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Alinea Land Corporation
4480 Paletta Court
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Re: 2026 Update: 1200 King Road, Hydrogeological and Hydrological Assessment, Burlington (Aldershot), ON

1.0 Introduction and Background Information

Alinea Land Corporation retained Terra-Dynamics Inc. (Terra-Dynamics), previously Terra-Dynamics Consulting Inc., to complete a Hydrogeological and Hydrological Assessment of the 1200 King Road property in Burlington (Aldershot), Ontario (the Site, Figures 1 and 2). The Site is approximately 49.1 hectares (121.3 acres) in area and mixed type development is planned, including residential, commercial, community and institutional (Giannone Petricone Associates Inc., 2026, Appendix 1). It is our understanding the Site is undergoing an Official Plan Amendment (OPA) and Zoning By-law Amendment (ZBA) application process in 2026.

Terra-Dynamics completed a Hydrogeological and Hydrological Assessment of the Site in 2014 and the work described herein builds upon that historic information. Only the eastern sections of Site were assessed as part of the Hydrogeological Assessment as access for a drilling rig is restricted by the presence of Falcon Creek, Grindstone Creek and the forested areas in the western sections of the site. The Hydrogeological Assessment of the eastern sections of the property are referenced as the Study Area herein.

The work entailed a Hydrogeological Assessment, including streamflow monitoring, and assessed the groundwater to surface water interactions of the Site for three subwatersheds that are present and cross the property from west to east, namely:

1. The eastern and western Grindstone Creek tributaries;
2. Falcon Creek; and
3. Indian Creek.

A Wetland Water Balance Study was also completed for the Site and is provided under a separate cover (Terra-Dynamics, 2026).

This report describes the various tasks associated with completing the Hydrogeological and Hydrological Assessment and the results of this assessment.

2.0 Purpose

The purpose of the Hydrogeology and Hydrology Assessment was to:

1. Assess pre-development hydrogeologic conditions of the study area and the inter-relationship of the Study Area's groundwater flow regime relative to the creeks that flow southwards across the Site; and

2. Evaluate conditions with respect to identifying any constraints to development.

3.0 Methodologies

3.1 Site Mapping

The Site was visited on numerous occasions from 2022 to 2024 to observe on-site conditions and the stream flow in the eastern and western tributaries of Grindstone Creek, Falcon Creek and Indian Creek (Figure 2). Aerial photographs of the site were evaluated, in addition to Ontario Geological Survey and Hamilton-Halton Source Protection maps of the Waterdown area. Aerial orthophotographs for 1999, 2002, 2005, 2007 and 2010 for the area were reviewed utilizing the City of Hamilton iMapper website and Indian Creek was historically altered into a straight channel to optimize past land use for agricultural purposes.

3.2 Installation of Groundwater Monitoring Wells

There have been 10 monitoring wells installed by Terra-Dynamics in the Study Area including two monitoring well nests of both shallow (S) and deep (D) wells located a few metres from each other to assess vertical hydraulic gradients (MW-6-S & D and MW-8-S & D).

The monitoring wells were installed at the following locations relative to the location of Falcon and Indian Creeks, listed below. Access to the Grindstone Creek tributary was historically not possible with a drilling rig due to the presence of the Falcon Creek ravine and densely forested lands that comprise the western half of the Site. Locations described below are in the context of the accessible sections of the Site (or the Study Area) east of Falcon Creek and west of King Road:

- MW-1: Shallow monitoring well installed between King Road and Indian Creek in the northeast corner of the Study Area;
- MW-2: Shallow monitoring well installed between King Road and Indian Creek in the southeast corner of the Study Area;
- MW-3: Shallow monitoring well installed west of Indian Creek in the southern section of the Study Area;
- MW-4: Shallow monitoring well installed in central portion of Study Area at the base of the slope associated with the ancestral glacial Lake Iroquois shoreline;
- MW-5: Shallow monitoring well installed east of Falcon Creek in the southwest corner of the accessible section of the Study Area;
- MW-6-Shallow (S): Shallow monitoring well installed east of Falcon's Creek in the northwest corner of the accessible section of the Study Area;
- MW-6-Deep (D): Deeper monitoring well (or piezometer) allowed for an evaluation of the vertical groundwater hydraulic gradient next to Falcon Creek to assess whether the upper section of the ancestral glacial Lake Iroquois shoreline is recharging the bedrock or is a groundwater discharge zone associated with the Niagara Escarpment to the north;

- MW-7: Shallow monitoring well installed in the central portion of the Study Area at the top of the slope of the ancestral shoreline;
- MW-8-Shallow (S): Shallow monitoring well installed west of Indian Creek at the top of the slope of the ancestral shoreline;
- MW-8-Deep (D): Deeper monitoring well (or piezometer) allowed for an evaluation of the vertical groundwater hydraulic gradient next to the western channel of Indian Creek to assess whether the upper section of the ancestral glacial Lake Iroquois shoreline is recharging the bedrock or is a groundwater discharge zone associated with the Niagara Escarpment to the north.

Monitoring well logs are presented in Appendix 2. All monitoring wells were surveyed for elevation and coordinates using a total station system prior to the 2014 reporting.

Monitoring wells (MWs) were inspected on November 30, 2021 by a Terra-Dynamics' staff member who is a licensed Ministry of the Environment, Conservation & Parks (MECP) Water Well Technician. Based on the results of the November 30, 2021 monitoring well inspection, a total of four monitoring wells were replaced in early-June, 2022 by a MECP-licensed water well contractor, Aardvark Drilling from Guelph, Ontario. The following monitoring wells were decommissioned and replaced a few metres from the decommissioned monitoring well:

MW-1;
MW-2;
MW-4; and
MW-6-S.

The drilling was completed 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 that have locked protective casings.

Some monitoring well casings were also replaced in early-June, 2022. Of note, MW-5 was observed to be destroyed by agricultural activities on April 5, 2024 and therefore will be located for appropriate decommissioning as per Regulation 903 of the Ontario Water Resources Act and should be replaced.

An additional 3 monitoring wells were installed by DS Consultants Ltd. (DS Consultants Ltd., 2024), one installed near to Terra-Dynamics MW-6 and two installed immediately west of King Road (Figure 2). They are identified as BH24-7, BH24-16 and BH24-17.

3.3 Staff Gauges

Stainless steel drive point wells, with appropriate extensions, were manually installed at the following locations to serve as staff gauges and correlate creek levels with groundwater levels:

- Indian Creek Inflow East (SG-IC-I-E): this staff gauge was used to measure levels in the eastern inflow channel of Indian Creek;
- Indian Creek Inflow West (SG-IC-I-W): this staff gauge was used to measure levels in the western inflow channel of Indian Creek;

- Indian Creek Outflow (SG-IC-O): this staff gauge was used to measure levels at the outflow of Indian Creek;
- Falcon Creek Inflow (SG-FC-I): this staff gauge was used to measure levels at the inflow of Falcon Creek;
- Falcon Creek Outflow (SG-FC-O): this staff gauge was used to measure levels at the outflow of Falcon Creek;
- Eastern Tributary of Grindstone Creek Inflow (SG-GC-I): this staff gauge was used to measure levels at the inflow of the eastern tributary of Grindstone Creek;
- Eastern Tributary of Grindstone Creek Pond (SG-GC-P): this man-made pond was instrumented with a staff gauge to assess fluctuations in pond levels; and
- Eastern Tributary of Grindstone Creek Outflow (SG-GC-O): this staff gauge was used to measure levels from the aforementioned pond.
- Western Tributary of Grindstone Creek Inflow (SG-GC-WI): this staff gauge was used to measure levels at the inflow of the western tributary of Grindstone Creek

All staff gauges, with the exception of SG-GC-W, have been surveyed for elevation and coordinates using a total station system prior to the 2014 reporting.

Additional staff gauges and piezometers were installed in the western lands as a component of the wetland water balance study, however that is discussed under separate cover (Terra-Dynamics, 2026).

Surface water monitoring locations discussed herein are presented on Figure 2.

3.4 Hydrological Measurements

Flows in the three watercourses were measured historically at each of the eight creek staff gauges. The flow measurement method utilized the "velocity x area" method, using a digital United States Geological Survey (USGS)-type flow meter to measure streamflow velocities and a tape measure to measure stream width and section depths. Rating curves for correlating the relationship between creek water height or stage and creek flow discharge were developed in 2014 and reported on in the 2014 Hydrogeological and Hydrological Assessment (Terra-Dynamics, 2014).

3.5 Water Level Data Loggers-Continuous Data

All monitoring wells were instrumented with Solinst water level data loggers for the purpose of generating continuous-type hydrographs of the water table and the deeper piezometric or potentiometric surface at MW-6-D and MW-8-D. The inflow and outflow locations of Indian Creek, Falcon Creek, and the tributaries of Grindstone Creek were also instrumented as staff gauges as described in Section 3.3. Data were acquired on a 15-minute frequency. A barometric pressure recorder was also installed at the Site in order to compensate water level logger data from barometric pressure effects.

3.6 *In Situ* Hydraulic Conductivity (Permeability) Tests

The Terra-Dynamics monitoring wells were subject to bailer withdrawal hydraulic conductivity (permeability) tests. Solinst water level data loggers were placed in each of the monitoring wells

installed by Terra-Dynamics and a volume of water was removed from the well with a disposable plastic bailer. Groundwater recovery was recorded with the water level data 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. Hydraulic conductivity data analysis and plots are provided in Appendix 3 and summarized on Table 1.

4.0 Physical Setting, Geologic Conditions and Surface Water

4.1 Physical Setting

The subject property is located in the Aldershot area of Burlington, Ontario. The site is bounded by King Road to the east, Highway 403 to the north, the Aldershot GO Station to the west and property associated with the Canadian National Railway to the south. Silty clay and silty clay with stones (Halton Till) overlie the Queenston Shale across the property. The Site is regionally located on the Iroquois Plain (Chapman and Putnam, 1984) with the approximate 7-metre high ridge of the historic Lake Iroquois shoreline (Karrow, 1963) mapped as roughly north to south, bisecting the Site, and situated above ground surface elevations of approximately of 106 to 107 metres above sea level (m ASL) (Figure 2), with Indian and Falcon Creeks cutting through this feature.

Four watercourses flow across the property from north to south as are shown on Figure 2:

1. Indian Creek in the eastern section of the property;
2. Falcon Creek through the middle section of the property;
3. An eastern tributary of Grindstone Creek in the western section of the property that also contains a rectangular man-made pond; and
4. A western tributary of Grindstone Creek in the very northwest corner of the Site.

The four creeks have eroded down through the silty clay and glacial till and bottom-out or are based in these fine-grained overburden sediments. All creeks at the Site eventually discharge into Hamilton Harbour.

4.2 Overburden Geology

The Study Area is situated on a 7 to 13.6 m thick layer consisting of a mixture of low permeability silty clay and clayey glacial till (Halton Till) based on site-specific investigations.

The Site is shown in geologic cross-sections on Figures 3 and 4 with reference to Figure 2. Monitoring Well logs and Borehole logs are presented in Appendix 2 (Terra-Dynamics), 4 (Soil-Mat) and 5 (DS Consultants Ltd.).

Within the Study Area, or eastern half of the Site, the overburden is predominantly silty clay with areas of 0.2 to 2 m thick sand to sandy silt documented at (i) Monitoring well MW-8 and Soil-Mat borehole BH-3 (2013) at the northern, higher elevation area in the northeast of the study area and (ii) Monitoring well MW-5, Soil-Mat boreholes BH-5 (2013) and BH-5 (2011) and DS Consultants Ltd. BH24-8 in the southwest corner of the study area (Figure 2).

The central and western portions of the Site are also underlain by low permeability silty clay to clayey till, however, the limited borehole geotechnical records (Soil-Mat, 2013) indicate some sand to silty/clayey sand, typically observed as having a thickness of 1 to 2 m. This is shown the southwest-northeast hydrogeologic cross-section (Figure 3).

It is recommended a Site surficial geology map be prepared once additional geotechnical and hydrogeological investigations for the western portion of the Site are completed. This new map will better represent on-site conditions than existing surficial geology mapping by the Ontario Geological Survey (2003) which over-represents sand at the Site based on investigations to-date.

4.3 Bedrock Geology

The Site's clay is underlain by red shale of the Queenston Formation (Terra-Dynamics, 2014). 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).

At the ridge associated with the Glacial Lake Iroquois Shoreline, the Queenston Shale was encountered at the following depths:

- 10.1 m BGS (metres below ground surface) (MW-8-D, Appendix 2);
- 10.7 m BGS (MW-6-D, Appendix 2);
- and at 12.3 m BGS (BH24-7, DS Consultants Ltd. (2024), Appendix 5).

Below the ridge, the Queenston Shale was encountered at the following depths:

- 7.3 m BGS (MW-1, Appendix 2);
- 8.8 m BGS (BH-5, Soil Mat (2011)) (Appendix 4);
- 7.7 m BGS, 11.3 m BGS, 13.6 m BGS (BH 24-16, BH24-17 and BH24-8, DS Consultants Ltd. (2024), Appendix 5).

West of the Site at the GO Station, OGS geotechnical boreholes drilled in the 1960s indicate bedrock depths ranging from 5.7 to 6.1 m BGS (OGS, 2012).

A southerly regional dip in the bedrock surface is present towards Hamilton Harbour.

4.4 Surface Water

Intermittent watercourses at the Site flow from north to south and include: (i) Indian Creek, (ii) Falcon Creek and (iii) two tributaries of Grindstone Creek (Figure 2). The eastern Grindstone Creek Tributary includes a man-made online pond from past agricultural activities, and is located within the 110.4 m ASL ground surface contour. The Wetland Water Balance report details the small percentage of each watercourse that is on the Site (Terra-Dynamics, 2026).

Although the creeks have eroded through the silty clay and glacial till they are still underlain by low permeability clayey materials (Terra-Dynamics, 2014).

The watercourse water depths have been fairly shallow, e.g. Indian Creek is 75 cm or less, Falcon creek is 125 cm or less, the eastern Grindstone Creek Tributary is 45 cm or less and the western Grindstone Creek Tributary is 90 cm or less (Appendix 6).

Dry conditions have been historically observed at: (i) the eastern Grindstone Creek tributary pond station (pond level <110.25 m ASL) in July 2013 and its southern outflow in summer 2013 and (ii) the outflow of Falcon Creek in September 2013. Surface water flow was measured to decline upstream to downstream at the Site during very dry weather measurements (e.g. summer and fall seasons of 2022, Appendix 9), however, given the very low flow values recorded at the upstream locations the limited water was ponding and evaporating prior to reaching downstream locations where dry conditions were noted. However, flows were measured to often increase across the Site during wet weather events. Inflow values in the east Grindstone Creek Tributary were often greater than flows recorded at the outflow location due to the retention capabilities of the Grindstone Creek Pond (Figure 2). Previous surface water field investigations have documented surface water level observations including responses to precipitation events when precipitation events were greater than 10 mm/day (Terra-Dynamics, 2014). Similar surface water conditions were observed in more recent monitoring, from July 2022 to November 2024 (Appendix 6).

Monitoring locations within Indian Creek were occasionally dry during the summer and fall seasons.

The inlet location for Falcon Creek was not recorded as going dry during the monitoring period with depths in the channel not decreasing below 4 cm, however stagnant conditions of ponding in low points in the channel occurred during dry conditions.

Surface water levels in the Grindstone Creek western tributary (SG-GC-WI, Appendix 6) were generally 15 cm to 40 cm deep in summer/early fall 2023 and 2024 with occasional dry periods (Appendix 6).

All four water courses exhibit “flashy” responses to precipitation, with very quick response times to precipitation events followed by quickly decreasing water levels indicative of runoff conditions.

5.0 Hydrogeologic Conditions and Groundwater Flow

5.1 Hydraulic Conductivity and Estimated Infiltration

Hydraulic conductivity test results are presented in Appendix 3 and summarized below in Table 1.

Table 1. Summary of *In-situ* Hydraulic Conductivity Tests

Well I.D.	Geologic Formation	Horizontal Hydraulic Conductivity (m/sec)	Estimated Vertical Hydraulic Conductivity (m/sec)	Estimated Infiltration (mm/hour)
MW-2	Silty Clay Till	1.0×10^{-8}	1.0×10^{-9}	7
MW-3	Silty Clay Till and Silty Clay	2.2×10^{-8}	2.2×10^{-9}	9

Well I.D.	Geologic Formation	Horizontal Hydraulic Conductivity (m/sec)	Estimated Vertical Hydraulic Conductivity (m/sec)	Estimated Infiltration (mm/hour)
MW-4	Silty Clay Till and Silty Clay	4.3×10^{-10}	4.3×10^{-11}	3
MW-5	Silty Clay and Silty Clay Till	8.1×10^{-10}	8.1×10^{-11}	4
MW-6-S	Silty Clay Till and Silty Clay	6.5×10^{-8}	6.5×10^{-9}	12
MW-6-D	Silty Clay	1.8×10^{-9}	NA*	NA*
MW-7	Silty Clay with Thin Sand Lens	2.3×10^{-6}	NA**	NA**
MW-8-S	Silty Clay with Lenses of Sand and Silt	7.9×10^{-9}	7.9×10^{-10}	7
MW-8-D	Silty Clay and Queenston Shale	3.2×10^{-9}	NA*	NA*
Geometric Mean		9.3×10^{-09}	5.8×10^{-10}	6

Notes: vertical hydraulic conductivity approximated as 1/10 of horizontal (Todd and Mays, 2004), NA: Not Applicable for deeper, potentiometric surface monitoring wells, NA** - not included as the hydraulic conductivity of the minor sand not the majority silty clay matrix*

The silty clay and silty clay till exhibit a very low horizontal hydraulic conductivity with a geometric mean of the nine tests referenced in Table 1 of 9×10^{-9} m/sec, indicating that the clay-based overburden within the Study Area of the Site is an aquitard.

Vertical hydraulic conductivity values for the shallow, water table monitoring wells were estimated as being one order of magnitude lower than the horizontal hydraulic conductivity (Todd and Mays, 2004). Using estimated vertical hydraulic conductivity values, infiltration rates were also estimated (Table 1) via a Credit Valley Conservation (CVC) methodology (CVC, 2012, Table 2). Estimated infiltration rates ranged from 3 to 12 mm/hour with a geometric mean of 6 mm/hour.

The monitoring wells presented on Table 1 are screened to depths of greater than 2 m BGS (with the deep wells at MW-6 and MW-8 screened deeper at 10 m BGS), however, to better understand surficial geology, at the design phase, areas for in-situ infiltration testing can be identified to evaluate any opportunities for infiltration of stormwater into the ground and implement Low Impact Development (LID) approaches. This will need to take into account the grading/cut and fill plans for the Site. It is our understanding that low pre-development infiltration rates (less than the MECP recommended 15 mm/hour) of the native clayey silt/silty clay till overburden may preclude the use of infiltration trenches, soakaway pits or pervious pipes (MECP, 2003).

The limited Well logs and borehole logs with at-surface sand observed are detailed in Section 4.2.

DS Consultants Ltd. Completed grain size analysis on five samples from varying depths (2.3 to 9.0 m BGS) from four of the boreholes completed in 2024 and the five samples were classified as silty clay till (DS Consultants, 2026).

Groundwater velocity calculations are provided in Appendix 8. During groundwater recharge conditions from the overburden aquitard to the shale bedrock aquitard, the average linear vertical groundwater flow velocity through the clay aquitard to the shale bedrock aquitard is approximately 3 cm/year.

The horizontal average linear groundwater flow velocity calculation is presented in Appendix 8 which is approximately 4 cm/year southerly towards Hamilton Harbour and locally, towards the creeks. There is no significant shallow groundwater baseflow to Falcon Creek or Indian Creek. Flow in these two creeks is derived from runoff.

5.2 Groundwater Flow and Levels

Figures 5a and 5b show the groundwater flow direction in the silty clay and clayey glacial till overburden as regionally southward towards Hamilton Harbour and locally towards both Falcon and Indian Creeks in the vicinity of the creeks. Figure 5b represents manually measured spring-season high groundwater levels and manual groundwater level and staff gauge level measurements are tabulated in Table 2 and Table 3, respectively.

Regional scale groundwater flow in the shale bedrock is predicted to be in a southerly direction towards Hamilton Harbour. Comparison of initial bedrock groundwater levels at BH24-16 and BH24-17 (DS Consultants Ltd., 2024, Appendix 5) compared to overburden groundwater levels at MW-1 and MW-2, respectively (Figure 2), suggest an overall downwards gradient. However, additional monitoring will be required to confirm.

Groundwater level elevation minimum and maximum values, as recorded by the water level data loggers from July 14, 2022 to November 1, 2024, are detailed on Table 4 (maximum groundwater elevation values from data logger values are displayed on Figure 8).

