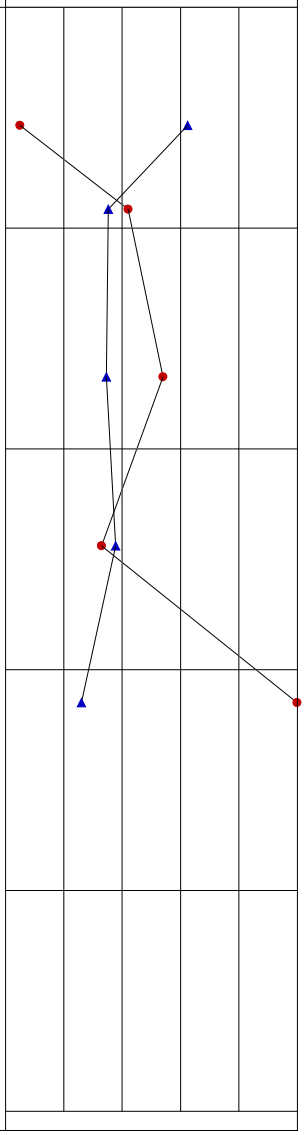
3. Soil samples will be discarded after 3 months unless otherwise directed by our client.

SAMPLE

Type	Number	Blow Counts	Blows/300mm	Recovery	PP (kgf/cm2)	U.Wt.(kN/m3)
SS	1	0,2,3,3	5		2.5	
SS	2	9,20,21,30	42		>4.5	
SS	3	12,20, 34,36	54		>4.5	
SS	4	8,13,20,25	33		4.5	
SS	5	11,22, 50/3"	100			

Moisture Content w% (10, 20, 30, 40)

Standard Penetration Test blows/300mm (20, 40, 60, 80)



Drill Method: Solid Stem Augers

Drill Date: January 24, 2017

Hole Size: 150mm

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Sheet: 1 of 1

Project No: SM 167182-G

Project: Eagle Heights and Taylor Property

Location: Waterdown Road, Burlington, ON

Client: Metropolitan Consulting Inc.

Log of Borehole No. 4

Project Manager: Ian Shaw, P. Eng.

Borehole Location: See Drawing No. 1

: ::

Soil-Mat

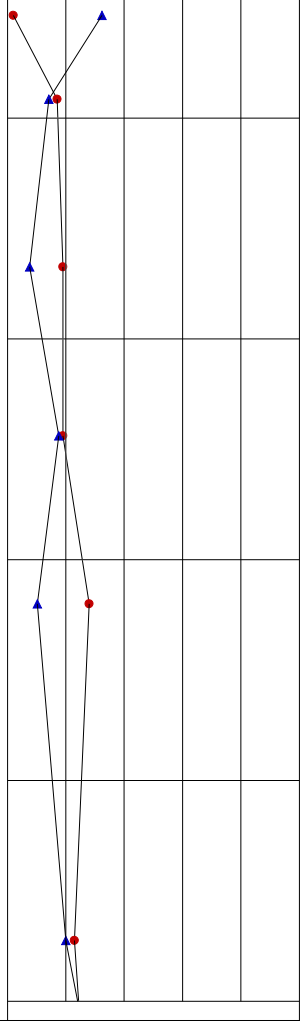
SUBSURFACE PROFILE

SAMPLE

Depth ft	Depth m	Elevation [m]	Symbol	Description	Well Data	Type	Number	Blow Counts	Blows/300mm	Recovery	PP (kgf/cm2)	U.Wt.(kN/m3)
		185.91		Ground Surface								
0	0			**Topsoil** Approximately 75 millimeters of overlying topsoil.								
				Silty Sand Brown, fine to medium in gradation, very loose to compact.		SS	1	2,1,1,2	2			
6	2					SS	2	5,8,9,10	17			
10						SS	3	10,12,7,12	19			
16						SS	4	6,8,11,13	19			
20	6					SS	5	9,14,14,14	28			
30						SS	6	9,11,12,14	23			
32												

Moisture Content
w%
10 20 30 40

Standard Penetration Test
blows/300mm
20 40 60 80



Drill Method: Hollow Stem Augers

Drill Date: January 24, 2017

Hole Size: 200mm

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Project No: SM 167182-G

Project: Eagle Heights and Taylor Property

Location: Waterdown Road, Burlington, ON

Client: Metropolitan Consulting Inc.

Log of Borehole No. 4

Project Manager: Ian Shaw, P. Eng.

Borehole Location: See Drawing No. 1

: ::

Soil-Mat

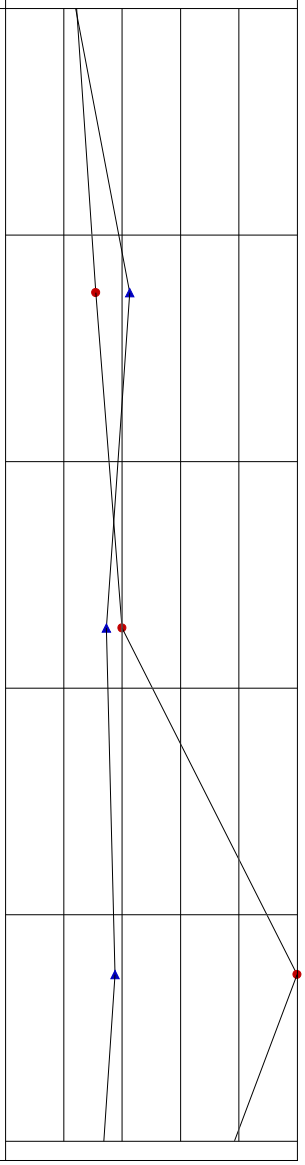
SUBSURFACE PROFILE

SAMPLE

Depth	Elevation [m]	Symbol	Description	Well Data	Type	Number	Blow Counts	Blows/300mm	Recovery	PP (kgf/cm2)	U.Wt.(kN/m3)
12	173.40		***Silty Clay*** Grey, trace fine gravel, hard.		SS	7	17,15, 16,19	31			
					SS	8	8,15,25,26	40			
					SS	9	32,48, 50/5"	98			

Moisture Content w% 10 20 30 40

Standard Penetration Test blows/300mm 20 40 60 80



Drill Method: Hollow Stem Augers

Drill Date: January 24, 2017

Hole Size: 200mm

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Project No: SM 167182-G

Project: Eagle Heights and Taylor Property

Location: Waterdown Road, Burlington, ON

Client: Metropolitan Consulting Inc.

Log of Borehole No. 4

Project Manager: Ian Shaw, P. Eng.

Borehole Location: See Drawing No. 1

Soil-Mat

SUBSURFACE PROFILE

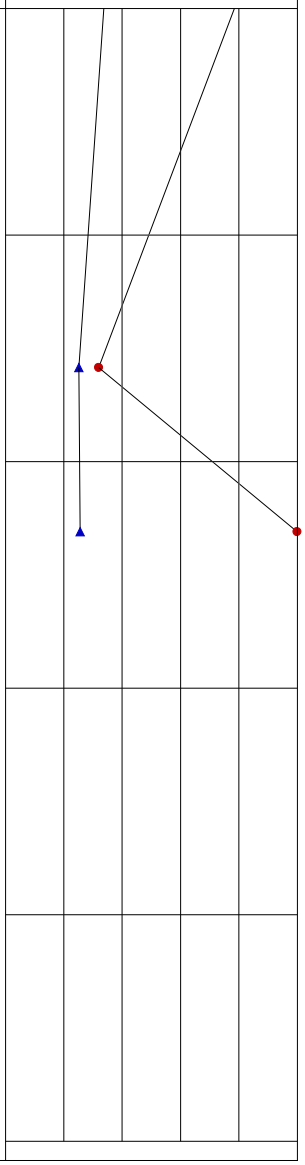
Depth	Elevation [m]	Symbol	Description	Well Data
67				
69				
71				
73 (22)				
75				
77				
79 (24)	161.40			
81	161.10		***Queenston Shale*** Red, highly weathered, hard in terms of soil.	
83			End of Borehole	
85 (26)				
87				
89				
91				
93 (28)				
95				
97				

SAMPLE

Type	Number	Blow Counts	Blows/300mm	Recovery	PP (kgf/cm2)	U.Wt.(kN/m3)
SS	10	6,12,20,27	32			
SS	11	39,46, 50/4"	100			

Moisture Content w% 10 20 30 40

Standard Penetration Test blows/300mm 20 40 60 80



NOTES:

1. Borehole was advanced using hollow stem auger equipment on January 25, 2017 to termination at a depth of 24.8 metres.

2. Borehole was recorded as 'dry' upon completion of drilling and backfilled as per Ontario Regulation 903.

3. Soil samples will be discarded after 3 months unless otherwise directed by our client.

Drill Method: Hollow Stem Augers

Drill Date: January 24, 2017

Hole Size: 200mm

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Sheet: 3 of 3

Project No: SM 167182-G

Project: Eagle Heights and Taylor Property

Location: Waterdown Road, Burlington, ON

Client: Metropolitan Consulting Inc.

Log of Borehole No. 5

Project Manager: Ian Shaw, P. Eng.

Borehole Location: See Drawing No. 1

Soil-Mat

SUBSURFACE PROFILE

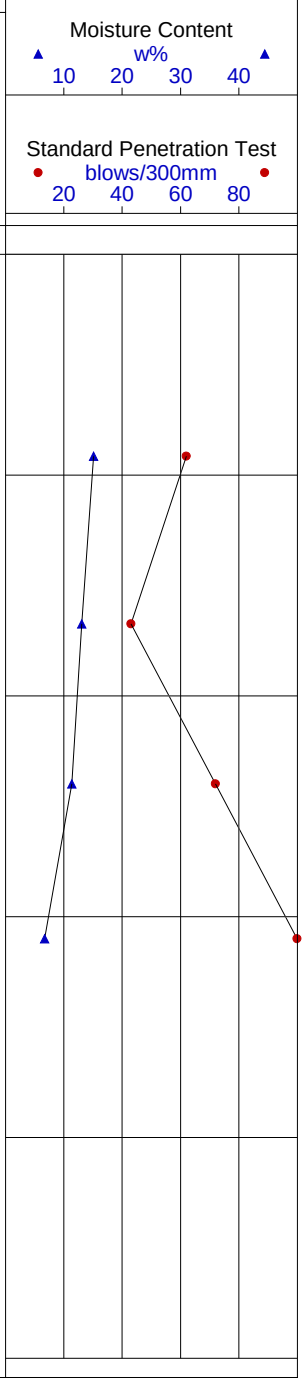
Depth (ft)	Depth (m)	Elevation [m]	Description
0	0	151.54	Ground Surface
			Topsoil Approximately 50 millimeters of overlying topsoil.
			Silty Clay Brown, trace fine gravel, hard.
		146.70	***Queenston Shale*** Red, highly weathered in the upper level, becoming more sound with depth, hard in terms of soil.
		145.20	End of Borehole

NOTES:

1. Borehole was advanced using solid stem auger equipment on January 24, 2017 to termination at a depth of 6.3 metres.
2. Borehole was recorded as 'open and dry' upon completion of drilling and backfilled as per Ontario Regulation 903.
3. Soil samples will be discarded after 3 months unless otherwise directed by our client.

SAMPLE

Type	Number	Blow Counts	Blows/300mm	Recovery	PP (kgf/cm2)	U.Wt.(kN/m3)
SS	1	18,28, 34,47	62		>4.5	
SS	2	9,18,25,43	43		>4.5	
SS	3	14,26,46	72		>4.5	
SS	4	50/5"	100			



Drill Method: Solid Stem Augers

Drill Date: January 24, 2017

Hole Size: 150mm

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Sheet: 1 of 1

Project No: SM 167182-G

Project: Eagle Heights and Taylor Property

Location: Waterdown Road, Burlington, ON

Client: Metropolitan Consulting Inc.

Log of Borehole No. 6

Project Manager: Ian Shaw, P. Eng.

Borehole Location: See Drawing No. 1

Soil-Mat

SUBSURFACE PROFILE

Depth (ft)	Depth (m)	Elevation [m]	Description
0	0	155.65	Ground Surface
			Topsoil — Approximately 50 millimeters of overlying topsoil.
			Silty Clay — Brown, trace fine gravel, hard.
		151.20	
			Queenston Shale — Red, highly weathered in the upper level, becoming more sound with depth, hard in terms of soil.
		149.45	
			End of Borehole

NOTES:

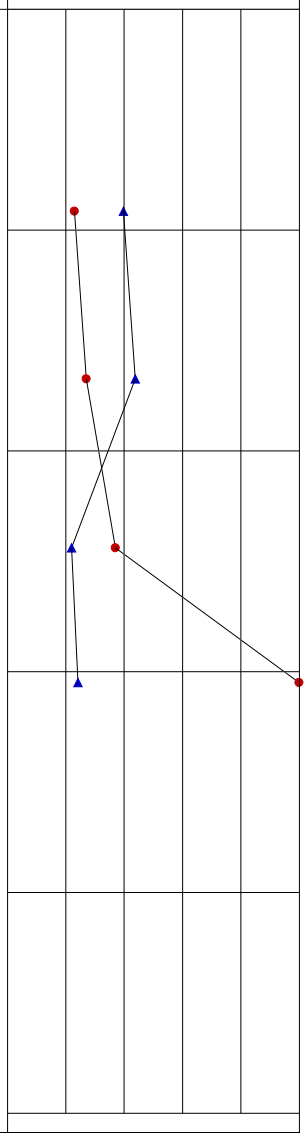
1. Borehole was advanced using solid stem auger equipment on January 25, 2017 to termination at a depth of 6.2 metres.
2. Borehole was recorded as 'open and dry' upon completion of drilling and backfilled as per Ontario Regulation 903.
3. Soil samples will be discarded after 3 months unless otherwise directed by our client.

SAMPLE

Type	Number	Blow Counts	Blows/300mm	Recovery	PP (kgf/cm2)	U.Wt.(kN/m3)
SS	1	8,11,12,13	23		3.0	
SS	2	7,13,14,15	27		4.0	
SS	3	1016, 21,29	37		>4.5	
SS	4	50/3"	100			

Moisture Content w% (10, 20, 30, 40)

Standard Penetration Test blows/300mm (20, 40, 60, 80)



Drill Method: Solid Stem Augers

Drill Date: January 25, 2017

Hole Size: 150mm

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Sheet: 1 of 1

Project No: SM 167182-G

Project: Eagle Heights and Taylor Property

Location: Waterdown Road, Burlington, ON

Client: Metropolitan Consulting Inc.

Log of Borehole No. 7

Project Manager: Ian Shaw, P. Eng.

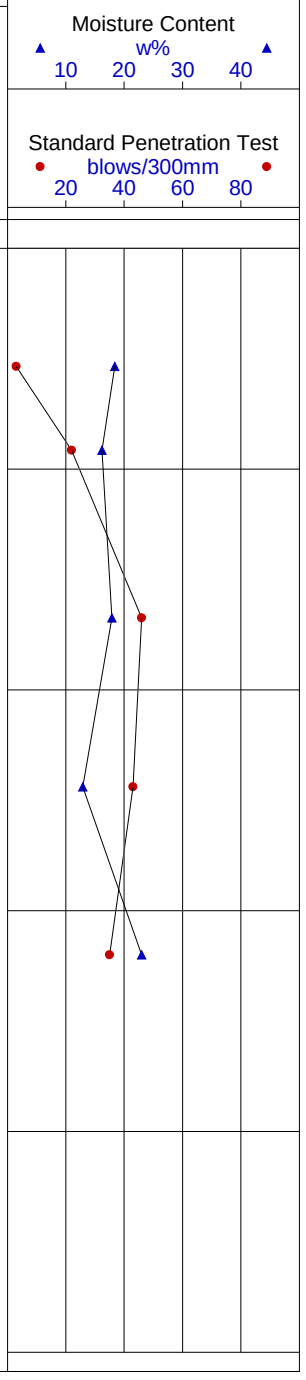
Borehole Location: See Drawing No. 1

Soil-Mat

SUBSURFACE PROFILE

SAMPLE

Depth (ft)	Depth (m)	Elevation [m]	Symbol	Description	Well Data	Type	Number	Blow Counts	Blows/300mm	Recovery	PP (kgf/cm2)	U.Wt.(kN/m3)
		187.28		Ground Surface								
0	0			**Topsoil** Approximately 75 millimeters of overlying topsoil.								
2												
4				**Silty Sand** Brown, trace clay and fine gravel, very loose to compact.		SS	1	2,1,2,3	3			
6	2					SS	2	8,10,12,15	22		4.0	
8												
10		183.90				SS	3	10,19, 27,26	46		4.0	
12				**Silty Clay** Brown, trace fine gravel, hard.								
14	4											
16						SS	4	9,18,25,37	43		>4.5	
18												
20	6					SS	5	4,12,23,34	35			
22		180.60		End of Borehole								
24				NOTES:								
26	8			1. Borehole was advanced using solid stem auger equipment on January 25, 2017 to termination at a depth of 6.7 metres.								
28				2. Borehole was recorded as 'open and dry' upon completion of drilling and backfilled as per Ontario Regulation 903.								
30				3. Soil samples will be discarded after 3 months unless otherwise directed by our client.								
32												



Drill Method: Solid Stem Augers

Drill Date: January 25, 2017

Hole Size: 150mm

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Sheet: 1 of 1

Appendix 4.

2018 Terra-Dynamics Monitoring Well Logs and Two MECP Water Well Records Near Ireson Road

Borehole Number: MW-1

Project: Eagle Heights

Client: Penta Properties Inc.

Site Location: Burlington, ON

Elevation: 142.69 masl

Geologist: Kevin Slaine, P. Geo.

TERRA-DYNAMICS CONSULTING INC.
404 Queenston Street
St. Catharines, ON L2P 2Y2
905-646-7931

SUBSURFACE PROFILE

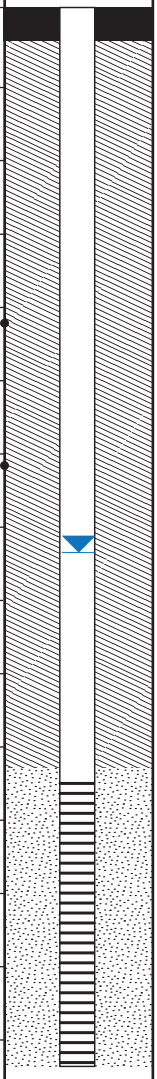
Depth (m)	Description	Elevation (masl)
0.0	Ground Surface	142.69
	TOPSOIL	0.0 / 142.63
	SAND, Silty, moist, soft, reddish brown	0.06 / 141.75
1.0	CLAY TILL, very hard, greyish brown	0.94
2.0		
	GRAVEL	139.95 / 2.74 / 139.87
3.0	CLAY TILL, very hard, greyish brown	2.82
4.0		138.13
	SHALE/TILL COMPLEX: red Queenston shale with greyish brown clay till, some large gravel	4.56 / 137.36
5.0	SHALE - Auger refusal, switched to Tri-cone	5.33
6.0		
7.0	- WET	
8.0		
9.0		
10.0		132.02
	End of Borehole at 10.67 m	10.67
11.0	Groundwater elevation of 137.22 masl measured on April 4, 2018	
12.0		

SAMPLE

Number	Sample Type	Blows/ft	Recovery	Symbol
1	SS	4		
2	SS	14		
3	SS	50		
4	SS	52		
5	SS	>60		
6	SS	58		
7	SS	>60		

Blows/Foot: 10 20 30 40 50

Well Completion Details



Drill Method: Hollow Stem Augers, Tri-cone

Hole Size: 20.3 cm

UTM Coordinates: 17591126.76E, 4796213.81N

Project No. Eagle Heights

Drill Date: March 20, 2018

Sheet: 1 of 1

Borehole Number: MW-2

Project: Eagle Heights

Client: Penta Properties Inc.

Site Location: Burlington, ON

Elevation: 144.56 masl

Geologist: Kevin Slaine, P. Geo.

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905-646-7931

SUBSURFACE PROFILE

Depth (m)	Description	Elevation (masl)
	Ground Surface	144.56
0.0	TOPSOIL	0.0
	SILT, sandy, medium, dry, brown	144.33 / 0.23
1.0	SAND, silty, soft, dry, brown	143.85 / 0.71
		143.04
	SAND, silty, fine, soft, wet, brown	1.52 / 142.81
2.0	TILL, silty, firm, brown	1.75
		141.97
	CLAY, firm, light, grey	2.59 / 141.82
3.0	End of Borehole at 2.74 m	2.74
4.0		
5.0		
6.0		
7.0		
8.0		
9.0		
10.0		
11.0		
12.0		

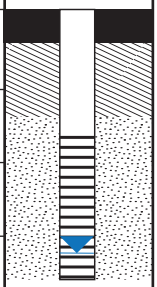
Groundwater elevation of 142.14 masl measured on April 4, 2018

SAMPLE

Number	Sample Type	Blows/ft	Recovery
1	SS	6	
2	SS	10	
3	SS	3	
4	SS	16	

Blows/Foot: 10 20 30 40 50

Well Completion Details



Drill Method: Hollow Stem Augers

Hole Size: 20.3 cm

UTM Coordinates: 17591061.39E, 4796112.39N

Project No. Eagle Heights

Drill Date: March 19, 2018

Sheet: 1 of 1

Borehole Number: MW-3

Project: Eagle Heights

Client: Penta Properties Inc.

Site Location: Burlington, ON

Elevation: 150.90 masl

Geologist: Kevin Slaine, P. Geo.

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905-646-7931

SUBSURFACE PROFILE

Depth (m)	Description	Elevation (masl)
	Ground Surface	150.90
0.0	TOPSOIL	0.0 / 150.82
	SAND, Silty, soft, brown	0.08 / 150.14
1.0	SAND, fine to medium, soft, brown	0.76 / 149.28
	SAND, silty, fine to medium, soft, brown	1.62
2.0		
	Water encountered (3.05m)	
3.0		
4.0		146.48
	CLAY, firm, grey	4.42 / 146.33
5.0	End of Borehole at 4.57 m	4.57
6.0		
7.0		
8.0		
9.0		
10.0		
11.0		
12.0		

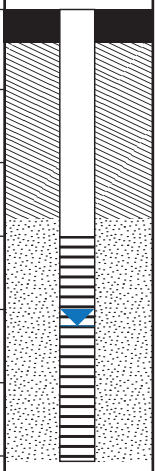
Groundwater elevation of 147.68 masl measured on April 4, 2018

SAMPLE

Number	Sample Type	Blows/ft	Recovery	Symbol
1	SS	4		
2	SS	3		
3	SS	6		
4	SS	7		
5	SS	6		
6	SS	8		

Blows/Foot: 10 20 30 40 50

Well Completion Details



Drill Method: Hollow Stem Augers

Hole Size: 20.3 cm

UTM Coordinates: 17590911.91E, 4796160.33N

Project No. Eagle Heights

Drill Date: March 19, 2018

Sheet: 1 of 1

Borehole Number: MW-4-S

Project: Eagle Heights

Client: Penta Properties Inc.

Site Location: Burlington, ON

Elevation: 155.98 masl

Geologist: Kevin Slaine, P. Geo.

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905-646-7931

SUBSURFACE PROFILE

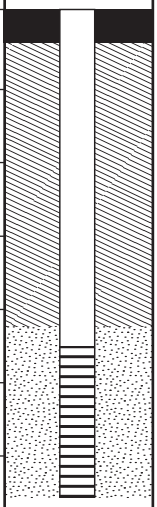
Depth (m)	Description	Elevation (masl)
	Ground Surface	155.98
0.0	TOPSOIL, brown	0.0 / 155.92
	SAND, Silty, brown, some gravel	0.06 / 155.22
1.0	GRAVEL	0.76 / 155.14
	SAND, medium, soft, brown	0.84
2.0		
3.0		
4.0		152.02
	SILT, sandy, soft, brown	3.96 / 151.41
	CLAY, grey	4.57 / 151.10
5.0	End of Borehole at 4.88 m	4.88
6.0		
7.0		
8.0		
9.0		
10.0		
11.0		
12.0	No groundwater on April 4, 2018	

SAMPLE

Number	Sample Type	Blows/ft	Recovery	Symbol
1	SS	4		
2	SS	16		
3	SS	11		
4	SS	17		
5	SS	15		
6	SS	11		
7	SS	14		

Blows/Foot — 10 20 30 40 50

Well Completion Details



Drill Method: Hollow Stem Augers

Hole Size: 20.3 cm

UTM Coordinates: 17590903.55E, 4796280.55N

Project No. Eagle Heights

Drill Date: March 21, 2018

Sheet: 1 of 1

Borehole Number: MW-4-D

Project: Eagle Heights

Client: Penta Properties Inc.

Site Location: Burlington, ON

Elevation: 156.13 masl

Geologist: Kevin Slaine, P. Geo.

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404 Queenston Street
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905-646-7931

SUBSURFACE PROFILE

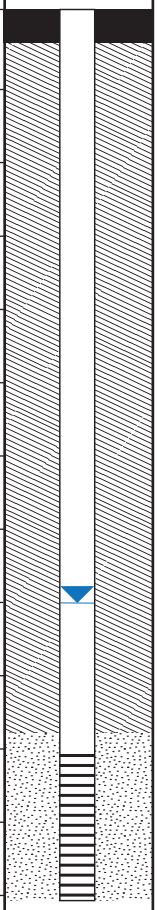
Depth (m)	Description	Elevation (masl)
	Ground Surface	156.13
0.0	TOPSOIL, brown	0.0 / 156.07
	SAND, Silty, brown, some gravel	0.06 / 155.37
1.0	GRAVEL	0.76 / 155.29
	SAND, medium, soft, brown	0.84
2.0		
3.0		
4.0		152.17
	SILT, sandy, soft, brown	3.96 / 151.56
	CLAY, grey	4.57
5.0		
6.0	- WET	
7.0		
8.0		
9.0		147.14
	End of Borehole at 8.99 m	8.99
10.0		
11.0		
12.0	Groundwater elevation of 150.14 masl measured on April 4, 2018	

SAMPLE

Number	Sample Type	Blows/ft	Recovery	Symbol
1	SS	4		
2	SS	16		
3	SS	11		
4	SS	17		
5	SS	15		
6	SS	11		
7	SS	14		
8	SS	11		
9	SS	10		
10	SS	7		
11	SS	10		
12	SS	14		

Blows/Foot: 10 20 30 40 50

Well Completion Details



Drill Method: Hollow Stem Augers

Hole Size: 20.3 cm

UTM Coordinates: 17590902.15E, 4796280.52N

Project No. Eagle Heights

Drill Date: March 21, 2018

Sheet: 1 of 1

Borehole Number: MW-5

Project: Eagle Heights

Client: Penta Properties Inc.

Site Location: Burlington, ON

Elevation: 146.78 masl

Geologist: Kevin Slaine, P. Geo.

TERRA-DYNAMICS CONSULTING INC.
404 Queenston Street
St. Catharines, ON L2P 2Y2
905-646-7931

SUBSURFACE PROFILE

Depth (m)	Description	Elevation (masl)
	Ground Surface	146.78
0.0	TOPSOIL, brown	0.0
		146.70
	CLAY TILL, hard, greyish brown	0.08
1.0		
2.0		144.49
	SHALE, weathered, red	2.29
3.0	- Auger refusal, switched to Tri-cone	
4.0		
5.0		
6.0	- WET	
7.0		
8.0		138.25
	End of Borehole at 8.53 m	8.53
9.0		
10.0		
11.0		
12.0	Groundwater elevation of 143.32 masl measured on April 4, 2018	

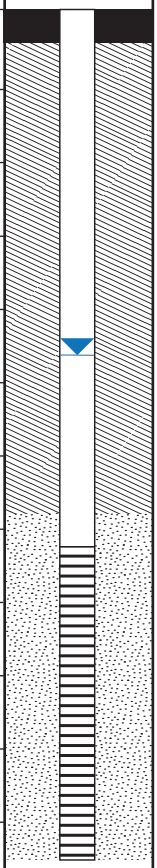
SAMPLE

Number	Sample Type	Blows/ft	Recovery	Symbol
1	SS	8		
2	SS	29		
3	SS	40		
4	SS	46		

Blows/Foot

10 20 30 40 50

Well Completion Details



Drill Method: Hollow Stem Augers, Tri-cone

Hole Size: 20.3 cm

UTM Coordinates: 17590982.34E, 4796326.44N

Project No. Eagle Heights

Drill Date: March 20, 2018

Sheet: 1 of 1

Borehole Number: MW-6

Project: Eagle Heights

Client: 17590982.34E, 4796326.44N

Site Location: Burlington, ON

Elevation: 144.72 masl

Geologist: Kevin Slaine, P. Geo.

TERRA-DYNAMICS CONSULTING INC.
404 Queenston Street
St. Catharines, ON L2P 2Y2
905-646-7931

SUBSURFACE PROFILE

Depth (m)	Description	Elevation (masl)
0.0	Ground Surface	144.72
	TOPSOIL, brown	0.0 / 144.66
	CLAY, Silty, firm, brownish grey	0.06 / 143.81
1.0	GRAVEL, red	0.91 / 143.74
	CLAY TILL, very hard, reddish brown	0.98 / 143.35
2.0	CLAY TILL, firm, grey, with gravel (2.5 cm diameter)	1.37
3.0		
4.0		140.30
	SHALE, very hard, weathered, grey	4.42
5.0	- Auger refusal, switched to Tri-cone	139.23
	SHALE, red - WET	5.49
6.0		
7.0		136.8
8.0	End of Borehole at 7.92 m	7.92
9.0		
10.0		
11.0		
12.0	Groundwater elevation of 143.49 masl measured on April 4, 2018	

SAMPLE

Number	Sample Type	Blows/ft	Recovery	Symbol
1	SS	10		
2	SS	36		
3	SS	47		
4	SS	40		
5	SS	30		
6	SS	>60		
7	SS	>60		

Blows/Foot — 10 20 30 40 50

Well Completion Details

Drill Method: Hollow Stem Augers

Hole Size: 20.3 cm

UTM Coordinates: 17591010.25E, 4796232.16N

Project No. Eagle Heights

Drill Date: March 21, 2018

Sheet: 1 of 1

Borehole Number: MW-7-S

Project: Eagle Heights

Client: Penta Properties Inc.

Site Location: Burlington, ON

Elevation: 179.23 masl

Geologist: Kevin Slaine, P. Geo.

TERRA-DYNAMICS CONSULTING INC.
404 Queenston Street
St. Catharines, ON L2P 2Y2
905-646-7931

SUBSURFACE PROFILE

Depth (m)	Description	Elevation (masl)
0.0	Ground Surface	179.23
	TOPSOIL, brown	0.0 / 178.99
	SAND, silty, fine, soft, brown	0.24
3.0		176.18
	SAND, medium, soft, brown	3.05 / 175.57
	SAND, fine, soft, brown - WET	3.66
5.0		174.66
	SILT, sandy (fine), soft, saturated, brown	4.57
7.0		172.39
	CLAY, grey, firm	6.89 / 172.07
	End of Borehole at 7.16 m	7.16
12.0	Groundwater elevation of 173.72 masl measured on April 4, 2018	

SAMPLE

Number	Sample Type	Blows/ft	Recovery	Symbol
1	SS	4		
2	SS	5		
3	SS	9		
4	SS	10		
5	SS	17		
6	SS	17		
7	SS	21		
8	SS	23		
9	SS	28		

Blows/Foot: 10 20 30 40 50

Well Completion Details

Drill Method: Hollow Stem Augers

Hole Size: 20.3 cm

UTM Coordinates: 17590762.75E, 4796992.42N

Project No. Eagle Heights

Drill Date: March 23, 2018

Sheet: 1 of 1

Borehole Number: MW-7-D

Project: Eagle Heights

Client: Penta Properties Inc.