Table 4. On-Site Groundwater Elevation Details (Data Logger Values)-July, 2022 to November, 2024

MW ID	Ground Surface Elevation (mASL)	Maximum Groundwater Elevation Recorded (mASL)/Groundwater depth below Ground Surface (m)	Minimum Groundwater Elevation Recorded (mASL)/Groundwater depth below Ground Surface (m)
MW-1	104.99	104.87/0.12	103.21/1.78
MW-2	104.13	103.82/0.31	101.62/2.51
MW-3	103.85	103.95/-0.10	101.61/2.24
MW-4	106.01	105.82/0.19	101.98/4.03
MW-5	104.66	104.27/0.39	102.62/2.04
MW-6-S	112.67	111.93/0.74	108.98/3.69
MW-6-D*	112.67	112.32/0.35	109.16/3.51

MW ID	Ground Surface Elevation (mASL)	Maximum Groundwater Elevation Recorded (mASL)/Groundwater depth below Ground Surface (m)	Minimum Groundwater Elevation Recorded (mASL)/Groundwater depth below Ground Surface (m)
MW-7	112.60	112.50/0.10	109.83/2.77
MW-8-S	111.61	110.01/1.60	107.79/3.82
MW-8-D*	111.45	110.00/1.45	107.39/4.06

*Notes: *: Deeper potentiometric surface monitoring wells, i.e. do not represent the water table; negative value represents above ground surface; minimum groundwater level elevations do not include the recovery period following well development (Figures 6 and 7). Maximum and minimum values obtained from data logger values and therefore can represent different dates for different monitoring wells.*

The details presented in Table 4 and on the data logger plots (Figures 6 and 7 and Appendix 7) indicate that groundwater levels in the Study Area are shallow with groundwater levels often being less than 1 m BGS, with this being more consistently apparent at the lower elevations at the base of the Glacial Lake Iroquois Ridge (i.e. MW1 through MW-5).

Maximum groundwater level elevations occurred typically in the winter and spring seasons, as is common in Southern Ontario and a significant precipitation event of 50 mm of rainfall on July 16, 2024 caused close-to maximum groundwater level elevations at MW-1, MW-2, MW-6-S, MW-6-D, MW-7, MW-8-S and MW-8-D.

However, as detailed in Section 4.0, the Study Area is underlain by an approximate 130 m thick aquitard consisting of an upper 7 to 13.6 m of low permeability glacial till underlain by approximately 120 m of shale, i.e. groundwater movement is generally very low. No significant aquifers are present. Therefore, given the Site geology and the shallow groundwater levels present (Table 4, Appendix 7), the use of infiltration-type LID techniques for the infiltration of stormwater will have a limited effect at groundwater recharge.

6.0 Hyetographs and Hydrographs

Figures 6 and 7 are hyetographs from July 14, 2022 to November 1, 2024 of (i) daily precipitation, (ii) the shallow water table in the clay-based aquitard, (iii) the potentiometric surface of the groundwater elevation at the base of the clay-based aquifer, and (iv) the water level in the two eastern creeks that flow across the property. Precipitation data are from Environment Canada's nearby Hamilton Royal Botanical Gardens (RBG) Climate Station Station, ID No. 6153301 (Environment Canada, 2026).

Figure 6 pertains to Monitoring Wells MW-6-Shallow and Deep and the inflow staff gauge at Falcon Creek (see Figure 2). Figure 6 pertains to Monitoring Wells MW-8-Shallow and Deep and the inflow staff gauge at Indian Creek West (see Figure 2). The following are some observations that pertain to precipitation events, surface water and groundwater level/elevation data:

<u>Figure 6, Falcon Creek Area Hyetograph (northwest corner of the Study Area and Falcon Creek, or vicinity of proposed Blocks 11 and 12, Appendix 1):</u>

1. The linear spikes in the water level of Falcon Creek uniformly correspond with storm events where precipitation was generally greater than 10 mm/day.

2. Shallow groundwater will slowly flow towards Falcon Creek at very low rates of approximately 4 cm/year.

3. The potentiometric pressure from the interface of the clay-based aquitard and the underlying shale aquitard was greater than the water table elevation (following the slow recovery of the purging of groundwater from the deeper piezometer (MW-6-D)). The source of this vertically upward groundwater vertical gradient is likely where the Queenston Shale is exposed near surface up-slope of the Site near the base of the Niagara Escarpment as is documented by Karrow (1963).

4. There will be no upward groundwater flow to the base of Falcon Creek (or baseflow) because of the presence of the low permeability silty clay till aquitard beneath Falcon Creek. As is shown on Figures 3 and 4, there is an approximate 5 m-thick layer of silty clay till present beneath Falcon Creek.

<u>Figure 7, Indian Creek Area Hyetograph (near the northeast corner of the study area, or vicinity of proposed Blocks 7 and 13, Appendix 1):</u>

1. The linear spikes in the water level of Indian Creek uniformly correspond with storm events where precipitation was generally greater than 10 mm/day.

2. Shallow groundwater will slowly flow towards Indian Creek at very low rates of approximately 4 cm/year.

3. The potentiometric pressure from the interface of the clay-based aquitard and the underlying shale aquitard was slightly less than the water table elevation (following the slow recovery of the purging of groundwater from the deeper piezometer (MW-8-D)). The potentiometric pressure from the interface of the clay-based aquitard and the underlying shale aquitard is continuously less than the water table elevation indicating vertically downward groundwater pressure or very slow groundwater recharge conditions to the underlying shale bedrock at velocities of approximately 3 cm/year.

4. There is no baseflow from the shale bedrock to Indian Creek as vertically downward hydraulic gradients are present as is referenced above and because an approximate 7 m-thick layer of low permeability silty clay till present beneath Indian Creek (see the cross-sections on Figures 3 and 4 and Borehole Logs for MW-1, MW-2 and MW-3 in Appendix 2).

<u>Remaining Hyetographs and Staff Gauge Rating Curves</u>

Hyetographs are presented in Appendix 7 for Monitoring Wells MW-1, MW-2, MW-3, MW-4, MW-5 and MW-7 as well as individual plots for the nested wells, MW-6 and MW-8. As was described by Terra-Dynamics (2014), the water table at MW-4, which is located at the base of the Ancestral Glacial Lake Iroquois Shoreline, was basically at surface for most of that year (2014). However, drought conditions in

2022 (Canada drought maps for select months of 2022 are presented in Appendix 9) resulted in a summer/fall water table decline across the Site, e.g. at MW-4 groundwater levels dropped almost 3 metres and MW-4 normally only seasonally varies less than 1.2 metres. The 2022 drought conditions are evident on the shallow groundwater flow direction map for January, 2023 (Figure 5a) where the surface water elevations in Indian Creek across the central part of the study area were higher than the water table representing local recharge conditions. This was reversed for this part of the study area in mid-April, 2023 (Figure 5b) where the water table was close to the spring season high values (highest measured manually).

The shallow groundwater table responds quickly to precipitation events at most monitoring wells, likely as a result of fracturing in the upper aquitard and/or recharge to surficial sandy silt/silty sand (MW-8-S and MW-5).

In the winter and spring seasons, as well as after periods of significant precipitation, groundwater level elevations slightly above surface have been recorded at MW-3.

Hyetographs for the three creek inflow and outflow locations, the inflow location for the western Grindstone Creek tributary and the hyetograph for the pond located on the eastern tributary of Grindstone Creek are presented in Appendix 6. Staff gauge flow rating curves are presented in the 2014 Hydrogeological and Hydrological Assessment (Terra-Dynamics, 2014).

Any loss of continuous monitoring data due to data logger malfunctions are indicated on the plots presented in Appendix 6 and 7.

7.0 Surface Water Quality (Historic)

Surface water quality sampling was previously completed during both low-flow and high-flow conditions in 2014 and is reported on in the originally submitted Hydrogeological Assessment for the Site (Terra-Dynamics, 2014). Surface water quality sampling locations included inflow and outflow stations for (i) Indian Creek, (ii) Falcon Creek and (iii) Eastern Grindstone Creek Tributary.

The surface water quality sampling program was detailed in the Terms of Reference for the original studies (City of Burlington, 2012). Key parameters analyzed included herbicides and pesticides, metals, nutrients, bacteria and field parameters (i.e. temperature, dissolved oxygen, conductivity and pH).

Terra-Dynamics (2014) previously concluded:

Results indicate elevated concentrations of chloride from the application of salt for deicing. Low concentrations of the pesticide atrazine were detected at the inflow and outflow points of the three creeks for the July, 2014 sampling event. Total phosphorus and iron concentrations were elevated throughout the three watersheds. A number of naturally occurring metals were detected that likely originate from the Halton till on-site, or the Queenston Shale as described by Armstrong (2001) upstream of the site, where the creek comes in contact with the shale and where the creek flows over the lower sections of the Niagara Escarpment.

8.0 Future Dewatering Study

A dewatering study can be completed (at detailed design phase) with zone of influence calculations and to provide dewatering recommendations for underground levels (i.e. recommendations for potential construction or long-term dewatering based on expected construction/excavation depths). However, if future site investigations (i.e. hydraulic conductivity testing of additional geotechnical monitoring wells, infiltration testing and hydrogeological investigation of the western half of the Site) reinforce current overburden geological findings, dewatering may not be feasible or necessary due to the low hydraulic conductivity values being lesser than 1×10^{-7} (Table 1) across the Study Area of the Site (Preene, 2016).

9.0 Discussion

The City of Burlington Official Plan (City of Burlington, 2020) Chapter 4 (Environment and Sustainability) includes a number of objectives (Section 4.4.1) in Section 4 Water Resources, that may be considered in a review of this report.

k) To encourage implementation of low impact development features, where possible.
l) To control future development in a way that protects, improves and restores groundwater quantity and prevents undesirable groundwater level increases or decline and reduction in base flow to watercourses.
n) To protect, improve or restore groundwater quality.
o) To restrict or limit development in sensitive groundwater features and sensitive surface water features.
p) To control the quality of stormwater runoff from future developed surfaces, so that surface water and groundwater quality is maintained or enhanced.

In order to inform responding to these objectives, Terra-Dynamics have completed an inventory of the geology, hydrology and hydrogeology information for the Site. Constraints to development have been identified (e.g. high/shallow groundwater levels and low permeability soils), while future site-level investigations may identify opportunities for infiltration or simply confirm the existing characterization.

A Water Budget has been completed, with low groundwater recharge rates modelled, and recommendations provided for meeting the low pre-development infiltration rates. Groundwater quality monitoring has not been completed because aquitards (as at the Site) limit the movement of groundwater (i.e. groundwater moves very slowly) and have typically natural poor quality from the long groundwater residence times.

Linkages have not been identified between the groundwater and surface water features largely because of the general low permeability Site characterization. The surface watercourses have been monitored, and investigated, and base flow (i.e. groundwater discharge) not been identified as they are flashy runoff driven systems.

The MECP have not mapped any designated vulnerable areas (i.e. Intake Protection Zones or Wellhead Protection Areas) for the Site. Also, no sensitive surface water or sensitive groundwater features have been identified and none anticipated upon further detailed Site characterizations.

No key hydrologic areas have been mapped (MECP, 2026) and none identified to-date through our investigations and monitoring. Key hydrologic areas are defined in the Official Plan (City of Burlington, 2020) as including "*Significant groundwater recharge areas, highly vulnerable aquifers, and significant surface water contribution areas that are necessary for the ecological and hydrologic integrity of a watershed*".

With respect to key hydrologic features, defined in the Official Plan as "*Permanent streams, intermittent streams, inland lakes and their littoral zones, seepage areas and springs and wetlands*", a Wetland Water Balance has been completed (Terra-Dynamics, 2026) to inform the stormwater management plan for their preservation, and no seepage areas or springs have been mapped for preservation.

10.0 Conclusions and Recommendations

10.1 Conclusions

The following conclusions are provided:

1. The Study Area is underlain by 7 to 13.6 m of very low permeability silty clay and clay-based glacial till (Halton Till) deposits with isolated and discontinuous lenses or pockets of silt and silty sand. The topographically higher areas of the northern section of the property are associated with a ridge of the ancestral Glacial Lake Iroquois shoreline.

2. The silty clay and clay-based till deposits form an aquitard resulting in "flashy" surface water runoff conditions. The overburden deposits overlie shale bedrock (Queenston Shale Formation) which is both laterally extensive and thick and also form a regional aquitard. The upper elevation of the shale aquitard dips to the south towards Hamilton Harbour, which is also the likely prominent flow direction of groundwater in the bedrock.

3. In 2023, a seasonally high-water table was experienced in March through May and again in late-August and early-September, in the Study Area. The late-August to early-September high water table was a direct function of intense periods of rain preceding, and during, this time of the year. In 2024, the seasonally high-water table was experienced in January through April with high water table values also recorded in July, 2024 as a result of a 50 mm/day rainfall event.

4. During the 2022 to 2024 monitoring period, maximum recorded groundwater levels ranged from 0.1 m BGS to 1.6 m BGS on the higher elevation (northern) portions of the Study Area and from just above ground surface to 0.4 m BGS at the base of the slope of the Study Area.

5. In the summer and fall seasons of 2022, the Hamilton area and the Study Area experienced a regional drought which resulted in a depressed water table at the Site.

6. On the northeastern sections of the proposed development, the overburden deposits provided limited recharge to the bedrock. Upward vertical hydraulic gradients are present on the northwestern sections of the study area, at MW-6. The presence of the upward vertical hydraulic gradients indicate at-surface recharge will not reach the bedrock in this portion of the Study Area.

7. Indian and Falcon Creeks and two tributaries of Grindstone Creek flow from north to south across the Site. Indian Creek was historically altered into a straight channel to optimize past land use for agricultural purposes.

8. Creek flow is quick to respond to precipitation events. Creek flow has little to no contribution from groundwater. A total of 5 to 7 m of low permeability clay-based deposits are located beneath Indian Creek and Falcon Creek which are in turn underlain by approximately 120 m of low permeability shale of the Queenston Formation.

9. Groundwater flow in the clay-based overburden deposits is generally southward towards Hamilton Harbour and localized groundwater flow is low, e.g. very slow horizontal velocities of approximately 4 cm/year occurs towards both Indian and Falcon Creeks.

10. The use of infiltration-based, low-impact development (LID) techniques (e.g. infiltration trenches or soakaway pits) to enhance groundwater recharge will likely be ineffective within the Study Area owing to the presence of the very low permeability silty clay and clay-based till overburden aquitard and shallow groundwater levels. Passive measures, with filtration-based LIDs can be considered for implementation on a best-efforts basis.

10.2 Recommendations

The following recommendations are provided for your consideration.

1. In-situ infiltration testing can be completed to further inform decision-making on potential LID measures but will be dependent on grading/cut and fill plans in the detailed design phase. Infiltration-based LID techniques may be constrained by low infiltration rates and shallow groundwater levels. LID feasibility will be further evaluated during the detailed design phase.

2. The monitoring wells installed with oversight by DS Consultants Ltd. in 2024 should be surveyed and in-situ hydraulic conductivity testing completed with water level data loggers installed to continuously record groundwater levels and supplement the previously completed groundwater monitoring.

3. Groundwater monitoring wells MW-1 through MW-8 are within the construction area of the proposed development. They should be decommissioned when they are no longer required for monitoring purposes by a Ministry of the Environment, Conservation & Parks-licensed water well contractor per Regulation 903 of the Ontario Water Resources Act. MW-5 has already been damaged by agricultural activities and should be decommissioned as soon as practical and replaced.

4. Additional Hydrogeologic Investigation should be completed on the western portions of the Site, currently heavily vegetated, (in the vicinity of proposed Blocks 8, 12, 14 and 26, Appendix 1) to further characterize conditions. However, vegetation removal will be required to allow drilling rig access to complete this work.

5. At the detailed design stage, a dewatering study can be considered with zone of influence calculations and to provide dewatering recommendations for underground levels (i.e. recommendations for potential construction or long-term dewatering based on expected construction/excavation depths), however dewatering may not be feasible or necessary due to low hydraulic conductivity values across the Study Area of the Site.

We trust this information is sufficient to satisfy your present needs. If you have any questions, please do not hesitate to contact me via email at kslaine@terra-dynamics.com.

Yours truly,

TERRA-DYNAMICS INC.





Kevin Slaine, B.Sc., P. Geo
Senior Hydrogeologist

Attachments

Table 2. Groundwater Level & Elevation Measurements
Table 3. Surface Water Level & Elevation Measurements

Figure 1. Location of Subject Lands
Figure 2. Base Map
Figure 3. Hydrogeologic Cross-section A-A'
Figure 4. Hydrogeologic Cross-section B-B'
Figure 5(a). Groundwater Flow Direction Map, January, 2023
Figure 5(b). Groundwater Flow Direction Map, April, 2023
Figure 6. 1200 King Rd MW-6-D, MW-6-S and Falcon Creek Inflow Water Level Elevation and Precipitation from July 14, 2022 to November 1, 2024
Figure 7. 1200 King Rd MW-8-D, MW-8-S and Indian Creek Inflow Water Level Elevation and Precipitation from July 14, 2022 to November 1, 2024
Figure 8. Maximum Groundwater Levels Recorded Via Data Loggers

Appendix 1. 1200 King Road Master Plan (Giannone Petricone Associates Inc., 2026)
Appendix 2. Borehole Logs (Terra-Dynamics, 2013)
Appendix 3. Hydraulic Conductivity Tests Analyses
Appendix 4. Soil-Mat Engineers & Consultants Ltd. Borehole Logs (2011/2013)
Appendix 5. DS Consultants Ltd. Geotechnical Borehole/Monitoring Well Logs (2024)
Appendix 6. Hyetographs for Surface Water Staff Gauge Locations

Appendix 7. Hyetographs: Monitoring Wells MW-1, MW-2, MW-3, MW-4, MW-5, MW-6-D, MW-6-S, MW-7, MW-8-D, MW-8-S
Appendix 8. Groundwater Velocity Calculations
Appendix 9. Select 2022 Canada Drought Monitor Maps

11.0 References

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Table 2. Groundwater Level and Elevation Measurements

Well I.D	Ground Elevation (masl)	Stick-up (m)	TOC Elevation (masl)	Northing	Easting	Sept 17/13		Dec 4/13		Jan 12/14	
						Depth TOC (m)	Elevation (masl)	Depth TOC (m)	Elevation (masl)	Depth TOC (m)	Elevation (masl)
MW 1	104.99	0.89	105.88	4797733	593906	1.41	104.47	0.97	104.91	FRZ	---
MW 2	104.13	0.88	105.01	4797658	594070	2.09	102.92	1.37	103.64	1.29	103.72
MW 3	103.85	0.88	104.73	4797485	593946	1.45	103.28	0.97	103.76	FRZ	---
MW 4	106.01	0.85	106.86	4797367	593688	2.23	104.63	1.03	105.83	FRZ	---
MW 5	104.66	1.01	105.67	4797133	593650	5.53	100.14	2.71	102.96	2.31	103.36
MW 6 S	112.67	0.86	113.53	4797241	593464	3.65	109.88	2.76	110.77	2.08	111.45
MW 6 D	112.67	0.60	113.27	4797246	593462	3.89	109.38	2.20	111.07	1.84	111.43
MW 7	112.60	0.91	113.51	4797419	593593	2.71	110.8	2.12	111.39	1.87	111.64
MW 8 S	111.61	0.92	112.53	4797588	593684	3.92	108.61	3.53	109.00	3.55	108.98
MW 8 D	111.45	0.95	112.40	4797586	593686	6.68	105.72	3.99	108.41	3.86	108.54

Well I.D	Ground Elevation (masl)	Stick-up (m)	TOC Elevation (masl)	Northing	Easting	Apr 9/14		July 17/14	
						Depth TOC (m)	Elevation (masl)	Depth TOC (m)	Elevation (masl)
MW 1	104.99	0.89	105.88	4797733	593906	0.99	104.89	1.26	104.62
MW 2	104.13	0.88	105.01	4797658	594070	1.02	103.99	1.72	103.29
MW 3	103.85	0.88	104.73	4797485	593946	0.96	103.77	1.41	103.32
MW 4	106.01	0.85	106.86	4797367	593688	1.13	105.73	1.28	105.58
MW 5	104.66	1.01	105.67	4797133	593650	1.89	103.78	2.96	102.71
MW 6 S	112.67	0.86	113.53	4797241	593464	1.82	111.71	3.33	110.2
MW 6 D	112.67	0.60	113.27	4797246	593462	1.78	111.49	2.57	110.7
MW 7	112.60	0.91	113.51	4797419	593593	1.59	111.92	2.53	110.98
MW 8 S	111.61	0.92	112.53	4797588	593684	3.96	108.57	3.78	108.75
MW 8 D	111.45	0.95	112.40	4797586	593686	4.19	108.21	4.14	108.26

Table 2. Groundwater Level and Elevation Measurements

Well I.D	Ground Elevation (masl)	Stick-up (m)	TOC Elevation (masl)	Northing	Easting	Jul 14/22		Sept 1/22		Nov 29/22	
						Depth TOC (m)	Elevation (masl)	Depth TOC (m)	Elevation (masl)	Depth TOC (m)	Elevation (masl)
MW 1	104.99	0.85	105.84	4797733	593906	2.16	103.68	2.54	103.30	2.81	103.03
MW 2	104.13	0.78	104.91	4797658	594070	2.50	102.41	3.00	101.91	3.20	101.71
MW 3	103.85	0.95	104.80	4797485	593946	2.33	102.47	2.61	102.19	3.14	101.66
MW 4	106.01	0.70	106.71	4797367	593688	2.02	104.69	2.90	103.81	4.46	102.25
MW 5	104.66	1.01	105.67	4797133	593650	2.99	102.68	2.99	102.68	3.04	102.63
MW 6 S	112.67	0.76	113.43	4797241	593464	3.52	109.91	4.19	109.24	4.43	109.00
MW 6 D	112.67	0.36	113.03	4797246	593462	2.44	110.59	3.50	109.53	3.86	109.17
MW 7	112.60	1.03	113.63	4797419	593593	2.94	110.69	3.35	110.28	3.70	109.93
MW 8 S	111.61	0.99	112.60	4797588	593684	4.15	108.45	4.45	108.15	4.74	107.86
MW 8 D	111.45	0.98	112.43	4797586	593686	4.19	108.23	4.99	107.44	4.94	107.48