Site Location: Burlington, ON

Elevation: 179.28 masl

Geologist: Kevin Slaine, P. Geo.

TERRA-DYNAMICS CONSULTING INC.
404 Queenston Street
St. Catharines, ON L2P 2Y2
905-646-7931

SUBSURFACE PROFILE

Depth (m)	Description	Elevation (masl)
0.0	Ground Surface	179.28
	TOPSOIL, brown	0.0 / 179.04
	SAND, silty, fine, soft, brown	0.24
3.0		176.23
	SAND, medium, soft, brown	3.05 / 175.62
	SAND, fine, soft, brown - WET	3.66
5.0		173.95
	SILT, sandy (fine), soft, saturated, brown	5.33
7.0		172.39
	CLAY, grey, firm	6.89
11.0		168.46
	End of Borehole at 10.82 m	10.82
	Groundwater elevation of 172.89 masl measured on April 4, 2018	
12.0		

SAMPLE

Number	Sample Type	Blows/ft	Recovery	Symbol
1	SS	4		
2	SS	5		
3	SS	9		
4	SS	10		
5	SS	17		
6	SS	17		
7	SS	21		
8	SS	23		
9	SS	28		
10	SS	15		
11	SS	13		
12	SS	12		
11	SS	9		
12	SS	8		

Blows/Foot: 10 20 30 40 50

Well Completion Details

Drill Method: Hollow Stem Augers

Hole Size: 20.3 cm

UTM Coordinates: 17591849E, 4799864N

Project No. Eagle Heights

Drill Date: March 22, 2018

Sheet: 1 of 1

Borehole Number: MW-8

Project: Eagle Heights

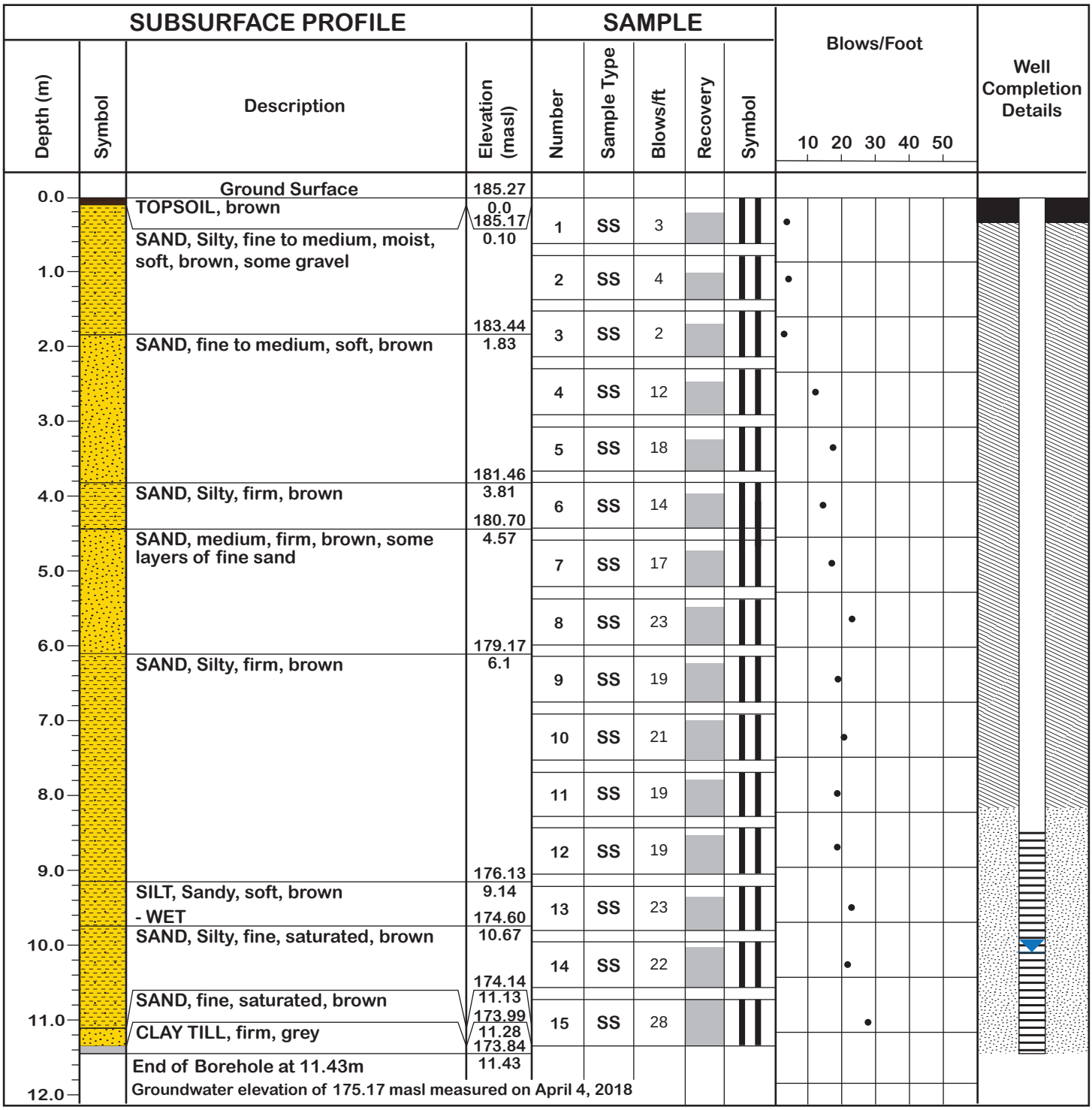
Client: Penta Properties Inc.

Site Location: Burlington, ON

Elevation: 185.27 masl

Geologist: Kevin Slaine, P. Geo.

TERRA-DYNAMICS CONSULTING INC.
404 Queenston Street
St. Catharines, ON L2P 2Y2
905-646-7931



Drill Method: Hollow Stem Augers

Hole Size: 20.3 cm

UTM Coordinates: 17590644.13E, 4797066.38N

Project No. Eagle Heights

Drill Date: March 22, 2018

Sheet: 1 of 1

Borehole Number: MW-9

Project: Eagle Heights

Client: Penta Properties Inc.

Site Location: Burlington, ON

Elevation: 147.41 masl

Geologist: Kevin Slaine, P. Geo.

TERRA-DYNAMICS CONSULTING INC.
404 Queenston Street
St. Catharines, ON L2P 2Y2
905-646-7931

SUBSURFACE PROFILE

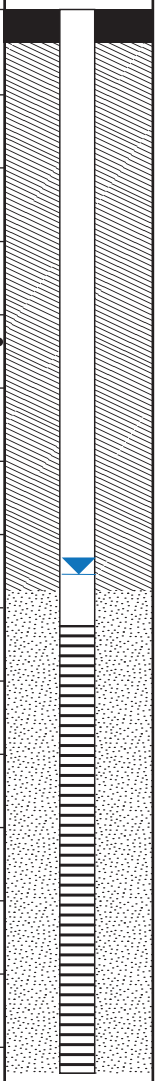
Depth (m)	Description	Elevation (masl)
0.0	Ground Surface	147.41
	TOPSOIL	0.0
	CLAY TILL, firm, grey	147.35 / 0.06
3.0	- Auger refusal, switched to Tri-cone	144.00
	SHALE, red	3.41
10.0		136.74
11.0	End of Borehole at 10.67m	10.67
	Groundwater elevation of 141.72 masl measured on April 4, 2018	
12.0		

SAMPLE

Number	Sample Type	Blows/ft	Recovery	Symbol
1	SS	12		
2	SS	41		
3	SS	55		
4	SS	53		
5	SS	59		

Blows/Foot — 10 20 30 40 50

Well Completion Details



Drill Method: Hollow Stem Augers, Tri-cone

Hole Size: 20.3 cm

UTM Coordinates: 17591375.2E, 4796547.34N

Project No. Eagle Heights

Drill Date: March 26, 2018

Sheet: 1 of 1

Borehole Number: MW-10-S

Project: Eagle Heights

Client: Penta Properties Inc.

Site Location: Burlington, ON

Elevation: 123.98 masl

Geologist: Kevin Slaine, P. Geo.

TERRA-DYNAMICS CONSULTING INC.
404 Queenston Street
St. Catharines, ON L2P 2Y2
905-646-7931

SUBSURFACE PROFILE

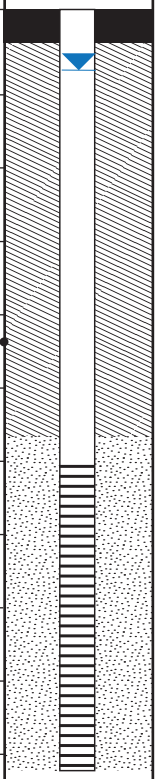
Depth (m)	Description	Elevation (masl)
0.0	Ground Surface	123.98
	TOPSOIL	0.0
	CLAY TILL, firm, grey	123.92 / 0.06
3.0	- Auger refusal, switched to Tri-cone	120.70
	SHALE, red	3.28
7.0		116.36
	End of Borehole at 7.62m	7.62
12.0	Groundwater elevation of 123.37masl measured on April 4, 2018	

SAMPLE

Number	Sample Type	Blows/ft	Recovery	Symbol
1	SS	8		
2	SS	28		
3	SS	48		
4	SS	41		
5	SS	>60		

Blows/Foot: 10 20 30 40 50

Well Completion Details



Drill Method: Hollow Stem Augers, Tri-cone

Hole Size: 20.3 cm

UTM Coordinates: 17591950.48E, 4796148.58N

Project No. Eagle Heights

Drill Date: March 27, 2018

Sheet: 1 of 1

Borehole Number: MW-10-D

Project: Eagle Heights

Client: Penta Properties Inc.

Site Location: Burlington, ON

Elevation: 123.96 masl

Geologist: Kevin Slaine, P. Geo.

TERRA-DYNAMICS CONSULTING INC.
404 Queenston Street
St. Catharines, ON L2P 2Y2
905-646-7931

SUBSURFACE PROFILE

Depth (m)	Description	Elevation (masl)
0.0	Ground Surface	123.96
	TOPSOIL	0.0
	CLAY TILL, firm, grey	123.90
		0.06
3.0	- Auger refusal, switched to Tri-cone	120.68
	SHALE, red	3.28
10.0		113.29
11.0	End of Borehole at 10.67m	10.67
	Groundwater elevation of 121.53 masl measured on April 4, 2018	
12.0		

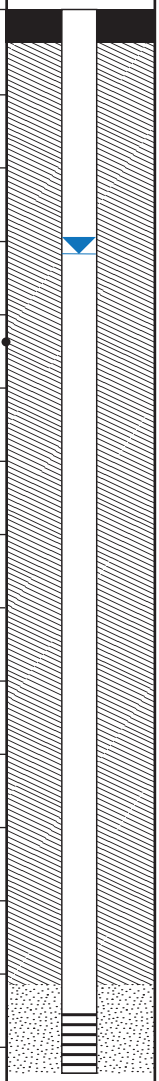
SAMPLE

Number	Sample Type	Blows/ft	Recovery	Symbol
1	SS	8		
2	SS	28		
3	SS	48		
4	SS	41		
5	SS	>60		

Blows/Foot

10 20 30 40 50

Well Completion Details



Drill Method: Hollow Stem Augers, Tri-cone

Hole Size: 20.3 cm

UTM Coordinates: 17591951.39E, 4796148.17N

Project No. Eagle Heights

Drill Date: March 27, 2018

Sheet: 1 of 1

UTM 17 Z 580237 E
FORMERLY EAST FLAMBORO
5 R 4794547 N
Elev. 649 R 40641
Basin 46

30M5d

GROUND WATER BRANCH
AUG 28 1961
ONTARIO WATER RESOURCES COMMISSION
No 328

The Ontario Water Resources Commission Act

WATER WELL RECORD

County or District ~~Wentworth~~ Halton Township, Village, Town or City Burlington

Con. 2 Lot 6 Date completed 28 (day) June (month) 1961 (year)

[redacted] dress 933 Mohawk Rd. W., Ancaster

Casing and Screen Record

Inside diameter of casing nil
Total length of casing "
Type of screen "
Length of screen "
Depth to top of screen "
Diameter of finished hole 6"

Pumping Test

Static level nil
Test-pumping rate " G.P.M.
Pumping level "
Duration of test pumping "
Water clear or cloudy at end of test nil
Recommended pumping rate " G.P.M.
with pump setting of feet below ground surface

Well Log

Overburden and Bedrock Record	From ft.	To ft.	Water Record: Depth(s) at which water(s) found	Water Record: Kind of water (fresh, salty, sulphur)
Brown clay	0	27		
Red shale	27	112	108 ft.	salty
(Hole cemented)				

For what purpose(s) is the water to be used? Dry

Is well on upland, in valley, or on hillside? Hillside

Drilling or Boring Firm J.B. Ruttan,

Address R.R.#2, Milton
Ontario

Licence Number 203

Name of Driller or Borer Same

Address "

Date June 28/61

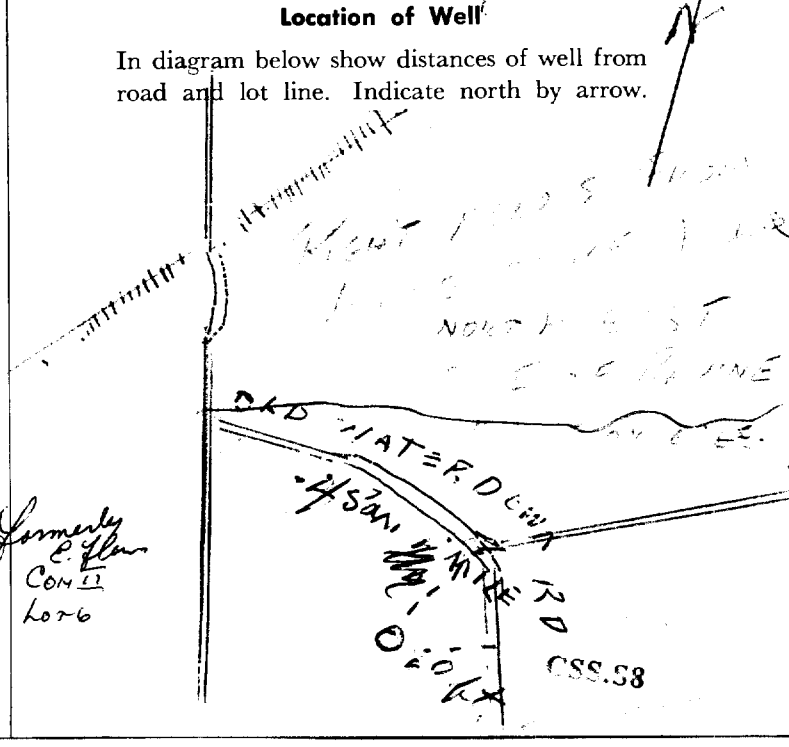
Burton Ruttan
(Signature of Licensed Drilling or Boring Contractor)

Form 7 15M Sets 60-5930

OWRC COPY

Location of Well

In diagram below show distances of well from road and lot line. Indicate north by arrow.



MINISTRY OF THE ENVIRONMENT
The Ontario Water Resources Act

Ontario

WATER WELL RECORD

S.P.N. 30m 5d

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

11 | 6809592 | MUNICIP 28602 | CON FEF 02

COUNTY OR DISTRICT	TOWNSHIP, BOROUGH, CITY, TOWN, VILLAGE	CON., BLOCK, TRACT, SURVEY, ETC.	LOT
HALTON (FORMERLY) WENTWORTH	~~EAST FLAMBORO~~ BURLINGTON	CON. 2	007

[redacted]
264 FAIRVIEW DR.
ACONS FIELD QUEBEC

DATE COMPLETED: DAY 13 05 YR 77

UTM: 797390 4 0643 4 24

LOG OF OVERBURDEN AND BEDROCK MATERIALS (SEE INSTRUCTIONS)

GENERAL COLOUR	MOST COMMON MATERIAL	OTHER MATERIALS	GENERAL DESCRIPTION	DEPTH - FEET FROM	DEPTH - FEET TO
BROWN	CLAY		LOOSE	0	24
RED	CLAY		LOOSE	24	32
RED	SHALE		HARD	32	70

31 | 0024605 77 | 0032705 77 | 0070717 73

32

41 WATER RECORD

WATER FOUND AT - FEET	KIND OF WATER
~~10-13~~	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	DEPTH - FEET TO
10-11 ~~6~~ 06	☒ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☐ OPEN HOLE	.188	+1	~~32~~ 0032
17-18	1 ☐ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE ☒ OPEN HOLE		32	~~70~~ 0070
24-25	1 ☐ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☐ OPEN HOLE			

SCREEN

SIZE(S) OF OPENING (SLOT NO.)	DIAMETER INCHES	LENGTH FEET
MATERIAL AND TYPE	DEPTH TO TOP OF SCREEN 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	PUMPING RATE GPM	DURATION OF PUMPING HOURS / MINS
1 ☐ PUMP 2 ☒ BAILER	0001	02 / 00

STATIC LEVEL	WATER LEVEL END OF PUMPING	WATER LEVELS DURING (1 ☐ PUMPING ☒ RECOVERY)			
		15 MINUTES	30 MINUTES	45 MINUTES	60 MINUTES
032 FEET	068 FEET	056 FEET	046 FEET	038 FEET	032 FEET

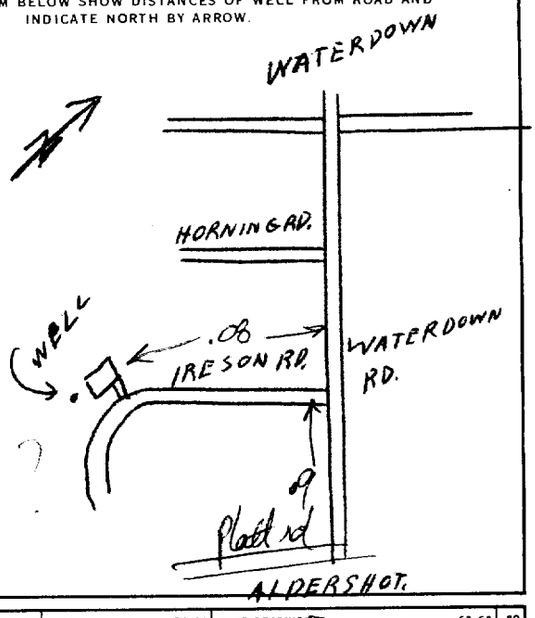
IF FLOWING, GIVE RATE	PUMP INTAKE SET AT	WATER AT END OF TEST (1 ☐ CLEAR 2 ☐ CLOUDY)
GPM	FEET	

RECOMMENDED PUMP TYPE	RECOMMENDED PUMP SETTING	RECOMMENDED PUMPING RATE
☐ SHALLOW ☒ DEEP	068 FEET	0001 GPM

50-53 ——•—— 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 54: 1 ☒ WATER SUPPLY; 2 ☐ OBSERVATION WELL; 3 ☐ TEST HOLE; 4 ☐ RECHARGE WELL; 5 ☐ ABANDONED, INSUFFICIENT SUPPLY; 6 ☐ ABANDONED, POOR QUALITY; 7 ☐ UNFINISHED

WATER USE 55-56: 01 — 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 57: 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	LICENCE NUMBER
OCONNOR WELLDRILLING LTD.	4005
ADDRESS: RR # 1 MILLGROVE ONT. L0R 1V0	
NAME OF DRILLER OR BORER: W. HOWE	LICENCE NUMBER
SIGNATURE OF CONTRACTOR: J.B. O'Connor.	SUBMISSION DATE: DAY ____ MO. ____ YR. ____

OFFICE USE ONLY

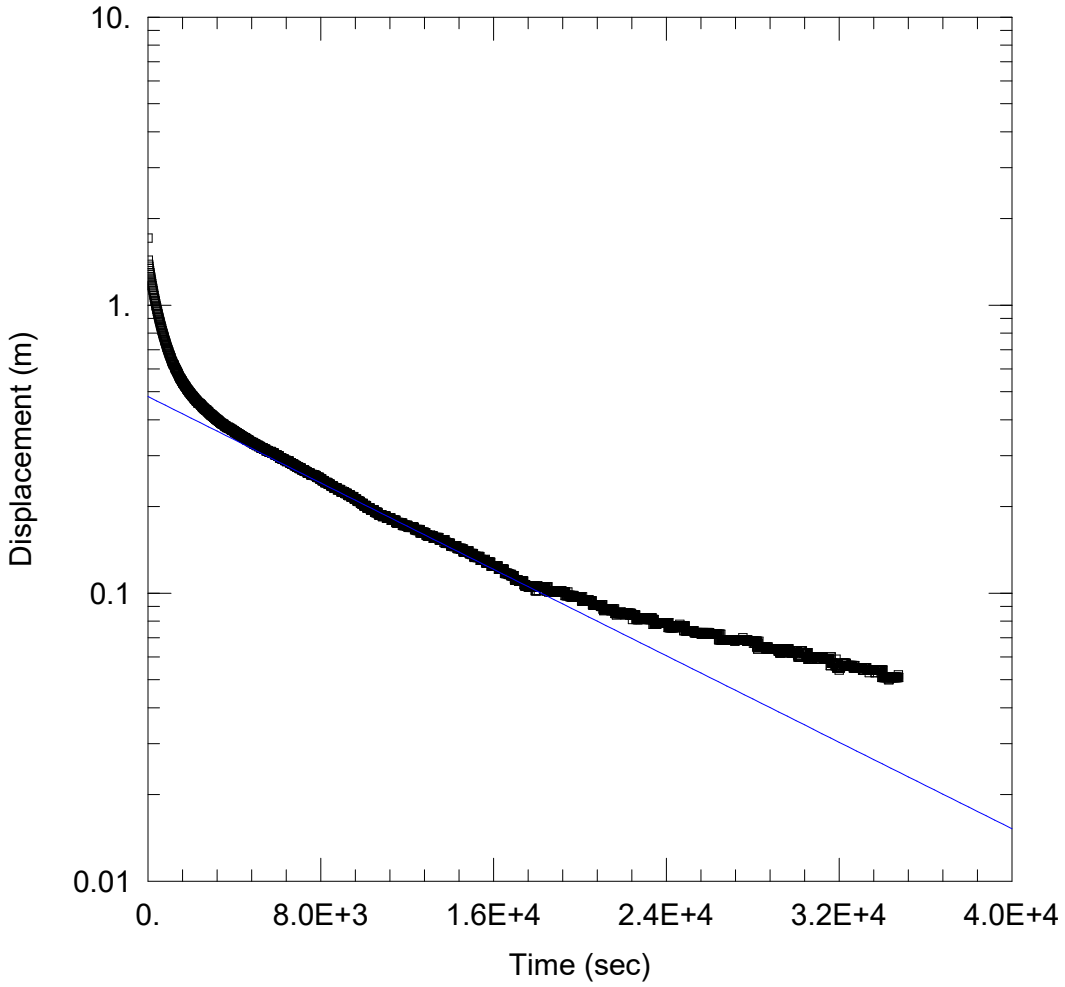
DATA SOURCE 58	CONTRACTOR 59-62	DATE RECEIVED 63-68
1	4005	810527
DATE OF INSPECTION	INSPECTOR	
REMARKS: Wiggin Gisternant CSS.S8		P W1

MINISTRY OF THE ENVIRONMENT COPY

FORM 7 MOE 07-091

Appendix 5.

Hydraulic Conductivity Analyses



WELL TEST ANALYSIS

Data Set: C:\Users\David\Documents\EagleHeights\MW-1.aqt
Date: 10/15/18 Time: 14:53:15

PROJECT INFORMATION

Company: Terra-Dynamics Consulting Inc.
Client: Eagle Heights
Project: 342
Location: MW-1
Test Well: MW-1
Test Date: 23-Apr-18

AQUIFER DATA

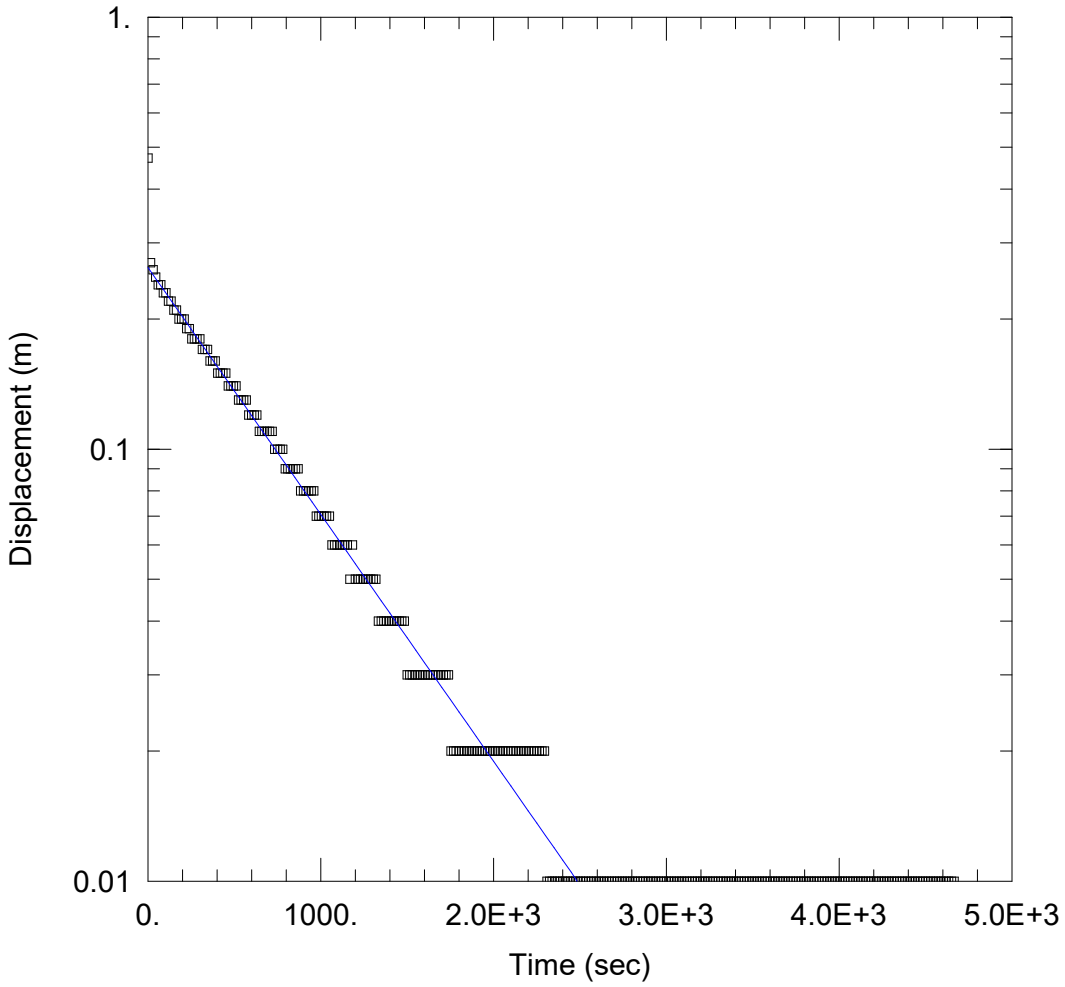
Saturated Thickness: 4.928 m Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (MW-1)

Initial Displacement: 1.709 m
Total Well Penetration Depth: 3.05 m
Casing Radius: 0.0254 m
Static Water Column Height: 4.928 m
Screen Length: 3.05 m
Well Radius: 0.102 m

SOLUTION

Aquifer Model: Unconfined
Solution Method: Hvorslev
K = 3.105E-8 m/sec
y0 = 0.4813 m



WELL TEST ANALYSIS

Data Set: C:\Users\David\Documents\EagleHeights\MW-2.aqt
Date: 10/15/18 Time: 14:54:56

PROJECT INFORMATION

Company: Terra-Dynamics Consulting Inc.
Client: Eagle Heights
Project: 342
Location: MW-2
Test Well: MW-2
Test Date: 23-Apr-18

AQUIFER DATA

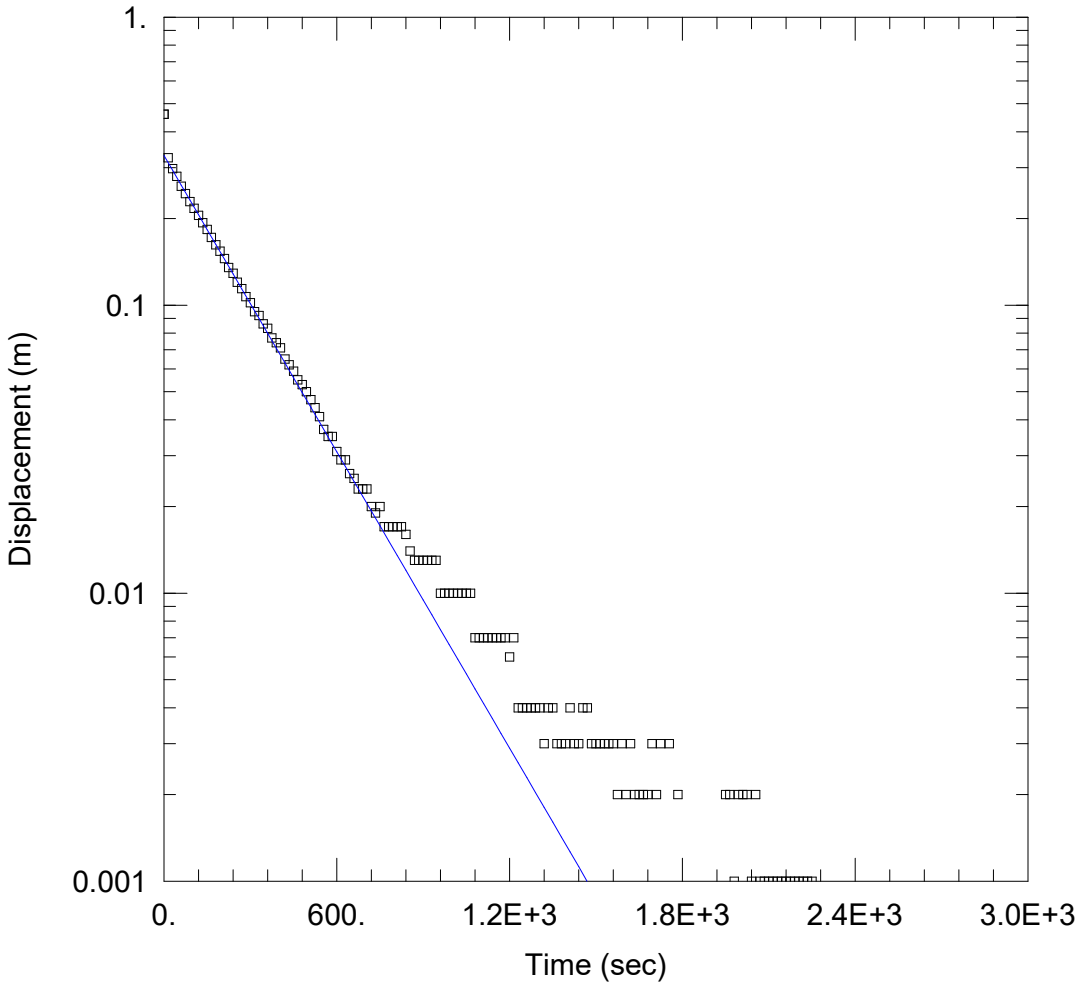
Saturated Thickness: 0.878 m Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (MW-2)

Initial Displacement: 0.472 m
Total Well Penetration Depth: 1.5 m
Casing Radius: 0.0254 m
Static Water Column Height: 0.878 m
Screen Length: 1.5 m
Well Radius: 0.102 m

SOLUTION

Aquifer Model: Unconfined
Solution Method: Hvorslev
K = 2.562E-6 m/sec
y0 = 0.2632 m



WELL TEST ANALYSIS

Data Set: C:\Users\David\Documents\EagleHeights\MW-3.aqt
Date: 10/15/18 Time: 14:56:31

PROJECT INFORMATION

Company: Terra-Dynamics Consulting Inc.
Client: Eagle Heights
Project: 342
Location: MW-3
Test Well: MW-3
Test Date: 23-Apr-18

AQUIFER DATA

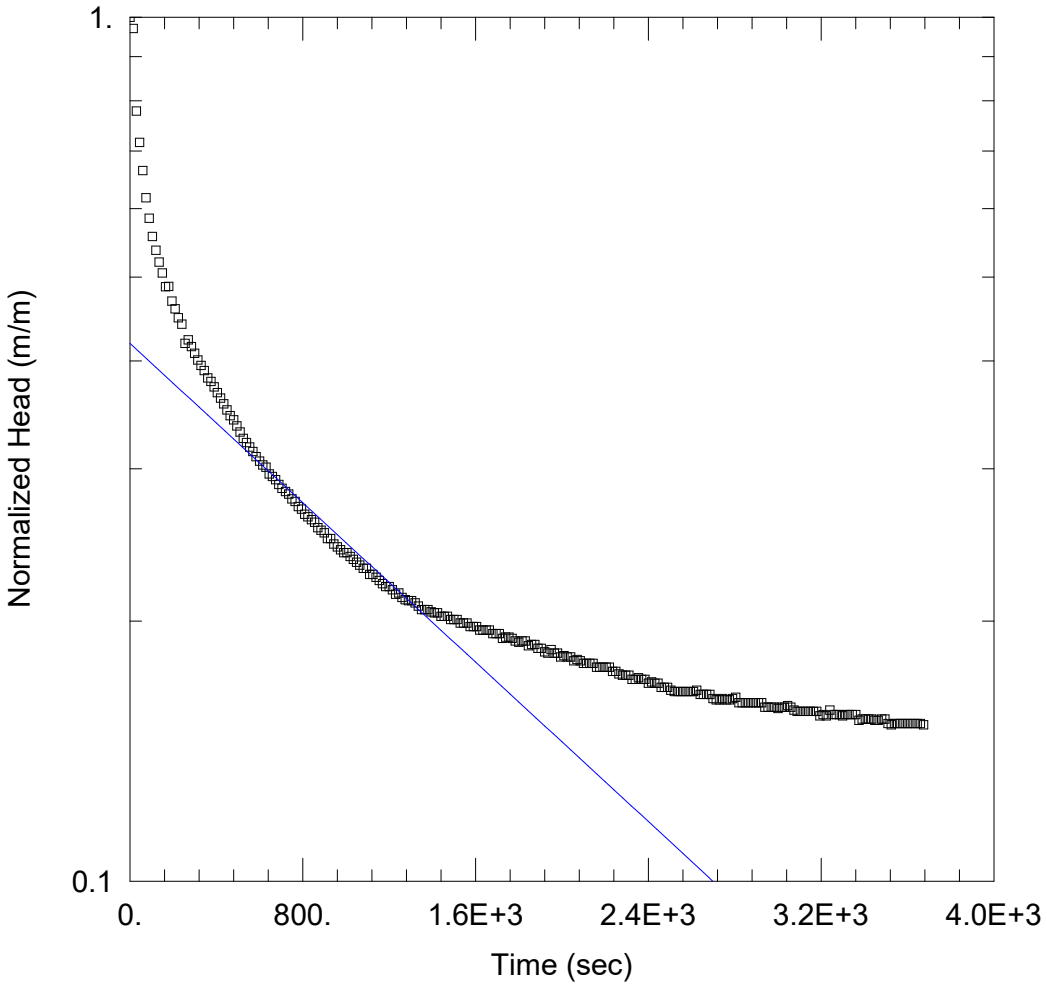
Saturated Thickness: 1.509 m Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (MW-3)

Initial Displacement: 0.46 m
Total Well Penetration Depth: 2.13 m
Casing Radius: 0.0254 m
Static Water Column Height: 1.509 m
Screen Length: 2.13 m
Well Radius: 0.102 m

SOLUTION

Aquifer Model: Unconfined
Solution Method: Hvorslev
K = 4.472E-6 m/sec
y0 = 0.3306 m



WELL TEST ANALYSIS

Data Set: C:\Users\David\Documents\EagleHeights\MW-4-S.aqt
Date: 10/15/18 Time: 14:58:20

PROJECT INFORMATION

Company: Terra-Dynamics Consulting Inc.
Client: Eagle Heights
Project: 342
Location: MW-4-S
Test Well: MW-4-S
Test Date: 26-Apr-18

AQUIFER DATA

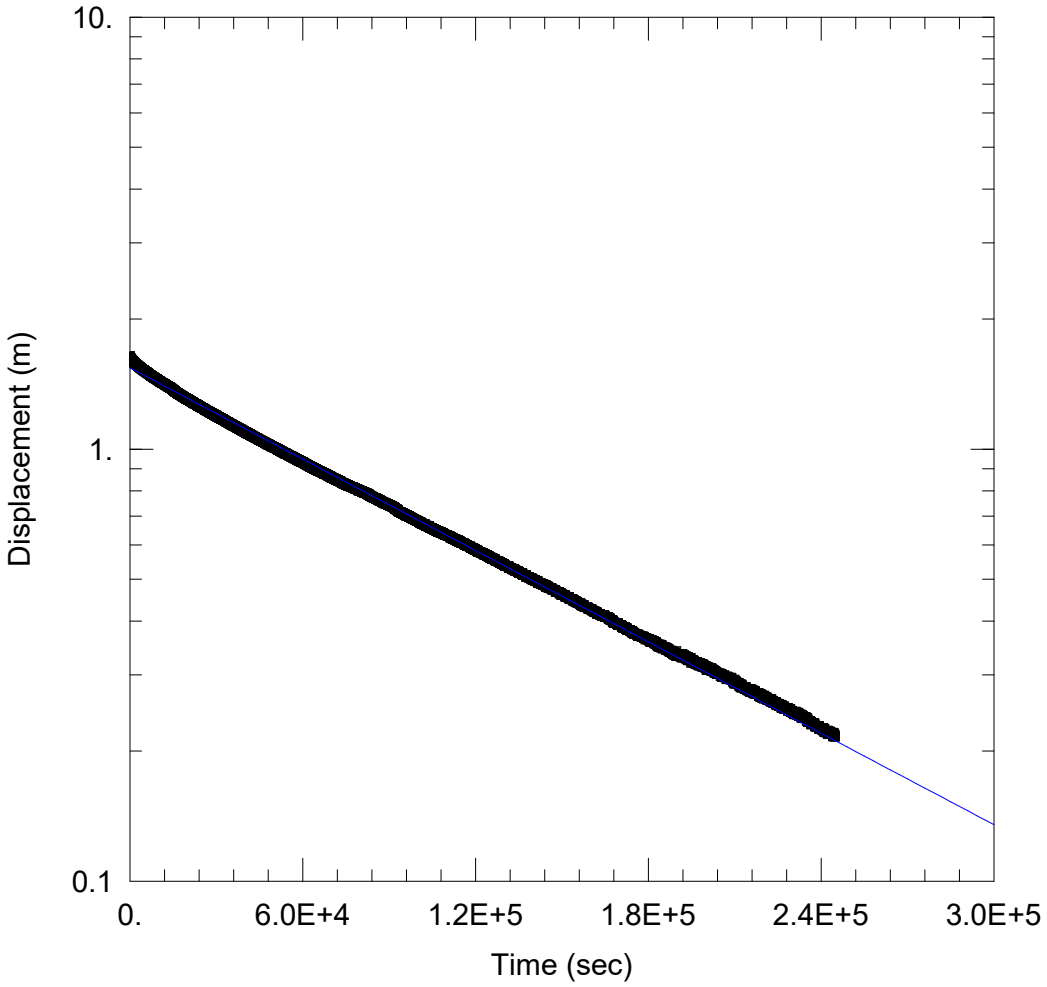
Saturated Thickness: 0.085 m Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (MW-4-S)

Initial Displacement: -1.629 m
Total Well Penetration Depth: 1.52 m
Casing Radius: 0.0254 m
Static Water Column Height: 0.085 m
Screen Length: 1.52 m
Well Radius: 0.102 m

SOLUTION

Aquifer Model: Unconfined
Solution Method: Hvorslev
K = 1.068E-5 m/sec
y0 = -0.6828 m



WELL TEST ANALYSIS

Data Set:
Date: 10/15/18 Time: 11:26:11

PROJECT INFORMATION

Company: Terra-Dynamics Consulting Inc.
Client: Eagle Heights
Project: 342
Location: MW-4-D
Test Well: MW-4-D
Test Date: 23-Apr-18

AQUIFER DATA

Saturated Thickness: 3.197 m Anisotropy Ratio (Kz/Kr): 1.

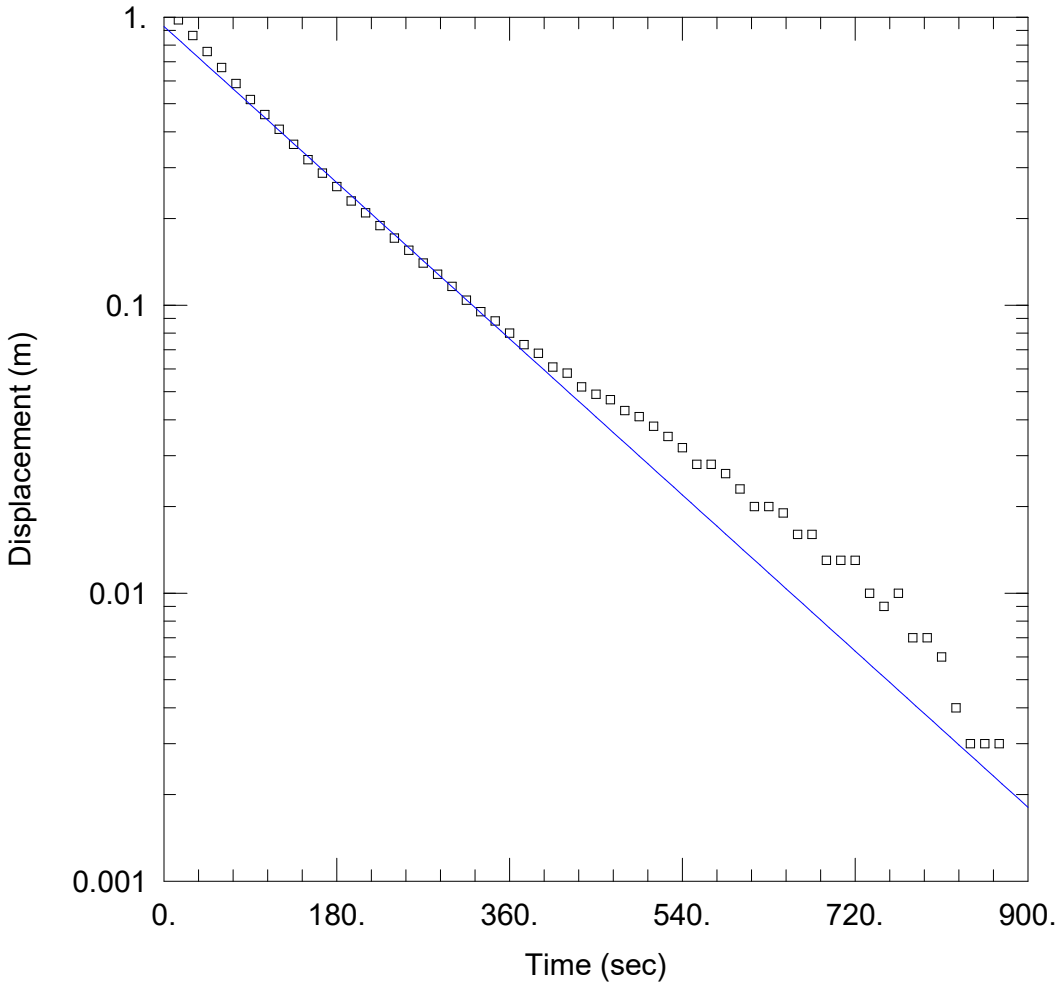
WELL DATA (MW-4-D)

Initial Displacement: 1.645 m
Total Well Penetration Depth: 3.177 m
Casing Radius: 0.0254 m
Static Water Column Height: 3.197 m
Screen Length: 1.5 m
Well Radius: 0.102 m

SOLUTION

Aquifer Model: Unconfined Solution Method: Hvorslev

K = 4.7E-9 m/sec y0 = 1.542 m



WELL TEST ANALYSIS

Data Set:
Date: 10/15/18 Time: 11:41:57

PROJECT INFORMATION

Company: Terra-Dynamics Consulting Inc.
Client: Eagle Heights
Project: 342
Location: MW-5
Test Well: MW-5
Test Date: 23-Apr-18

AQUIFER DATA

Saturated Thickness: 5.3 m Anisotropy Ratio (Kz/Kr): 1.

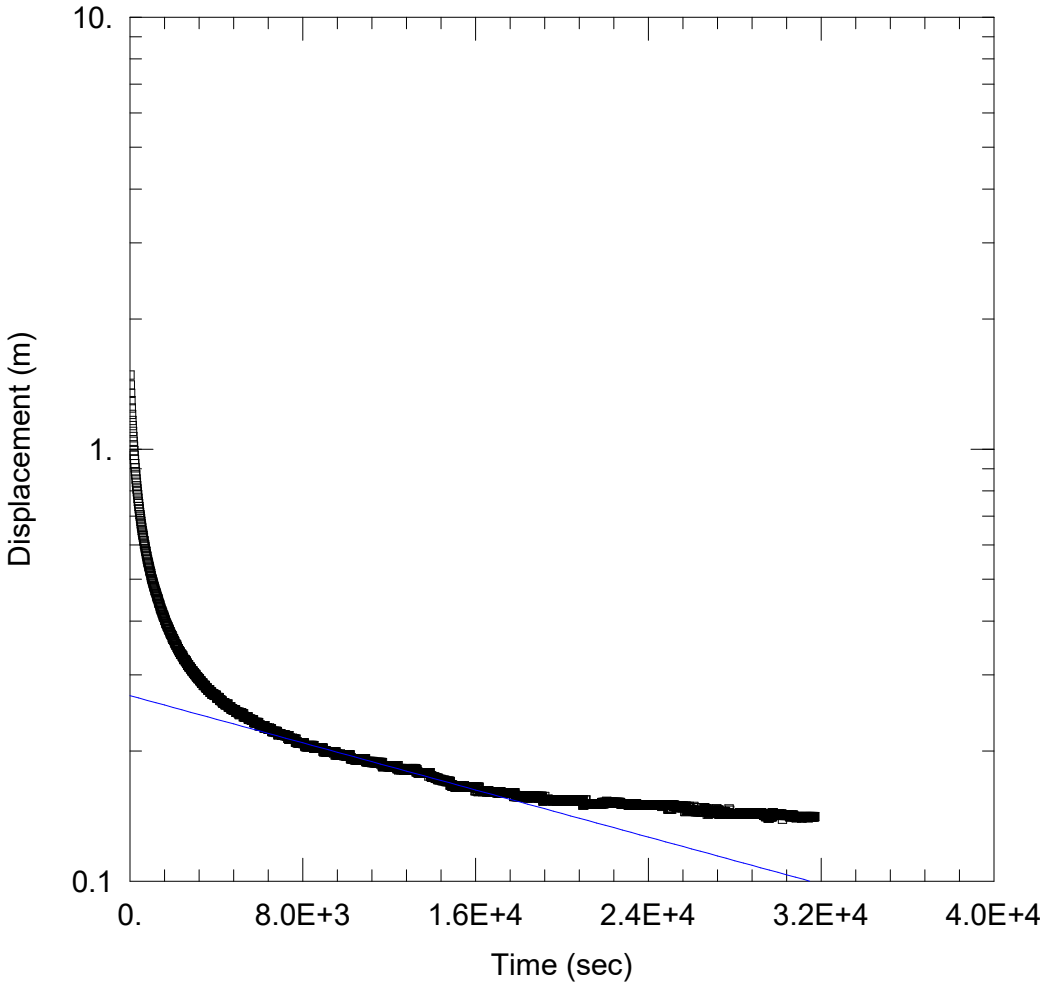
WELL DATA (MW-5)

Initial Displacement: 1.194 m
Total Well Penetration Depth: 3.05 m
Casing Radius: 0.0254 m
Static Water Column Height: 5.3 m
Screen Length: 3.05 m
Well Radius: 0.102 m

SOLUTION

Aquifer Model: Unconfined Solution Method: Hvorslev

K = 2.494E-6 m/sec y0 = 0.9282 m



WELL TEST ANALYSIS

Data Set: C:\Users\David\Documents\EagleHeights\MW-6.aqt
Date: 10/15/18 Time: 15:00:44

PROJECT INFORMATION

Company: Terra-Dynamics Consulting Inc.
Client: Eagle Heights
Project: 342
Location: MW-6
Test Well: MW-6
Test Date: 23-Apr-18

AQUIFER DATA

Saturated Thickness: 3.05 m Anisotropy Ratio (Kz/Kr): 1.

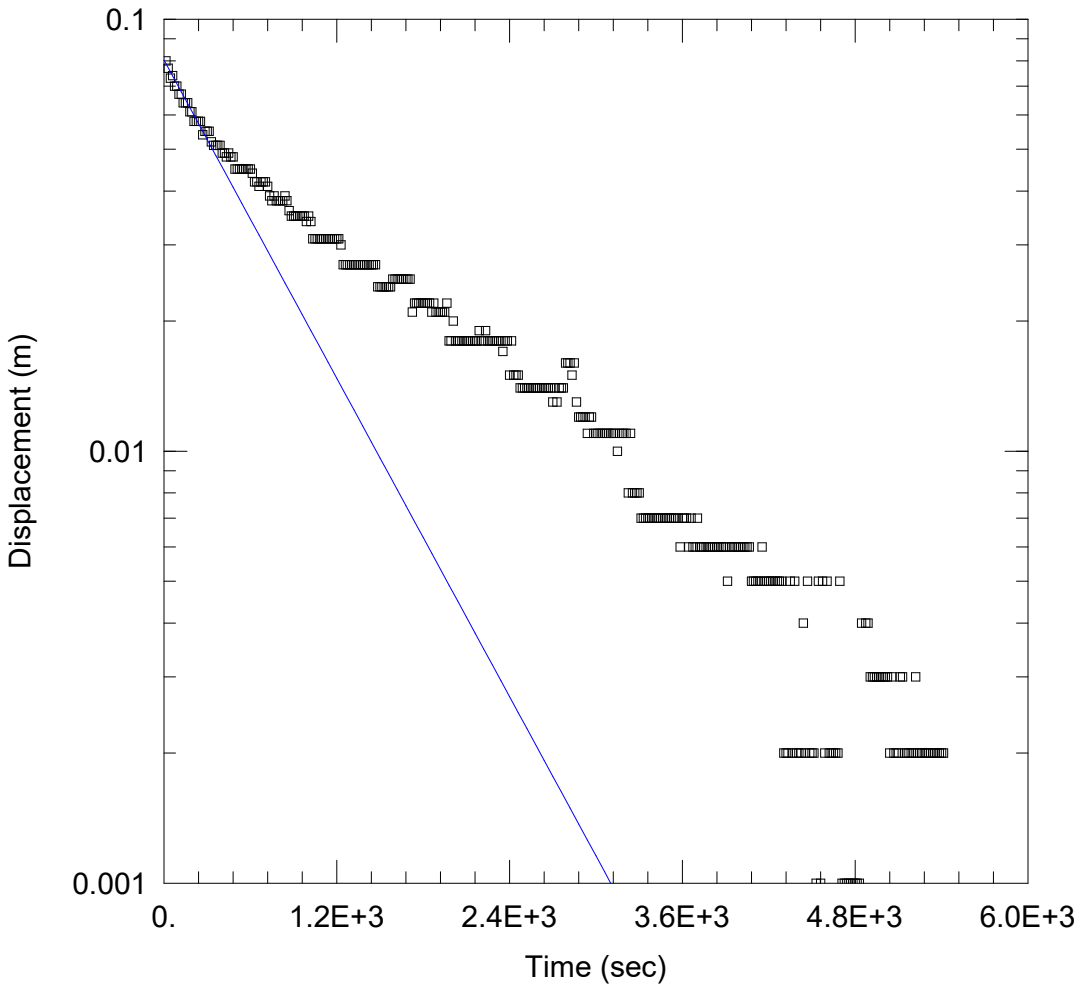
WELL DATA (MW-6)

Initial Displacement: 1.484 m
Total Well Penetration Depth: 6.94 m
Casing Radius: 0.0254 m
Static Water Column Height: 6.584 m
Screen Length: 3.05 m
Well Radius: 0.102 m

SOLUTION

Aquifer Model: Confined Solution Method: Hvorslev

K = 1.359E-8 m/sec y0 = 0.2687 m



WELL TEST ANALYSIS

Data Set: C:\Users\David\Documents\EagleHeights\MW-7-S.aqt
Date: 10/15/18 Time: 15:08:45

PROJECT INFORMATION

Company: Terra-Dynamics Consulting Inc.
Client: Eagle Heights
Project: 342
Location: MW-7-S
Test Well: MW-7-S
Test Date: 23-Apr-18

AQUIFER DATA

Saturated Thickness: 1.261 m Anisotropy Ratio (Kz/Kr): 1.

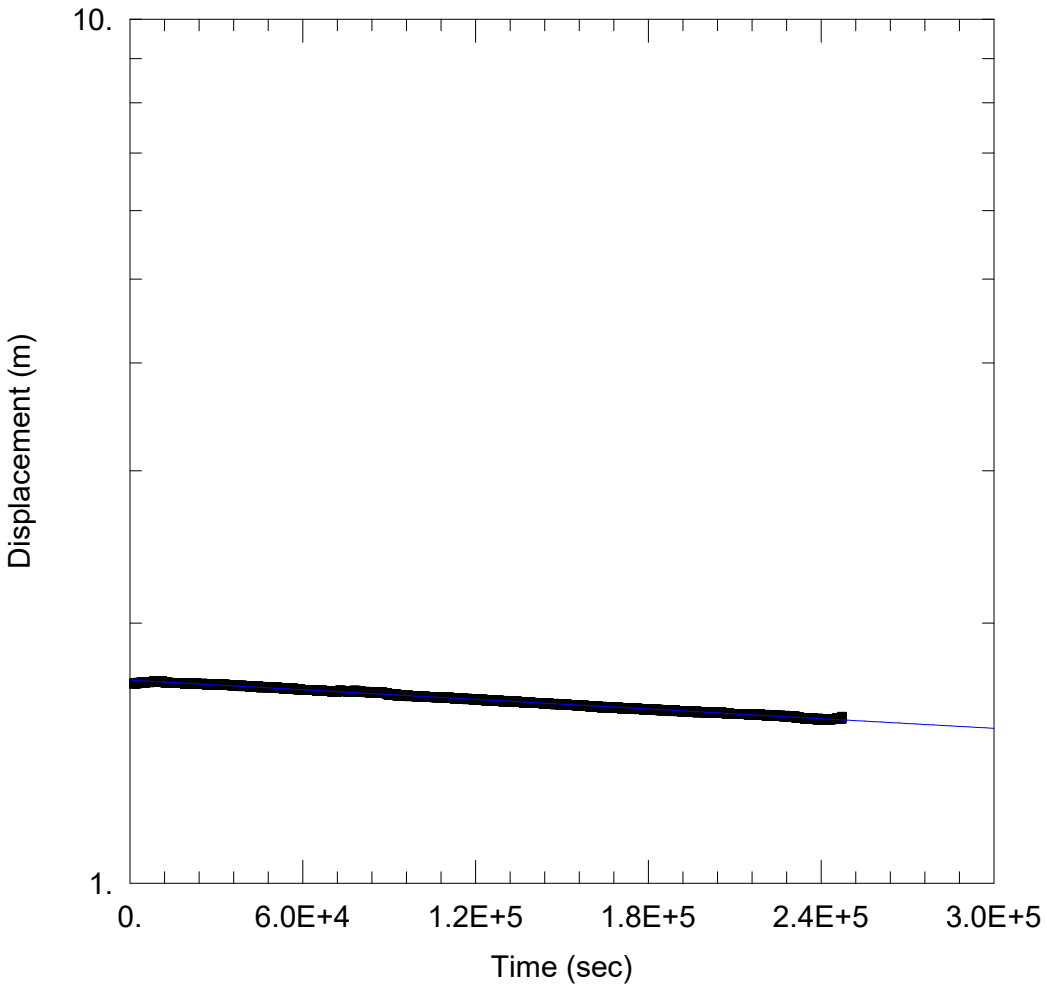
WELL DATA (MW-7-S)

Initial Displacement: 0.131 m
Total Well Penetration Depth: 3.05 m
Casing Radius: 0.0254 m
Static Water Column Height: 1.261 m
Screen Length: 3.05 m
Well Radius: 0.102 m

SOLUTION

Aquifer Model: Unconfined Solution Method: Hvorslev

K = 1.917E-6 m/sec y0 = 0.08045 m



SINGLE WELL RESPONSE TESTING

Data Set: C:\Users\David\Documents\EagleHeights\MW-7-D.aqt
Date: 10/15/18 Time: 08:11:10

PROJECT INFORMATION

Company: Terra-Dynamics Consulting Inc.
Client: Eagle Heights
Project: 342
Location: MW-7-D
Test Well: MW-7-D
Test Date: 23-Apr-18

AQUIFER DATA

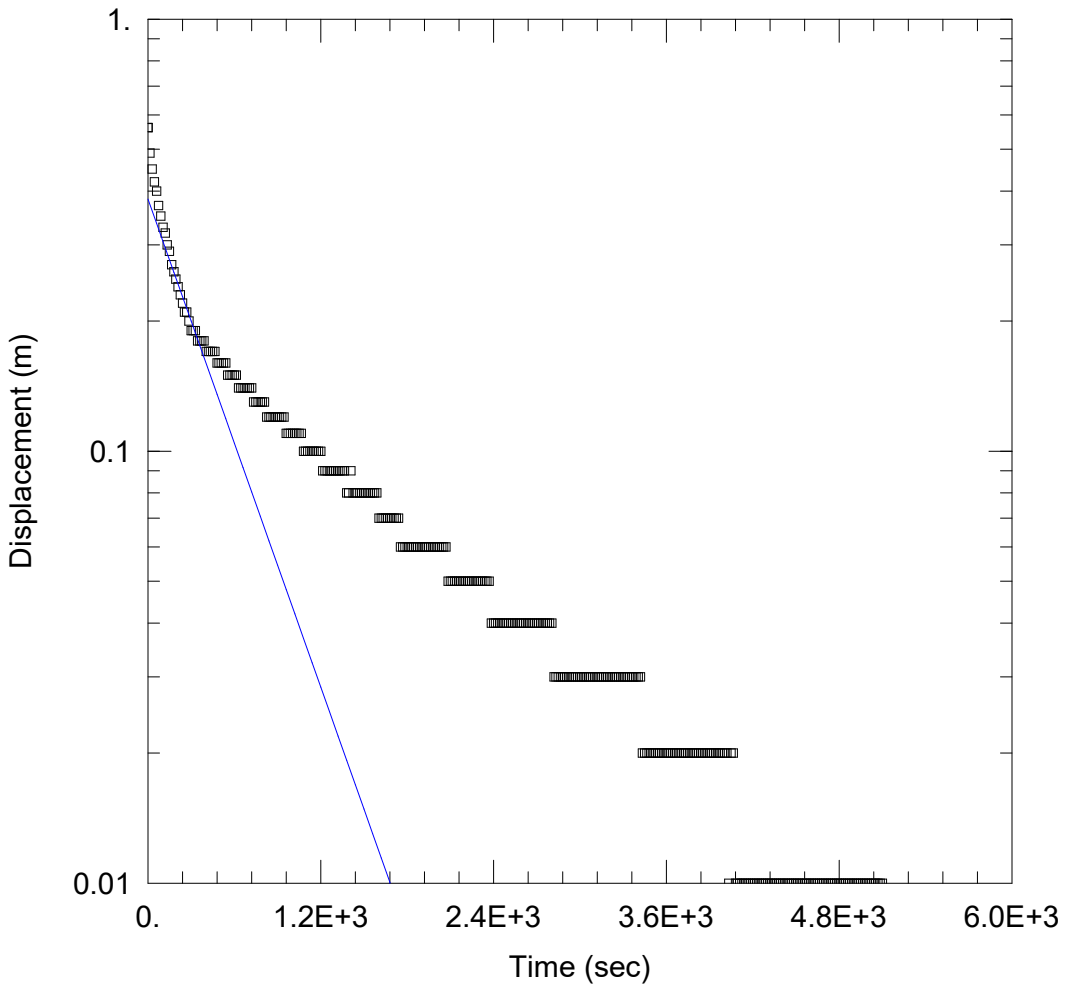
Saturated Thickness: 3.58 m Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (MW-7-D)

Initial Displacement: 1.702 m
Total Well Penetration Depth: 3.58 m
Casing Radius: 0.0254 m
Static Water Column Height: 3.6 m
Screen Length: 0.61 m
Well Radius: 0.102 m

SOLUTION

Aquifer Model: Confined
Solution Method: Hvorslev
K = 5.633E-10 m/sec
y0 = 1.718 m



WELL TEST ANALYSIS

Data Set: C:\Users\David\Documents\EagleHeights\MW-8.aqt
Date: 10/15/18 Time: 15:05:09

PROJECT INFORMATION

Company: Terra-Dynamics Consulting Inc.
Client: Eagle Heights
Project: 342
Location: MW-8
Test Well: MW-8
Test Date: 23-Apr-18

AQUIFER DATA

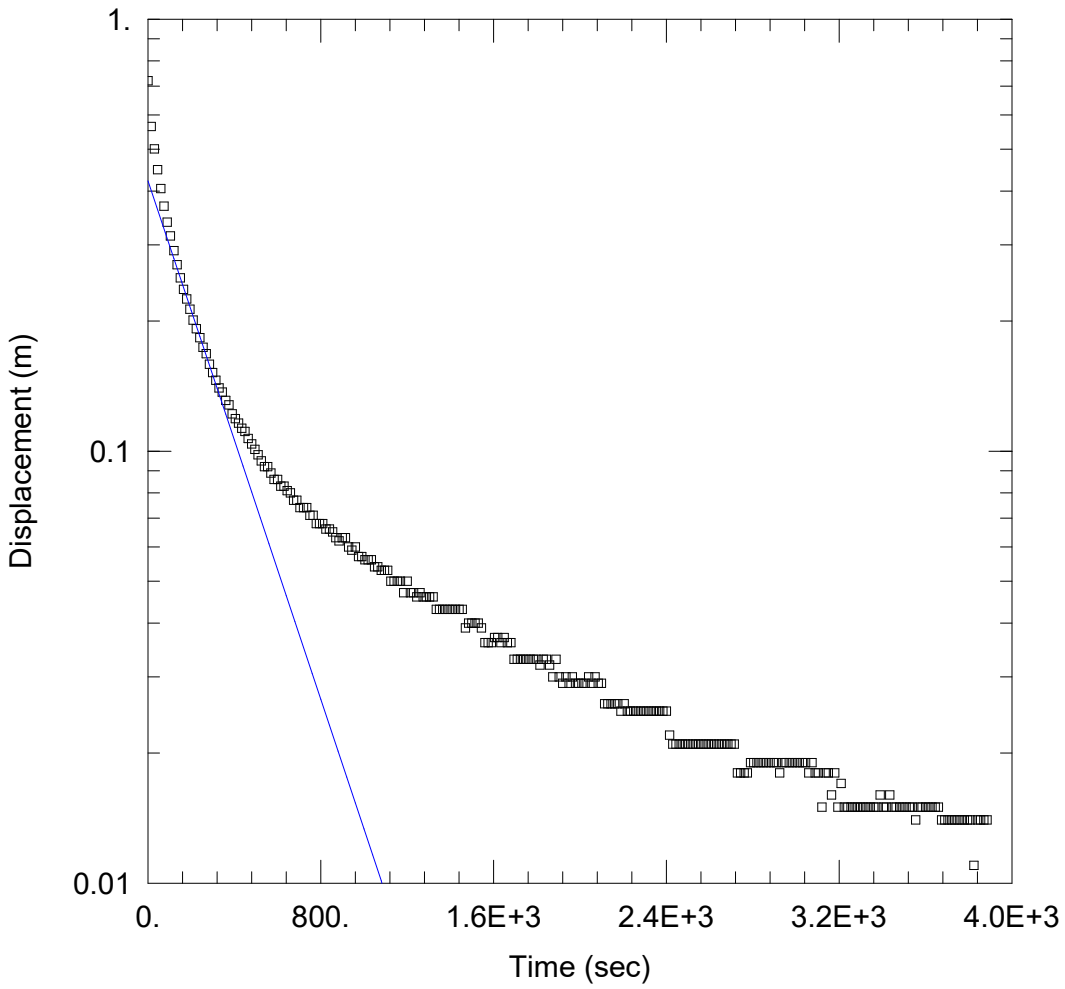
Saturated Thickness: 1.261 m
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (MW-8)

Initial Displacement: 0.561 m
Total Well Penetration Depth: 3.05 m
Casing Radius: 0.0254 m
Static Water Column Height: 1.261 m
Screen Length: 3.05 m
Well Radius: 0.102 m

SOLUTION

Aquifer Model: Unconfined
Solution Method: Hvorslev
K = 2.938E-6 m/sec
y0 = 0.383 m



WELL TEST ANALYSIS

Data Set: C:\Users\David\Documents\EagleHeights\MW-9.aqt
Date: 10/15/18 Time: 15:03:15

PROJECT INFORMATION

Company: Terra-Dynamics Consulting Inc.
Client: Eagle Heights
Project: 342
Location: MW-9
Test Well: MW-9
Test Date: 23-Apr-18

AQUIFER DATA

Saturated Thickness: 4.546 m Anisotropy Ratio (Kz/Kr): 1.