Well I.D	Ground Elevation (masl)	Stick-up (m)	TOC Elevation (masl)	Northing	Easting	Jan 5/23		Apr 10/23		June 1/23		Sept 8/23	
						Depth TOC (m)	Elevation (masl)	Depth TOC (m)	Elevation (masl)	Depth TOC (m)	Elevation (masl)	Depth TOC (m)	Elevation (masl)
MW 1	104.99	0.85	105.84	4797733	593906	1.44	104.40	1.21	104.63	1.53	104.31	1.40	104.44
MW 2	104.13	0.78	104.91	4797658	594070	2.68	102.23	1.24	103.68	1.84	103.07	1.64	103.27
MW 3	103.85	0.95	104.80	4797485	593946	2.02	102.77	1.00	103.80	1.68	103.12	1.32	103.47
MW 4	106.01	0.70	106.71	4797367	593688	4.73	101.98	0.98	105.73	1.58	105.13	1.37	105.34
MW 5	104.66	1.01	105.67	4797133	593650	3.02	102.66	1.79	103.88	2.69	102.99	2.86	102.82
MW 6 S	112.67	0.76	113.43	4797241	593464	3.29	110.14	1.90	111.53	2.80	110.63	2.77	110.66
MW 6 D	112.67	0.36	113.03	4797246	593462	3.18	109.85	1.01	112.02	1.71	111.32	1.60	111.43
MW 7	112.60	1.03	113.63	4797419	593593	3.67	109.96	1.49	112.14	2.42	111.22	2.44	111.19
MW 8 S	111.61	0.99	112.60	4797588	593684	4.80	107.80	3.08	109.52	3.67	108.93	3.91	108.69
MW 8 D	111.45	0.98	112.43	4797586	593686	5.03	107.39	2.94	109.49	3.53	108.90	3.77	108.65

Table 2. Groundwater Level and Elevation Measurements

Well I.D	Ground Elevation (masl)	Stick-up (m)	TOC Elevation (masl)	Northing	Easting	Oct 31/23		Nov 28/23		April 5/24		July 17/24	
						Depth TOC (m)	Elevation (masl)	Depth TOC (m)	Elevation (masl)	Depth TOC (m)	Elevation (masl)	Depth TOC (m)	Elevation (masl)
MW 1	104.99	0.85	105.84	4797733	593906	2.18	103.67	1.69	104.16	1.17	104.67	1.08	104.77
MW 2	104.13	0.78	104.91	4797658	594070	2.51	102.40	2.26	102.66	1.24	103.67	1.09	103.82
MW 3	103.85	0.95	104.80	4797485	593946	2.00	102.80	1.29	103.51	0.98	103.82	0.89	103.91
MW 4	106.01	0.70	106.71	4797367	593688	1.90	104.81	1.36	105.35	0.97	105.74	0.94	105.77
MW 5	104.66	1.01	105.67	4797133	593650	2.97	102.71	2.99	102.69	2.19	103.48	1.63	104.04
MW 6 S	112.67	0.76	113.43	4797241	593464	3.51	109.93	3.51	109.92	1.81	111.63	1.49	111.94
MW 6 D	112.67	0.36	113.03	4797246	593462	2.55	110.48	2.80	110.23	1.19	111.84	0.97	112.06
MW 7	112.60	1.03	113.63	4797419	593593	2.99	110.64	3.13	110.51	1.53	112.11	1.18	112.45
MW 8 S	111.61	0.99	112.60	4797588	593684	4.17	108.43	4.22	108.38	3.52	109.08	2.87	109.73
MW 8 D	111.45	0.98	112.43	4797586	593686	4.09	108.34	4.30	108.13	3.35	109.08	2.72	109.71

Well I.D	Ground Elevation (masl)	Stick-up (m)	TOC Elevation (masl)	Northing	Easting	Sep 19/24		Nov 1/24	
						Depth TOC (m)	Elevation (masl)	Depth TOC (m)	Elevation (masl)
MW 1	104.99	0.85	105.84	4797733	593906	2.35	103.49	2.34	103.50
MW 2	104.13	0.78	104.91	4797658	594070	2.44	102.47	2.62	102.29
MW 3	103.85	0.95	104.80	4797485	593946	2.20	102.60	2.26	102.54
MW 4	106.01	0.70	106.71	4797367	593688	1.88	104.83	1.83	104.88
MW 5	104.66	1.01	105.67	4797133	593650	3.01	102.66	N/A	---
MW 6 S	112.67	0.76	113.43	4797241	593464	3.64	109.79	3.86	109.57
MW 6 D	112.67	0.36	113.03	4797246	593462	2.56	110.47	3.05	109.98
MW 7	112.60	1.03	113.63	4797419	593593	2.93	110.70	3.24	110.39
MW 8 S	111.61	0.99	112.60	4797588	593684	4.05	108.55	4.22	108.38
MW 8 D	111.45	0.98	112.43	4797586	593686	3.92	108.51	4.26	108.17

Note: MW=Monitoring well; TOC= Top of Casing; m ASL=metres above sea level; N/A = Not Available

Table 3. Surface Water Level and Elevation Measurements

Drive Point I.D	TOC Elevation (masl)	Northing	Easting	Sept 20/13		Nov 1/13		Dec 4/13	
				Depth TOC (m)	Elevation (masl)	Depth TOC (m)	Elevation (masl)	Depth TOC (m)	Elevation (masl)
Indian Creek Inflow- East	107.56	4797706	593779	0.54*	107.02	0.47	107.09	0.51	107.05
Indian Creek Inflow- West	106.95	4797644	593751	0.31	106.64	0.22	106.73	0.16	106.79
Indian Creek Outflow	103.37	4797525	593975	0.28	103.09	0.21	103.16	0.26	103.11
Falcon Creek Inflow	107.66	4797096	593392	0.42	107.24	0.36	107.3	0.37	107.29
Falcon Creek Outflow	103.37	4797022	593633	0.73*	Dry	0.36	103.01	0.42	102.95
Grindstone Creek Inflow	111.37	4796771	592986	0.24	111.13	0.23	111.14	0.23	111.14
Grindstone Creek Outflow	109.20	4796651	593164	0.52*	Dry	0.43	108.77	0.49	108.71
Grindstone Creek Pond	110.63	4796709	593144	0.41*	Dry	0.27	110.36	0.35	110.28

Drive Point I.D	TOC Elevation (masl)	Northing	Easting	Jan 12/14		Apr 9/14		July 17/14	
				Depth TOC (m)	Elevation (masl)	Depth TOC (m)	Elevation (masl)	Depth TOC (m)	Elevation (masl)
Indian Creek Inflow- East	107.56	4797706	593779	0.49	107.07	0.51	107.05	Dry	Dry
Indian Creek Inflow- West	106.95	4797644	593751	-0.04	106.99	0.16	106.79	0.14	106.81
Indian Creek Outflow	103.37	4797525	593975	0.04	103.33	0.04	103.33	0.06	103.31
Falcon Creek Inflow	107.66	4797096	593392	0.06	107.60	0.31	107.35	0.42	107.24
Falcon Creek Outflow	103.37	4797022	593633	-0.10	103.47	0.35	103.02	0.48	102.89
Grindstone Creek Inflow	111.37	4796771	592986	0.19	111.18	0.28	111.09	0.25	111.12
Grindstone Creek Outflow	109.20	4796651	593164	0.30	108.90	0.43	108.77	Dry	Dry
Grindstone Creek Pond	110.63	4796709	593144	0.25	110.38	0.28	110.35	Dry	Dry

Drive Point I.D	Ground Elevation (masl)	Stick Up (m)	TOC Elevation (masl)	Northing	Easting	Jul 14/22		Sept 1/22		Nov 29/22	
						Depth TOC (m)	Elevation (masl)	Depth TOC (m)	Elevation (masl)	Depth TOC (m)	Elevation (masl)
Indian Creek Inflow- East	107.09	0.68	107.77	4797706	593779	Dry	Dry	Dry	Dry	Dry	Dry
Indian Creek Inflow- West	106.68	0.64	107.33	4797644	593751	Dry	Dry	Dry	Dry	Dry	Dry
Indian Creek Outflow	103.17	0.51	103.68	4797525	593975	Dry	Dry	Dry	Dry	0.32	103.36
Falcon Creek Inflow	107.11	0.62	107.72	4797096	593392	0.47	107.26	0.48	107.25	0.45	107.27
Falcon Creek Outflow	102.76	0.61	103.37	4797022	593633	Dry	Dry	Dry	Dry	0.49	102.88
Grindstone Creek Inflow	111.06	0.30	111.36	4796771	592986	0.15	111.21	0.16	111.20	0.14	111.22
Grindstone Creek Outflow	108.64	0.68	109.32	4796651	593164	Dry	Dry	Dry	Dry	Dry	Dry
Grindstone Creek Pond	110.25	1.02	111.27	4796709	593144	0.81	110.45	0.83	110.44	0.74	110.53

Table 3. Surface Water Level and Elevation Measurements

Drive Point I.D	Ground Elevation (masl)	Stick Up (m)	TOC Elevation (masl)	Northing	Easting	Jan 5/2023	
						Depth TOC (m)	Elevation (masl)
Indian Creek Inflow- East	107.09	0.68	107.77	4797706	593779	0.62	107.14
Indian Creek Inflow- West	106.68	0.64	107.33	4797644	593751	0.48	106.85
Indian Creek Outflow	103.17	0.51	103.68	4797525	593975	0.16	103.52
Falcon Creek Inflow	107.11	0.62	107.72	4797096	593392	0.38	107.34
Falcon Creek Outflow	102.76	0.61	103.37	4797022	593633	0.33	103.04
Grindstone Creek Inflow	111.06	0.30	111.36	4796771	592986	0.13	111.23
Grindstone Creek Outflow	108.64	0.68	109.32	4796651	593164	0.44	108.88
Grindstone Creek Pond	110.40	0.87	111.27	4796709	593144	0.58	110.69

Drive Point I.D	Ground Elevation (masl)	Stick Up (m)	TOC Elevation (masl)	Northing	Easting	Apr 10/2023		June 1/23		June 12/23	
						Depth TOC (m)	Elevation (masl)	Depth TOC (m)	Elevation (masl)	Depth TOC (m)	Elevation (masl)
Indian Creek Inflow- East	107.09	0.68	107.77	4797706	593779	0.62	107.15	0.67	107.10	0.60	107.17
Indian Creek Inflow- West	106.68	0.64	107.33	4797644	593751	0.47	106.86	Dry	Dry	Dry	Dry
Indian Creek Outflow	102.50	0.51	103.01	4797525	593975	0.16	102.84	0.47	102.54	0.35	102.66
Falcon Creek Inflow	107.11	0.62	107.72	4797096	593392	0.37	107.36	0.41	107.31	0.34	107.39
Falcon Creek Outflow	102.76	0.61	103.37	4797022	593633	0.35	103.02	0.43	102.94	0.25	103.12
Grindstone Creek Inflow	111.06	0.30	111.36	4796771	592986	0.13	111.23	0.15	111.21	N/A	N/A
Grindstone Creek Outflow	108.64	0.60	109.23	4796651	593164	0.57	108.66	N/A	Dry	N/A	N/A
Grindstone Creek Pond	110.47	0.80	111.27	4796709	593144	0.61	110.66	0.77	110.51	N/A	N/A
Grindstone Creek West Trib-Inflow	109.50	0.61	110.11	4796628	592891.9	N/A	N/A	0.35	109.76	0.27	109.84

Drive Point I.D	Ground Elevation (masl)	Stick Up (m)	TOC Elevation (masl)	Northing	Easting	Sept 8/23		Oct 31/23		Nov 28/23	
						Depth TOC (m)	Elevation (masl)	Depth TOC (m)	Elevation (masl)	Depth TOC (m)	Elevation (masl)
Indian Creek Inflow- East	107.09	0.68	107.77	4797706	593779	N/A	Dry	0.65	107.12	0.64	107.13
Indian Creek Inflow- West	106.68	0.64	107.33	4797644	593751	N/A	Dry	Dry	Dry	0.51	106.82
Indian Creek Outflow	102.50	0.55	103.05	4797525	593975	0.47	102.58	0.45	102.61	0.37	102.68
Falcon Creek Inflow	107.11	0.62	107.72	4797096	593392	0.41	107.31	0.43	107.29	0.39	107.34
Falcon Creek Outflow	102.76	0.61	103.37	4797022	593633	0.49	102.88	0.49	102.88	0.47	102.90
Grindstone Creek Inflow	111.06	0.30	111.36	4796771	592986	0.15	111.21	0.16	111.20	0.16	111.20
Grindstone Creek Outflow	108.64	0.60	109.23	4796651	593164	Dry	Dry	Dry	Dry	0.59	108.65
Grindstone Creek Pond	110.47	0.80	111.27	4796709	593144	0.74	110.53	N/A	Dry at DP	0.70	110.57
Grindstone Creek West Trib-Inflow	109.50	0.61	110.11	4796628	592891.9	0.32	109.79	0.29	109.82	0.29	109.82

Table 3. Surface Water Level and Elevation Measurements

Drive Point I.D	Ground Elevation (masl)	Stick Up (m)	TOC Elevation (masl)	Northing	Easting	April 5/24		July 17/24	
						Depth TOC (m)	Elevation (masl)	Depth TOC (m)	Elevation (masl)
Indian Creek Inflow- East	107.09	0.68	107.77	4797706	593779	0.60	107.16	0.59	107.18
Indian Creek Inflow- West	106.68	0.64	107.33	4797644	593751	0.54	106.78	0.42	106.91
Indian Creek Outflow	102.50	0.55	103.05	4797525	593975	0.42	102.64	0.33	102.72
Falcon Creek Inflow	107.11	0.62	107.72	4797096	593392	0.37	107.36	N/A	N/A
Falcon Creek Outflow	102.76	0.61	103.37	4797022	593633	0.44	102.93	N/A	N/A
Grindstone Creek Inflow	111.06	0.30	111.36	4796771	592986	0.15	111.21	0.09	111.27
Grindstone Creek Outflow	108.64	0.60	109.23	4796651	593164	0.52	108.71	0.51	108.72
Grindstone Creek Pond	110.47	0.80	111.27	4796709	593144	0.59	110.68	0.56	110.71
Grindstone Creek West Trib-Inflow	109.50	0.61	110.11	4796628	592891.9	0.26	109.85	0.26	109.85

Drive Point I.D	Ground Elevation (masl)	Stick Up (m)	TOC Elevation (masl)	Northing	Easting	Sept 19/24		Nov 1/24	
						Depth TOC (m)	Elevation (masl)	Depth TOC (m)	Elevation (masl)
Indian Creek Inflow- East	107.09	0.68	107.77	4797706	593779	Dry	Dry	0.65	107.12
Indian Creek Inflow- West	106.68	0.64	107.33	4797644	593751	Dry	Dry	0.57	106.76
Indian Creek Outflow	102.50	0.55	103.05	4797525	593975	Dry	Dry	0.45	102.60
Falcon Creek Inflow	107.11	0.70	107.81	4797096	593392	0.50	107.31	0.46	107.35
Falcon Creek Outflow	102.76	0.67	103.43	4797022	593633	Dry	Dry	0.50	102.93
Grindstone Creek Inflow	111.06	0.30	111.36	4796771	592986	0.15	111.21	0.12	111.24
Grindstone Creek Outflow	108.64	0.60	109.23	4796651	593164	Dry	Dry	Dry	Dry
Grindstone Creek Pond	110.47	0.80	111.27	4796709	593144	Dry	Dry	0.68	110.59
Grindstone Creek West Trib-Inflow	109.50	0.61	110.11	4796628	592892	Dry	Dry	0.30	109.81

Notes: *= Dry, No flowing water present at SG

TOC= Top of Casing; masl=metres above sea level, N/A= Not available;

On April 10, 2023, GC-O shifted to capture low flow and IC-O shifted downstream with a new ground elevation of approximately 102.5 masl

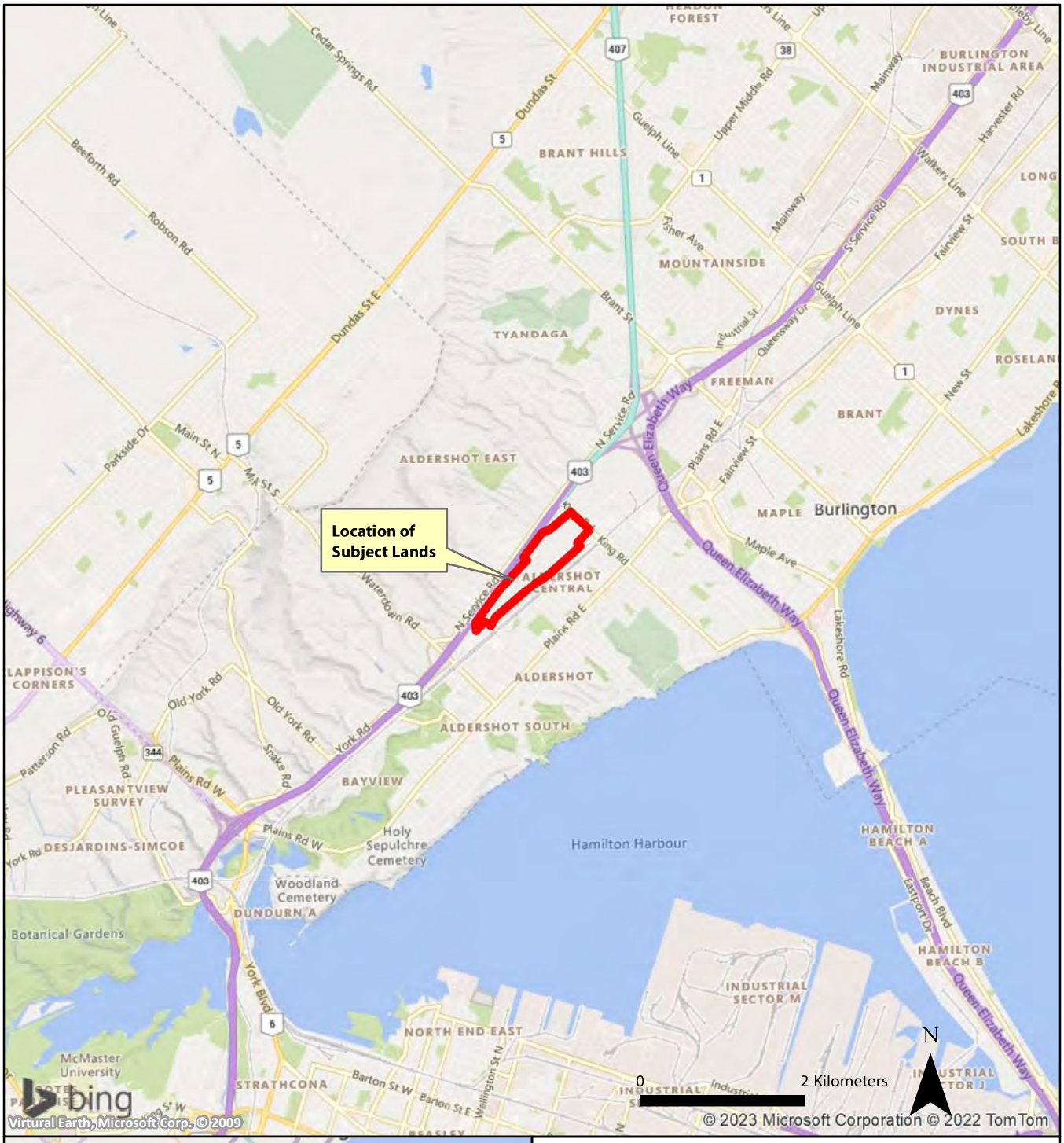
On January 5, 2023, Grindstone Creek Pond ground elevation increased to 110.40 masl

On April 10, 2023, Grindstone Creek Pond ground elevation increased to 110.47 masl

On September 19, 2024, logger equipment at Falcon Creek Inflow and Outflow locations were re-positioned as the previous equipment was washed out during large precipitation event

Starting September 19, 2024 new TOC elevation at Falcon Creek Inflow is approximately 107.81 masl

Starting September 19, 2024 new TOC elevation at Falcon Creek Outflow is approximately 103.42 masl