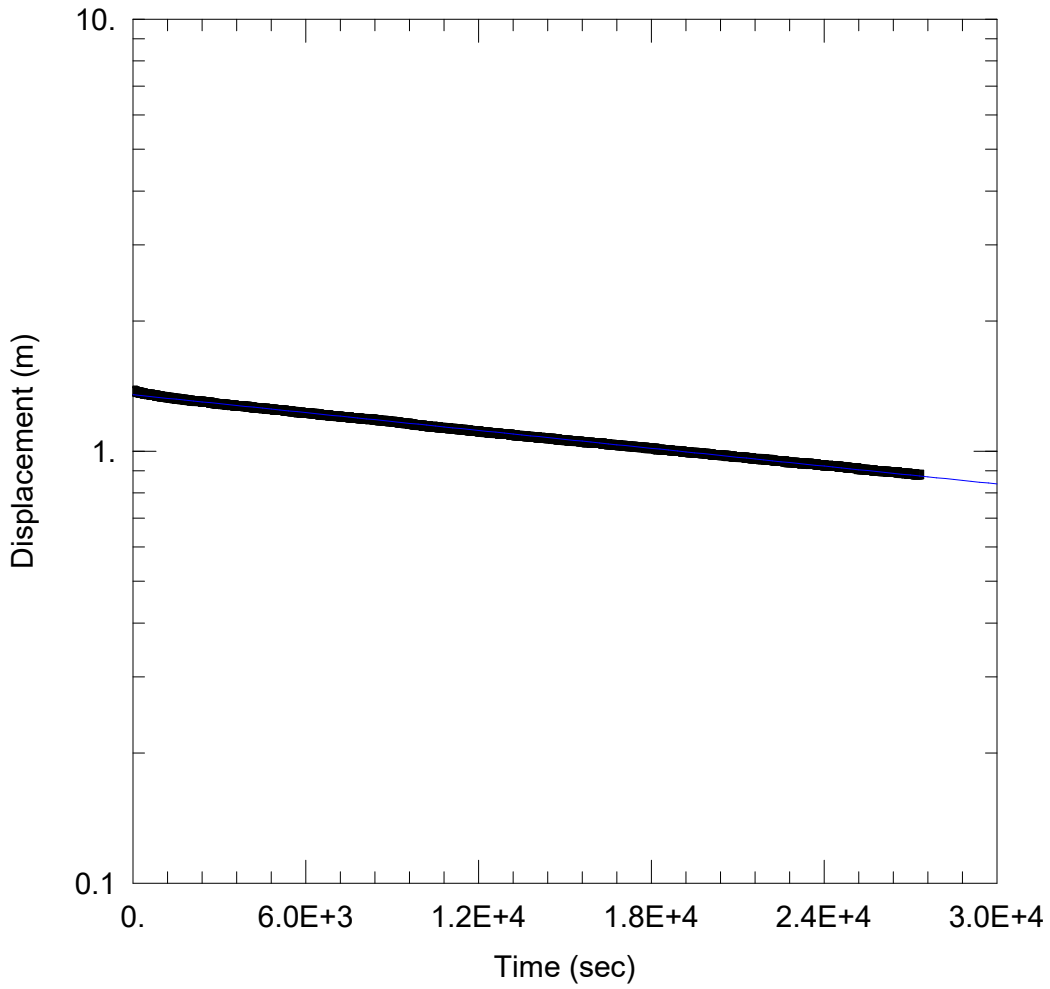
WELL DATA (MW-9)

Initial Displacement: 0.72 m
Total Well Penetration Depth: 4.57 m
Casing Radius: 0.0254 m
Static Water Column Height: 4.546 m
Screen Length: 4.57 m
Well Radius: 0.102 m

SOLUTION

Aquifer Model: Unconfined Solution Method: Hvorslev

K = 1.299E-6 m/sec y0 = 0.4222 m



WELL TEST ANALYSIS

Data Set: C:\Users\David\Documents\EagleHeights\MW-10-S.aqt
Date: 10/15/18 Time: 14:10:28

PROJECT INFORMATION

Company: Terra-Dynamics Consulting Inc.
Client: Eagle Heights
Project: 342
Location: MW-10-S
Test Well: MW-10-S
Test Date: 23-Apr-18

AQUIFER DATA

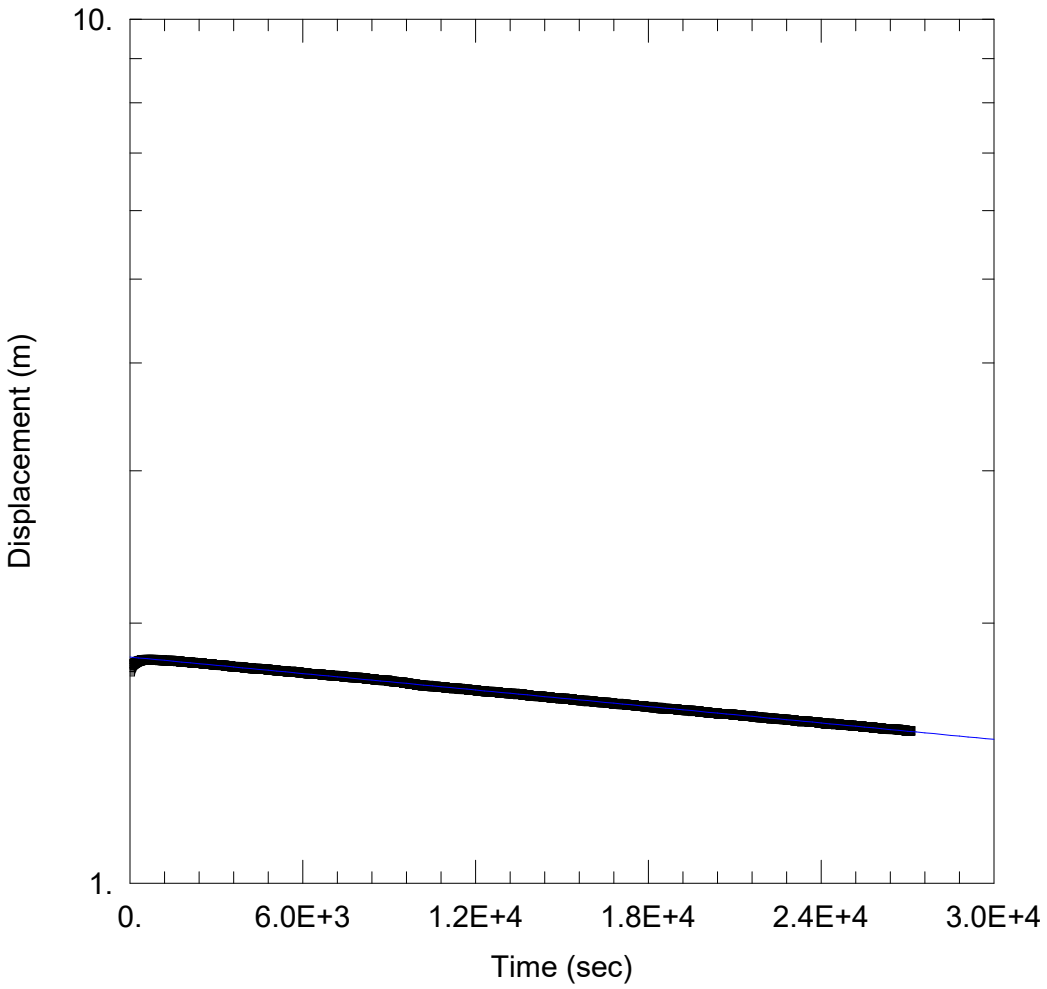
Saturated Thickness: 4.34 m Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (MW-10-S)

Initial Displacement: 1.383 m
Total Well Penetration Depth: 4.34 m
Casing Radius: 0.0254 m
Static Water Column Height: 7.022 m
Screen Length: 3.05 m
Well Radius: 0.102 m

SOLUTION

Aquifer Model: Confined
Solution Method: Hvorslev
K = 6.86E-9 m/sec
y0 = 1.35 m



WELL TEST ANALYSIS

Data Set: C:\Users\David\Documents\EagleHeights\MW-10-D.aqt
Date: 10/15/18 Time: 13:59:23

PROJECT INFORMATION

Company: Terra-Dynamics Consulting Inc.
Client: Eagle Heights
Project: 342
Location: MW-10-D
Test Well: MW-10-D
Test Date: 23-Apr-18

AQUIFER DATA

Saturated Thickness: 7.39 m Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (MW10-D)

Initial Displacement: 1.778 m
Total Well Penetration Depth: 7.39 m
Casing Radius: 0.0254 m
Static Water Column Height: 8.108 m
Screen Length: 0.61 m
Well Radius: 0.102 m

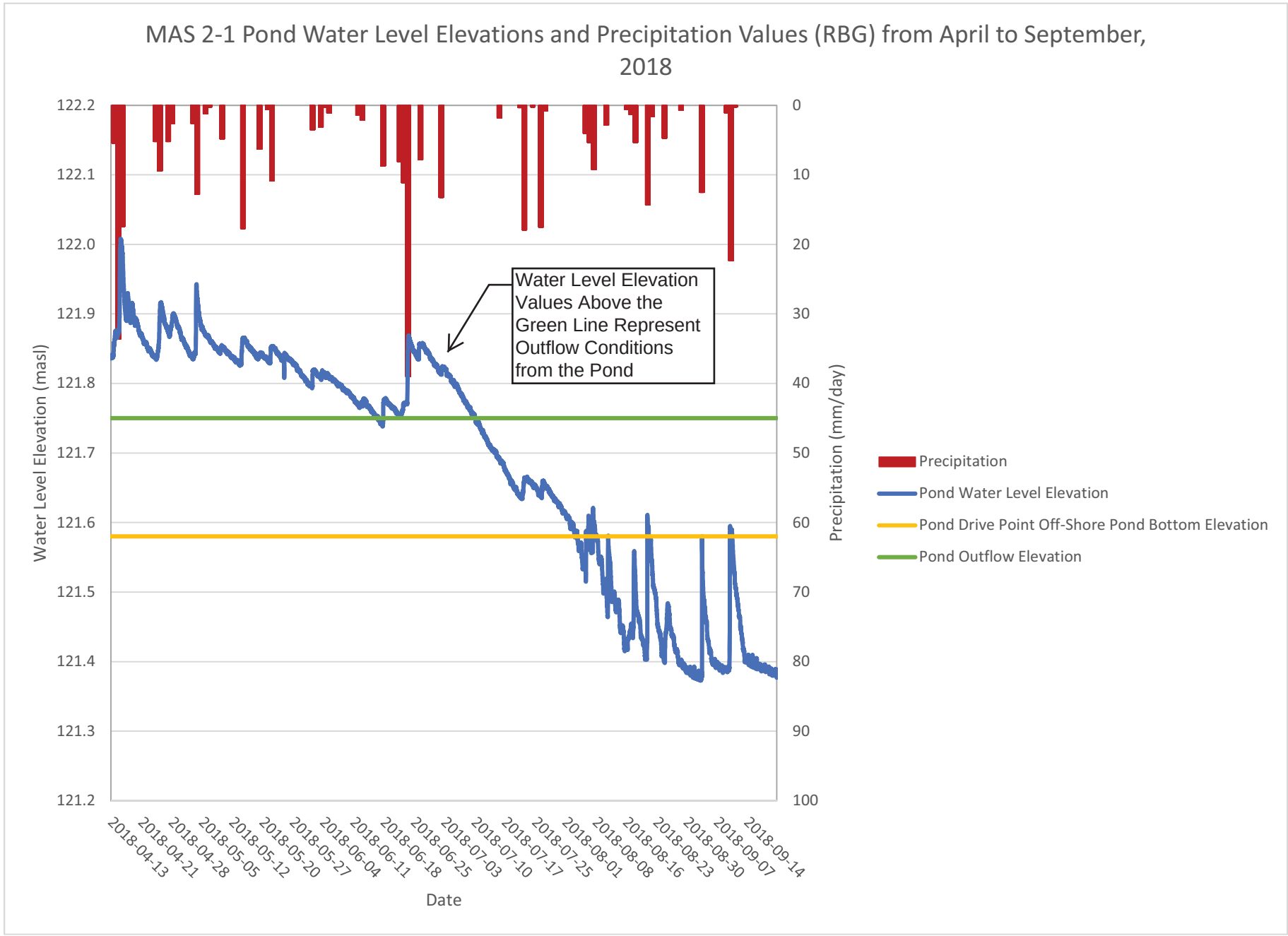
SOLUTION

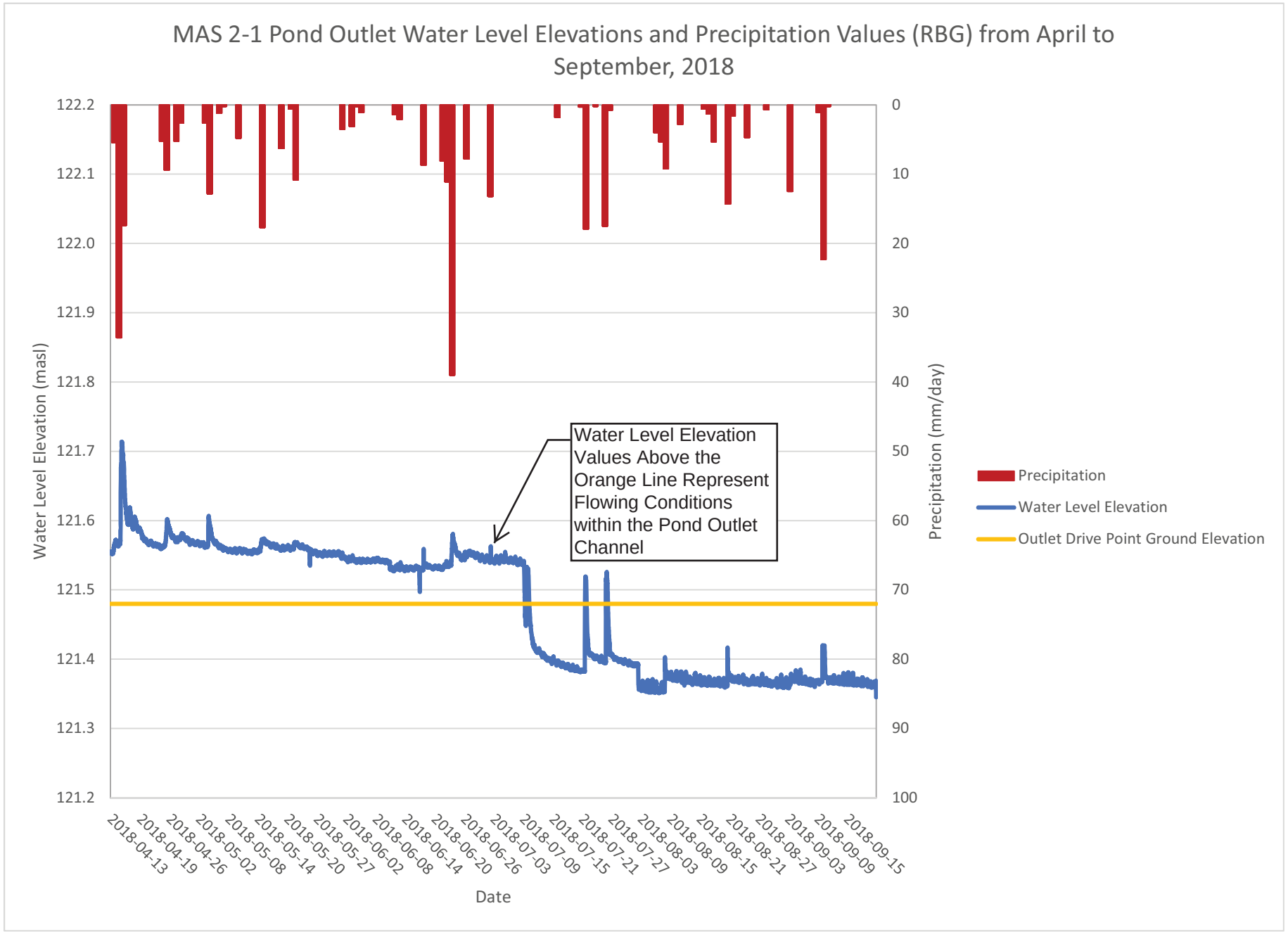
Aquifer Model: Confined Solution Method: Hvorslev

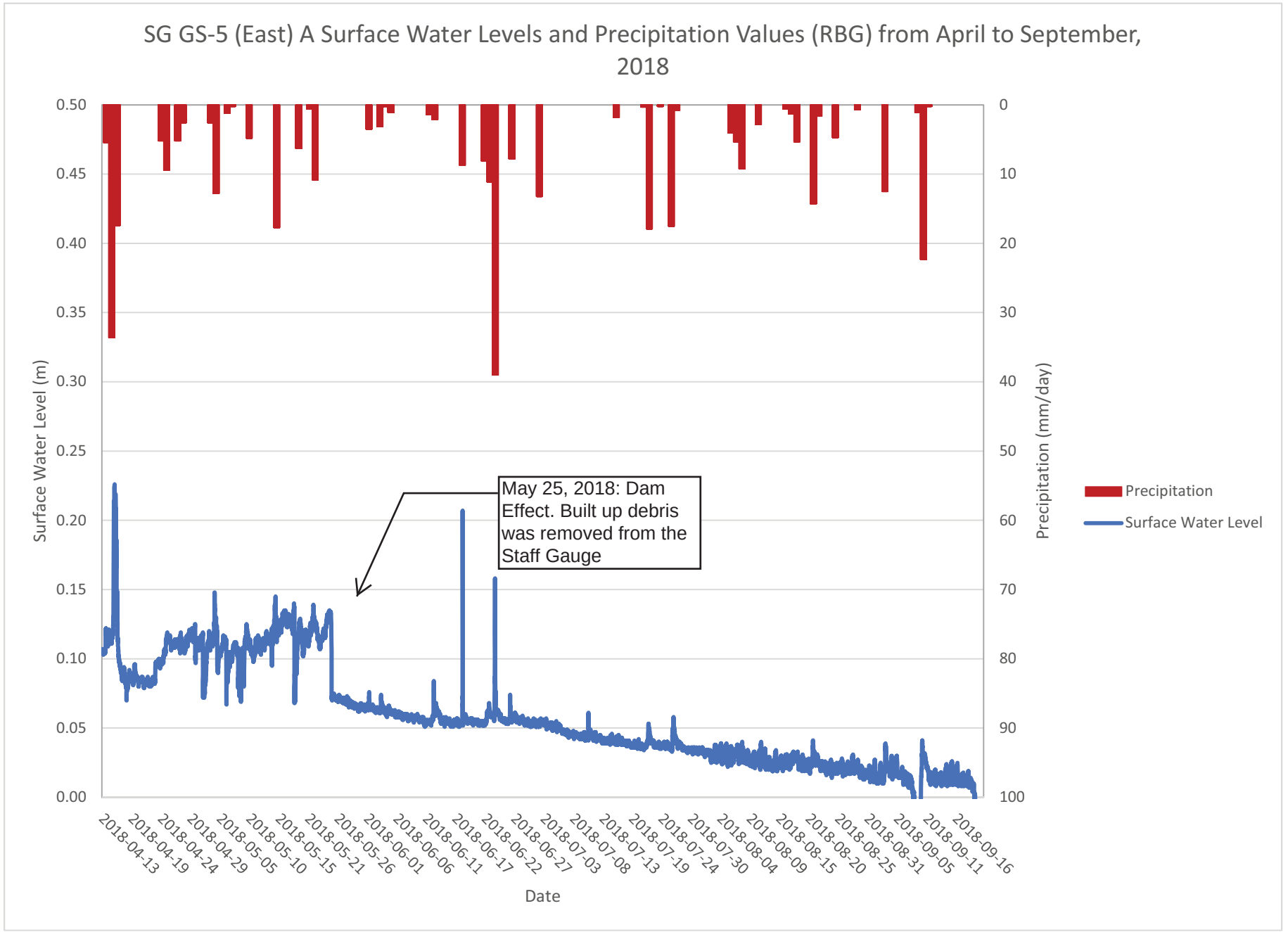
K = 9.622E-9 m/sec y0 = 1.826 m

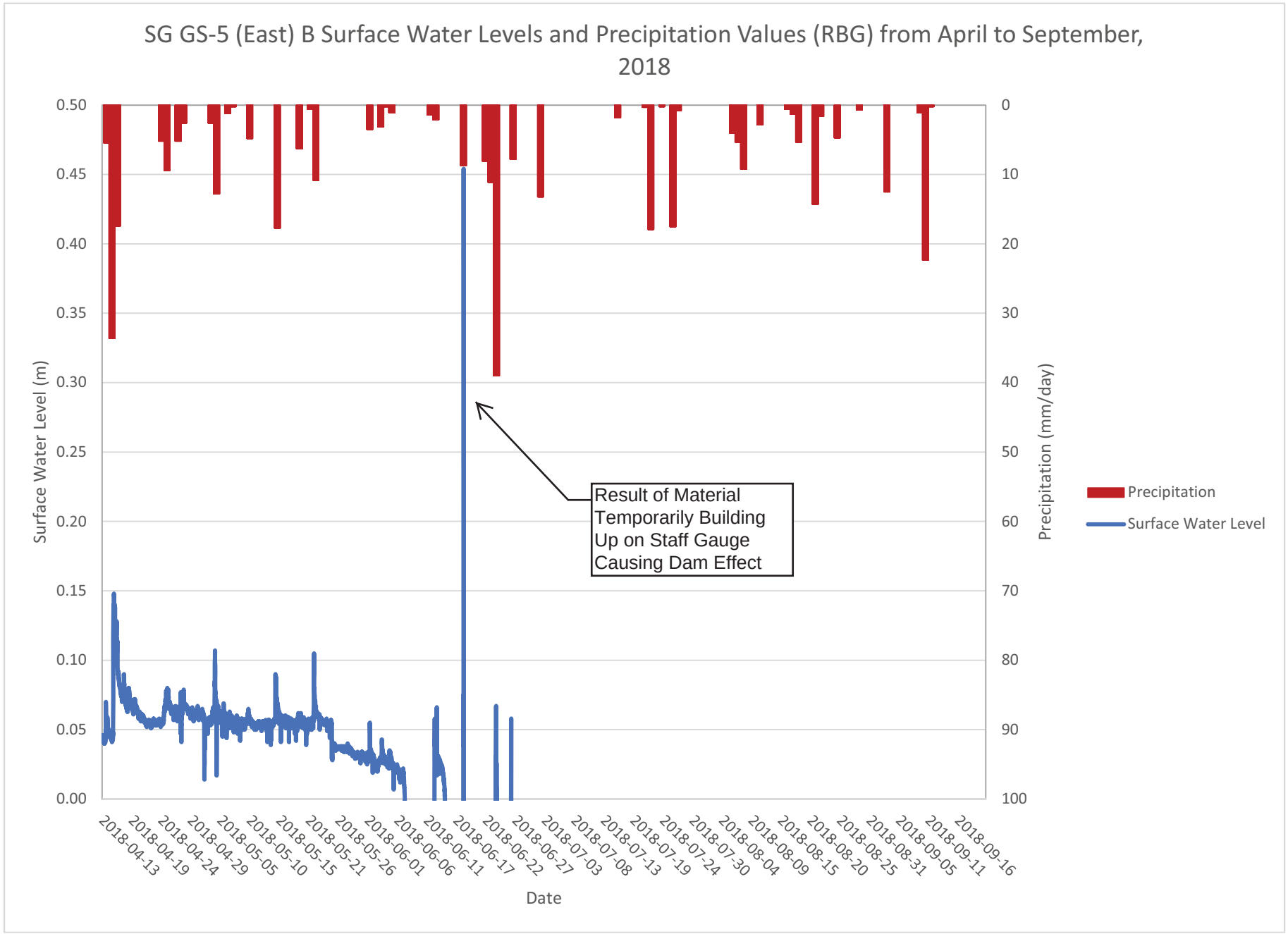
Appendix 6.

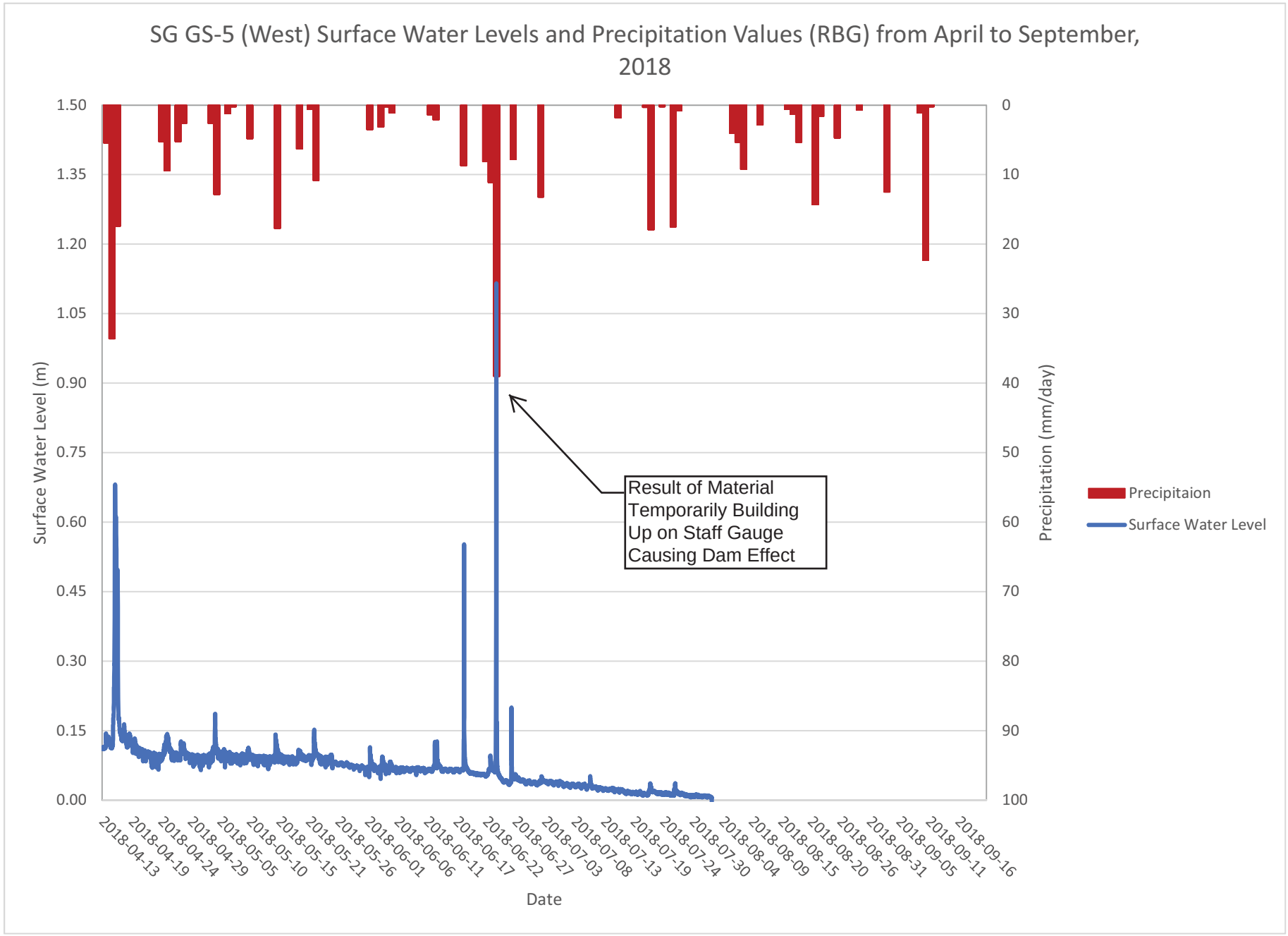
Staff Gauge Hydrographs

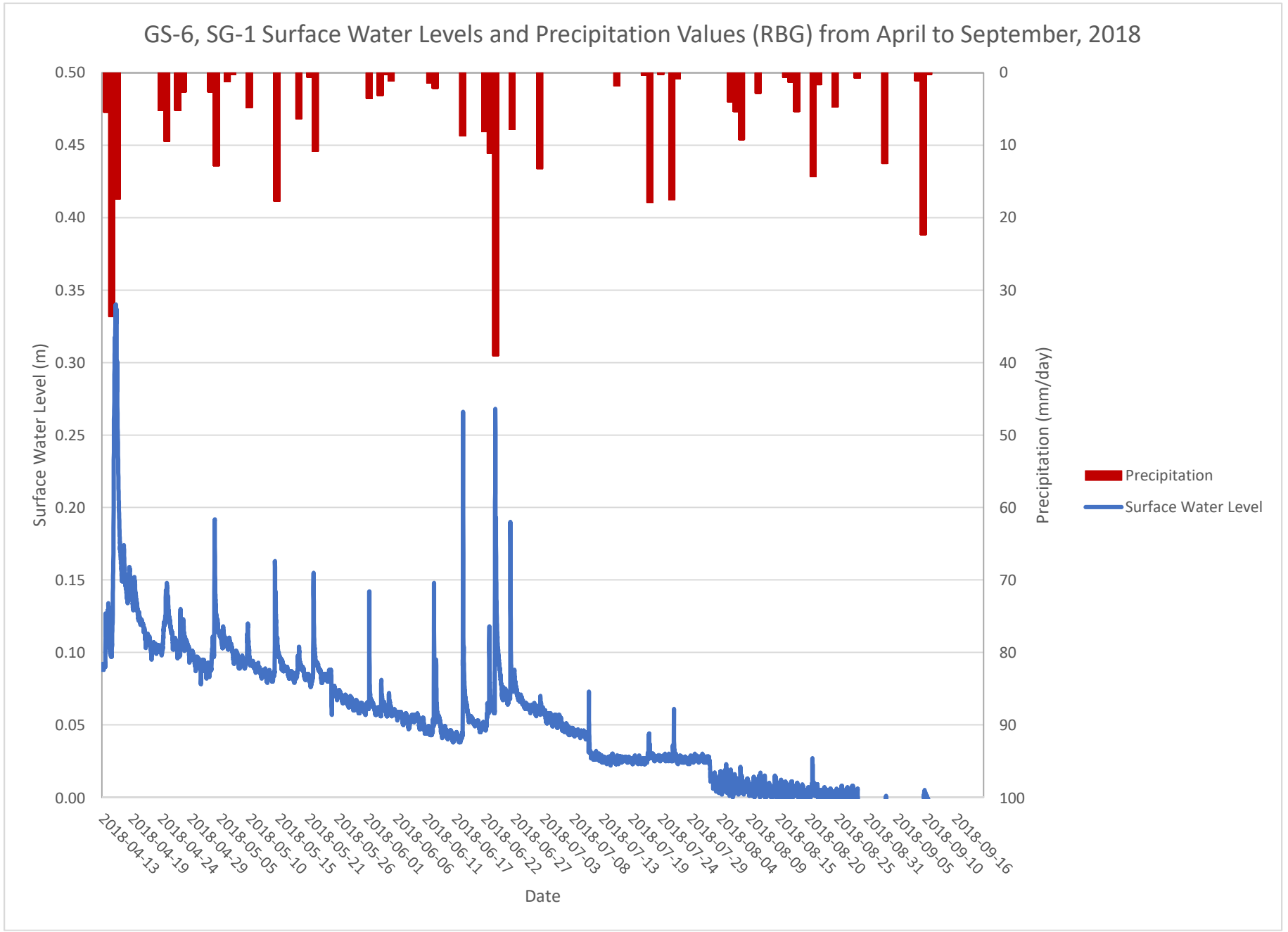

MAS 2-1 Pond Water Level Elevations and Precipitation Values (RBG) from April to September, 2018
Water Level Elevation (masl)
Precipitation (mm/day)
Date
Water Level Elevation Values Above the Green Line Represent Outflow Conditions from the Pond
Precipitation
Pond Water Level Elevation
Pond Drive Point Off-Shore Pond Bottom Elevation
Pond Outflow Elevation
122.2
122.1
122.0
121.9
121.8
121.7
121.6
121.5
121.4
121.3
121.2
0
10
20
30
40
50
60
70
80
90
100
2018-04-13
2018-04-21
2018-04-28
2018-05-05
2018-05-12
2018-05-20
2018-05-27
2018-06-04
2018-06-11
2018-06-18
2018-06-25
2018-07-03
2018-07-10
2018-07-17
2018-07-25
2018-08-01
2018-08-08
2018-08-16
2018-08-23
2018-08-30
2018-09-07
2018-09-14

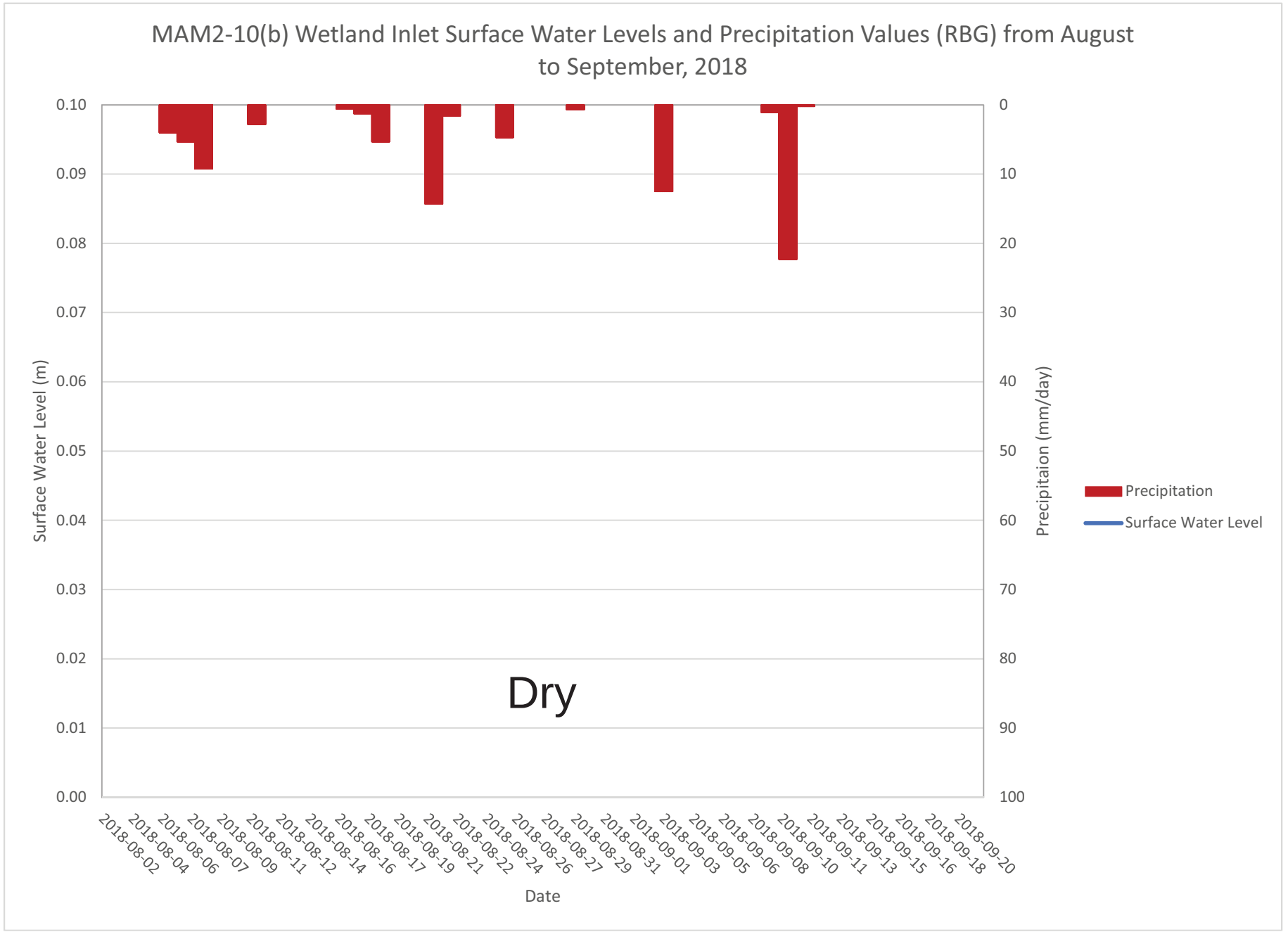

MAS 2-1 Pond Outlet Water Level Elevations and Precipitation Values (RBG) from April to September, 2018
Water Level Elevation (masl)
Precipitation (mm/day)
Date
Water Level Elevation Values Above the Orange Line Represent Flowing Conditions within the Pond Outlet Channel
Precipitation
Water Level Elevation
Outlet Drive Point Ground Elevation
122.2
122.1
122.0
121.9
121.8
121.7
121.6
121.5
121.4
121.3
121.2
0
10
20
30
40
50
60
70
80
90
100
2018-04-13
2018-04-19
2018-04-26
2018-05-02
2018-05-08
2018-05-14
2018-05-20
2018-05-27
2018-06-02
2018-06-08
2018-06-14
2018-06-20
2018-06-26
2018-07-03
2018-07-09
2018-07-15
2018-07-21
2018-07-27
2018-08-03
2018-08-09
2018-08-15
2018-08-21
2018-08-27
2018-09-03
2018-09-09
2018-09-15

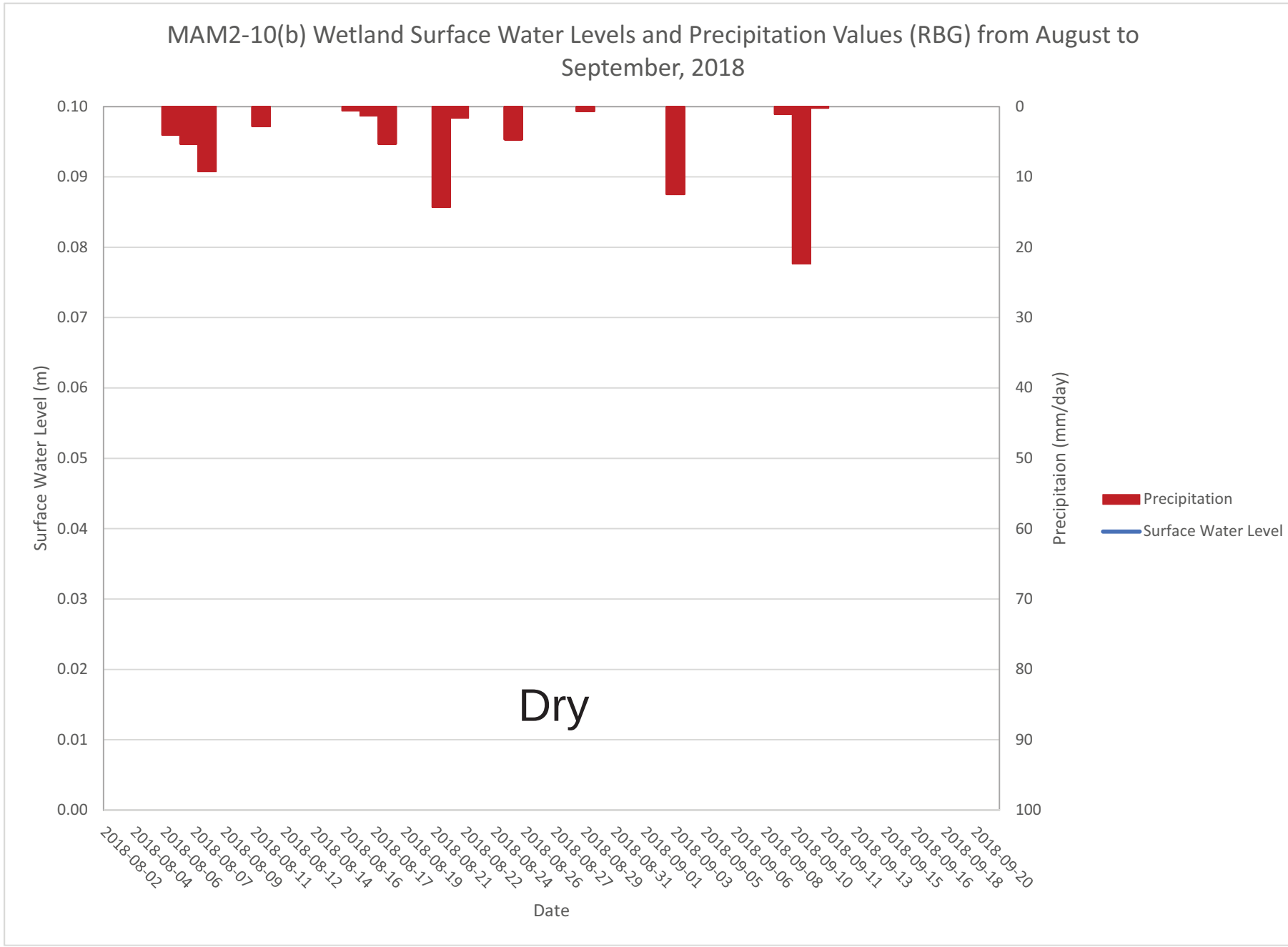

SG GS-5 (East) A Surface Water Levels and Precipitation Values (RBG) from April to September, 2018
Surface Water Level (m)
0.50
0.45
0.40
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
Precipitation (mm/day)
0
10
20
30
40
50
60
70
80
90
100
May 25, 2018: Dam Effect. Built up debris was removed from the Staff Gauge
Precipitation
Surface Water Level
2018-04-13
2018-04-19
2018-04-24
2018-04-29
2018-05-05
2018-05-10
2018-05-15
2018-05-21
2018-05-26
2018-06-01
2018-06-06
2018-06-11
2018-06-17
2018-06-22
2018-06-27
2018-07-03
2018-07-08
2018-07-13
2018-07-19
2018-07-24
2018-07-30
2018-08-04
2018-08-09
2018-08-15
2018-08-20
2018-08-25
2018-08-31
2018-09-05
2018-09-11
2018-09-16
Date

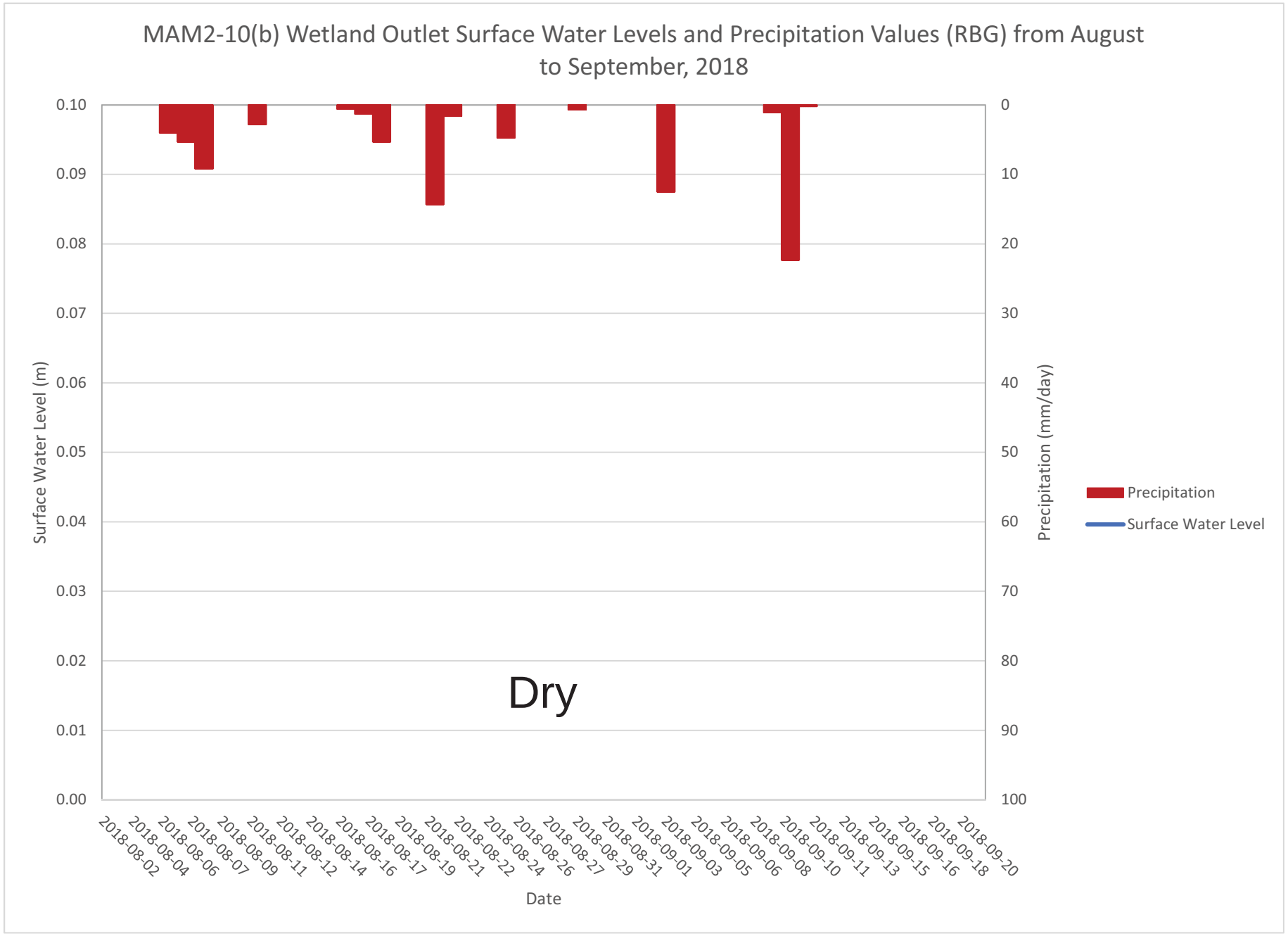

SG GS-5 (East) B Surface Water Levels and Precipitation Values (RBG) from April to September, 2018
Surface Water Level (m)
0.50
0.45
0.40
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
Precipitation (mm/day)
0
10
20
30
40
50
60
70
80
90
100
Result of Material Temporarily Building Up on Staff Gauge Causing Dam Effect
Precipitation
Surface Water Level
2018-04-13
2018-04-19
2018-04-24
2018-04-29
2018-05-05
2018-05-10
2018-05-15
2018-05-21
2018-05-26
2018-06-01
2018-06-06
2018-06-11
2018-06-17
2018-06-22
2018-06-27
2018-07-03
2018-07-08
2018-07-13
2018-07-19
2018-07-24
2018-07-30
2018-08-04
2018-08-09
2018-08-15
2018-08-20
2018-08-25
2018-08-31
2018-09-05
2018-09-11
2018-09-16
Date


SG GS-5 (West) Surface Water Levels and Precipitation Values (RBG) from April to September, 2018
Surface Water Level (m)
1.50
1.35
1.20
1.05
0.90
0.75
0.60
0.45
0.30
0.15
0.00
Precipitation (mm/day)
0
10
20
30
40
50
60
70
80
90
100
Result of Material Temporarily Building Up on Staff Gauge Causing Dam Effect
Precipitaion
Surface Water Level
2018-04-13
2018-04-19
2018-04-24
2018-04-29
2018-05-05
2018-05-10
2018-05-15
2018-05-21
2018-05-26
2018-06-01
2018-06-06
2018-06-11
2018-06-17
2018-06-22
2018-06-27
2018-07-03
2018-07-08
2018-07-13
2018-07-19
2018-07-24
2018-07-30
2018-08-04
2018-08-09
2018-08-15
2018-08-20
2018-08-26
2018-08-31
2018-09-05
2018-09-11
2018-09-16
Date


GS-6, SG-1 Surface Water Levels and Precipitation Values (RBG) from April to September, 2018
Surface Water Level (m)
0.50
0.45
0.40
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
Precipitation (mm/day)
0
10
20
30
40
50
60
70
80
90
100
2018-04-13
2018-04-19
2018-04-24
2018-04-29
2018-05-05
2018-05-10
2018-05-15
2018-05-21
2018-05-26
2018-06-01
2018-06-06
2018-06-11
2018-06-17
2018-06-22
2018-06-27
2018-07-03
2018-07-08
2018-07-13
2018-07-19
2018-07-24
2018-07-29
2018-08-04
2018-08-09
2018-08-15
2018-08-20
2018-08-25
2018-08-31
2018-09-05
2018-09-10
2018-09-16
Date
Precipitation
Surface Water Level

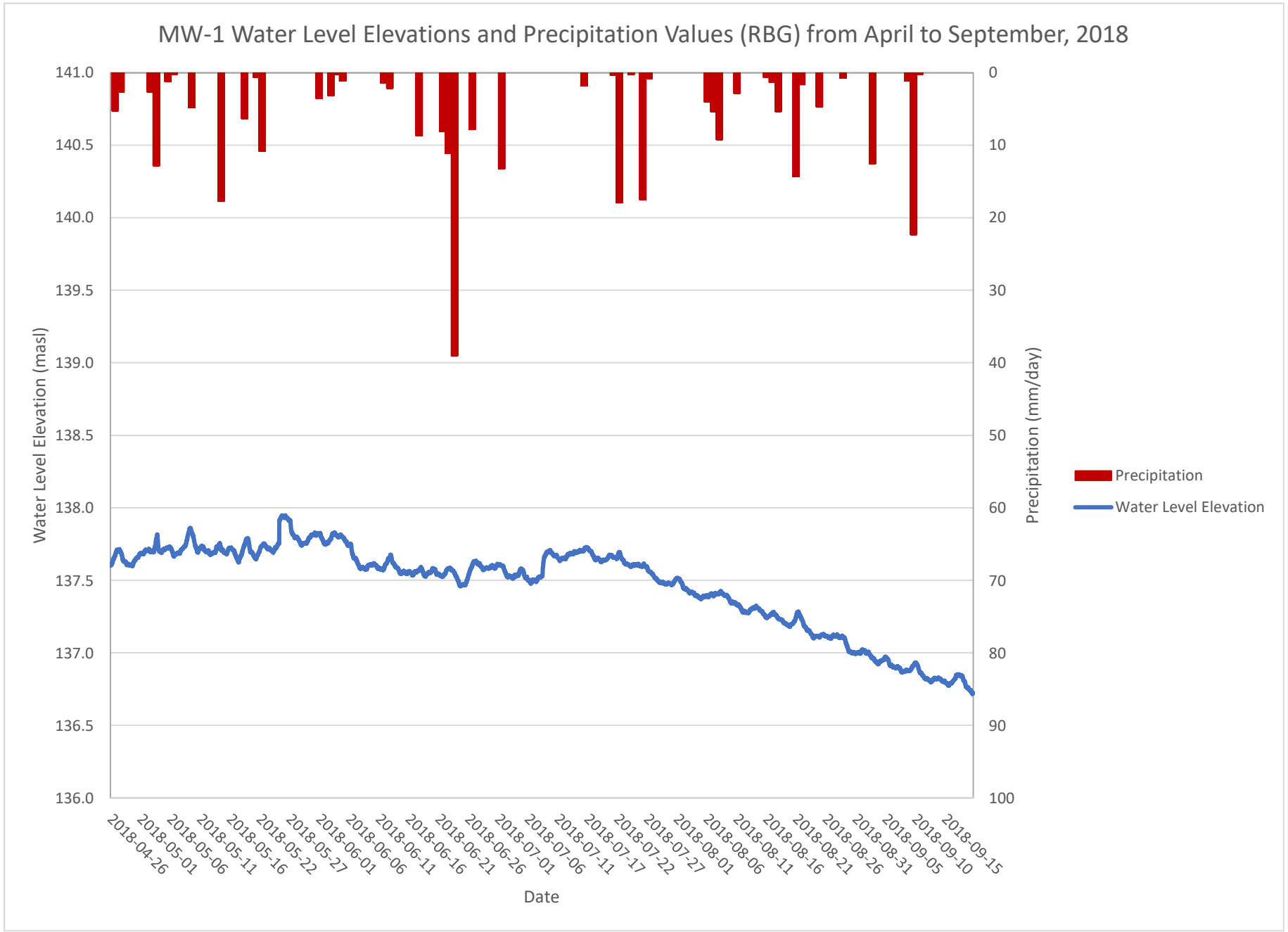

MAM2-10(b) Wetland Inlet Surface Water Levels and Precipitation Values (RBG) from August to September, 2018
Surface Water Level (m)
0.10
0.09
0.08
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0.00
Precipitaion (mm/day)
0
10
20
30
40
50
60
70
80
90
100
Dry
Precipitation
Surface Water Level
2018-08-02
2018-08-04
2018-08-06
2018-08-07
2018-08-09
2018-08-11
2018-08-12
2018-08-14
2018-08-16
2018-08-17
2018-08-19
2018-08-21
2018-08-22
2018-08-24
2018-08-26
2018-08-27
2018-08-29
2018-08-31
2018-09-01
2018-09-03
2018-09-05
2018-09-06
2018-09-08
2018-09-10
2018-09-11
2018-09-13
2018-09-15
2018-09-16
2018-09-18
2018-09-20
Date

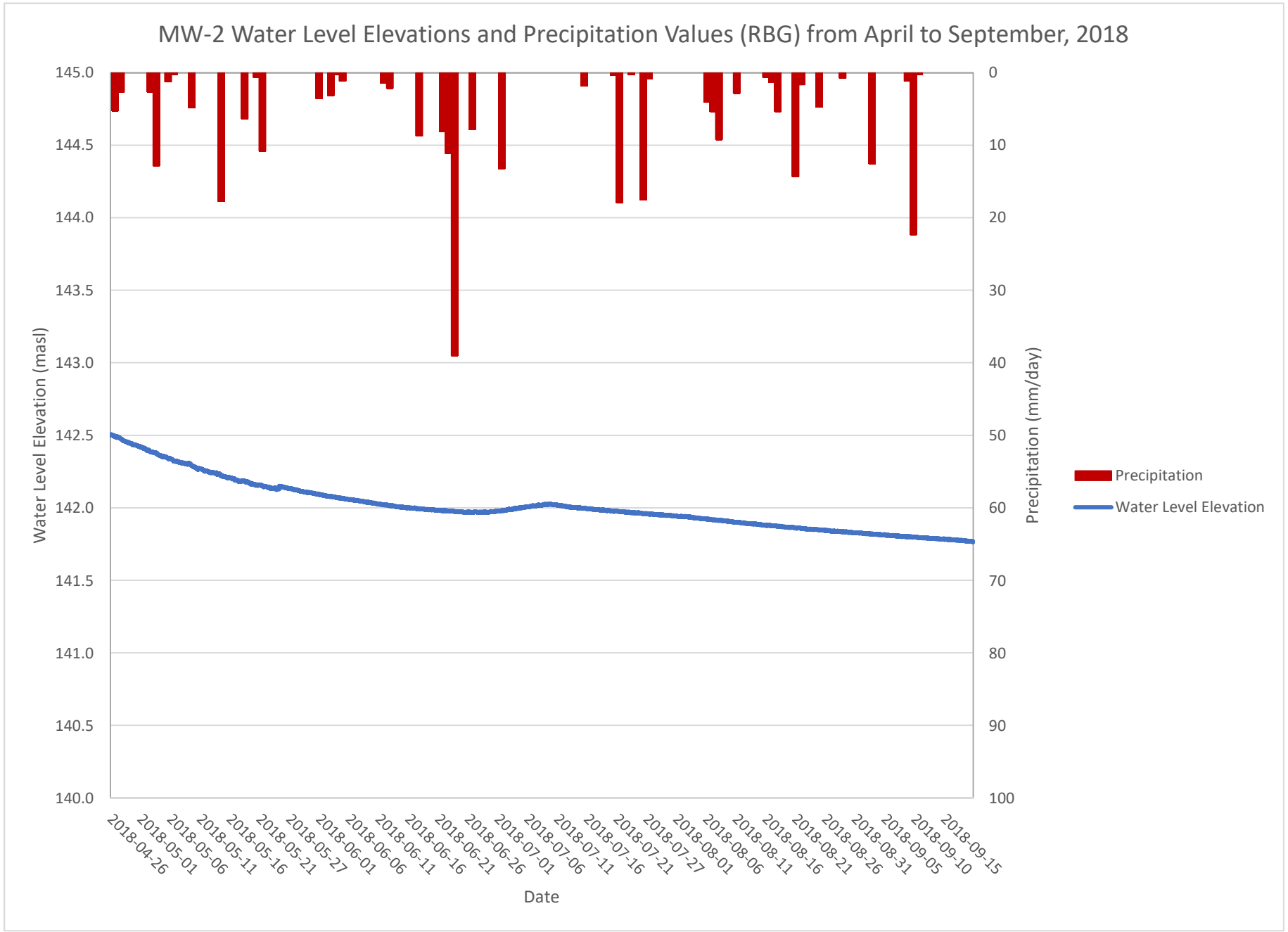

MAM2-10(b) Wetland Surface Water Levels and Precipitation Values (RBG) from August to September, 2018
Surface Water Level (m)
0.10
0.09
0.08
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0.00
Precipitaion (mm/day)
0
10
20
30
40
50
60
70
80
90
100
Dry
2018-08-02
2018-08-04
2018-08-06
2018-08-07
2018-08-09
2018-08-11
2018-08-12
2018-08-14
2018-08-16
2018-08-17
2018-08-19
2018-08-21
2018-08-22
2018-08-24
2018-08-26
2018-08-27
2018-08-29
2018-08-31
2018-09-01
2018-09-03
2018-09-05
2018-09-06
2018-09-08
2018-09-10
2018-09-11
2018-09-13
2018-09-15
2018-09-16
2018-09-18
2018-09-20
Date
Precipitation
Surface Water Level

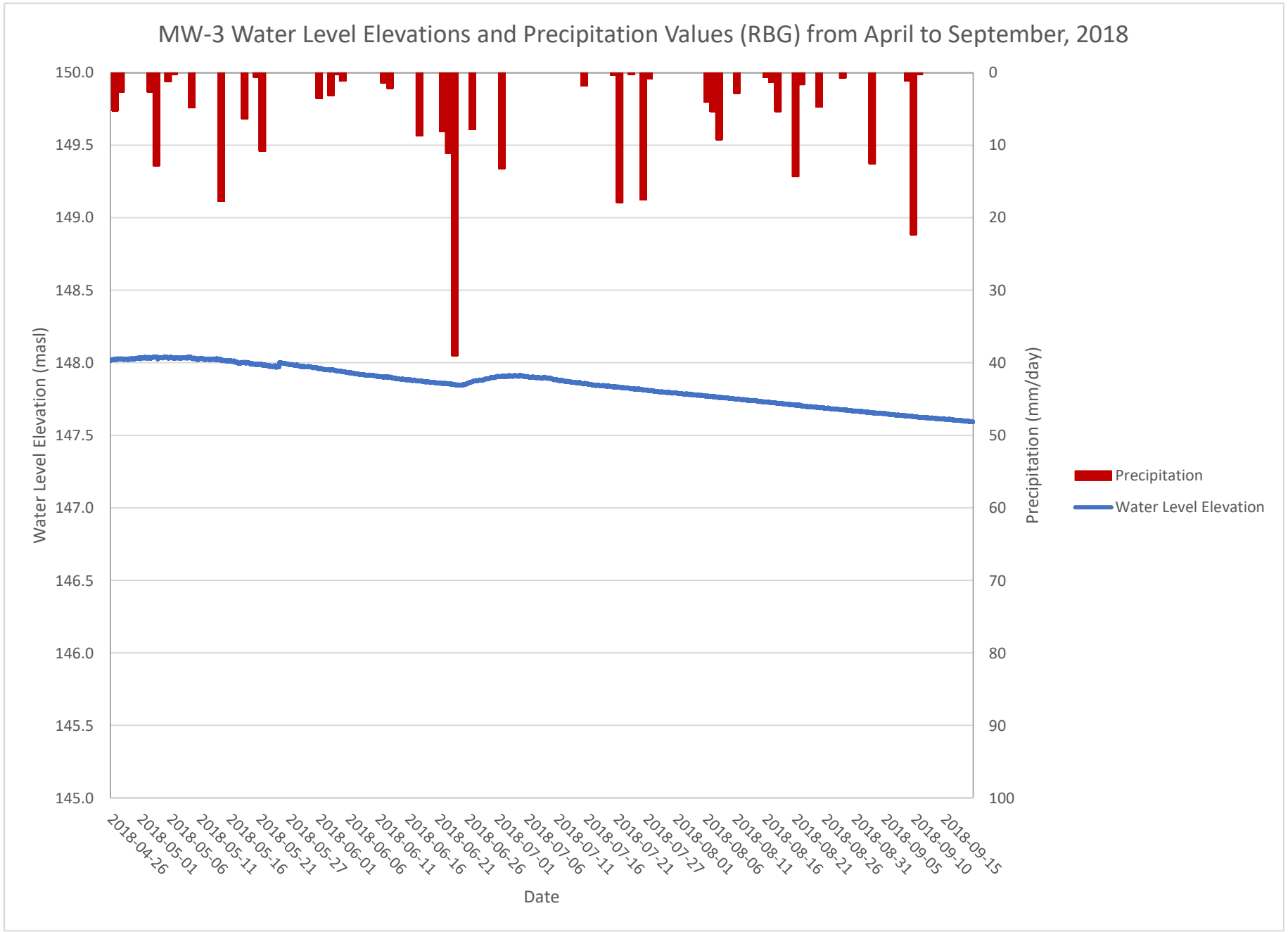

MAM2-10(b) Wetland Outlet Surface Water Levels and Precipitation Values (RBG) from August to September, 2018
Surface Water Level (m)
0.10
0.09
0.08
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0.00
Precipitation (mm/day)
0
10
20
30
40
50
60
70
80
90
100
Dry
2018-08-02
2018-08-04
2018-08-06
2018-08-07
2018-08-09
2018-08-11
2018-08-12
2018-08-14
2018-08-16
2018-08-17
2018-08-19
2018-08-21
2018-08-22
2018-08-24
2018-08-26
2018-08-27
2018-08-29
2018-08-31
2018-09-01
2018-09-03
2018-09-05
2018-09-06
2018-09-08
2018-09-10
2018-09-11
2018-09-13
2018-09-15
2018-09-16
2018-09-18
2018-09-20
Date
Precipitation
Surface Water Level