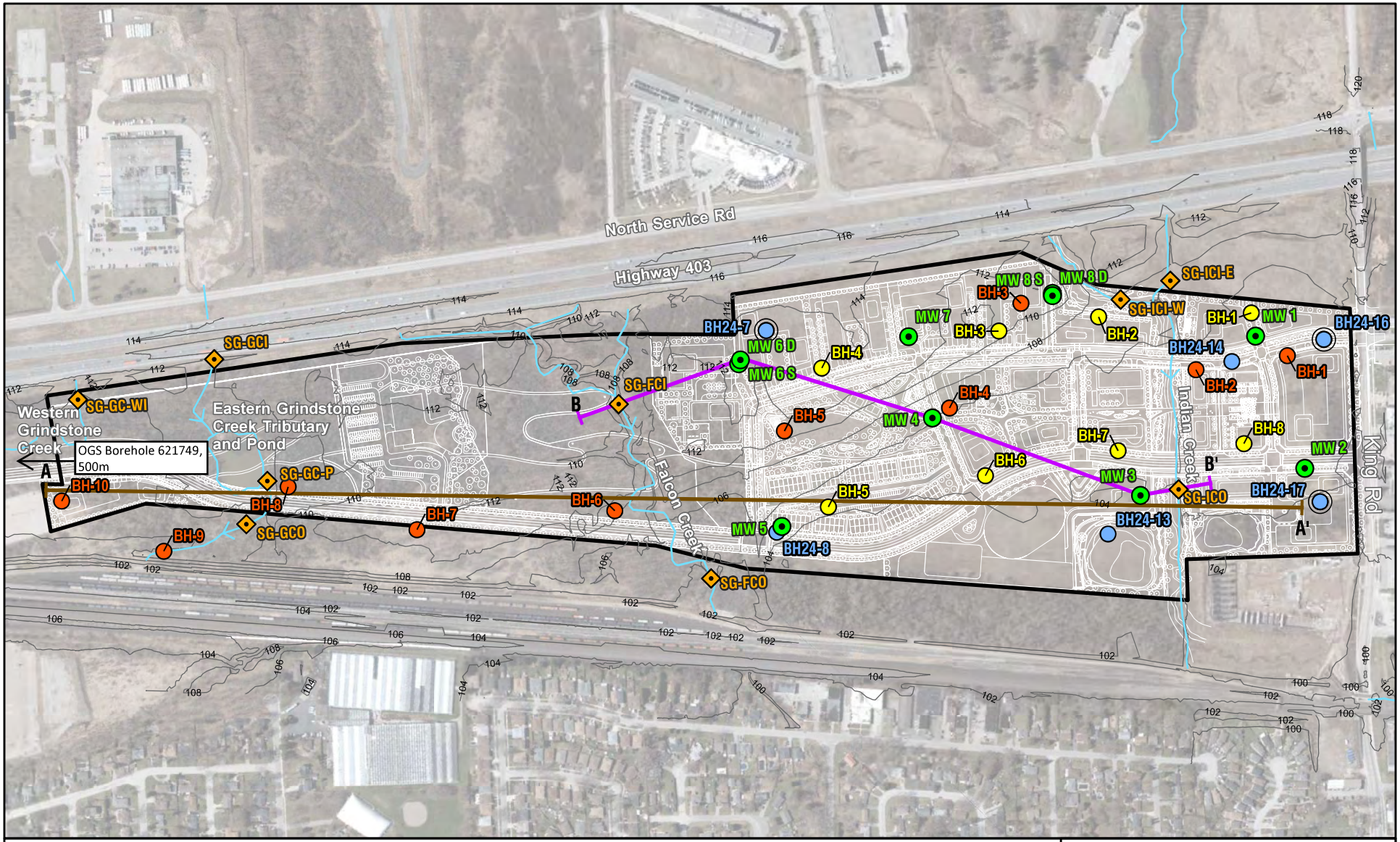
Location of Subject Lands

1200 King Road, Aldershot

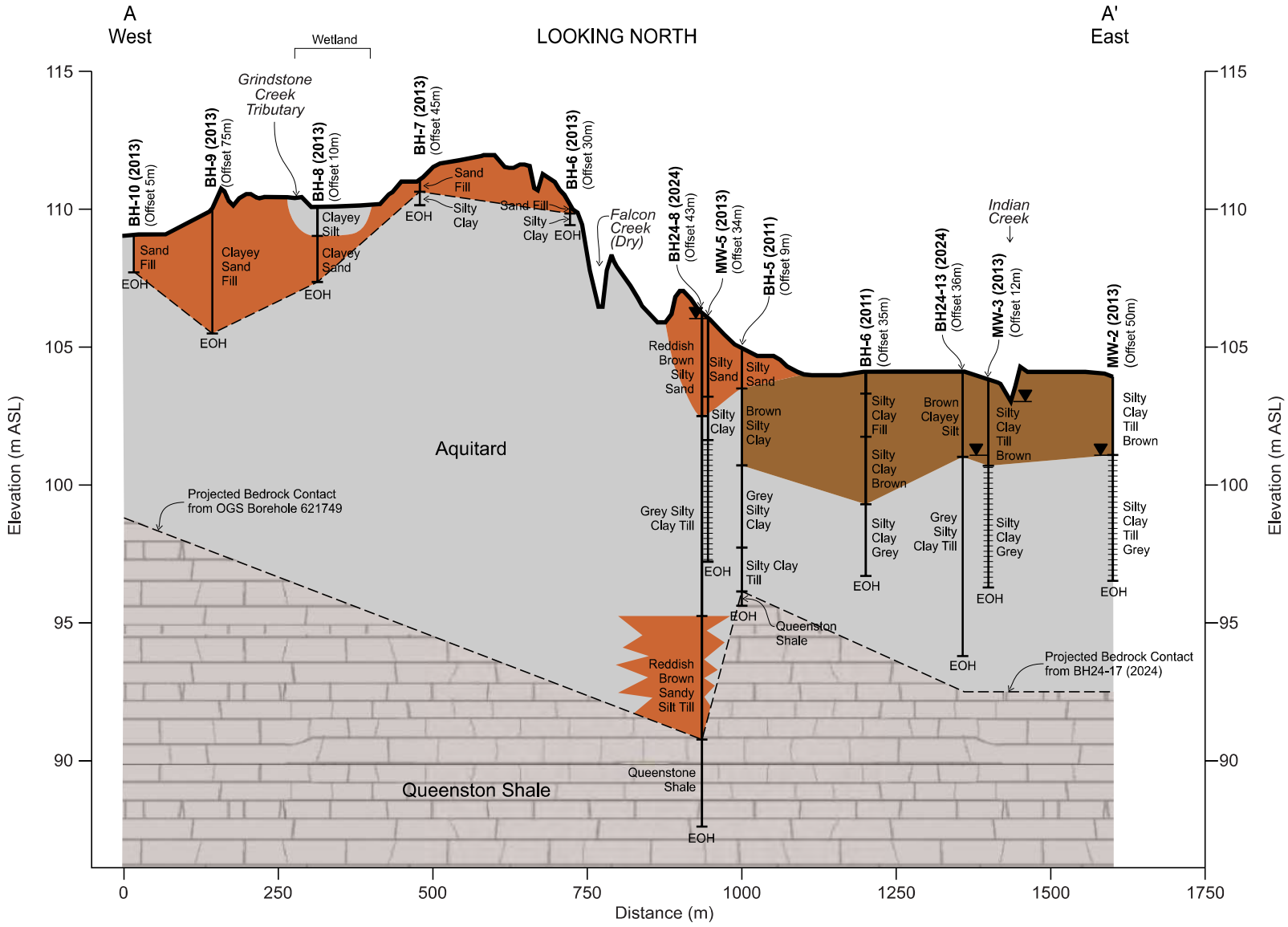
Terra-Dynamics inc.

Project No. 493	Figure 1

Path: H:\TERRA_DYNAMICS\8755 - Terra-Dynamics 261 1200 King Road Aldershot\gis\mxd\Figure 1 Location of Subject Lands.mxd Revised: March 1, 2023



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Borehole/Monitoring Well

EOH End of Hole

Water Level (mASL) Nov. 15, 2022

Monitoring Well Screen

Sand/Fill/Silty Sand/Clayey Sand

Brown Clay

Grey Clay

Bedrock

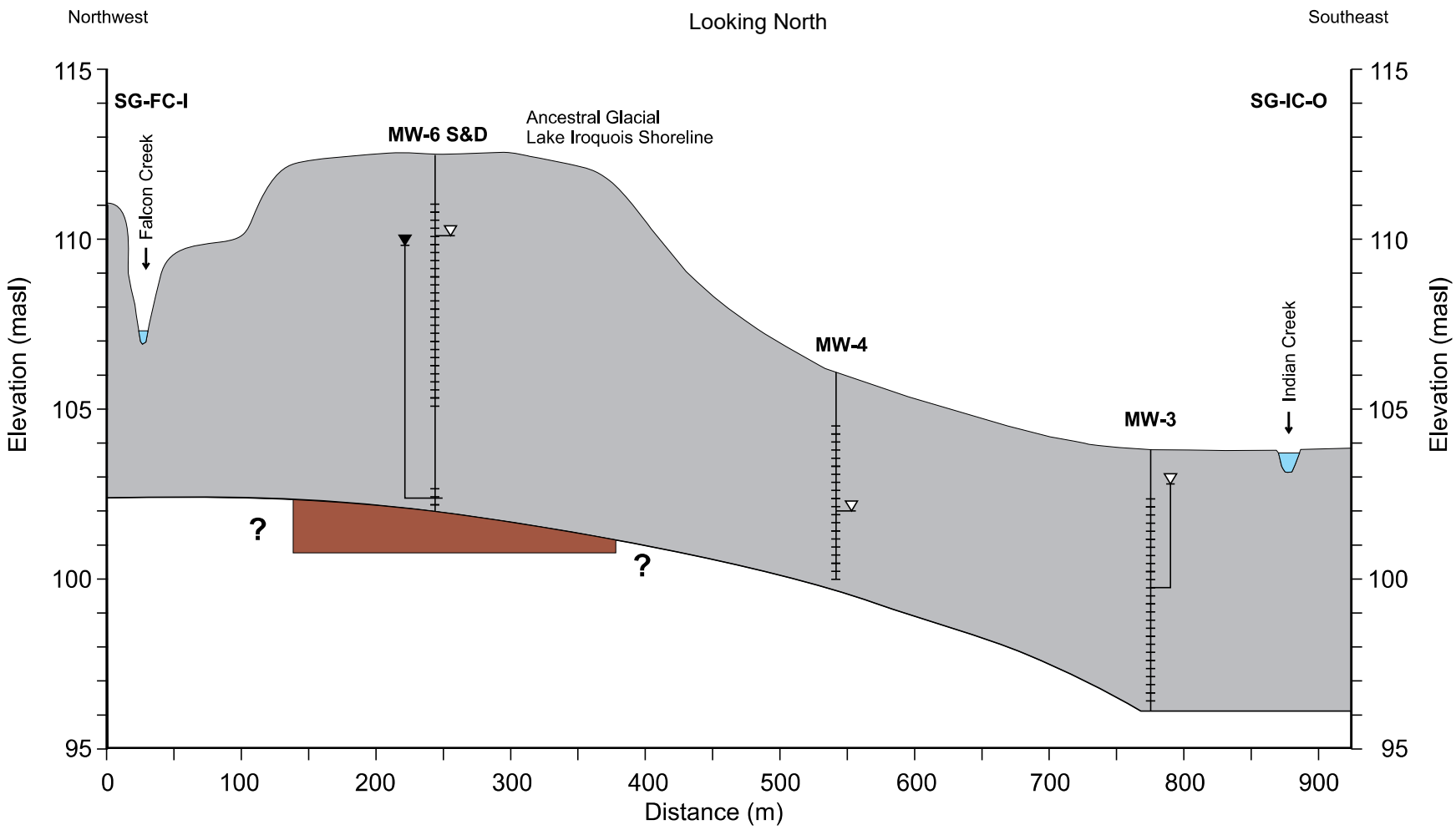
Note:
2024 borehole surface elevations are approximate and not surveyed.

Hydrogeologic Cross-section A-A'

1200 King Road, Aldershot, Wetland Water Balance

Terra-Dynamics inc.

Figure 3



▽ Water Table

▼ Potentiometric Groundwater Elevation (masl)

Well Screen

MW Monitoring Well

SG-IC-O Indian Creek Staff Gauge - Outflow

SG-FC-I Falcon Creek Staff Gauge - Inflow

Glacial Clayey Silt Till, or Clayey Silt, or Silty Clay

Bedrock, Queenston Shale Formation

Groundwater and surface water elevations from January 5, 2023

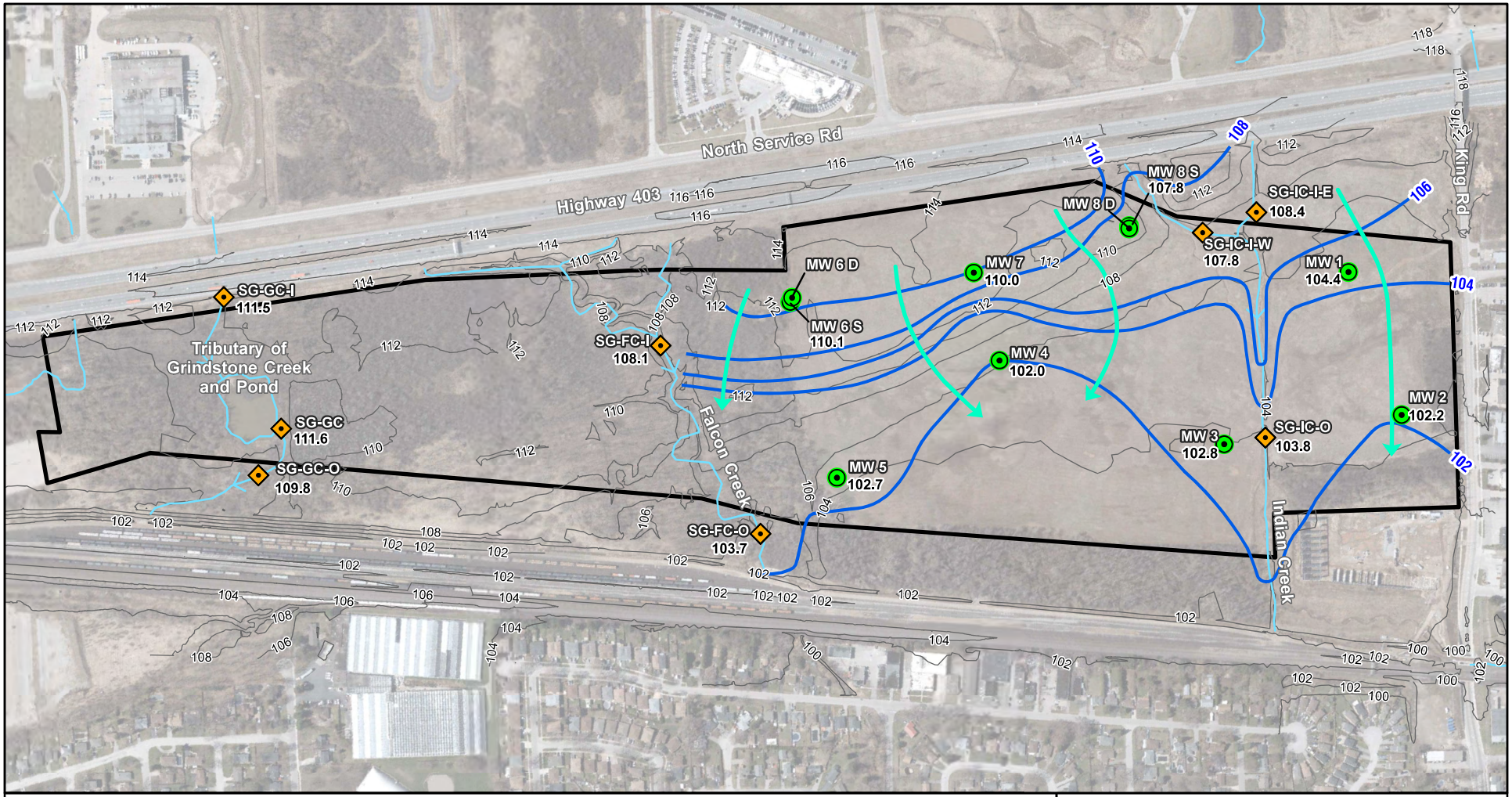
Hydrogeologic Cross-section B-B'

1200 King Road, Aldershot

Terra-Dynamics inc.

Project No. 493

Figure 4



Property Boundary

Watercourse

Water Table or Creek Elevation (m ASL) — MW5 102.7 / SG-IC-O 103.8

Monitoring Well

Staff Gauge

Water Table Elevation Contour (masl)

Shallow Groundwater Flow Direction

Ground Surface Contours

SG-IC-O Indian Creek Staff Gauge - Outflow

SG-FC-I Falcon Creek Staff Gauge - Inflow

Groundwater and staff gauge elevation data are from January 5, 2023.

Groundwater Flow Directions Map January, 2023

1200 King Road, Aldershot

Terra-Dynamics inc.

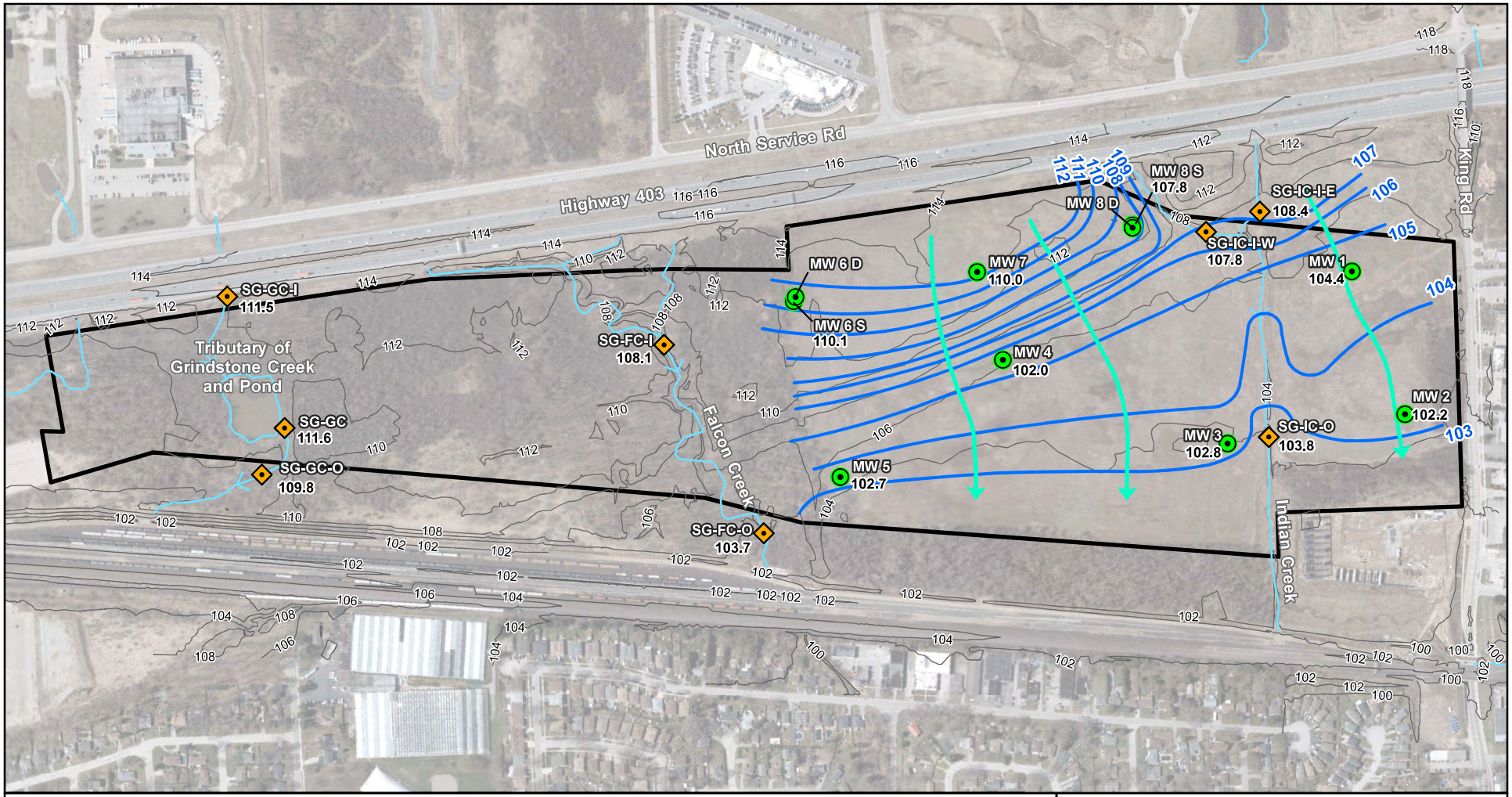
0 100 M

1:7,000

N

Figure 5(a)

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Property Boundary

Watercourse

Water Table or Creek Elevation (m ASL) — MW5 103.9 / SG-IC-O 102.8

Monitoring Well

Staff Gauge

Water Table Elevation Contours (m ASL)

Shallow Groundwater Flow Direction

Ground Surface Contours

SG-IC-O Indian Creek Staff Gauge - Outflow

SG-FC-I Falcon Creek Staff Gauge - Inflow

Groundwater and staff gauge elevation data are from April 10, 2023.

Groundwater Flow Directions Map
April, 2023

1200 King Road, Aldershot

Terra-Dynamics inc.