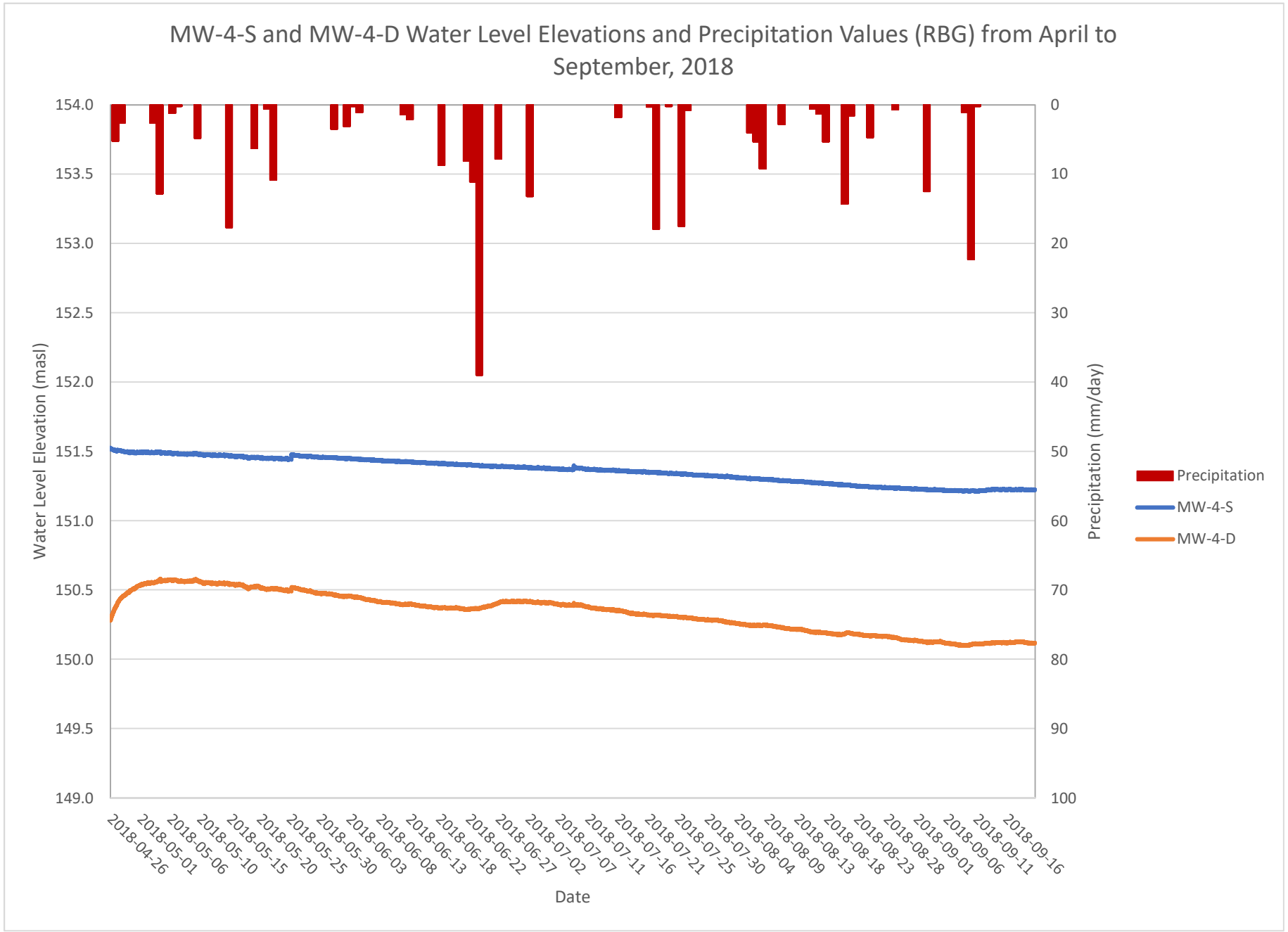
Appendix 7.

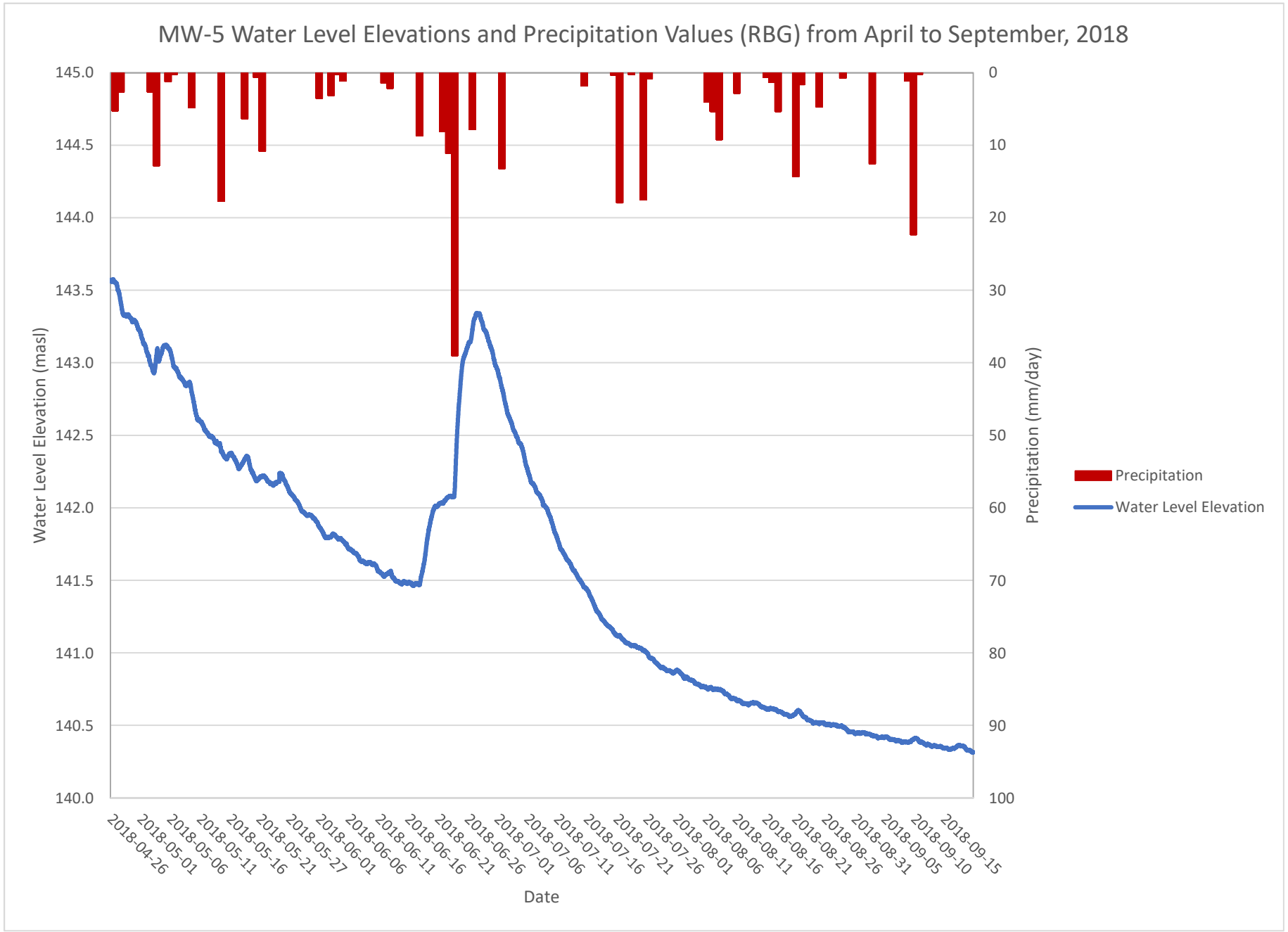
Monitoring Well Hydrographs

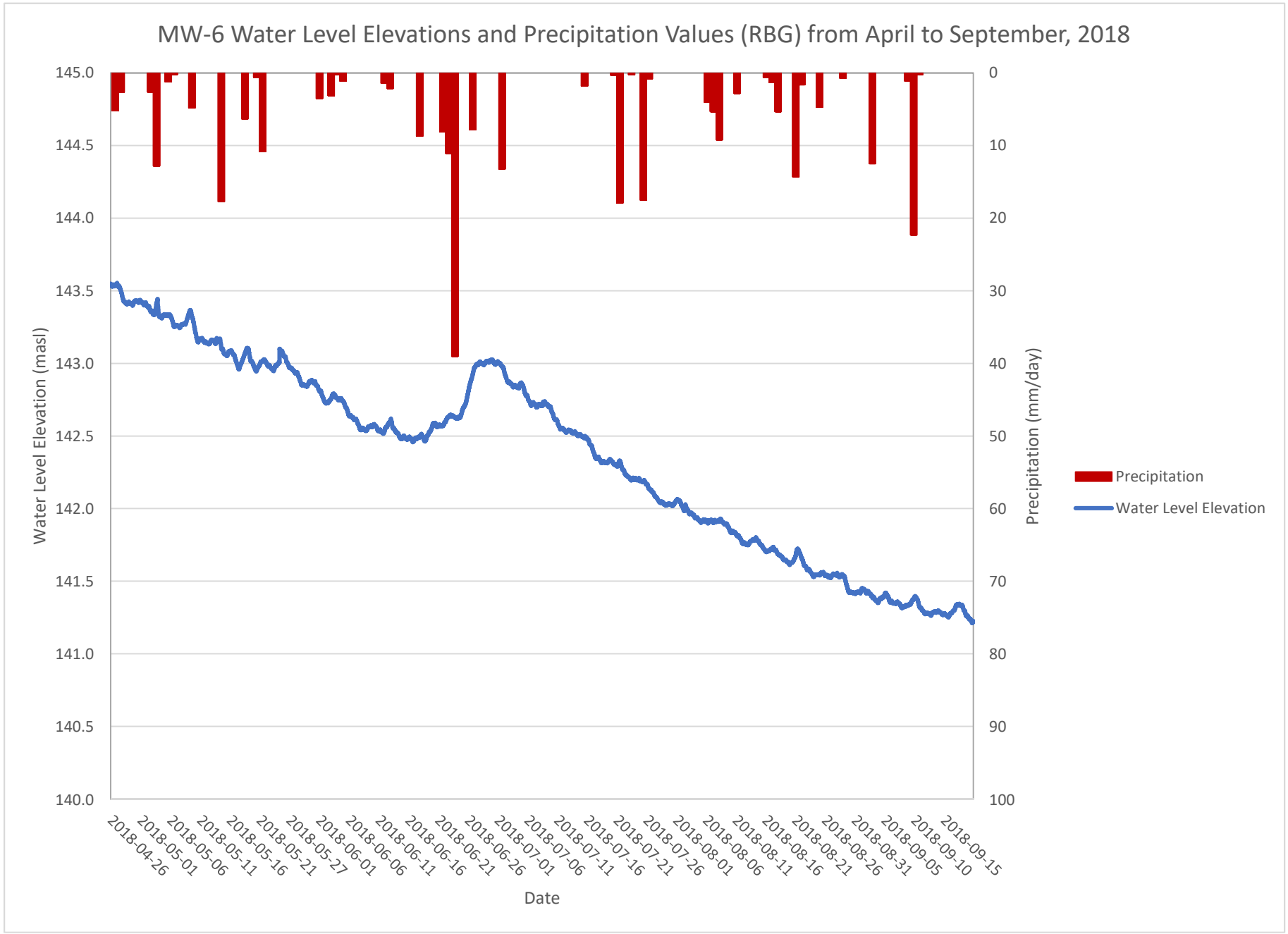

MW-1 Water Level Elevations and Precipitation Values (RBG) from April to September, 2018
Water Level Elevation (masl)
141.0
140.5
140.0
139.5
139.0
138.5
138.0
137.5
137.0
136.5
136.0
Precipitation (mm/day)
0
10
20
30
40
50
60
70
80
90
100
2018-04-26
2018-05-01
2018-05-06
2018-05-11
2018-05-16
2018-05-22
2018-05-27
2018-06-01
2018-06-06
2018-06-11
2018-06-16
2018-06-21
2018-06-26
2018-07-01
2018-07-06
2018-07-11
2018-07-17
2018-07-22
2018-07-27
2018-08-01
2018-08-06
2018-08-11
2018-08-16
2018-08-21
2018-08-26
2018-08-31
2018-09-05
2018-09-10
2018-09-15
Date
Precipitation
Water Level Elevation

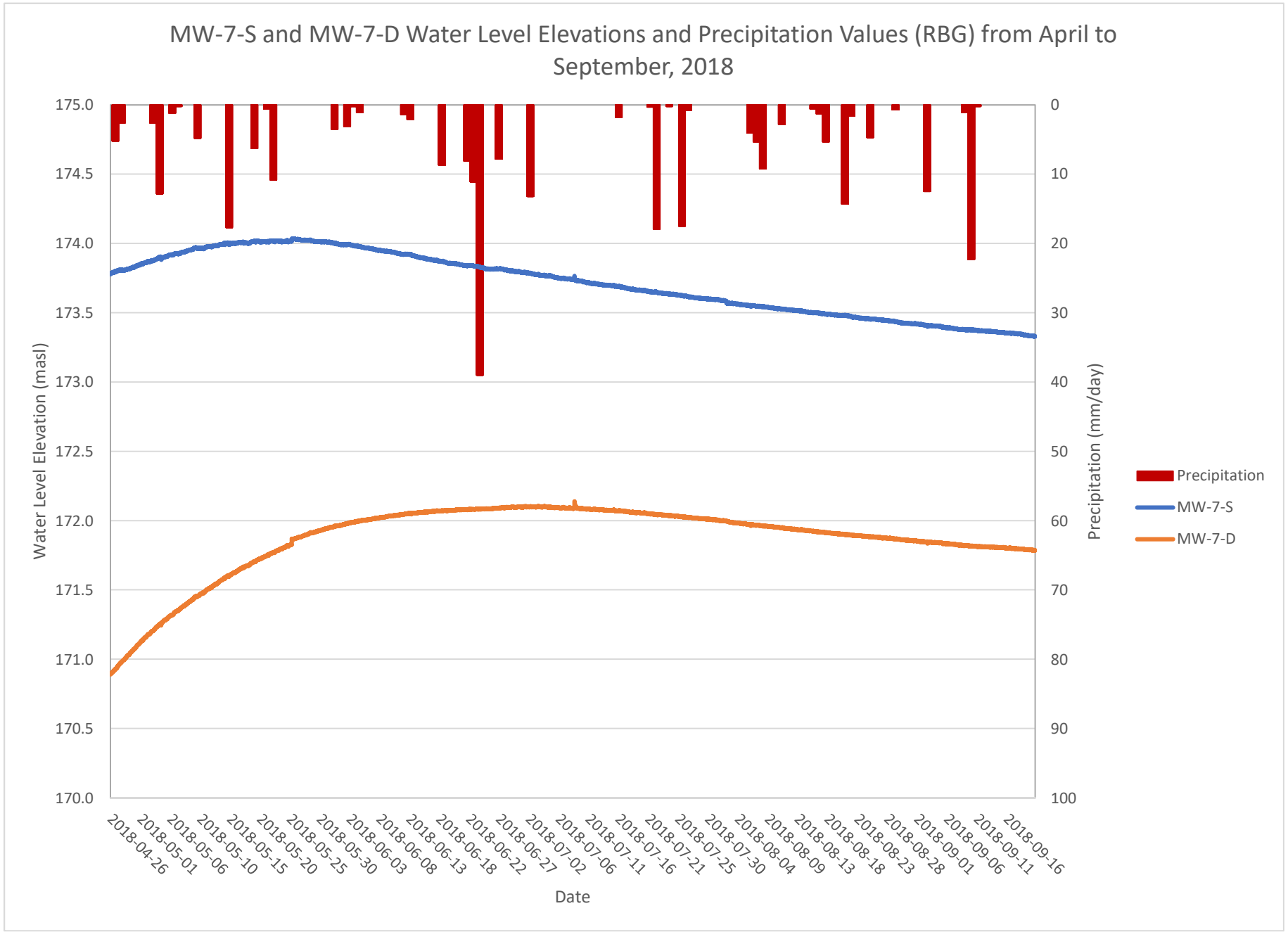

MW-2 Water Level Elevations and Precipitation Values (RBG) from April to September, 2018
Water Level Elevation (masl)
Precipitation (mm/day)
Date
Precipitation
Water Level Elevation
145.0
144.5
144.0
143.5
143.0
142.5
142.0
141.5
141.0
140.5
140.0
0
10
20
30
40
50
60
70
80
90
100
2018-04-26
2018-05-01
2018-05-06
2018-05-11
2018-05-16
2018-05-21
2018-05-27
2018-06-01
2018-06-06
2018-06-11
2018-06-16
2018-06-21
2018-06-26
2018-07-01
2018-07-06
2018-07-11
2018-07-16
2018-07-21
2018-07-27
2018-08-01
2018-08-06
2018-08-11
2018-08-16
2018-08-21
2018-08-26
2018-08-31
2018-09-05
2018-09-10
2018-09-15

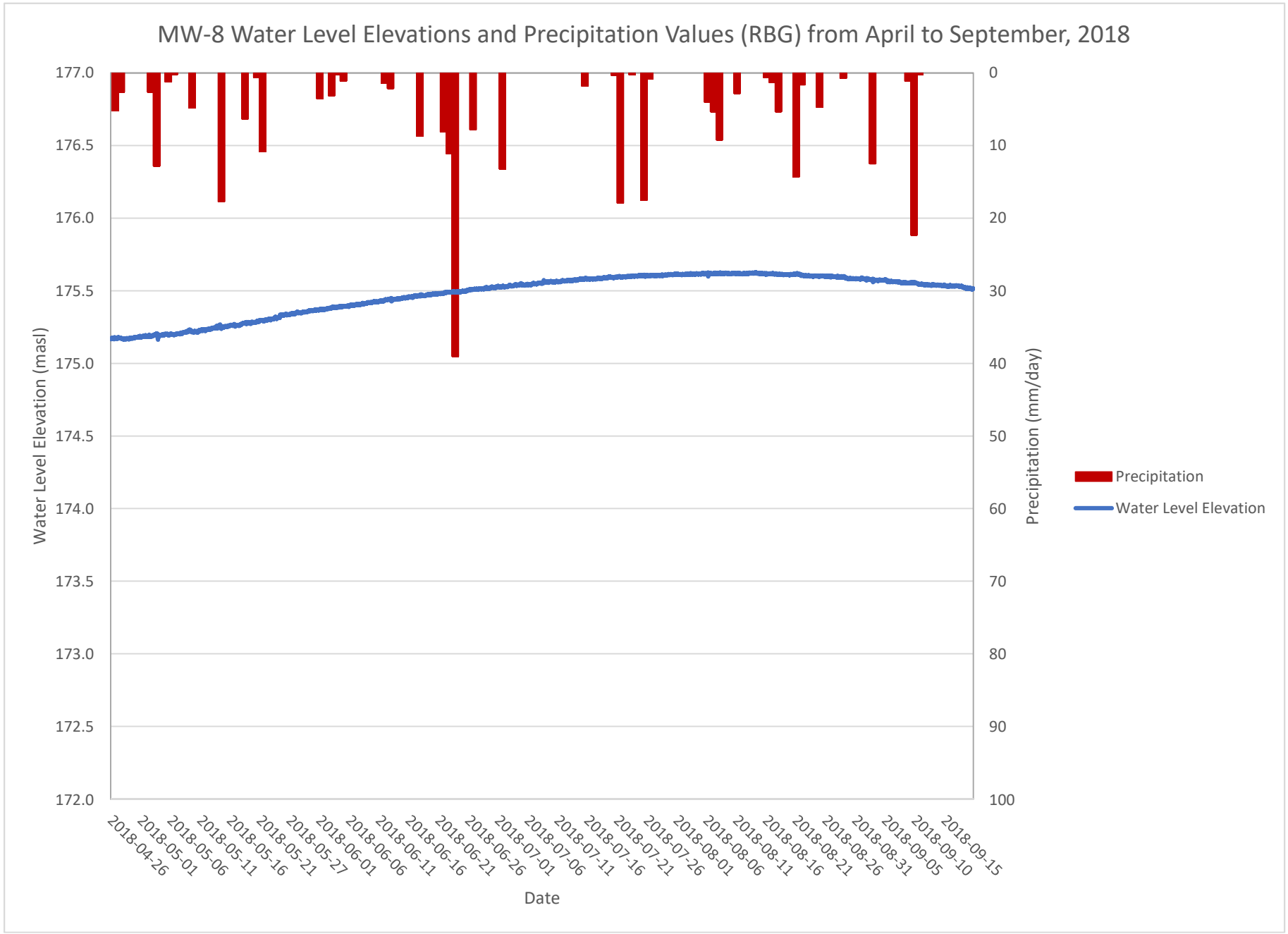

MW-3 Water Level Elevations and Precipitation Values (RBG) from April to September, 2018
Water Level Elevation (masl)
Precipitation (mm/day)
Date
Precipitation
Water Level Elevation
150.0
149.5
149.0
148.5
148.0
147.5
147.0
146.5
146.0
145.5
145.0
0
10
20
30
40
50
60
70
80
90
100
2018-04-26
2018-05-01
2018-05-06
2018-05-11
2018-05-16
2018-05-21
2018-05-27
2018-06-01
2018-06-06
2018-06-11
2018-06-16
2018-06-21
2018-06-26
2018-07-01
2018-07-06
2018-07-11
2018-07-16
2018-07-21
2018-07-27
2018-08-01
2018-08-06
2018-08-11
2018-08-16
2018-08-21
2018-08-26
2018-08-31
2018-09-05
2018-09-10
2018-09-15

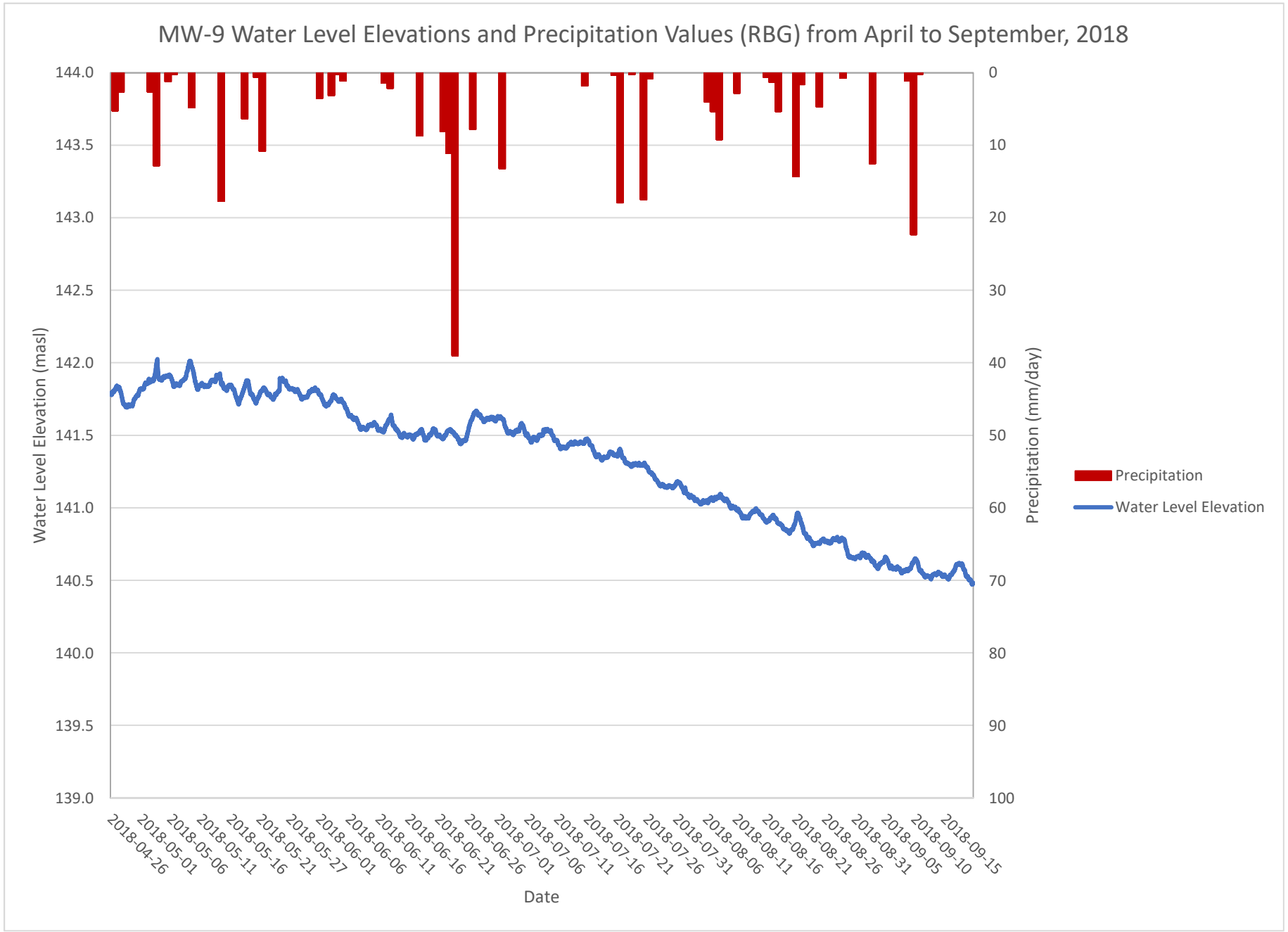

MW-4-S and MW-4-D Water Level Elevations and Precipitation Values (RBG) from April to September, 2018
Water Level Elevation (masl)
Precipitation (mm/day)
Date
Precipitation
MW-4-S
MW-4-D
154.0
153.5
153.0
152.5
152.0
151.5
151.0
150.5
150.0
149.5
149.0
0
10
20
30
40
50
60
70
80
90
100
2018-04-26
2018-05-01
2018-05-06
2018-05-10
2018-05-15
2018-05-20
2018-05-25
2018-05-30
2018-06-03
2018-06-08
2018-06-13
2018-06-18
2018-06-22
2018-06-27
2018-07-02
2018-07-07
2018-07-11
2018-07-16
2018-07-21
2018-07-25
2018-07-30
2018-08-04
2018-08-09
2018-08-13
2018-08-18
2018-08-23
2018-08-28
2018-09-01
2018-09-06
2018-09-11
2018-09-16

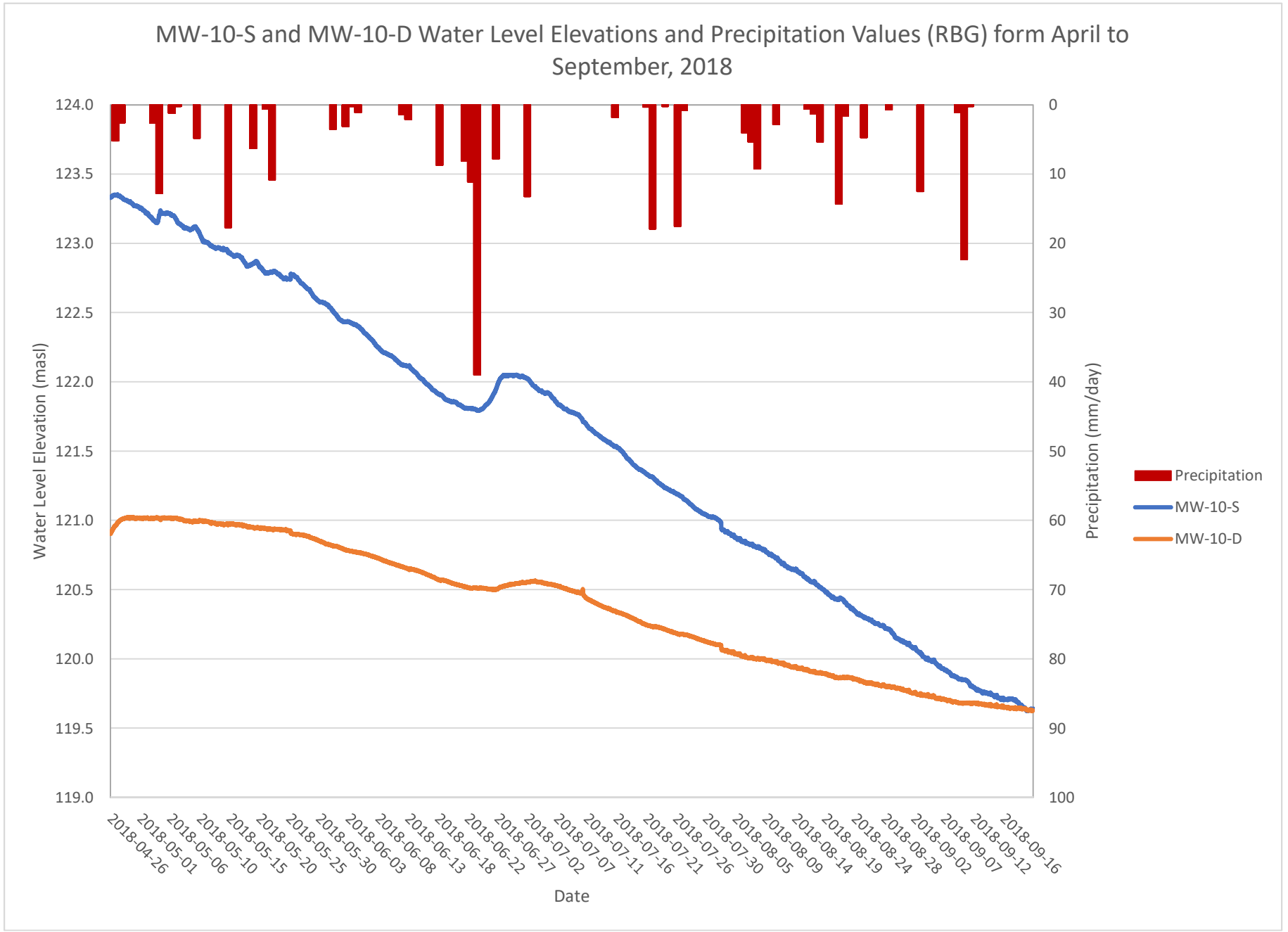

MW-5 Water Level Elevations and Precipitation Values (RBG) from April to September, 2018
Water Level Elevation (masl)
Precipitation (mm/day)
Date
Precipitation
Water Level Elevation
145.0
144.5
144.0
143.5
143.0
142.5
142.0
141.5
141.0
140.5
140.0
0
10
20
30
40
50
60
70
80
90
100
2018-04-26
2018-05-01
2018-05-06
2018-05-11
2018-05-16
2018-05-21
2018-05-27
2018-06-01
2018-06-06
2018-06-11
2018-06-16
2018-06-21
2018-06-26
2018-07-01
2018-07-06
2018-07-11
2018-07-16
2018-07-21
2018-07-26
2018-08-01
2018-08-06
2018-08-11
2018-08-16
2018-08-21
2018-08-26
2018-08-31
2018-09-05
2018-09-10
2018-09-15

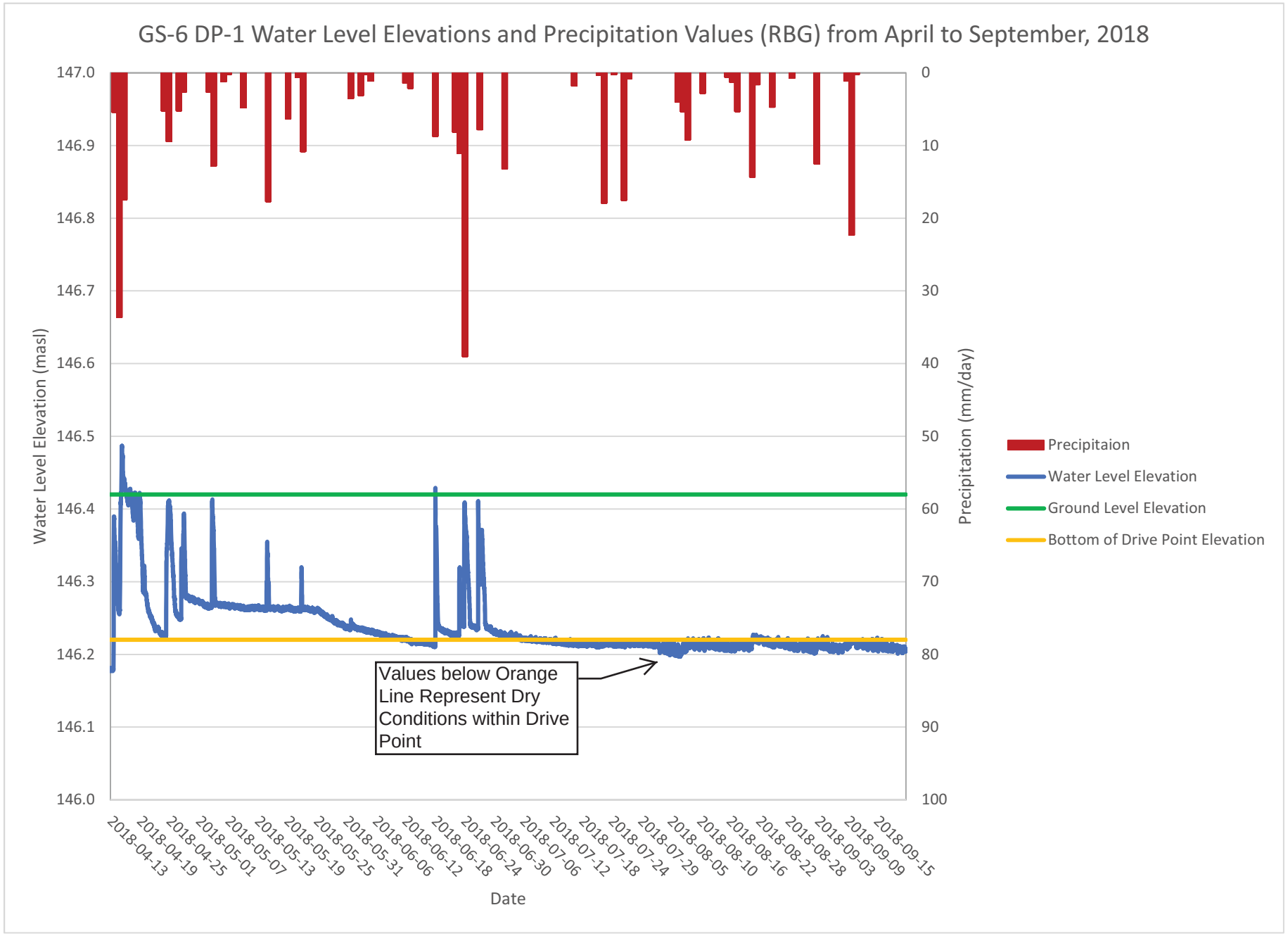

MW-6 Water Level Elevations and Precipitation Values (RBG) from April to September, 2018
Water Level Elevation (masl)
145.0
144.5
144.0
143.5
143.0
142.5
142.0
141.5
141.0
140.5
140.0
Precipitation (mm/day)
0
10
20
30
40
50
60
70
80
90
100
2018-04-26
2018-05-01
2018-05-06
2018-05-11
2018-05-16
2018-05-21
2018-05-27
2018-06-01
2018-06-06
2018-06-11
2018-06-16
2018-06-21
2018-06-26
2018-07-01
2018-07-06
2018-07-11
2018-07-16
2018-07-21
2018-07-26
2018-08-01
2018-08-06
2018-08-11
2018-08-16
2018-08-21
2018-08-26
2018-08-31
2018-09-05
2018-09-10
2018-09-15
Date
Precipitation
Water Level Elevation


MW-7-S and MW-7-D Water Level Elevations and Precipitation Values (RBG) from April to September, 2018
Water Level Elevation (masl)
175.0
174.5
174.0
173.5
173.0
172.5
172.0
171.5
171.0
170.5
170.0
Precipitation (mm/day)
0
10
20
30
40
50
60
70
80
90
100
2018-04-26
2018-05-01
2018-05-06
2018-05-10
2018-05-15
2018-05-20
2018-05-25
2018-05-30
2018-06-03
2018-06-08
2018-06-13
2018-06-18
2018-06-22
2018-06-27
2018-07-02
2018-07-06
2018-07-11
2018-07-16
2018-07-21
2018-07-25
2018-07-30
2018-08-04
2018-08-09
2018-08-13
2018-08-18
2018-08-23
2018-08-28
2018-09-01
2018-09-06
2018-09-11
2018-09-16
Date
Precipitation
MW-7-S
MW-7-D


MW-8 Water Level Elevations and Precipitation Values (RBG) from April to September, 2018
Water Level Elevation (masl)
177.0
176.5
176.0
175.5
175.0
174.5
174.0
173.5
173.0
172.5
172.0
Precipitation (mm/day)
0
10
20
30
40
50
60
70
80
90
100
2018-04-26
2018-05-01
2018-05-06
2018-05-11
2018-05-16
2018-05-21
2018-05-27
2018-06-01
2018-06-06
2018-06-11
2018-06-16
2018-06-21
2018-06-26
2018-07-01
2018-07-06
2018-07-11
2018-07-16
2018-07-21
2018-07-26
2018-08-01
2018-08-06
2018-08-11
2018-08-16
2018-08-21
2018-08-26
2018-08-31
2018-09-05
2018-09-10
2018-09-15
Date
Precipitation
Water Level Elevation


MW-9 Water Level Elevations and Precipitation Values (RBG) from April to September, 2018
Water Level Elevation (masl)
144.0
143.5
143.0
142.5
142.0
141.5
141.0
140.5
140.0
139.5
139.0
Precipitation (mm/day)
0
10
20
30
40
50
60
70
80
90
100
2018-04-26
2018-05-01
2018-05-06
2018-05-11
2018-05-16
2018-05-21
2018-05-27
2018-06-01
2018-06-06
2018-06-11
2018-06-16
2018-06-21
2018-06-26
2018-07-01
2018-07-06
2018-07-11
2018-07-16
2018-07-21
2018-07-26
2018-07-31
2018-08-06
2018-08-11
2018-08-16
2018-08-21
2018-08-26
2018-08-31
2018-09-05
2018-09-10
2018-09-15
Date
Precipitation
Water Level Elevation


MW-10-S and MW-10-D Water Level Elevations and Precipitation Values (RBG) form April to September, 2018
Water Level Elevation (masl)
124.0
123.5
123.0
122.5
122.0
121.5
121.0
120.5
120.0
119.5
119.0
Precipitation (mm/day)
0
10
20
30
40
50
60
70
80
90
100
2018-04-26
2018-05-01
2018-05-06
2018-05-10
2018-05-15
2018-05-20
2018-05-25
2018-05-30
2018-06-03
2018-06-08
2018-06-13
2018-06-18
2018-06-22
2018-06-27
2018-07-02
2018-07-07
2018-07-11
2018-07-16
2018-07-21
2018-07-26
2018-07-30
2018-08-05
2018-08-09
2018-08-14
2018-08-19
2018-08-24
2018-08-28
2018-09-02
2018-09-07
2018-09-12
2018-09-16
Date
Precipitation
MW-10-S
MW-10-D


GS-6 DP-1 Water Level Elevations and Precipitation Values (RBG) from April to September, 2018
Water Level Elevation (masl)
Precipitation (mm/day)
Date
147.0
146.9
146.8
146.7
146.6
146.5
146.4
146.3
146.2
146.1
146.0
0
10
20
30
40
50
60
70
80
90
100
2018-04-13
2018-04-19
2018-04-25
2018-05-01
2018-05-07
2018-05-13
2018-05-19
2018-05-25
2018-05-31
2018-06-06
2018-06-12
2018-06-18
2018-06-24
2018-06-30
2018-07-06
2018-07-12
2018-07-18
2018-07-24
2018-07-29
2018-08-05
2018-08-10
2018-08-16
2018-08-22
2018-08-28
2018-09-03
2018-09-09
2018-09-15
Values below Orange Line Represent Dry Conditions within Drive Point
Precipitaion
Water Level Elevation
Ground Level Elevation
Bottom of Drive Point Elevation

Appendix 8.

Peto MacCallum 2003 Infiltration Test Results

PML Ref.: 02HF094

TABLE IA

FIELD PERCOLATION TEST RESULTS
EAGLE HEIGHTS AND TAYLOR PROPERTY
WATERDOWN ROAD
BURLINGTON, ONTARIO

Location: Borehole 1
Depth: 125 cm
Diameter: 15 cm

Soil Type: Fine Sandy Silt over Clay Till

TIME (min)	DEPTH TO WATER (cm)
0	0
10	9
20	16
30	21
40	24
50	27
60	30
90	36
120	42
150	47

Computed permeability over last 90 min of test,
$k = 2.9 \times 10^{-5}$ cm/sec

PML Ref.: 02HF094

TABLE IB

FIELD PERCOLATION TEST RESULTS
EAGLE HEIGHTS AND TAYLOR PROPERTY
WATERDOWN ROAD
BURLINGTON, ONTARIO

Location: Borehole 11
Depth: 125 cm
Diameter: 15 cm

Soil Type: Silty Clay Till

TIME (min)	DEPTH TO WATER (cm)
0	0
10	2
20	3
30	4
40	5
50	6
60	7
90	9
120	11
150	11
180	12
210	12

Computed permeability over last 90 min of test,
$k = 1.1 \times 10^{-6}$ cm/sec

Peto MacCallum Ltd.
CONSULTING ENGINEERS

PML Ref.: 02HF094

TABLE IC

FIELD PERCOLATION TEST RESULTS
EAGLE HEIGHTS AND TAYLOR PROPERTY
WATERDOWN ROAD
BURLINGTON, ONTARIO

Location: Borehole 20
Depth: 125 cm
Diameter: 15 cm

Soil Type: Clay Till

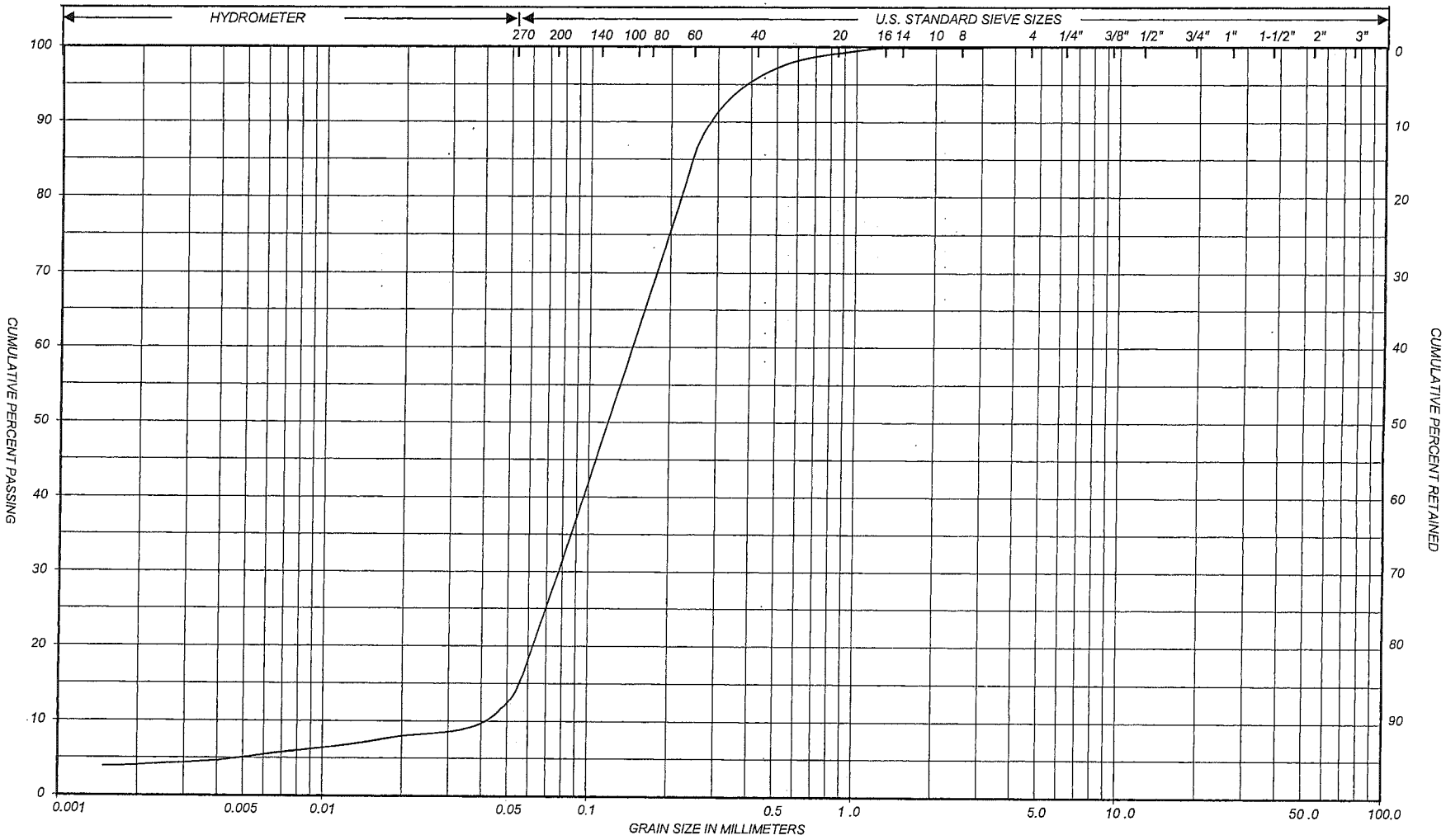
TIME (min)	DEPTH TO WATER (cm)
0	0
10	2
20	3
30	4
40	5
50	6
60	7
90	7
120	8
150	8

Computed permeability over last 90 min of test,
$k = 1.0 \times 10^{-6}$ cm/sec

Peto MacCallum Ltd.
CONSULTING ENGINEERS

PML REF. 02 HF 094
REPORT NO.
FIGURE 1

PARTICLE SIZE DISTRIBUTION CHART



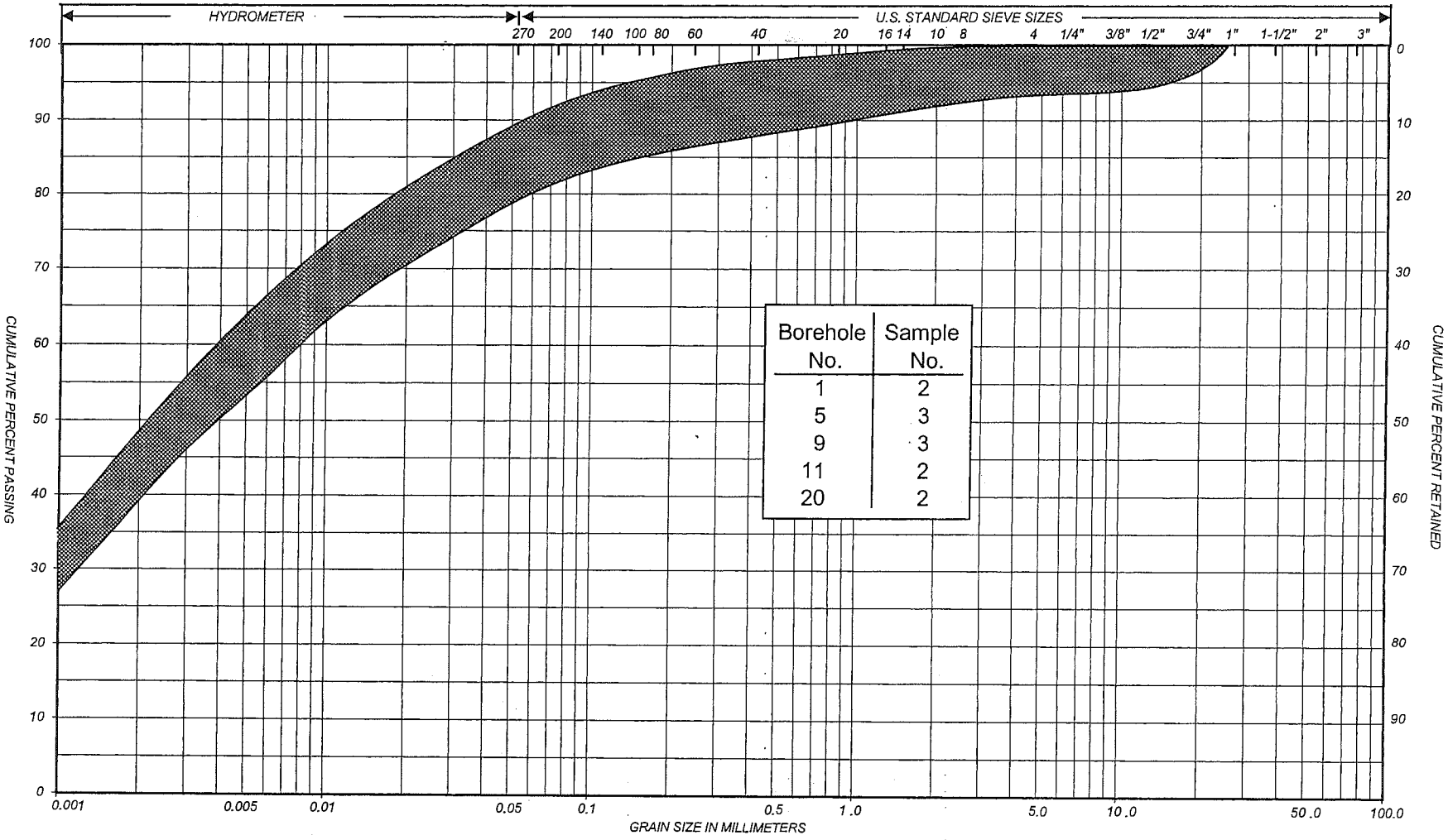
SILT & CLAY				FINE	MEDIUM	COARSE	GRAVEL		COBBLES	UNIFIED
				SAND						
CLAY	FINE	MEDIUM	COARSE	FINE	MEDIUM	COARSE	GRAVEL		COBBLES	M.I.T.
	SILT			SAND						
CLAY	SILT			VERY FINE	FINE	MEDIUM	COARSE	GRAVEL		U.S. BUREAU
				SAND						

REMARKS BH13 SS2 : SILTY FINE SAND

Peto MacCallum Ltd.
CONSULTING ENGINEERS

PML REF. 02 HF 094
REPORT NO.
FIGURE 2

PARTICLE SIZE DISTRIBUTION CHART



Borehole No.	Sample No.
1	2
5	3
9	3
11	2
20	2

SILT & CLAY			FINE	MEDIUM	COARSE	GRAVEL	COBBLES	UNIFIED
			SAND					
CLAY	FINE	MEDIUM	COARSE	FINE	MEDIUM	COARSE	GRAVEL	COBBLES	M.I.T.
	SILT			SAND					
CLAY	SILT		VERY FINE	FINE	MEDIUM	COARSE	GRAVEL		U.S. BUREAU
			SAND						

REMARKS SILTY CLAY TILL

LOG OF BOREHOLE NO. 1

PROJECT EAGLE HEIGHTS AND TAYLOR PROPERTY
LOCATION Waterdown Road, Burlington, Ontario
BORING METHOD Continuous Flight Solid Stem Augers
BORING DATE 2002 12 18
OUR PROJECT NO. 02HF094
ENGINEER M. Anderson
TECHNICIAN M. Rapsey

DEPTH in METRES	DESCRIPTION	LEGEND	ELEVATION	NUMBER	TYPE	BLOWS/0.3m N - VALUES
	GROUND ELEVATION 144.61					
0.20	**TOPSOIL:** Dark brown clayey silt, low organic		144			
1.05	**SILT:** Loose, reddish brown fine sandy silt, moist			1	SS	10
1.5	**CLAY TILL:** Very stiff, brown silty clay, some sand, trace of gravel, low to medium plastic, D.T.P.L., with blueish grey fissures and oxidized stains		143	2	SS	19
			142			
3.0				3	SS	23
3.90			141			
	becoming hard, slightly to low plastic					
4.5			140	4	SS	70
5.10						
	SILT TILL/SHALE COMPLEX: Hard, reddish brown clayey silt/shale		139			
6.0				5	SS	81
			138			
7.5			137	6	SS	98 for 225 mm*
8.00	BOREHOLE TERMINATED AT 8.00 m					

SHEAR STRENGTH C_u ▲ (50 100 150 200)
DYNAMIC CONE PENETRATION ×
STANDARD PENETRATION TEST ●
BLOWS/0.3M (20 40 60 80)

LIQUID LIMIT ____ W_L
PLASTIC LIMIT ____ W_P
WATER CONTENT ____ W
W_P W W_L
WATER CONTENT % (10 20 30)

GROUND WATER OBSERVATIONS AND REMARKS

*50 for last 75 mm

Upon completion of augering, no free water, no cave.

NOTES

CHECKED BY

LOG OF BOREHOLE NO. 11

PROJECT EAGLE HEIGHTS AND TAYLOR PROPERTY
LOCATION Waterdown Road, Burlington, Ontario
BORING METHOD Continuous Flight Solid Stem Augers
BORING DATE 2002 12 20
OUR PROJECT NO. 02HF094
ENGINEER M. Anderson
TECHNICIAN M. Rapsey

DEPTH in METRES	DESCRIPTION	LEGEND	ELEVATION	SAMPLES NUMBER	SAMPLES TYPE	BLOWS/0.3m N - VALUES	GROUND WATER OBSERVATIONS AND REMARKS
	GROUND ELEVATION 151.20						
0.20	**TOPSOIL:** Dark brown clayey silt, low organic		151				
	CLAY TILL: Hard, brown silty clay, some sand, trace of gravel, low plastic, D.T.P.L., with thin silt partings		150	1	SS	36	
1.5				2	SS	63	
			149				
3.0			148	3	SS	61	
3.90							
	SHALE: Weathered red shale		147				
4.5 4.60				4	SS	50 for 60 mm	
	BOREHOLE TERMINATED AT 4.60 m						Upon completion of augering, no free water, no cave.

SHEAR STRENGTH C_u ▲ (50 100 150 200)
DYNAMIC CONE PENETRATION ×
STANDARD PENETRATION TEST ●
BLOWS/0.3M (20 40 60 80)

LIQUID LIMIT ____ W_L
PLASTIC LIMIT ____ W_P
WATER CONTENT ____ W
W_P W W_L
WATER CONTENT % (10 20 30)

NOTES

CHECKED BY

LOG OF BOREHOLE NO. 20

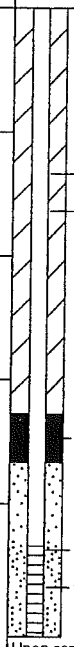
PROJECT EAGLE HEIGHTS AND TAYLOR PROPERTY
LOCATION Waterdown Road, Burlington, Ontario
BORING METHOD Continuous Flight Solid Stem Augers
BORING DATE 2003 01 13
OUR PROJECT NO. 02HF094
ENGINEER M. Anderson
TECHNICIAN M. Rapsey

DEPTH in METRES	DESCRIPTION	LEGEND	ELEVATION	SAMPLES NUMBER	SAMPLES TYPE	BLOWS/0.3m N - VALUES
	GROUND ELEVATION 125.39					
0.18	**TOPSOIL:** Dark brown clayey silt, low organic		125			
1.5	**CLAY TILL:** Very stiff to hard, brown silty clay, some sand, trace of gravel, low plastic, D.T.P.L., fissures infilled with silt		124	1	SS	26
				2	SS	45
2.70			123			
3.0	**SAND TILL/SHALE COMPLEX:** Very dense, reddish brown silty sand/shale, trace gravel		122	3	SS	50 for 100 mm
3.90	becoming a silt till/shale complex					
4.5			121	4	SS	100
5.40	**SHALE:** Weathered red shale		120			
6.0	6.20			5	SS	50 for 75 mm
	BOREHOLE TERMINATED AT 6.20 m					

SHEAR STRENGTH C_u ▲ (50 100 150 200)
DYNAMIC CONE PENETRATION ×
STANDARD PENETRATION TEST ●
BLOWS/0.3M (20 40 60 80)

LIQUID LIMIT ____ W_L
PLASTIC LIMIT ____ W_P
WATER CONTENT ____ W
W_P W W_L
WATER CONTENT % (10 20 30)

GROUND WATER OBSERVATIONS AND REMARKS



Upon completion of augering, no free water, no cave.

Depth to water in piezometer measured on 2003 05 12 was 0.90 m.

NOTES

CHECKED BY

Appendix 9.

9.A Infiltration Test Photographs

9.B Grain Size Laboratory Reports

9.C Test Pit Logs

Appendix 9.A Infiltration Test Photographs

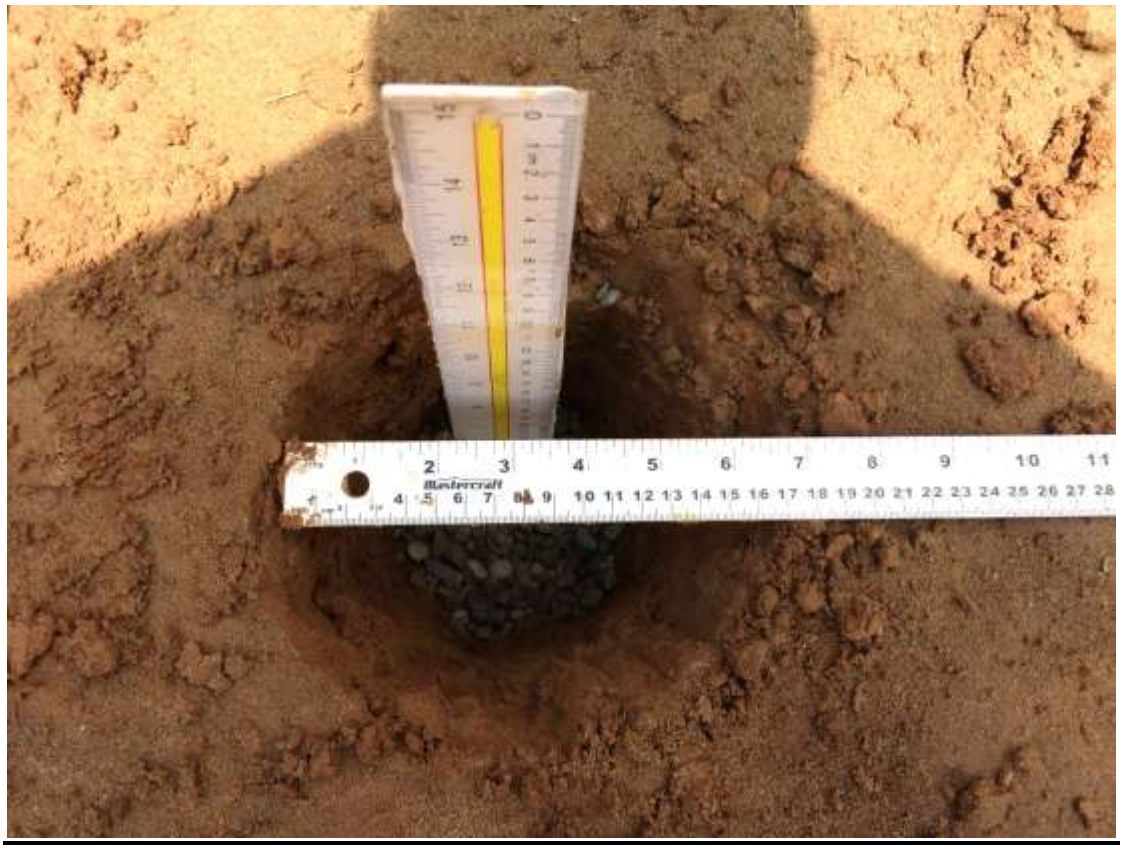


Photo 1: Test hole 503-1 prior to infiltration testing



Photo 2: Test hole 503-1 during infiltration testing



Photo 3: Test hole 515-1 prior to infiltration test (grey clay seam visible at approximately 18 cm)



Photo 4: Test hole 515-2 during infiltration testing



Photo 5: Hardpan clod from test pit 621



Photo 6: Discontinuous hardpan layer observed in test pit 621



Photo 7: Red shale inclusion observed in clay near the base of test pit profile 606-2