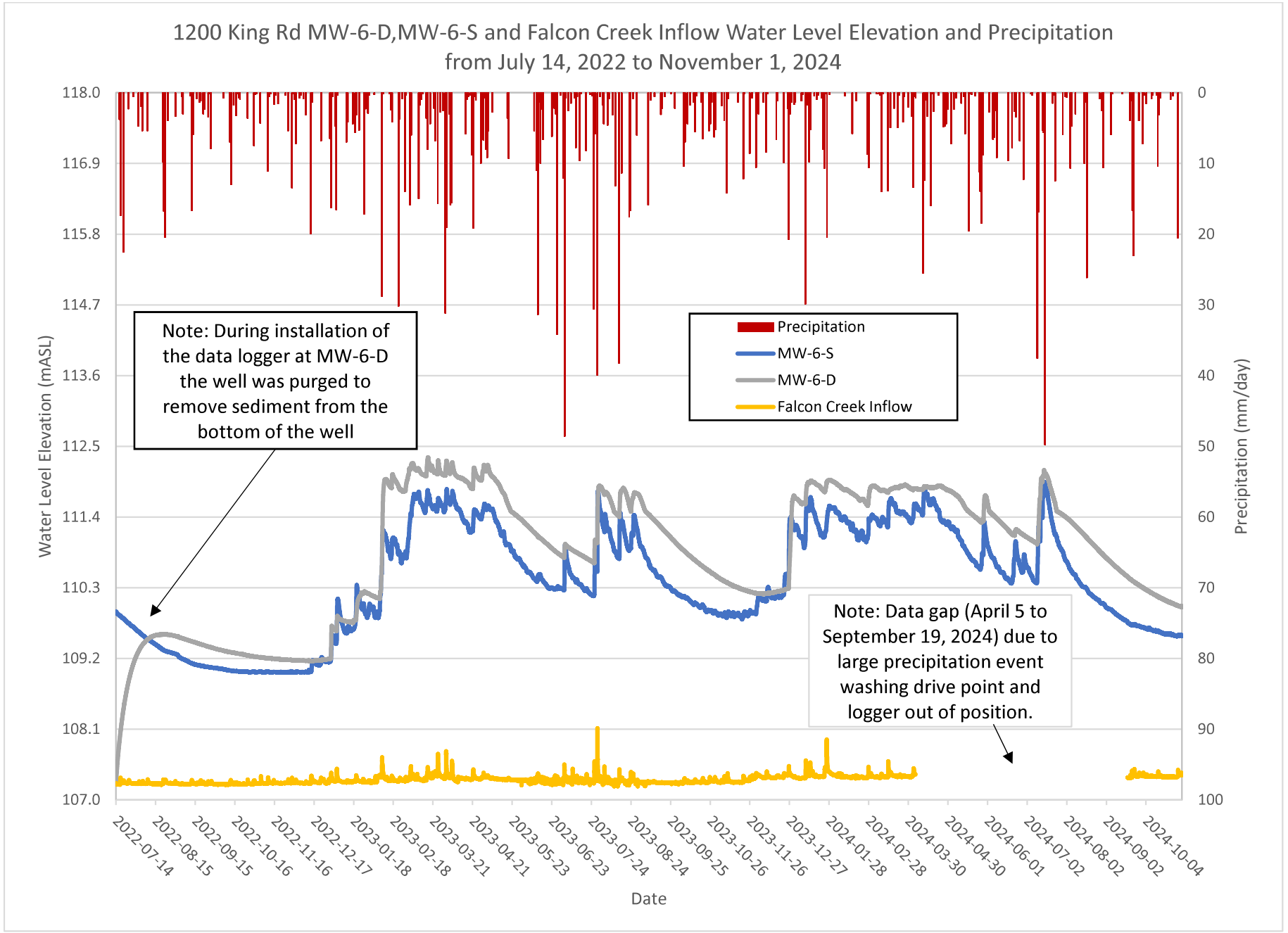
0 100 M

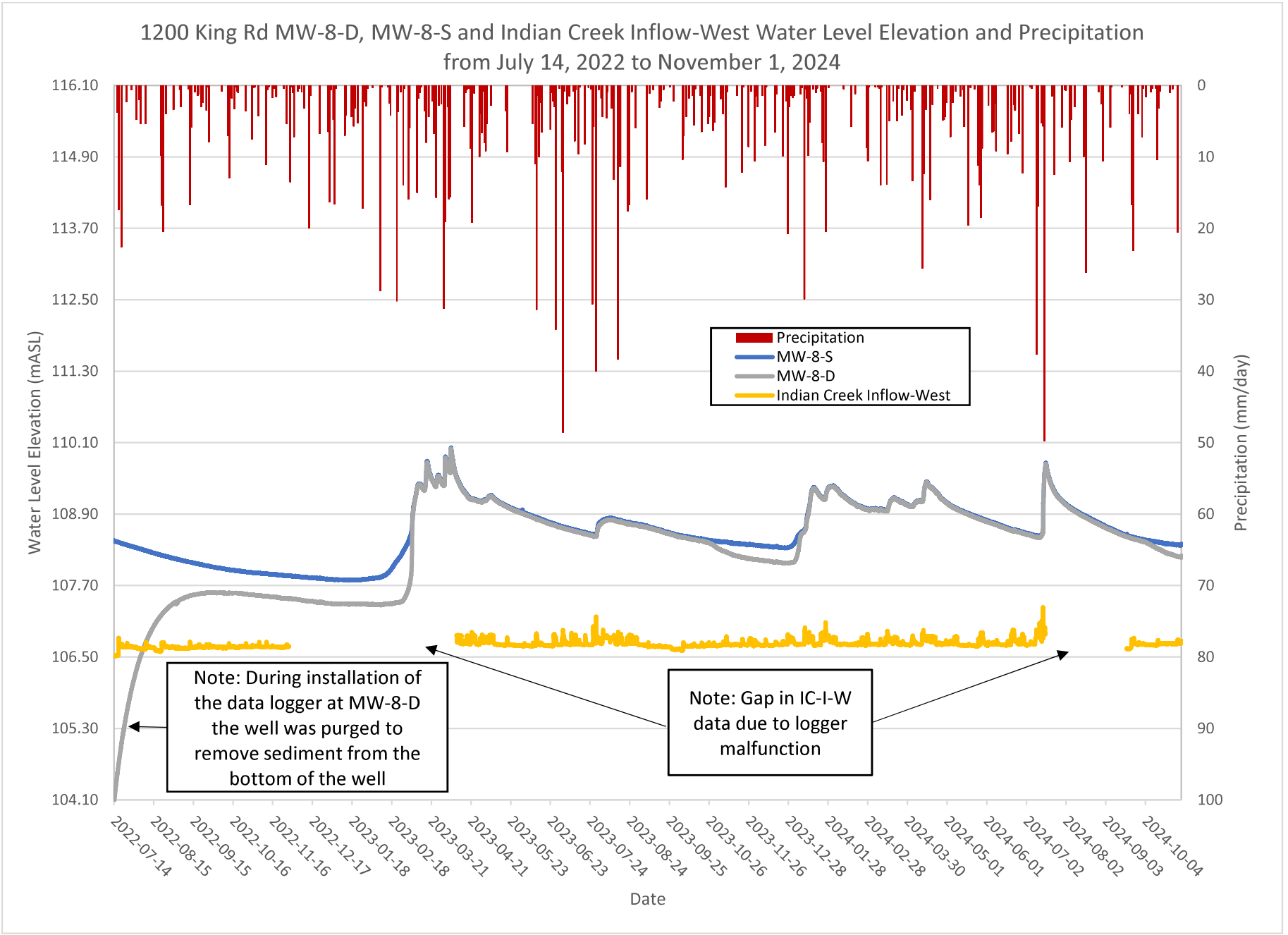
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N

Figure 5(b)

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1200 King Rd MW-6-D,MW-6-S and Falcon Creek Inflow Water Level Elevation and Precipitation
from July 14, 2022 to November 1, 2024
Water Level Elevation (mASL)
Precipitation (mm/day)
Date
Precipitation
MW-6-S
MW-6-D
Falcon Creek Inflow
Note: During installation of the data logger at MW-6-D the well was purged to remove sediment from the bottom of the well
Note: Data gap (April 5 to September 19, 2024) due to large precipitation event washing drive point and logger out of position.
118.0
116.9
115.8
114.7
113.6
112.5
111.4
110.3
109.2
108.1
107.0
0
10
20
30
40
50
60
70
80
90
100
2022-07-14
2022-08-15
2022-09-15
2022-10-16
2022-11-16
2022-12-17
2023-01-18
2023-02-18
2023-03-21
2023-04-21
2023-05-23
2023-06-23
2023-07-24
2023-08-24
2023-09-25
2023-10-26
2023-11-26
2023-12-27
2024-01-28
2024-02-28
2024-03-30
2024-04-30
2024-06-01
2024-07-02
2024-08-02
2024-09-02
2024-10-04


1200 King Rd MW-8-D, MW-8-S and Indian Creek Inflow-West Water Level Elevation and Precipitation from July 14, 2022 to November 1, 2024
Water Level Elevation (mASL)
Precipitation (mm/day)
Date
Precipitation
MW-8-S
MW-8-D
Indian Creek Inflow-West
Note: During installation of the data logger at MW-8-D the well was purged to remove sediment from the bottom of the well
Note: Gap in IC-I-W data due to logger malfunction
116.10
114.90
113.70
112.50
111.30
110.10
108.90
107.70
106.50
105.30
104.10
0
10
20
30
40
50
60
70
80
90
100
2022-07-14
2022-08-15
2022-09-15
2022-10-16
2022-11-16
2022-12-17
2023-01-18
2023-02-18
2023-03-21
2023-04-21
2023-05-23
2023-06-23
2023-07-24
2023-08-24
2023-09-25
2023-10-26
2023-11-26
2023-12-28
2024-01-28
2024-02-28
2024-03-30
2024-05-01
2024-06-01
2024-07-02
2024-08-02
2024-09-03
2024-10-04



Monitoring Well ID
Highest Groundwater Elevation (m ASL)
Shallowest Groundwater Depth Below Ground Surface (m)

MW-6 S
111.93 / 0.74

- Property Boundary
- Monitoring Well
- Watercourse
- Ground Surface Contour
- Deeper, Potentiometric Monitoring Well

Site Plan: 23117_1299King_SITEPLAN_26_02_06.dwg

Maximum Groundwater Levels Recorded Via Data Loggers

1200 King Road, Aldershot

Terra-Dynamics inc.

0 100 M
1:5,000

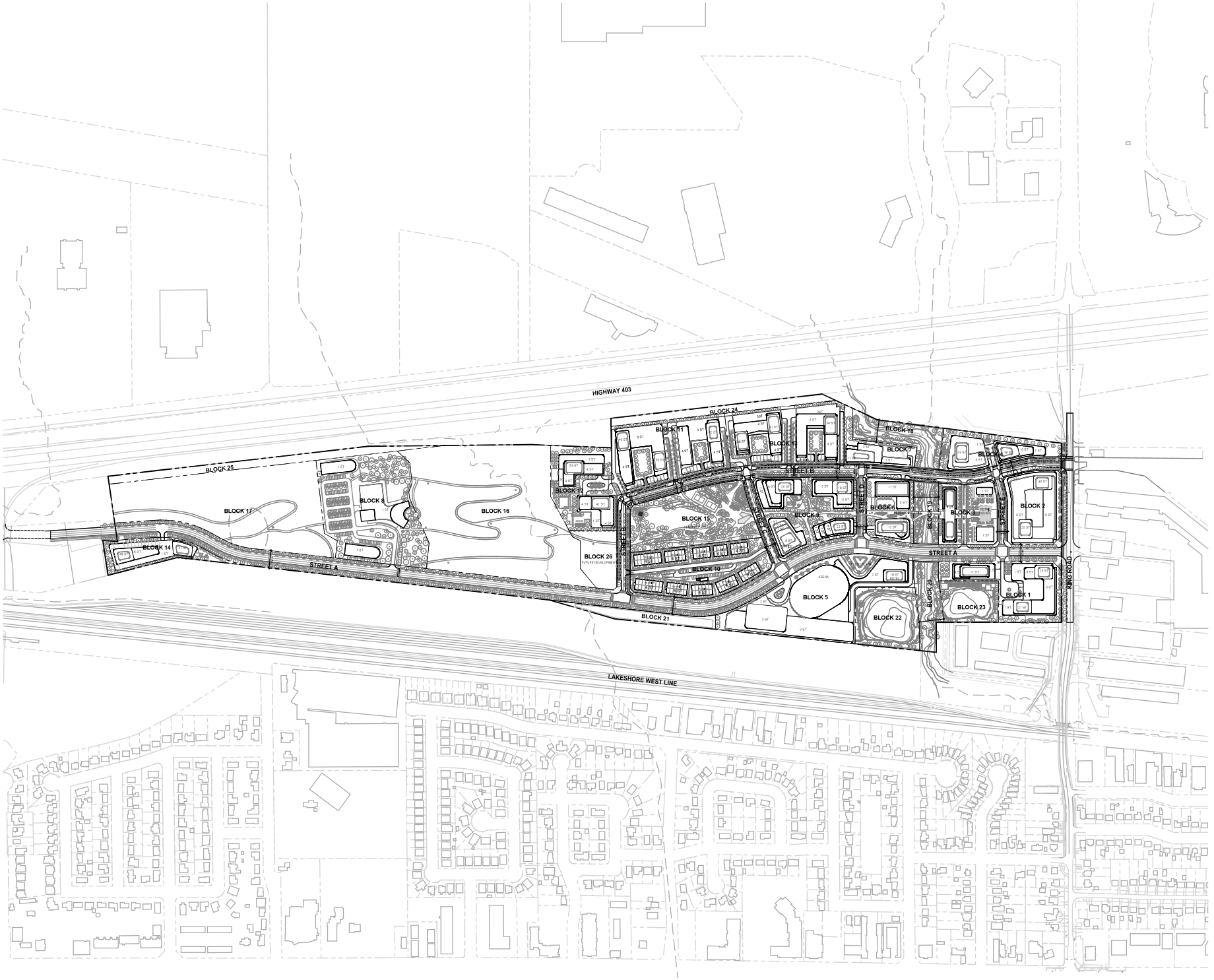
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Figure 8

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Appendix 1

1200 King Road Master Plan
(Giannone Petricone Associates Inc., 2026)



1 SITE AND LANDSCAPE PLAN
A0.01 1 : 2000

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Revision Date

NOT FOR CONSTRUCTION

WITHOUT PREJUDICE

ISSUED FOR COORDINATION 26-02-06

Revision	Date
5 ISSUED FOR COORDINATION	2026-02-06
4 ISSUED FOR REZONING SUBMISSION	2025-12-22
3 ISSUED FOR ERS	2025-12-12
2 ISSUED FOR DRAFT ZBA	2025-03-28
1 ISSUED FOR PRE-SUBMISSION	2024-12-20

gannone petricone associates
Gannone Petricone Associates Inc. Architects
99 Sandford Fleming Ave., Suite 500, Toronto, ON, Canada M5V 2J6
T 416.340.1788 F 416.340.2783 E info@gpaa.com

1200 KING ROAD

1200 King Road, Burlington, ON

SHEET TITLE

SITE AND LANDSCAPE PLAN

DRAWN BY	Author
CHECKED BY	Checker
PROJECT START DATE	2025-04-04
PROJECT NO.	20117
SHEET NUMBER	A0.07

PLOT DATE: 2026-02-06 12:37:06 PM

Appendix 2

Borehole Logs (Terra-Dynamics, 2013)

Terra-Dynamics Consulting Inc
404 Queenston St.
St. Catharines, ON L2P 2Y2
905-646-7931

Log of Borehole: MW-1

Project No.: 261

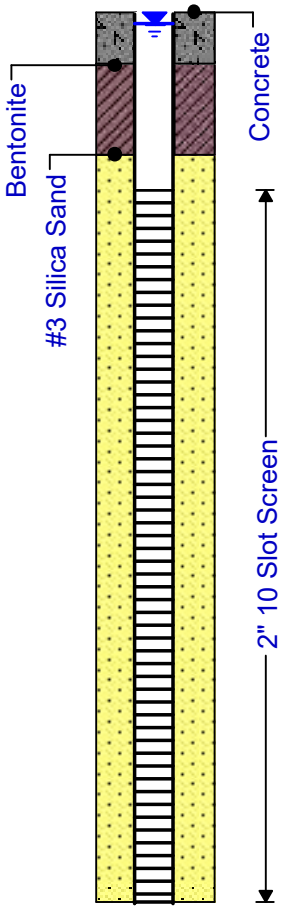
Project: 1200 King Road Hydrogeological Assessment

Client: Penta Properties Inc.

Location: Aldershot, ON ***Geologist:*** K. Slaine/D. Slaine

Depth (m)	Description	Elev. (masl)	Number	Type	Recovery	Blows/Ft
	Ground Surface	104.99				
0.0	TOPSOIL - silty clay based	0.00	1		50	13
1.0	SILTY CLAY - reddish brown turning wet at approximately 1.52 m, turning grey at approximately 3.05 m. There are a few small lenses of medium sand between 3.05 and 6.10 m. Very stiff to hard.					
2.0			2		100	36
3.0		101.94				
		3.05	3		100	29
4.0						
5.0			4		83	44
6.0		98.89				
	SANDY SILT - brown, wet, hard	6.10	5		75	55
7.0		97.67				
	SHALE - Queenstion Formation, red, weathered .	7.32				
8.0						
9.0						
10.0						

Well Completion Details



UTM Coordinates: 593906E, 4797733N ***Hole Size:*** 20.3 cm

Drill Method: Hollow Stem Augers ***Datum:*** 104.99 masl

Drill Date: August 14, 2013 ***Sheet:*** 1 of 1

Terra-Dynamics Consulting Inc
404 Queenston St.
St. Catharines, ON L2P 2Y2
905-646-7931

Log of Borehole: MW-2

Project No.: 261

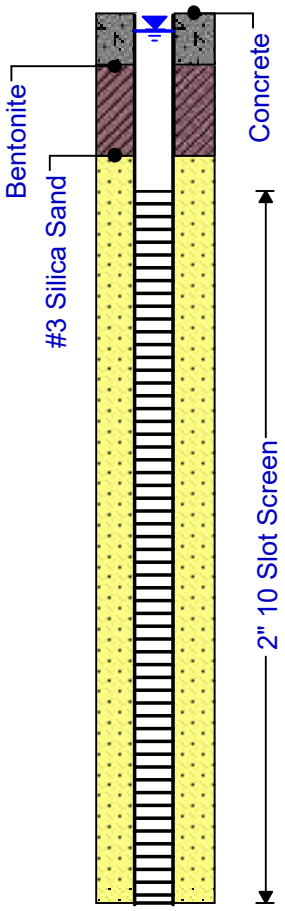
Project: 1200 King Road Hydrogeological Assessment

Client: Penta Properties Inc.

Location: Aldershot, ON ***Geologist:*** K. Slaine/D. Slaine

Depth (m)	Description	Elev. (masl)	Number	Type	Recovery	Blows/Ft
	Ground Surface	104.13				
0.0	TOPSOIL - silty clay based	0.00	1		29	7
1.0	SILTY CLAY TILL - Halton Till, reddish brown with trace of gravel, turning grey at approximately 2.13 m. Trace of gravel persists to bottom of borehole. Very stiff to hard.					
2.0		102.00	2		96	46
		2.13				
3.0			3		100	21
4.0						
5.0			4		63	20
6.0						
			5		100	40
7.0		96.51				
		7.62				
8.0						
9.0						
10.0						

Well Completion Details



UTM Coordinates: 594070E, 4797658N

Hole Size: 20.3 cm

Drill Method: Hollow Stem Augers

Datum: 104.13 masl

Drill Date: August 14, 2013

Sheet: 1 of 1

Terra-Dynamics Consulting Inc
404 Queenston St.
St. Catharines, ON L2P 2Y2
905-646-7931

Log of Borehole: MW-3

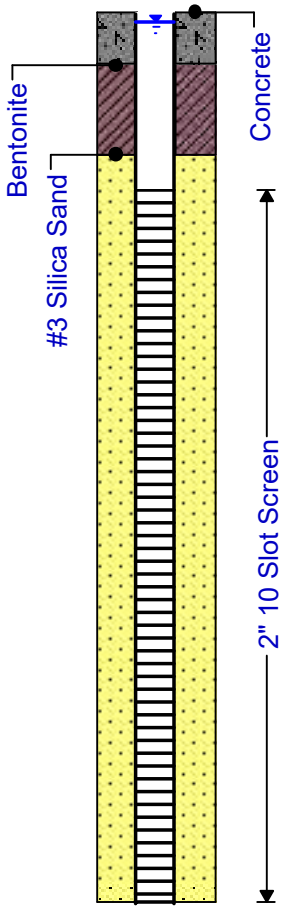
Project No.: 261

Project: 1200 King Road Hydrogeological Assessment

Client: Penta Properties Inc.

Location: Aldershot, ON ***Geologist:*** K. Slaine/D. Slaine

Depth (m)	Description	Elev. (masl)	Number	Type	Recovery	Blows/Ft
	Ground Surface	103.85				
0.0	TOPSOIL - silty clay based	0.00	1		54	7
1.0	SILTY CLAY TILL - Halton Till, reddish brown with trace of gravel, turning grey at approximately 3.05 m , medium to very stiff.					
2.0			2		100	34
3.0		100.80				
	SILTY CLAY - grey, wet, medium to very stiff.	3.05	3		100	12
4.0						
5.0			4		29	10
6.0						
			5		100	21
7.0		96.23				
		7.62				
8.0						
9.0						
10.0						



UTM Coordinates: 593946E, 4797485N ***Hole Size:*** 20.3 cm

Drill Method: Hollow Stem Augers ***Datum:*** 103.85 masl

Drill Date: August 14, 2013 ***Sheet:*** 1 of 1

Terra-Dynamics Consulting Inc
404 Queenston St.
St. Catharines, ON L2P 2Y2
905-646-7931

Log of Borehole: MW-4

Project No.: 261

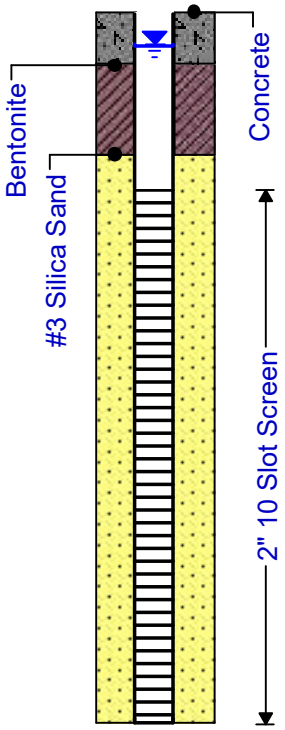
Project: 1200 King Road Hydrogeological Assessment

Client: Penta Properties Inc.

Location: Aldershot, ON ***Geologist:*** K. Slaine/D. Slaine

Depth (m)	Symbol	Description	Elev. (masl)	Number	Type	Recovery	Blows/Ft
		Ground Surface	106.01				
0.0		TOPSOIL - silty clay based , some gravel	0.00	1		42	7
1.0		SILTY CLAY TILL - Halton Till, reddish brown and grey with trace of gravel and silt, medium to very stiff.		2		83	37
2.0							
3.0			102.96				
		SILTY CLAY - grey, wet, stiff to very soft.	3.05	3		100	12
4.0							
5.0				4		100	1
6.0			99.91				
			6.10				
7.0							
8.0							
9.0							
10.0							

Well Completion Details



UTM Coordinates: 593688E, 4797367N

Hole Size: 20.3 cm

Drill Method: Hollow Stem Augers

Datum: 106.01

Drill Date: August 14, 2013

Sheet: 1 of 1

Terra-Dynamics Consulting Inc
404 Queenston St.
St. Catharines, ON L2P 2Y2
905-646-7931

Log of Borehole: MW-5

Project No.: 261

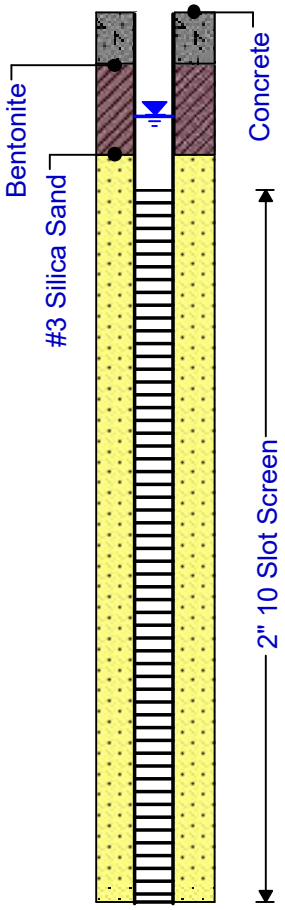
Project: 1200 King Road Hydrogeological Assessment

Client: Penta Properties Inc.

Location: Aldershot, ON ***Geologist:*** K. Slaine/D. Slaine

Depth (m)	Symbol	Description	Elev. (masl)	Number	Type	Recovery	Blows/Ft
		SUBSURFACE PROFILE		**SAMPLE**			
0.0		Ground Surface	104.66				
		TOPSOIL - sandy	0.00	1		67	3
1.0		SILTY SAND - brown with traces of gravel, very loose .	103.14				
		SILTY CLAY - brown with a 28 cm thick segment of sandy gravel at 1.28 m, wet, very stiff.	1.52	2		88	18
2.0			101.61				
3.0		SILTY CLAY TILL - grey, with traces of gravel, grey, very stiff.	3.05	3		100	21
4.0			100.09				
		SILTY CLAY - brownish grey, stiff.	4.57	4		100	9
5.0			98.56				
6.0		SILTY CLAY TILL - grey, with traces of red shale, very stiff.	6.10	5		100	18
7.0			97.04				
			7.62				
8.0							
9.0							
10.0							

Well Completion Details



UTM Coordinates: 593650E, 4797133N ***Hole Size:*** 20.3 cm

Drill Method: Hollow Stem Augers ***Datum:*** 104.66 masl

Drill Date: August 15, 2013 ***Sheet:*** 1 of 1

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Log of Borehole: MW-6-S

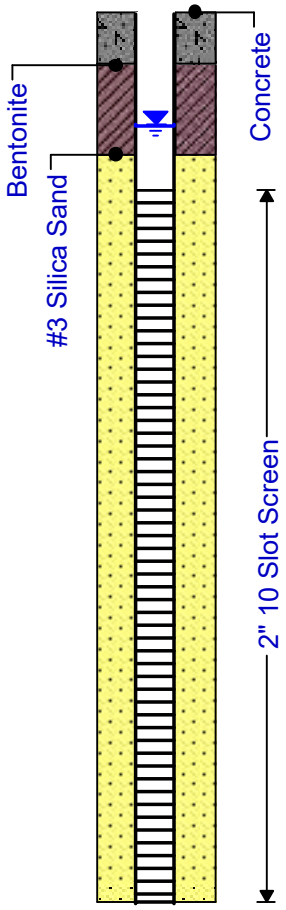
Project No.: 261

Project: 1200 King Road Hydrogeological Assessment

Client: Penta Properties Inc.

Location: Aldershot, ON ***Geologist:*** K. Slaine/D. Slaine

Depth (m)	Description	Elev. (masl)	Number	Type	Recovery	Blows/Ft
	Ground Surface	112.67				
0.0	TOPSOIL - clay based.	0.00	1		63	15
1.0	SILTY CLAY TILL - brown with traces of gravel, medium to stiff.		2		100	9
2.0						
3.0			3		92	7
4.0		108.10				
5.0	SILTY CLAY TILL - grey with traces of gravel, hard.	4.57	4		92	35
6.0		106.57				
	SILTY CLAY - grey, stiff to very stiff. MW-6-S was drilled straight to a depth of 7.62 m using the geologic log from MW-6-D and then inst rumented witht the monitoring well.	6.10	5		100	20
7.0		105.05				
		7.62				
8.0						
9.0						
10.0						



UTM Coordinates: 593464E, 4797241N

Hole Size: 20.3 cm

Drill Method: Hollow Stem Augers

Datum: 112.67 masl

Drill Date: August 16, 2013

Sheet: 1 of 1

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Log of Borehole: MW-6-D

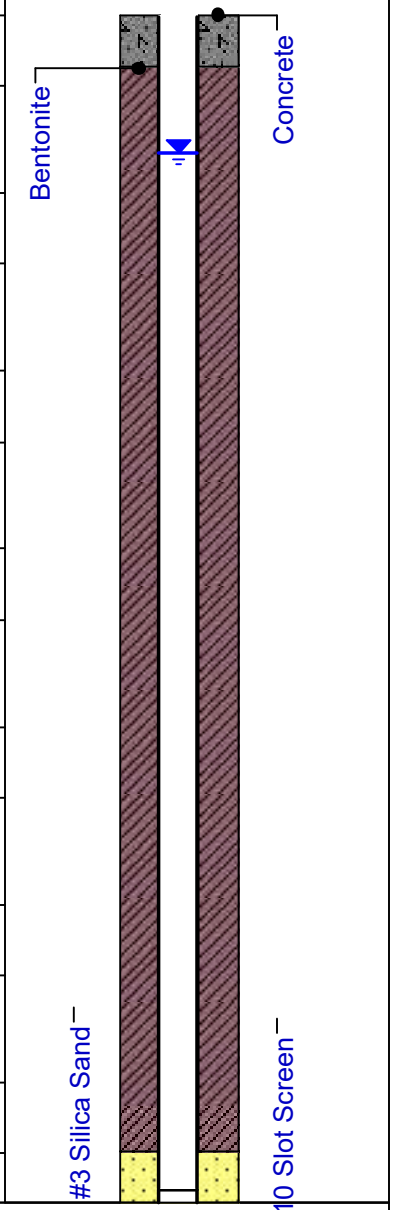
Project No.: 261

Project: 1200 King Road Hydrogeological Assessment

Client: Penta Properties Inc.

Location: Aldershot, ON ***Geologist:*** K. Slaine/D. Slaine

Depth (m)	Symbol	Description	Elev. (masl)	Number	Type	Recovery	Blows/Ft
		Ground Surface	112.67				
0.0		TOPSOIL - clay based.	0.00	1		63	15
1.0		SILTY CLAY TILL - brown with traces of gravel, medium to stiff.					
2.0				2		100	9
3.0				3		92	7
4.0			108.10				
5.0		SILTY CLAY TILL - grey with traces of gravel, hard.	4.57	4		92	35
6.0			106.57				
		SILTY CLAY - grey with red shale fragments from approximately 9.14 m, stiff to very stiff.	6.10	5		100	20
7.0							
8.0				6		100	12
9.0				7		100	17
10.0		Borehole terminated at 10.67 m on assumed Queenston Shale					



UTM Coordinates: 593462E, 4797246N ***Hole Size:*** 20.3 cm

Drill Method: Hollow Stem Augers ***Datum:*** 112.67 masl

Drill Date: August 16, 2013 ***Sheet:*** 1 of 2

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Log of Borehole: MW-6-D

Project No.: 261

Project: 1200 King Road Hydrogeological Assessment

Client: Penta Properties Inc.

Location: Aldershot, ON ***Geologist:*** K. Slaine/D. Slaine

SUBSURFACE PROFILE				SAMPLE				
Depth (m)	Symbol	Description	Elev. (masl)	Number	Type	Recovery	Blows/Ft	Well Completion Details
			102.00					
11.0			10.67					
12.0								Groundwater Level Apr 9/14
13.0								
14.0								
15.0								
16.0								
17.0								
18.0								
19.0								
20.0								

UTM Coordinates: 593462E, 4797246N ***Hole Size:*** 20.3 cm

Drill Method: Hollow Stem Augers ***Datum:*** 112.67 masl

Drill Date: August 16, 2013 ***Sheet:*** 2 of 2

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Log of Borehole: MW-7

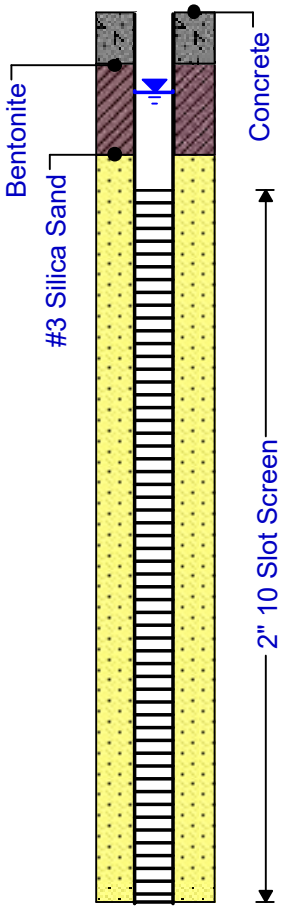
Project No.: 261

Project: 1200 King Road Hydrogeological Assessment

Client: Penta Properties Inc.

Location: Aldershot, ON ***Geologist:*** K. Slaine/D. Slaine

Depth (m)	Description	Elev. (masl)	Number	Type	Recovery	Blows/Ft
	Ground Surface	112.60				
0.0	TOPSOIL - clay based.	0.00	1		29	11
1.0	SILTY CLAY - reddish brown, stiff.	111.08				
	SILTY SAND.	1.52	2		75	21
2.0	SILTY CLAY - reddish brown, turning to a brownish grey at 3.05 m with a 5 cm thick sandy gravel lens at 3.35 m. Silty clay is stiff to very stiff.					
3.0			3		88	9
4.0						
5.0			4		75	25
6.0		106.50				
	SILTY CLAY - grey, wet, stiff to very stiff.	6.10	5		71	15
7.0		104.98				
		7.62				
8.0						
9.0						
10.0						



UTM Coordinates: 5935593E, 4797419N ***Hole Size:*** 20.3 cm

Drill Method: Hollow Stem Augers ***Datum:*** 112.60 masl

Drill Date: August 16, 2013 ***Sheet:*** 1 of 1

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Log of Borehole: MW-8-S

Project No.: 261

Project: 1200 King Road Hydrogeological Assessment

Client: Penta Properties Inc.

Location: Aldershot, ON ***Geologist:*** K. Slaine/D. Slaine

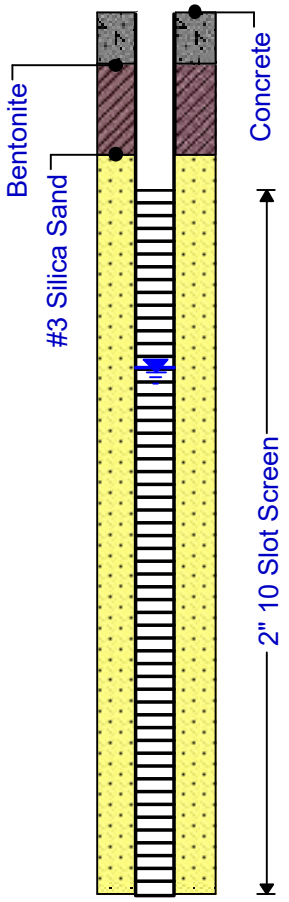
SUBSURFACE PROFILE

Depth (m)	Symbol	Description	Elev. (masl)
		Ground Surface	111.61
0.0		TOPSOIL - silt based.	0.00
1.0		SANDY SILT - brown, traces of gravel, very stiff.	110.09
		SAND - brown, medium grained, loose.	1.52
2.0		SILTY CLAY - brown, very stiff.	
3.0			108.41
		SANDY SILT - brown, wet, stiff.	3.20
4.0		SILTY CLAY - grey, wet, very stiff.	
		MW-8-S was drilled straight to a depth of 7.62 m using the geologic log from MW-8-D and then inst rumented with the monitoring well.	
5.0			
6.0			
7.0			104.05
			7.56
8.0			
9.0			
10.0			

SAMPLE

Number	Type	Recovery	Blows/Ft
1		50	22
2		75	23
3		75	15
4		83	29
5		88	27

Well Completion Details



UTM Coordinates: 593684E, 4797588N

Hole Size: 20.3 cm

Drill Method: Hollow Stem Augers

Datum: 111.61 masl

Drill Date: August 20, 2013

Sheet: 1 of 1

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Log of Borehole: MW-8-D

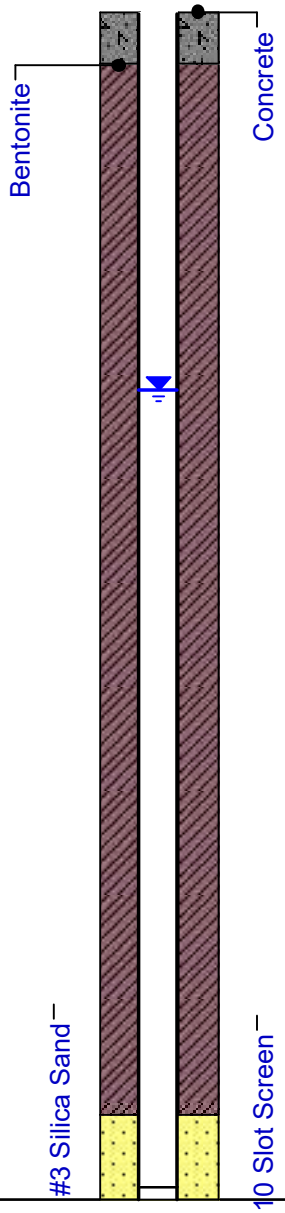
Project No.: 261

Project: 1200 King Road Hydrogeological Assessment

Client: Penta Properties Inc.

Location: Aldershot, ON ***Geologist:*** K. Slaine/D. Slaine

Depth (m)	Description	Elev. (masl)	Number	Type	Recovery	Blows/Ft
	Ground Surface	111.45				
0.0	TOPSOIL - silt based.	0.00	1		50	22
1.0	SANDY SILT - brown, traces of gravel, very stiff.	109.93				
	SAND - brown, medium grained, loose.	1.52	2		75	23
2.0	SILTY CLAY - brown, very stiff.					
3.0		108.25				
	SANDY SILT - brown, wet, stiff.	3.20	3		75	15
4.0	SILTY CLAY - grey, wet, very stiff.					
5.0			4		83	29
6.0			5		88	27
7.0		103.68				
	SAND - brown, medium grained.	7.77	6		100	20
8.0	SILTY CLAY - grey, wet, very stiff.					
9.0			7		100	30
10.0		101.39				
		10.06				



UTM Coordinates: 593686E, 4797586N ***Hole Size:*** 20.3 cm

Drill Method: Hollow Stem Augers ***Datum:*** 111.45 masl

Drill Date: August 20, 2013 ***Sheet:*** 1 of 2

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Log of Borehole: MW-8-D

Project No.: 261

Project: 1200 King Road Hydrogeological Assessment

Client: Penta Properties Inc.

Location: Aldershot, ON ***Geologist:*** K. Slaine/D. Slaine

SUBSURFACE PROFILE				SAMPLE				
Depth (m)	Symbol	Description	Elev. (masl)	Number	Type	Recovery	Blows/Ft	Well Completion Details
		SHALE - Queenston Formation, red, weathered.	100.78					
11.0			10.67					
12.0								Groundwater Level Apr 9/14
13.0								
14.0								
15.0								
16.0								
17.0								
18.0								
19.0								
20.0								

UTM Coordinates: 593686E, 4797586N ***Hole Size:*** 20.3 cm

Drill Method: Hollow Stem Augers ***Datum:*** 111.45 masl

Drill Date: August 20, 2013 ***Sheet:*** 2 of 2

Appendix 3

Hydraulic Conductivity Tests Analyses

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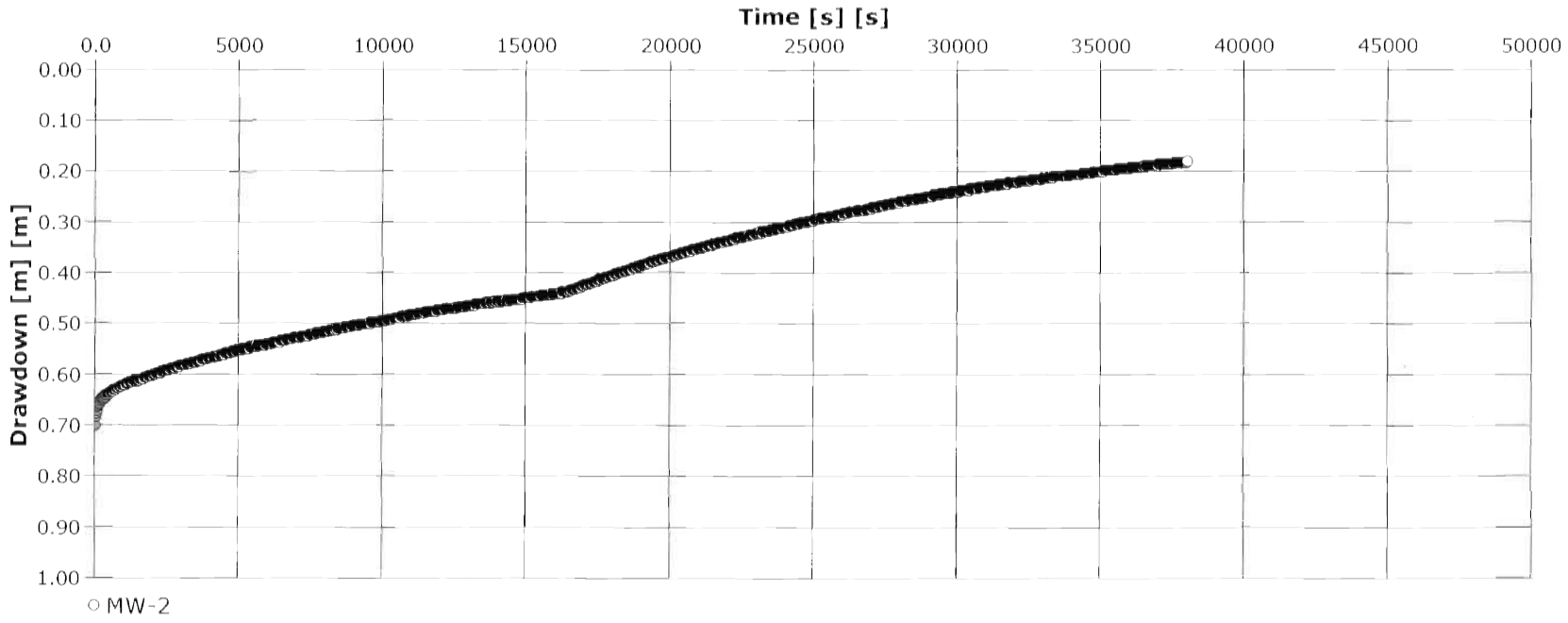
Slug Test Analysis Report

Project: 1200 King Road

Number: 261

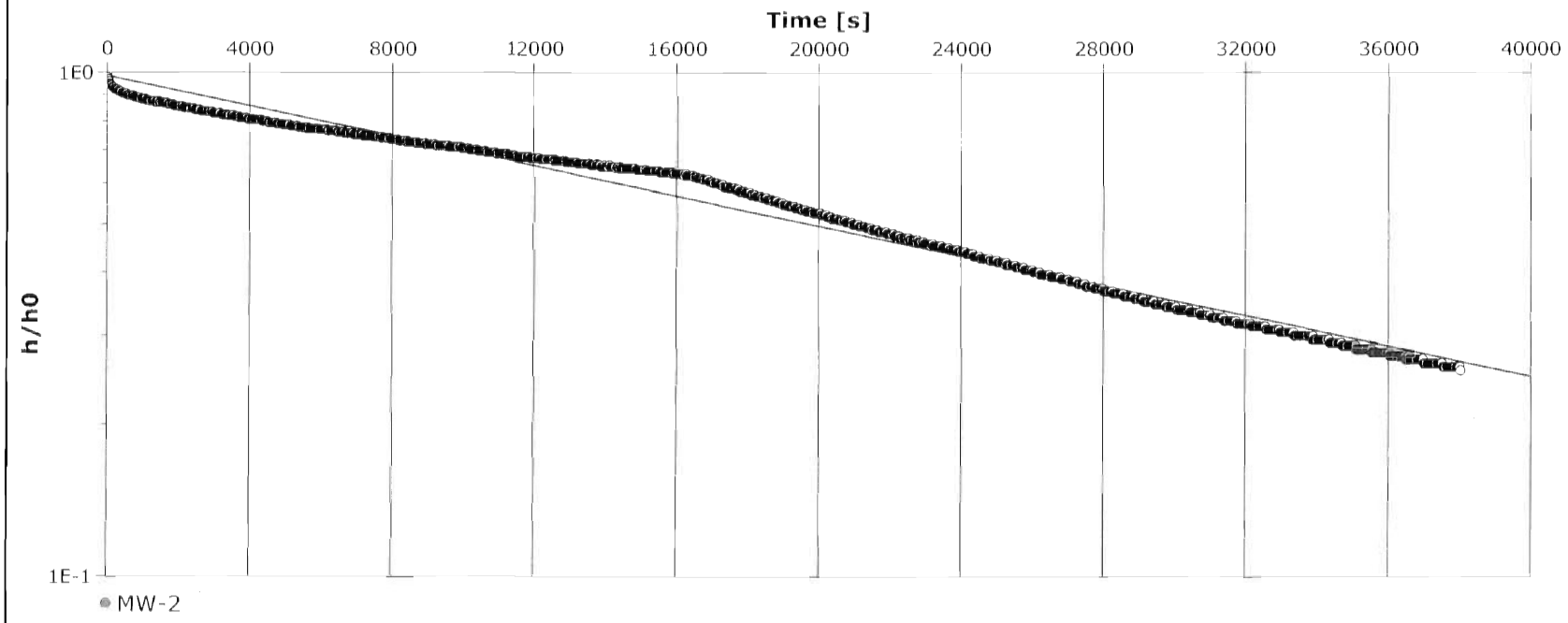
Client: Penta Properties Inc.