Photo 8: Discontinuous seam of grey clay observed near the base of test pit 515

Appendix 9.B Grain Size Laboratory Reports

TEST REPORT

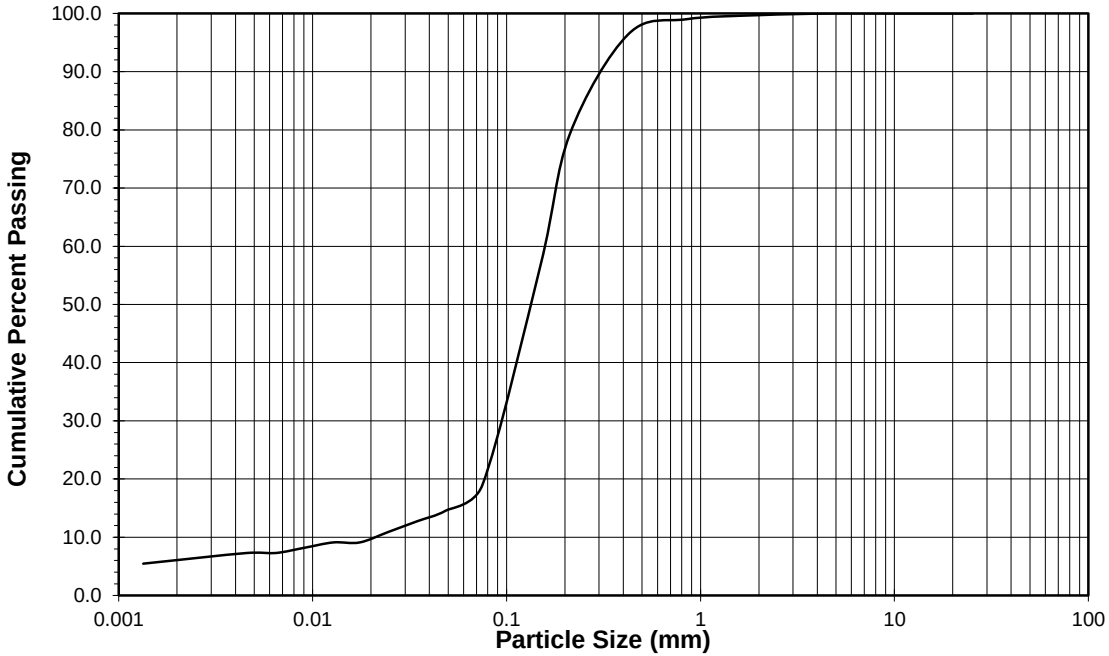
Particle Size Analysis by Hydrometer

Sample ID: 503
Date Completed: 13-Jul-18
Reference: ASTM D 422, SOP 7-18-6

Specific Gravity: 2.72

Sieve Size (Tyler)	Particle Size (mm)	Weight Passing %
1"	25.400	100.0
1/2"	12.500	100.0
3/8"	9.500	100.0
#4	4.750	100.0
#9	2.000	99.7
#20	0.850	99.0
#35	0.425	96.4
#65	0.212	79.3
#100	0.150	56.9
#200	0.075	19.0
-	0.049	14.6
-	0.035	12.8
-	0.025	10.9
-	0.018	9.1
-	0.013	9.1
-	0.009	8.2
-	0.006	7.3
-	0.005	7.3
-	0.001	5.5

Particle Size Distribution



Note: Correction factors for SG's less than 2.45 and greater than 2.85 are calculated

SAND with some silt, trace clay

D. French
Project Technician, Environmental Testing

B. Bowman
Environmental Metallurgist, Environmental Testing

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TEST REPORT

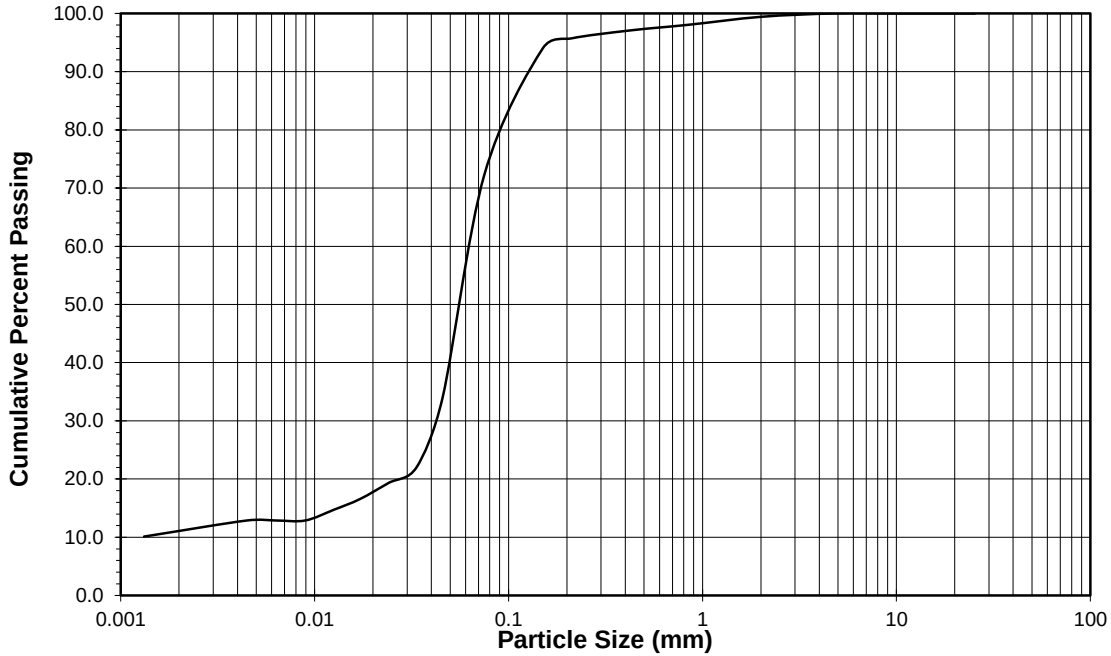
Particle Size Analysis by Hydrometer

Sample ID: 515-B
Date Completed: 13-Jul-18
Reference: ASTM D 422, SOP 7-18-6

Specific Gravity: 2.71

Sieve Size (Tyler)	Particle Size (mm)	Weight Passing %
1"	25.400	100.0
1/2"	12.500	100.0
3/8"	9.500	100.0
#4	4.750	100.0
#9	2.000	99.4
#20	0.850	98.1
#35	0.425	97.1
#65	0.212	95.7
#100	0.150	94.0
#200	0.075	72.3
-	0.046	34.0
-	0.034	22.1
-	0.024	19.3
-	0.017	16.6
-	0.013	14.7
-	0.009	12.9
-	0.006	12.9
-	0.004	12.9
-	0.001	10.1

Particle Size Distribution



Note: Correction factors for SG's less than 2.45 and greater than 2.85 are calculated

Sandy SILT with some clay

D. French
Project Technician, Environmental Testing

B. Bowman
Environmental Metallurgist, Environmental Testing

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TEST REPORT

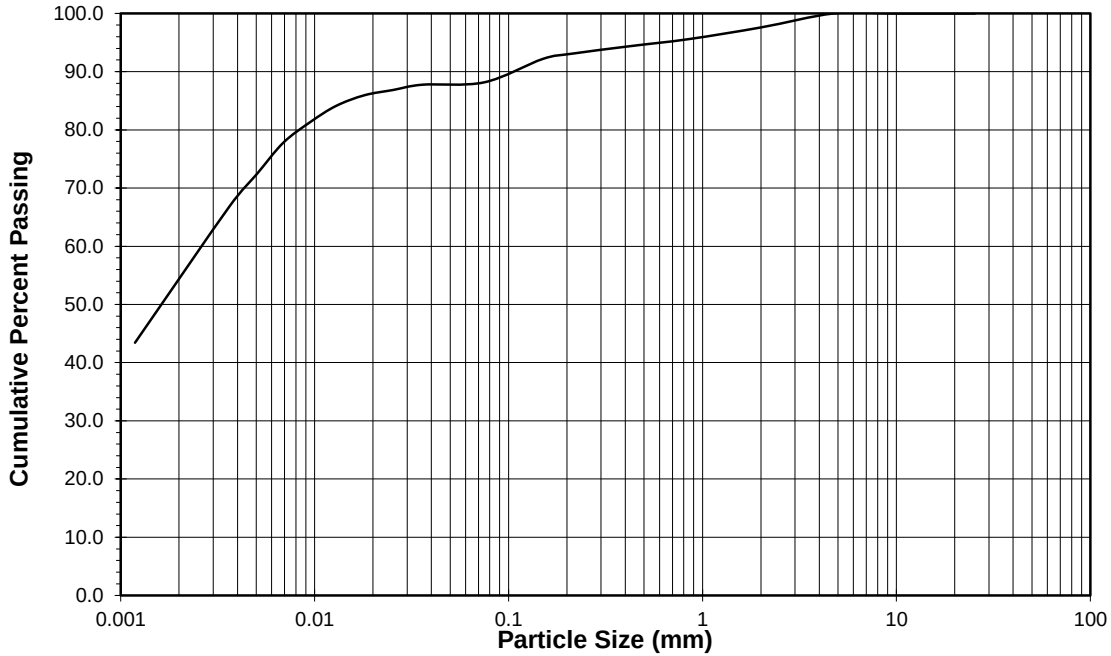
Particle Size Analysis by Hydrometer

Sample ID: 515-A
Date Completed: 13-Jul-18
Reference: ASTM D 422, SOP 7-18-6

Specific Gravity: 2.70

Sieve Size (Tyler)	Particle Size (mm)	Weight Passing %
1"	25.400	100.0
1/2"	12.500	100.0
3/8"	9.500	100.0
#4	4.750	100.0
#9	2.000	97.6
#20	0.850	95.6
#35	0.425	94.4
#65	0.212	93.1
#100	0.150	92.2
#200	0.075	88.2
-	0.036	87.8
-	0.025	86.8
-	0.018	85.9
-	0.013	84.1
-	0.010	81.4
-	0.007	77.8
-	0.005	72.4
-	0.004	66.9
-	0.001	43.4

Particle Size Distribution



Note: Correction factors for SG's less than 2.45 and greater than 2.85 are calculated

Silty CLAY with some sand

D. French
Project Technician, Environmental Testing

B. Bowman
Environmental Metallurgist, Environmental Testing

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TEST REPORT

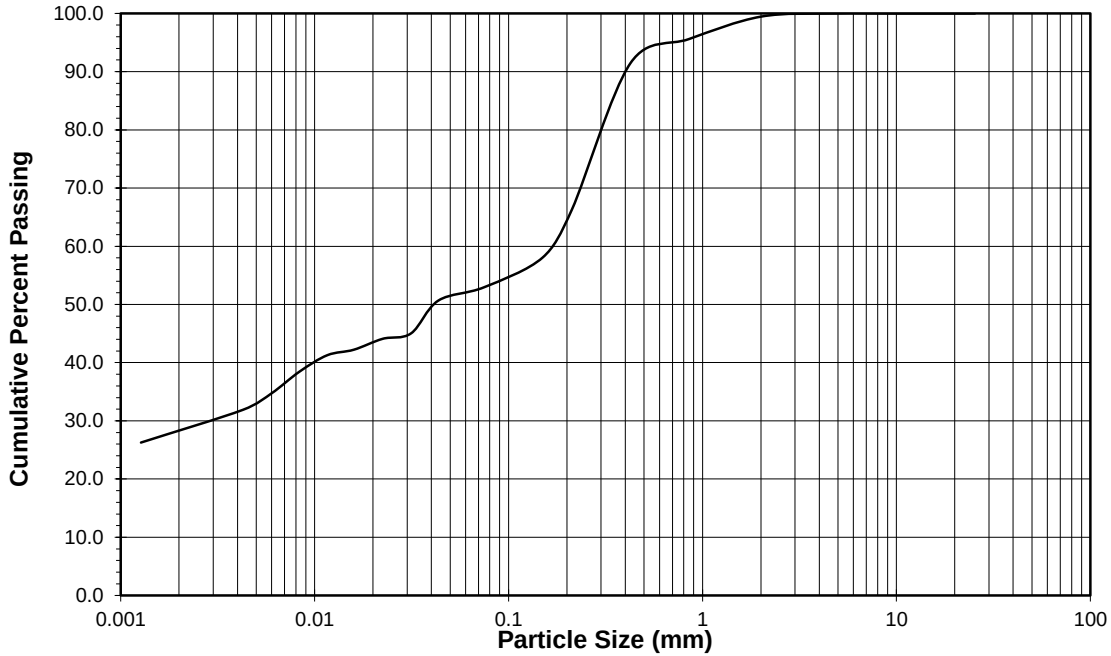
Particle Size Analysis by Hydrometer

Sample ID: 606-1B
Date Completed: 13-Jul-18
Reference: ASTM D 422, SOP 7-18-6

Specific Gravity: 2.69

Sieve Size (Tyler)	Particle Size (mm)	Weight Passing %
1"	25.400	100.0
1/2"	12.500	100.0
3/8"	9.500	100.0
#4	4.750	100.0
#9	2.000	99.4
#20	0.850	95.6
#35	0.425	91.4
#65	0.212	66.3
#100	0.150	58.1
#200	0.075	53.0
-	0.043	50.7
-	0.031	45.0
-	0.022	44.1
-	0.016	42.2
-	0.012	41.3
-	0.008	38.5
-	0.006	34.7
-	0.004	31.9
-	0.001	26.3

Particle Size Distribution



Note: Correction factors for SG's less than 2.45 and greater than 2.85 are calculated

clayey, silty, sand

D. French
Project Technician, Environmental Testing

B. Bowman
Environmental Metallurgist, Environmental Testing

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TEST REPORT

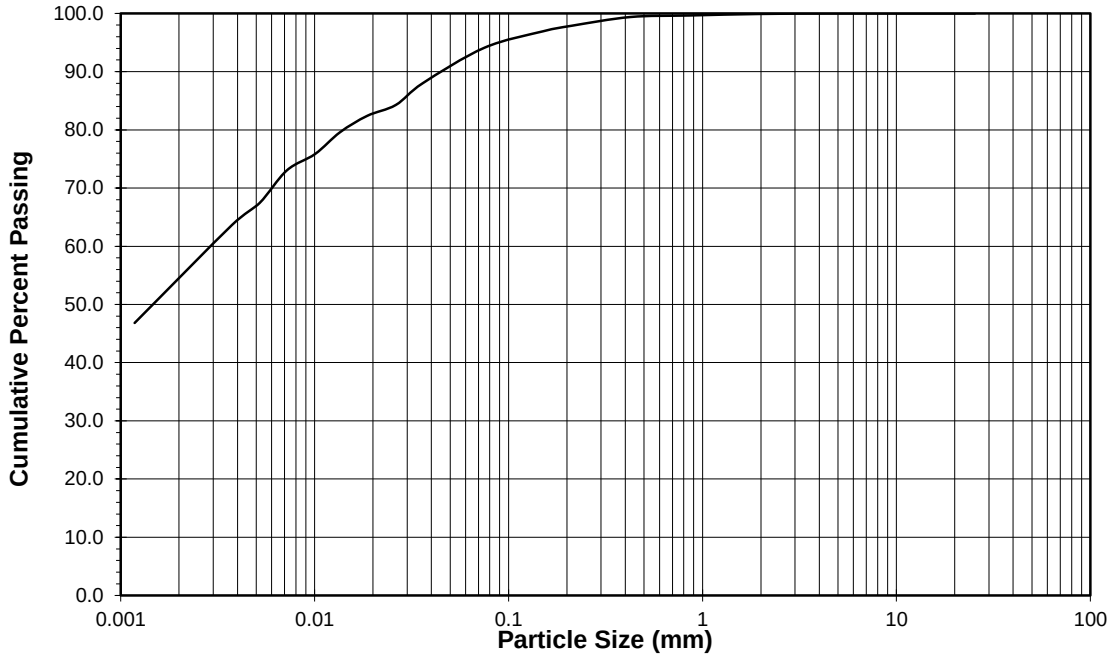
Particle Size Analysis by Hydrometer

Sample ID: 606-2
Date Completed: 13-Jul-18
Reference: ASTM D 422, SOP 7-18-6

Specific Gravity: 2.66

Sieve Size (Tyler)	Particle Size (mm)	Weight Passing %
1"	25.400	100.0
1/2"	12.500	100.0
3/8"	9.500	100.0
#4	4.750	100.0
#9	2.000	99.9
#20	0.850	99.6
#35	0.425	99.4
#65	0.212	97.9
#100	0.150	96.9
#200	0.075	94.1
-	0.036	88.0
-	0.026	84.3
-	0.019	82.4
-	0.014	79.6
-	0.010	75.8
-	0.007	73.0
-	0.005	67.4
-	0.004	63.7
-	0.001	46.8

Particle Size Distribution



Note: Correction factors for SG's less than 2.45 and greater than 2.85 are calculated

CLAY and silt, trace sand

D. French
Project Technician, Environmental Testing

B. Bowman
Environmental Metallurgist, Environmental Testing

This report refers to the samples as-received. SGS Minerals Services is not responsible for any use of this data beyond the result of this test method.

TEST REPORT

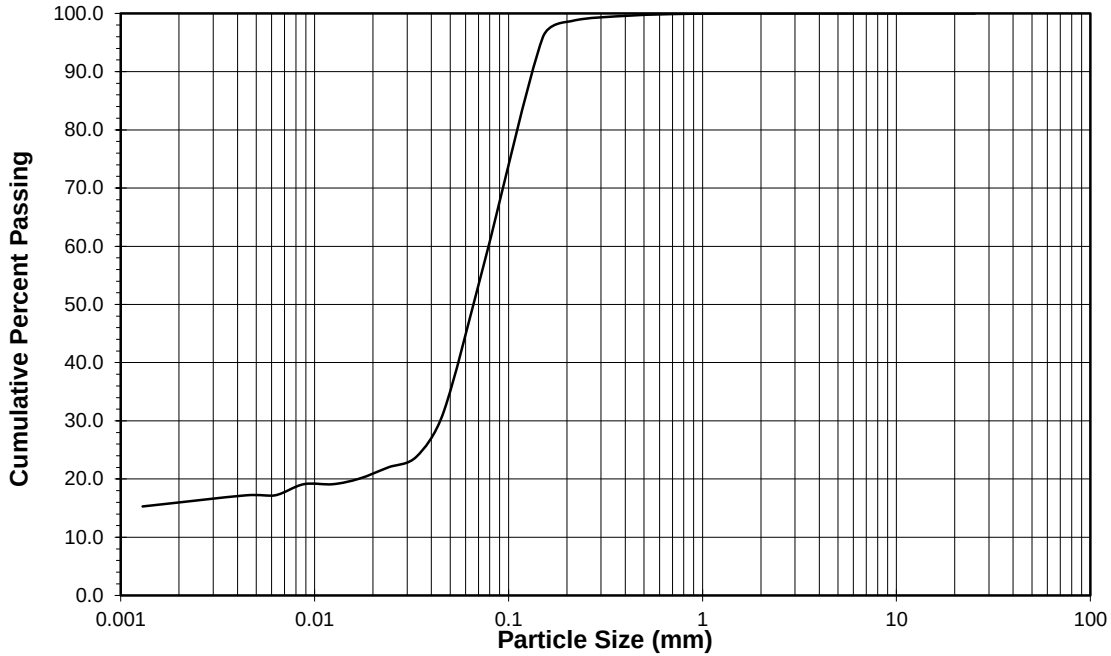
Particle Size Analysis by Hydrometer

Sample ID: 621
Date Completed: 13-Jul-18
Reference: ASTM D 422, SOP 7-18-6

Specific Gravity: 2.72

Sieve Size (Tyler)	Particle Size (mm)	Weight Passing %
1"	25.400	100.0
1/2"	12.500	100.0
3/8"	9.500	100.0
#4	4.750	100.0
#9	2.000	100.0
#20	0.850	99.9
#35	0.425	99.6
#65	0.212	98.7
#100	0.150	95.8
#200	0.075	57.2
-	0.046	31.5
-	0.034	23.9
-	0.024	22.0
-	0.017	20.1
-	0.012	19.1
-	0.009	19.1
-	0.006	17.2
-	0.004	17.2
-	0.001	15.3

Particle Size Distribution



Note: Correction factors for SG's less than 2.45 and greater than 2.85 are calculated

sand and silt with some clay

D. French
Project Technician, Environmental Testing

B. Bowman
Environmental Metallurgist, Environmental Testing

This report refers to the samples as-received. SGS Minerals Services is not responsible for any use of this data beyond the result of this test method.

Appendix 9.C Test Pit Logs

Test Pit Number: 503

Project: Eagle Heights

Elevation: 185.50 masl

Site Location: Burlington, ON

Geologist: Annie Michaud, P.Eng.

TERRA-DYNAMICS CONSULTING INC.
404 Queenston Street
St. Catharines, ON L2P 2Y2
905-646-7931

SUBSURFACE PROFILE

Depth (m)	Symbol	Description	Elevation (masl)
0.0		**Ground Surface**	185.50
		SILTY SAND • Granular, moist, no plasticity • No mottling, non-stony • Dark brown (7.5 YR 3/2)	
0.30			185.18
		SAND with some silt, trace clay • Granular/blocky, moist consistence, no plasticity • No mottling, non-stony • Dark yellowish brown (10 YR 4/6) • Roots extending past 1.0m depth • Dark staining along roots and worm holes	
0.80		– ***Discontinuous compacted layer observed at approximately 0.80m depth***	
1.3			184.12
1.4		**HOLE BOTTOM at 1.38m**	
1.5			

Drill Method: Excavator

Hole Size: n/a

UTM Coordinates: 17590613E, 4797107N

Project No. Eagle Heights

Drill Date: June 13, 2018

Sheet: 1 of 1

Test Pit Number: 515

Project: Eagle Heights

Elevation: 151.50 masl

Site Location: Burlington, ON

Geologist: Annie Michaud, P.Eng.

TERRA-DYNAMICS CONSULTING INC.
404 Queenston Street
St. Catharines, ON L2P 2Y2
905-646-7931

SUBSURFACE PROFILE

Depth (m)	Symbol	Description	Elevation (masl)
0.0		**Ground Surface**	151.50
0.10		**SANDY SILT** • Granular, moist, no plasticity • No mottling, non-stony • Brown (7.5 YR 4/2)	
0.20			151.32
0.30		**SILTY CLAY with some sand** • Blocky, moist, some plasticity • No mottling, non-stony • Brown (7.5 YR 4/4)	
0.40			151.08
0.50		**SANDY SILT with some clay** • Blocky, moist, no plasticity • No mottling, non-stony • Dark yellowish brown (10 YR 4/6) • Discontinuous seams of clay observed at depths below 0.42m • Clay is moist, granular • Grey (7.5 YR 6/1) • Seam thickness varies between 0.02 - 0.20m • No mottling • Calcareous	
0.60			
0.70			
0.80			
0.90			
1.0			
1.1			
1.2			
1.3			
1.4			
1.5			149.97
		HOLE BOTTOM at 1.53m	

Drill Method: Excavator

Hole Size: n/a

UTM Coordinates: 17591051E, 4796653N

Project No. Eagle Heights

Drill Date: June 15, 2018

Sheet: 1 of 1

Test Pit Number: 606-1

Project: Eagle Heights

Elevation: 152.50 masl

Site Location: Burlington, ON

Geologist: Annie Michaud, P.Eng.

TERRA-DYNAMICS CONSULTING INC.
404 Queenston Street
St. Catharines, ON L2P 2Y2
905-646-7931

SUBSURFACE PROFILE

Depth (m)	Symbol	Description	Elevation (masl)
0.0		**Ground Surface**	152.50
0.10		**SANDY SILT** • Granular/platy, dry, no plasticity • No mottling, non-stony • Dark yellowish brown (10 YR 4/4)	152.38
0.20		**SILTY SAND** • Blocky, moist, no plasticity, compacted • No mottling, non-stony • Reddish brown (5 YR 4/4) ***Discontinuous layer of hardpan observed near depth of 0.12 to 0.20m***	
1.0			151.45
1.1		**clayey, silty SAND** • Blocky, moist to wet consistence • No mottling, non-stony • Very dark grey (5 YR 3/1) with streaks of yellowish red (5 YR 5/6)	
1.2			151.22
1.3		**HOLE BOTTOM at 1.28m**	
1.4			
1.5			

Drill Method: Excavator

Hole Size: n/a

UTM Coordinates: 17590977E, 4796569N

Project No. Eagle Heights

Drill Date: June 12, 2018

Sheet: 1 of 1

Test Pit Number: 606-2

Project: Eagle Heights

Elevation: 152.50 masl

Site Location: Burlington, ON

Geologist: Annie Michaud, P.Eng.

TERRA-DYNAMICS CONSULTING INC.
404 Queenston Street
St. Catharines, ON L2P 2Y2
905-646-7931

SUBSURFACE PROFILE

Depth (m)	Symbol	Description	Elevation (masl)
0.0		**Ground Surface**	152.50
		SANDY SILT • Granular/platy, dry, no plasticity • No mottling, non-stony • Dark yellowish brown (10 YR 4/4)	152.42
0.20		**SILTY SAND** • Blocky, moist, no plasticity, compacted • No mottling, non-stony • Reddish brown (5 YR 4/4) ***Discontinuous layer of hardpan observed near depth of 0.08 to 0.20m***	151.63
0.90		**CLAY and silt, trace sand** • Blocky/columnar, moist, calcareous, plastic • Visible mottling - red (2.5 YR 4/6) • Dark reddish grey (2.5 YR 3/1) • Red shale inclusions observed	151.21
1.3		**HOLE BOTTOM at 1.29m**	
1.5			

Drill Method: Excavator

Hole Size: n/a

UTM Coordinates: 17590979E, 4796572N

Project No. Eagle Heights

Drill Date: June 12, 2018

Sheet: 1 of 1

Test Pit Number: 621

Project: Eagle Heights

Elevation: 144.50 masl

Site Location: Burlington, ON

Geologist: Annie Michaud, P.Eng.

TERRA-DYNAMICS CONSULTING INC.
404 Queenston Street
St. Catharines, ON L2P 2Y2
905-646-7931

SUBSURFACE PROFILE

Depth (m)	Symbol	Description	Elevation (masl)
0.0		**Ground Surface**	144.50
		SANDY SILT • Granular, dry, no plasticity • No mottling, non-stony • Grey to light brown (7.5 YR 6/1 to 6/3)	
0.20			144.27
		SAND and SILT with some clay • Massive/blocky, moist consistence • No plasticity • No mottling, non-stony • Grey to light brown (7.5 YR 6/1 to 6/3)	
0.70		***Discontinuous compacted layer of hardpan observed at depth of between 0.70 and 0.90m*** ***Hardpan clods between 5-15cm in size observed at this depth***	
0.90			
1.48		**HOLE BOTTOM at 1.48m**	143.02

Drill Method: Excavator

Hole Size: n/a

UTM Coordinates: 17591065E, 4796126N

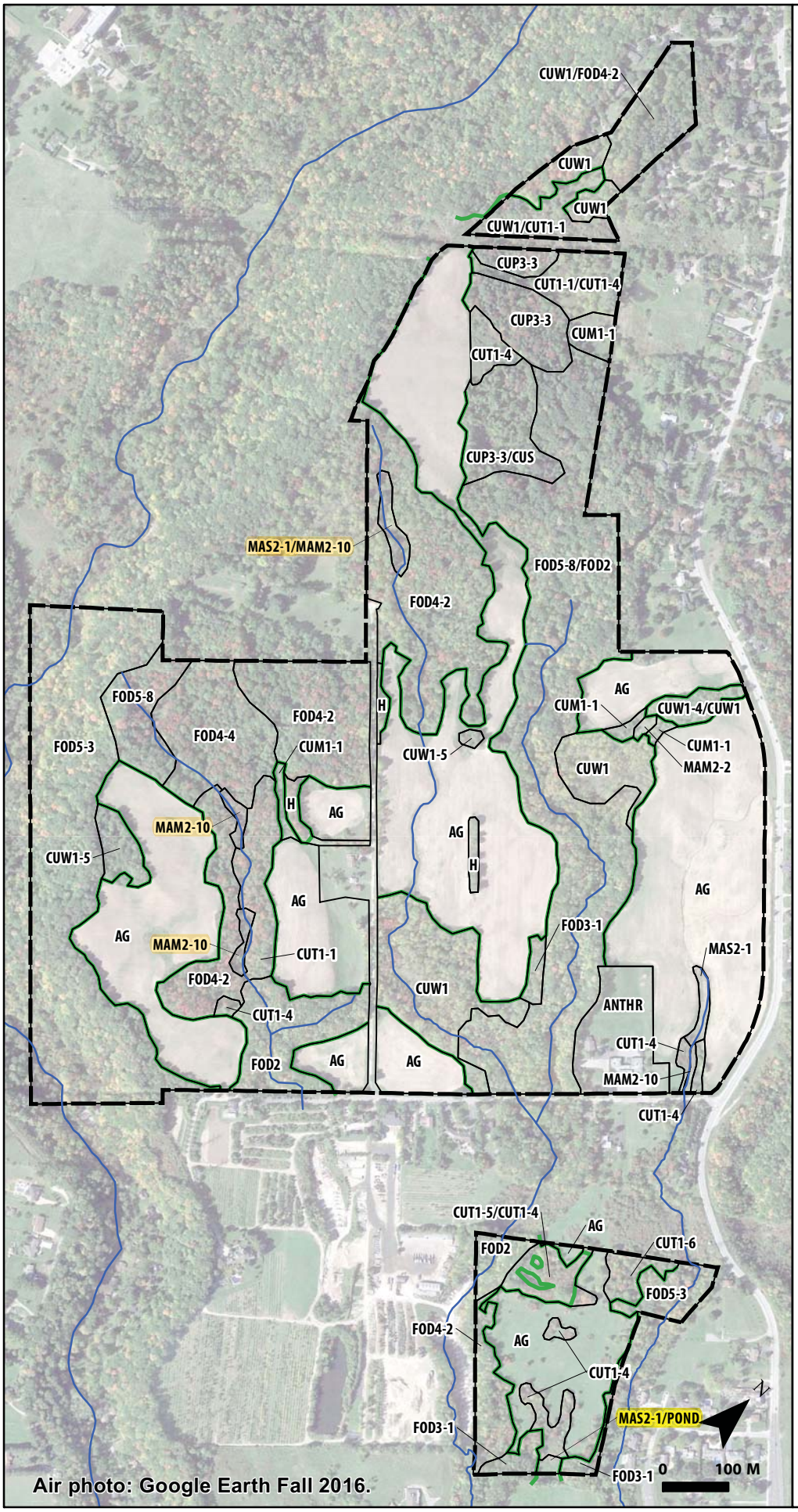
Project No. Eagle Heights

Drill Date: June 11, 2018

Sheet: 1 of 1

Appendix 10.

Savanta Figure 4 *Ecological Land Classification*



Eagle Heights EIA
Penta Properties Inc., Burlington

ELC LEGEND

CULTURAL (CU)

CUP3-3	Scots Pine Coniferous Plantation
CUS	Cultural Savanna
CUW1*	Black Walnut-White Ash Cultural Woodland
CUW1-4*	Black Locust Cultural Woodland
CUW1-5*	Manitoba Maple Cultural Woodland
CUT1-1	Sumac Cultural Thicket
CUT1-4	Grey Dogwood Cultural Thicket
CUT1-5*	White Ash Cultural Thicket
CUT1-6*	Black Walnut Cultural Thicket
CUM1-1	Old Field Cultural Meadow

FOREST (FO)

FOD2	Dry-Fresh Oak-Maple-Hickory Deciduous Forest
FOD3-1	Dry-Fresh Poplar Deciduous Forest
FOD4-2	Dry-Fresh White Ash Deciduous Forest
FOD4-4*	Dry-Fresh Manitoba Maple Deciduous Forest
FOD5-3	Dry-Fresh Sugar Maple-Oak Deciduous Forest
FOD5-8	Dry-Fresh Sugar Maple-White Ash Deciduous Forest

MARSH (MA)

MAM2-2	Reed-canary Grass Mineral Meadow Marsh
MAM2-10	Forb Mineral Meadow Marsh
MAS2-1	Cattail Mineral Shallow Marsh

**Not listed in Southern Ontario ELC Guide*

AG	Agricultural
ANTHR	Anthropogenic Use
H	Hedgerow

Subject Lands
Ecological Land Classification
Dripline (Staked 2015)
Watercourse

Figure 4
Ecological Land Classification

SAVANTA

Document Path: S:\SAVANTA\7077 - SAV 6374 Eagle Heights EIA [Grindstone]\gis\mxd\2018 02 06 report figures\Figure _ Ecological Land Classification.mxd Revised: March 29, 2018