Location: Burlington, ON	Slug Test: MW-2 Withdrawal	Test Well: MW-2
Test conducted by: Kevin Slaine		Test date: 17/09/2013
Analysis performed by: David Slaine	Time vs. Change in Water Level	Date: 20/11/2013
Aquifer Thickness: 7.00 m		



Terra-Dynamics Consulting 404 Queenston Street St. Catharines, ON L2P 2Y2 www.terra-dynamics.com	Slug Test Analysis Report Project: 1200 King Road Number: 261 Client: Penta Properties Inc.

Location: Burlington, ON	Slug Test: MW-2 Withdrawal	Test Well: MW-2
Test conducted by: Kevin Slaine		Test date: 17/09/2013
Analysis performed by: David Slaine	Hvorslev	Date: 20/11/2013
Aquifer Thickness: 7.00 m		



Calculation after Hvorslev

Observation well	K [m/s]
MW-2	1.00×10^{-8}

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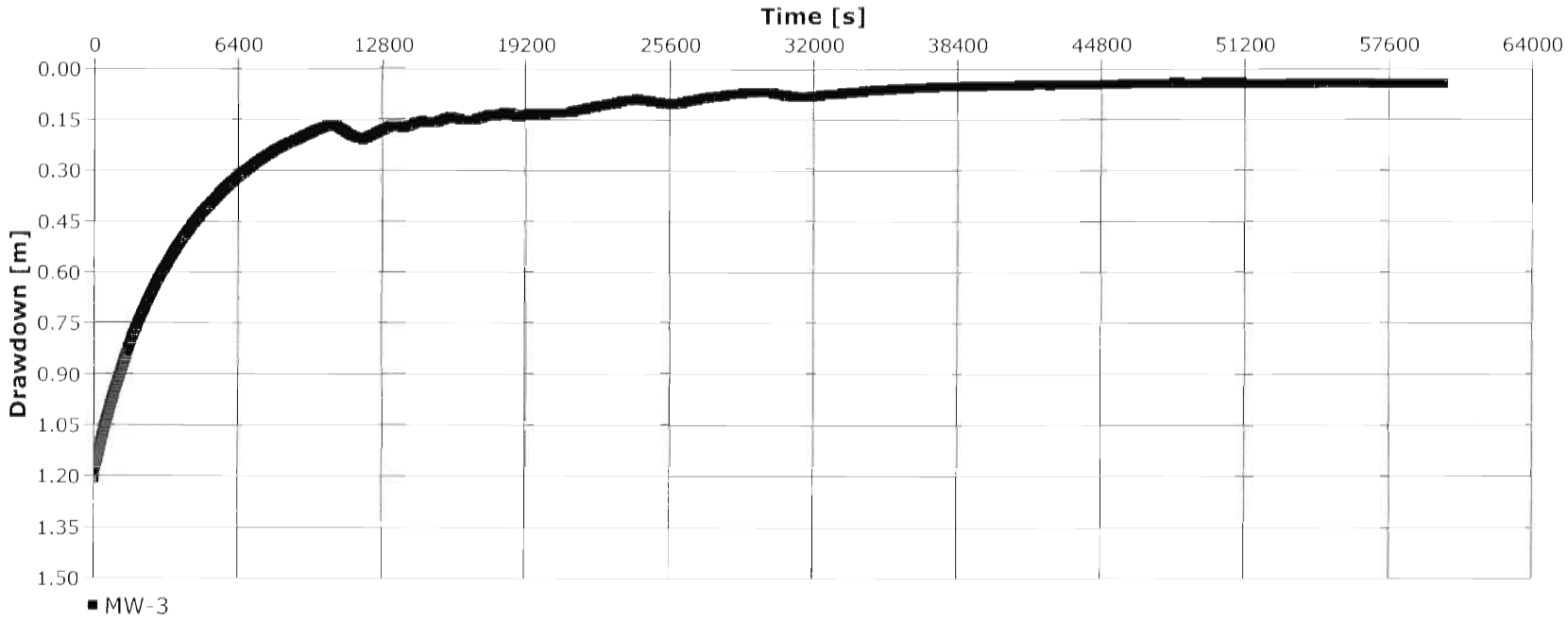
Slug Test Analysis Report

Project: 1200 King Road

Number: 261

Client: Penta Properties Inc.

Location: Burlington, ON	Slug Test: MW-3 Withdrawal	Test Well: MW-3
Test conducted by: Kevin Slaine		Test date: 17/09/2013
Analysis performed by: David Slaine	Time vs. Change in Water Level	Date: 20/11/2013
Aquifer Thickness: 7.00 m		



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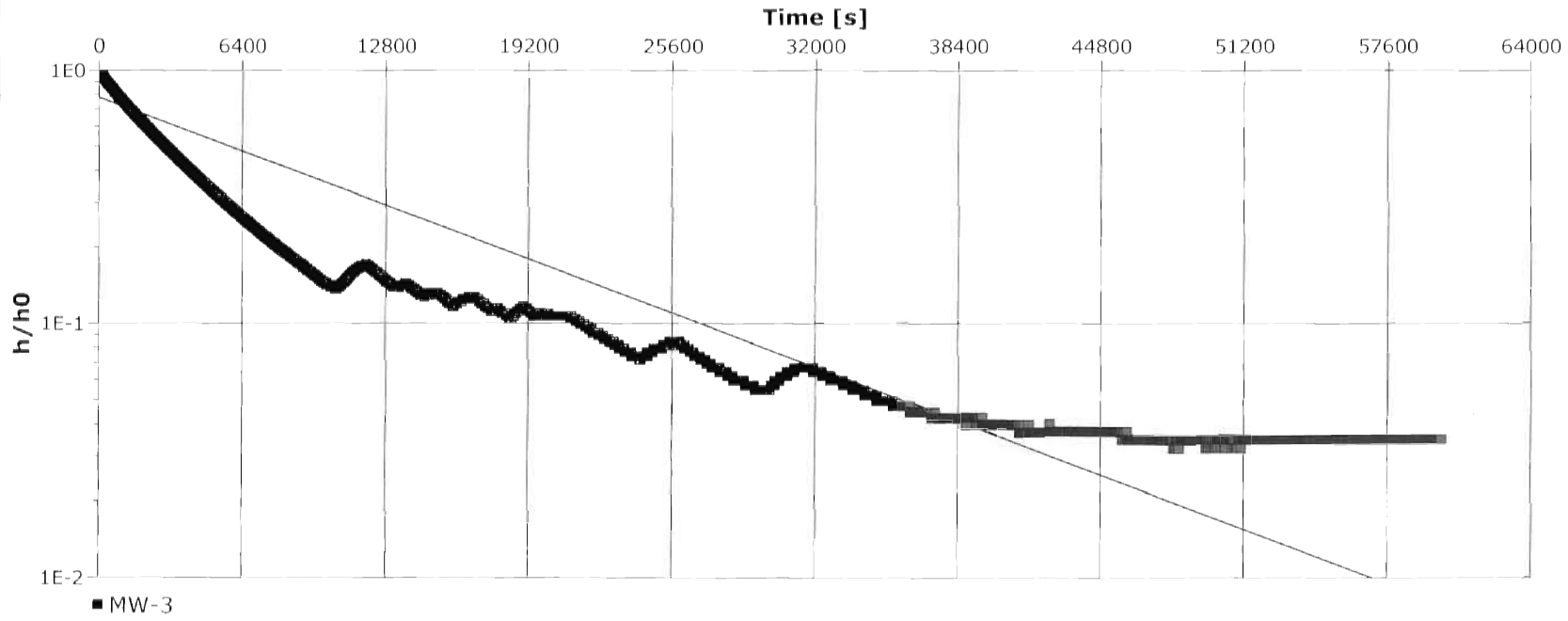
Slug Test Analysis Report

Project: 1200 King Road

Number: 261

Client: Penta Properties Inc.

Location: Burlington, ON	Slug Test: MW-3 Withdrawal	Test Well: MW-3
Test conducted by: Kevin Slaine		Test date: 17/09/2013
Analysis performed by: David Slaine	Hvorslev	Date: 20/11/2013
Aquifer Thickness: 7.00 m		



Calculation after Hvorslev

Observation well	K [m/s]
MW-3	2.23×10^{-6}

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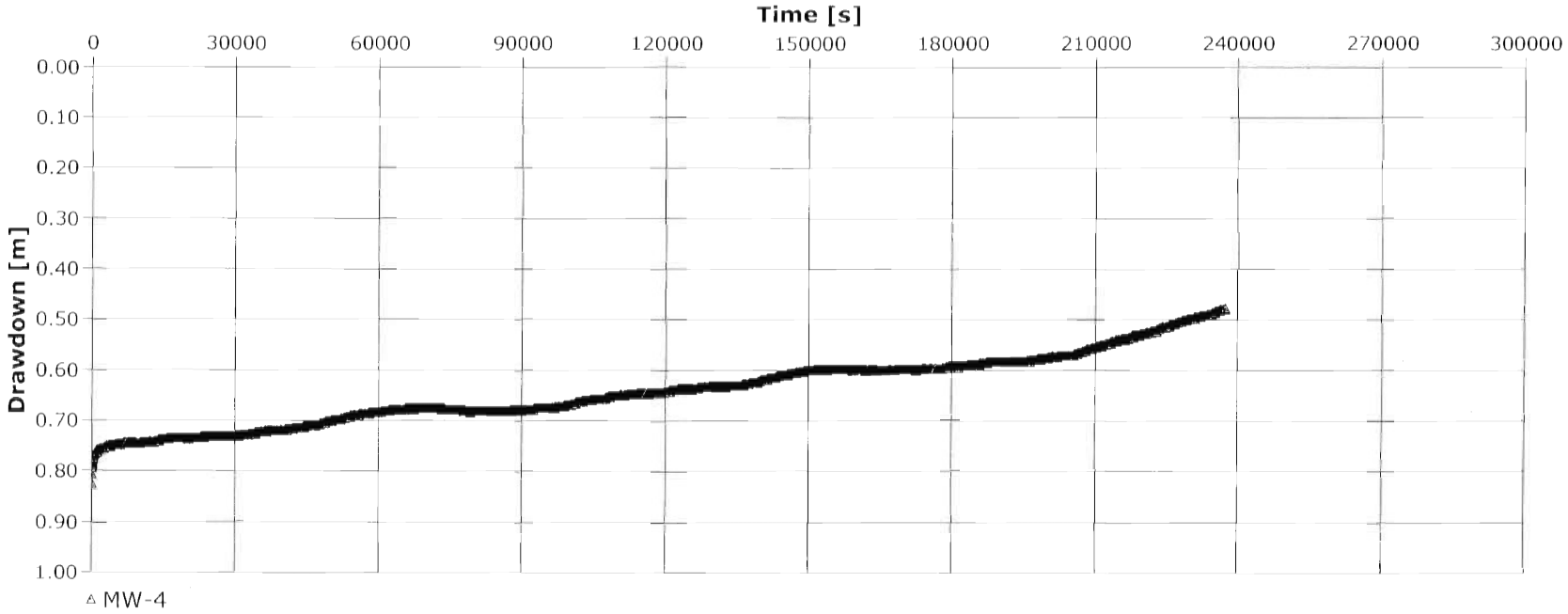
Slug Test Analysis Report

Project: 1200 King Road

Number: 261

Client: Penta Properties Inc.

Location: Burlington, ON	Slug Test: MW-4 Withdrawal	Test Well: MW-4
Test conducted by: Kevin Slaine		Test date: 17/09/2013
Analysis performed by: David Slaine	Time vs. Change in Water Level	Date: 20/11/2013
Aquifer Thickness: 4.50 m		



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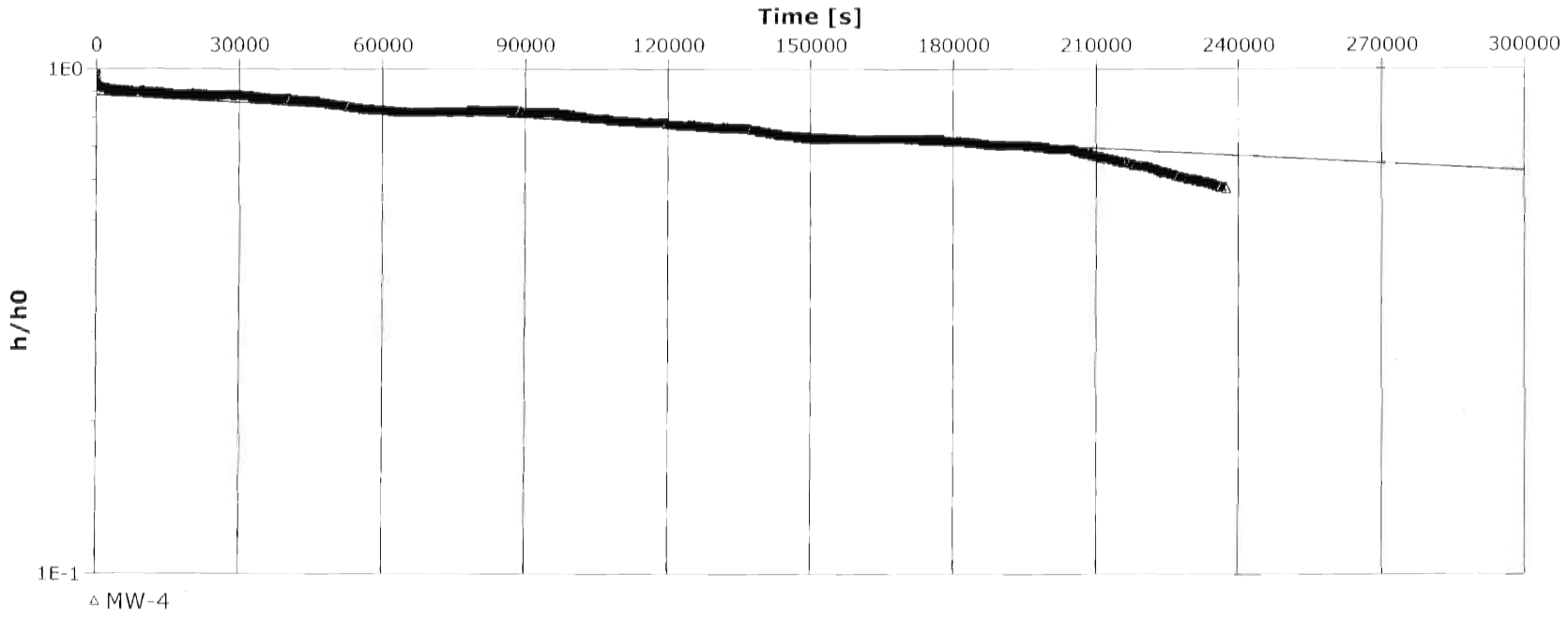
Slug Test Analysis Report

Project: 1200 King Road

Number: 261

Client: Penta Properties Inc.

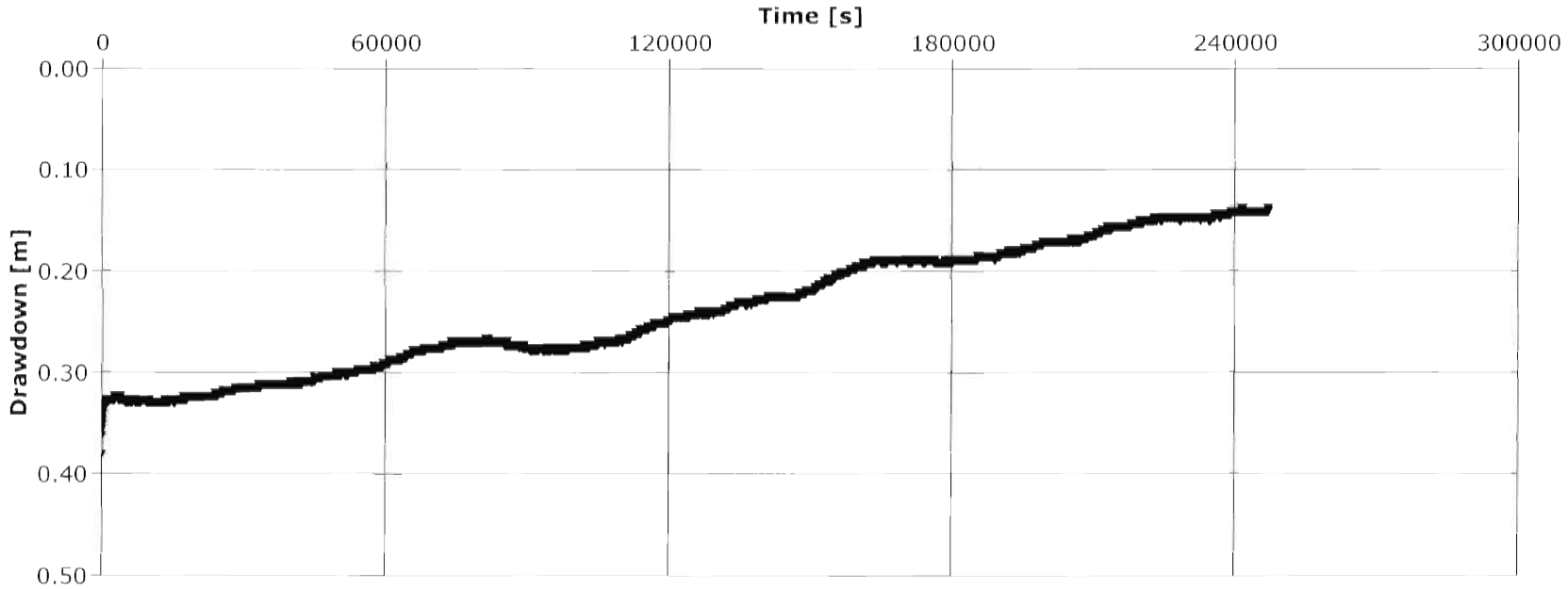
Location: Burlington, ON	Slug Test: MW-4 Withdrawal	Test Well: MW-4
Test conducted by: Kevin Slaine		Test date: 17/09/2013
Analysis performed by: David Slaine	Hvorslev	Date: 20/11/2013
Aquifer Thickness: 4.50 m		



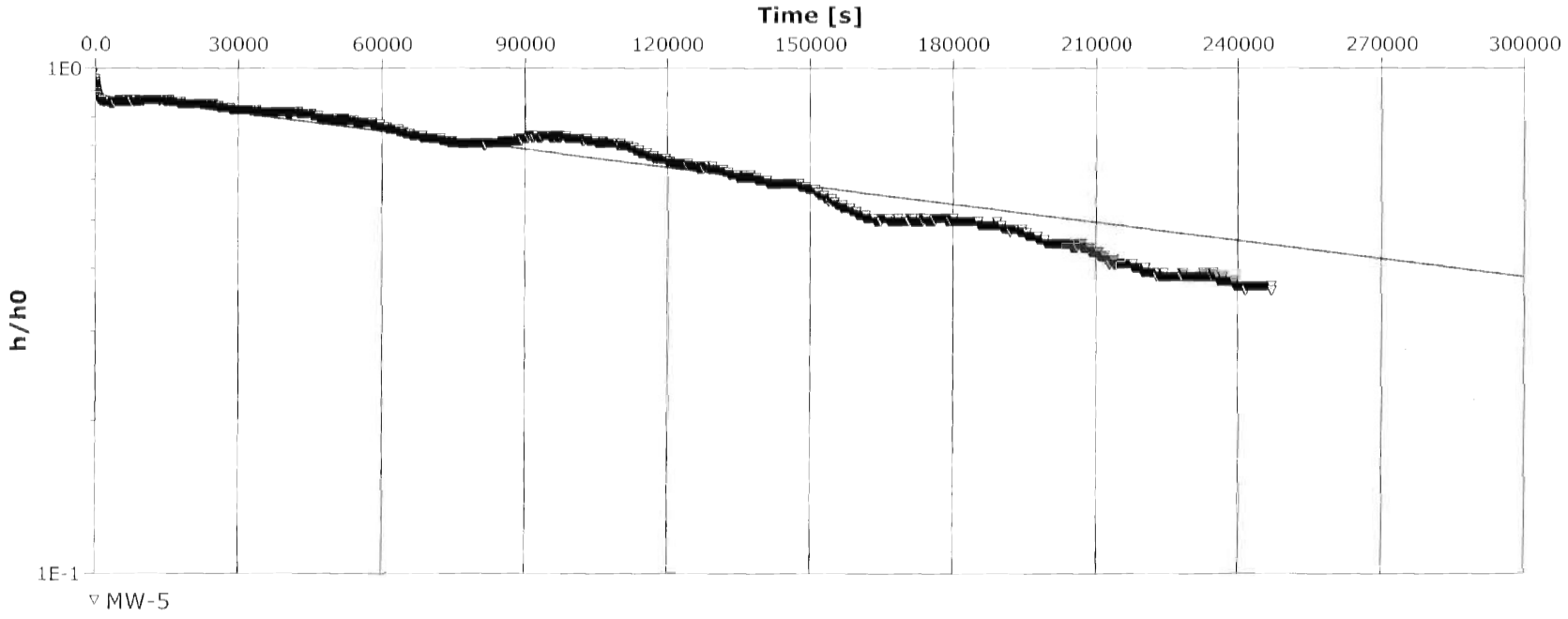
Calculation after Hvorslev

Observation well	K [m/s]
MW-4	4.26×10^{-10}

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	Project: 1200 King Road	
	Number: 261	
	Client: Penta Properties Inc.	
Location: Burlington, ON	Slug Test: MW-5 Withdrawal	Test Well: MW-5
Test conducted by: Kevin Slaine		Test date: 17/09/2013
Analysis performed by: David Slaine	Time vs. Change in Water Level	Date: 20/11/2013
Aquifer Thickness: 7.00 m		



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	Project: 1200 King Road	
	Number: 261	
	Client: Penta Properties Inc.	
Location: Burlington, ON	Slug Test: MW-5 Withdrawal	Test Well: MW-5
Test conducted by: Kevin Slaine		Test date: 17/09/2013
Analysis performed by: David Slaine	Hvorslev	Date: 20/11/2013
Aquifer Thickness: 7.00 m		



Calculation after Hvorslev

Observation well	K [m/s]
MW-5	8.07×10^{-10}

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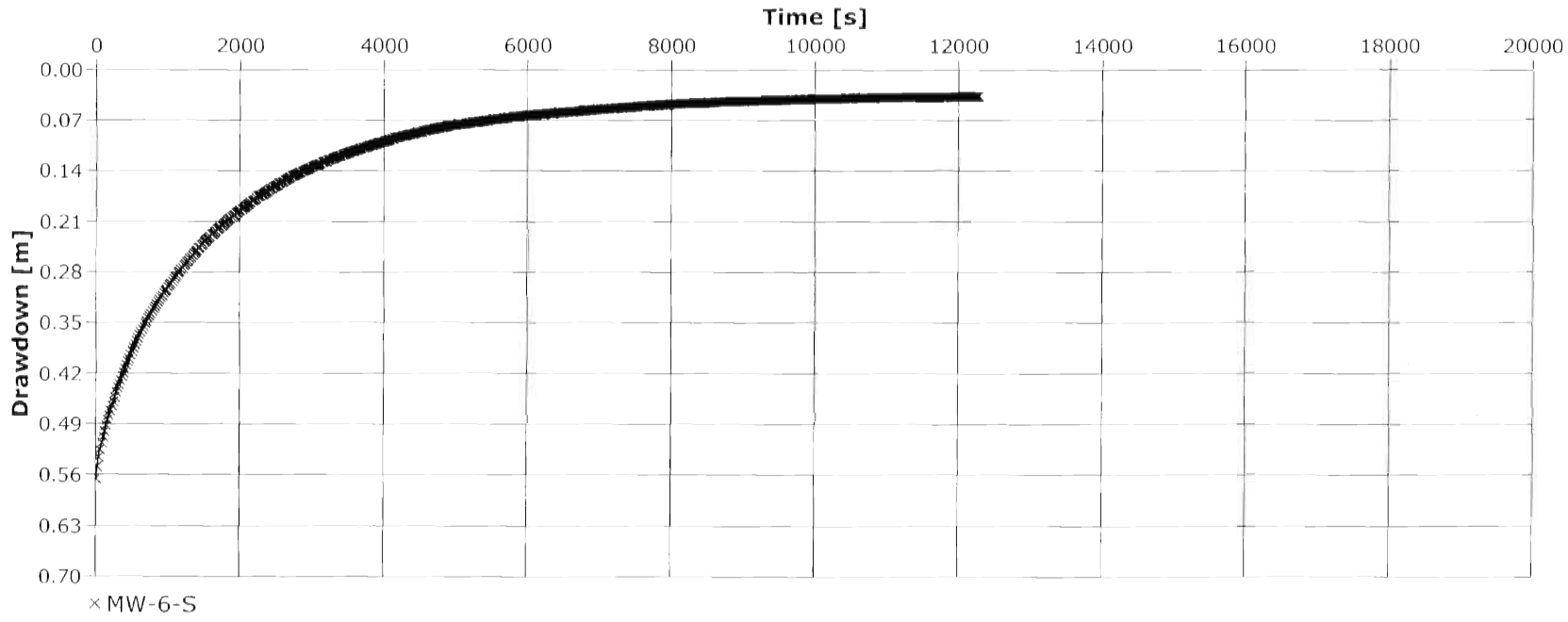
Slug Test Analysis Report

Project: 1200 King Road

Number: 261

Client: Penta Properties Inc.

Location: Burlington, ON	Slug Test: MW-6-S Withdrawal	Test Well: MW-6-S
Test conducted by: Kevin Slaine		Test date: 17/09/2013
Analysis performed by: David Slaine	Time vs. Change in Water Level	Date: 20/11/2013
Aquifer Thickness: 7.00 m		



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Slug Test Analysis Report

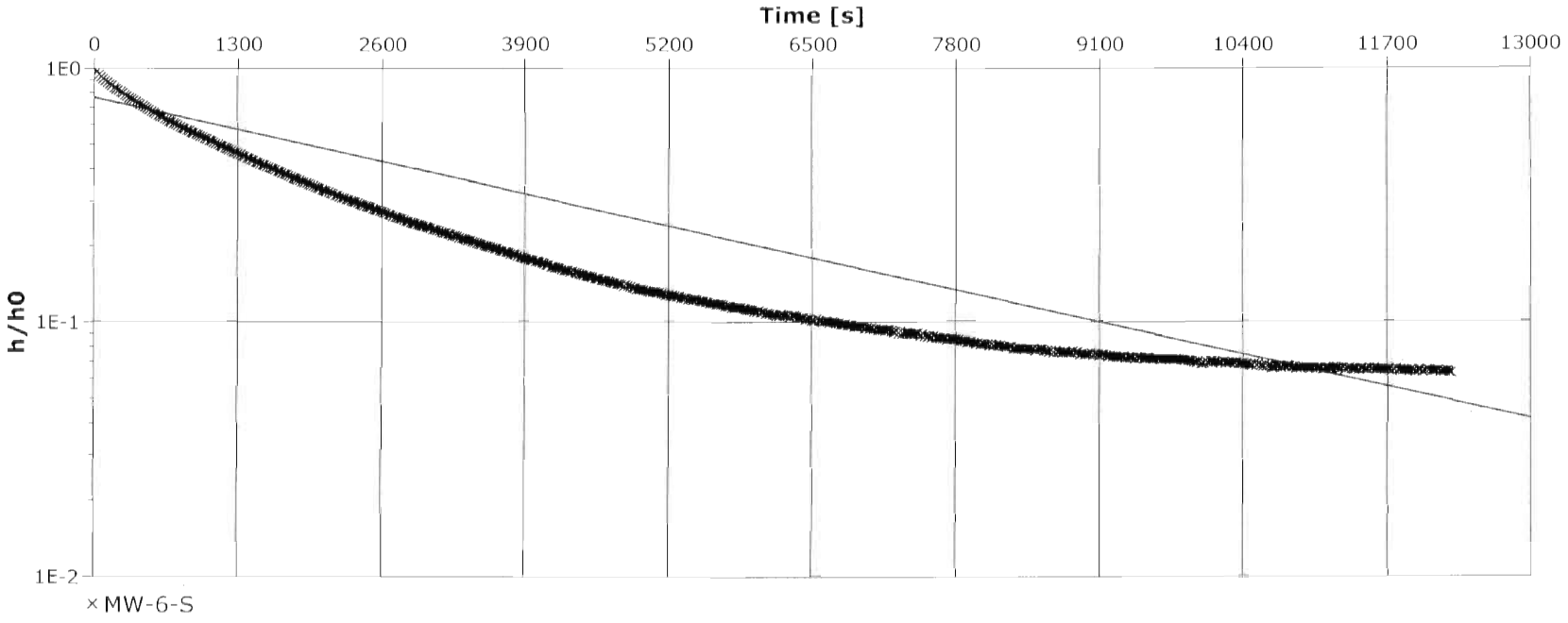
Project: 1200 King Road

Number: 261

Client: Penta Properties Inc.

Location: Burlington, ON	Slug Test: MW-6-S Withdrawal	Test Well: MW-6-S
Test conducted by: Kevin Slaine		Test date: 17/09/2013
Analysis performed by: David Slaine	Hvorslev	Date: 20/11/2013

Aquifer Thickness: 7.00 m



Calculation after Hvorslev

Observation well	K [m/s]
MW-6-S	6.53×10^{-8}

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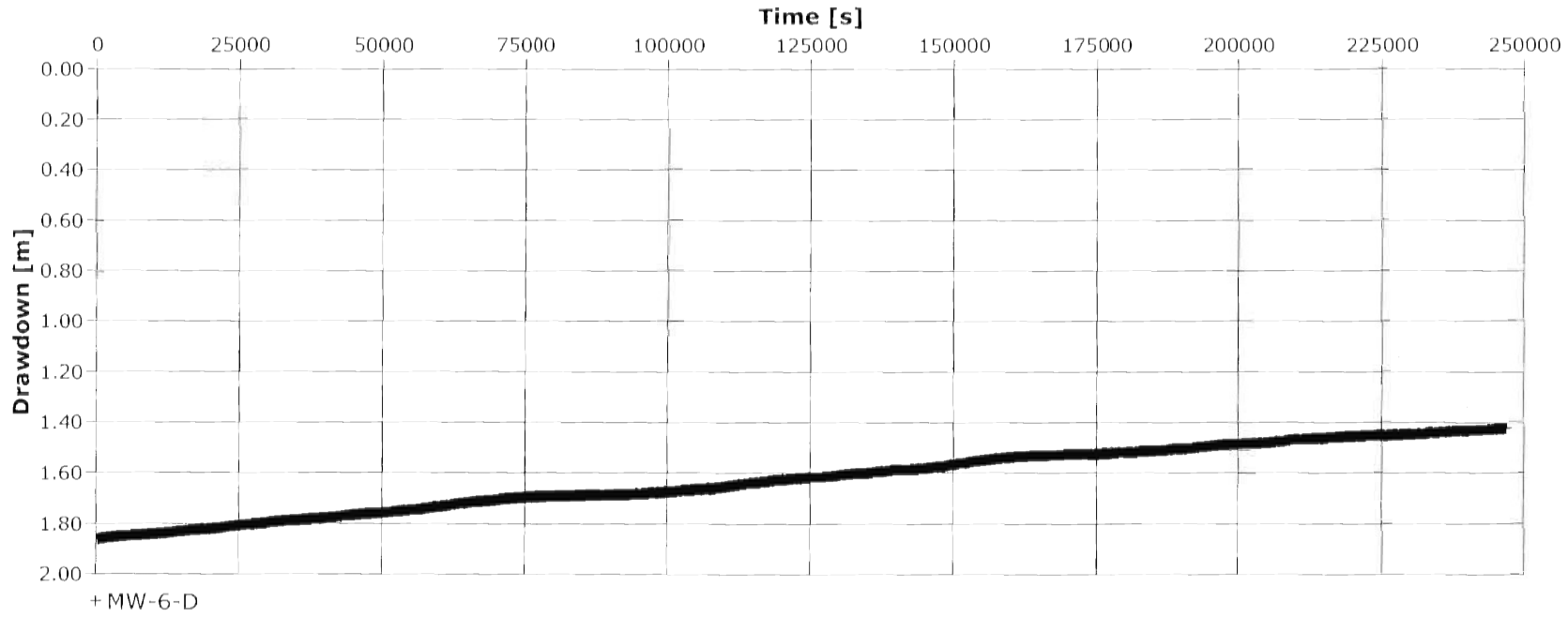
Slug Test Analysis Report

Project: 1200 King Road

Number: 261

Client: Penta Properties Inc.

Location: Burlington, ON	Slug Test: MW-6-D Withdrawal	Test Well: MW-6-D
Test conducted by: Kevin Slaine		Test date: 17/09/2013
Analysis performed by: David Slaine	Time vs. Change in Water Level	Date: 20/11/2013
Aquifer Thickness: 1.00 m		



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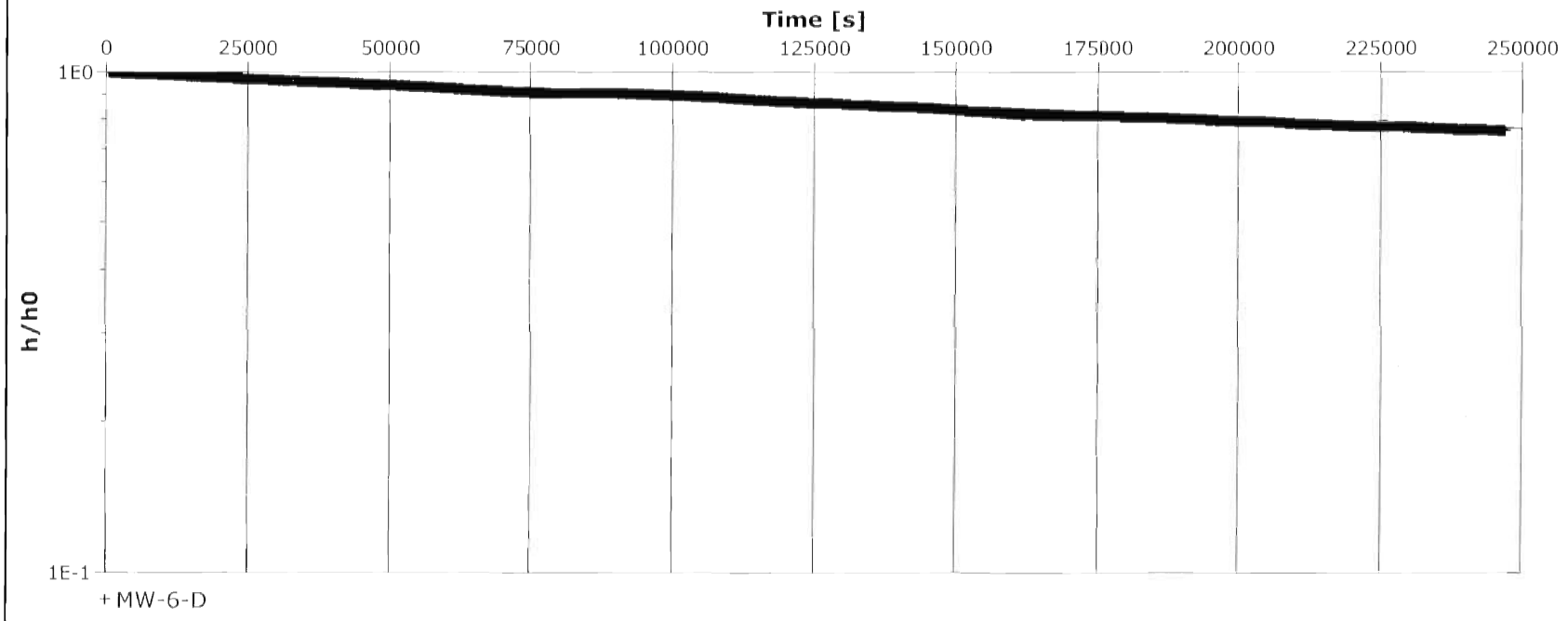
Slug Test Analysis Report

Project: 1200 King Road

Number: 261

Client: Penta Properties Inc.

Location: Burlington, ON	Slug Test: MW-6-D Withdrawal	Test Well: MW-6-D
Test conducted by: Kevin Slaine		Test date: 17/09/2013
Analysis performed by: David Slaine	Hvorslev	Date: 20/11/2013
Aquifer Thickness: 1.00 m		



Calculation after Hvorslev

Observation well	K [m/s]
MW-6-D	1.78×10^{-9}

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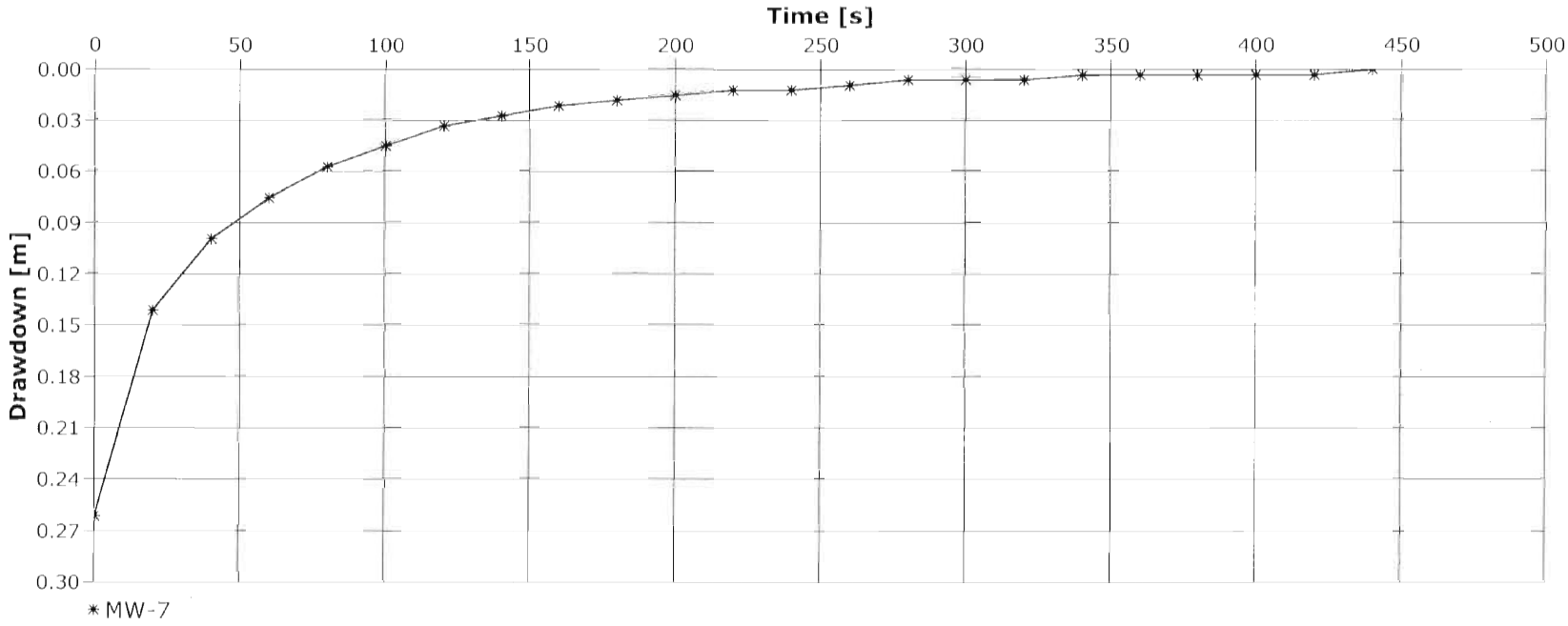
Slug Test Analysis Report

Project: 1200 King Road

Number: 261

Client: Penta Properties Inc.

Location: Burlington, ON	Slug Test: MW-7 Withdrawal	Test Well: MW-7
Test conducted by: Kevin Slaine		Test date: 17/09/2013
Analysis performed by: David Slaine	Time vs. Change in Water Level	Date: 20/11/2013
Aquifer Thickness: 7.00 m		



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www.terra-dynamics.com

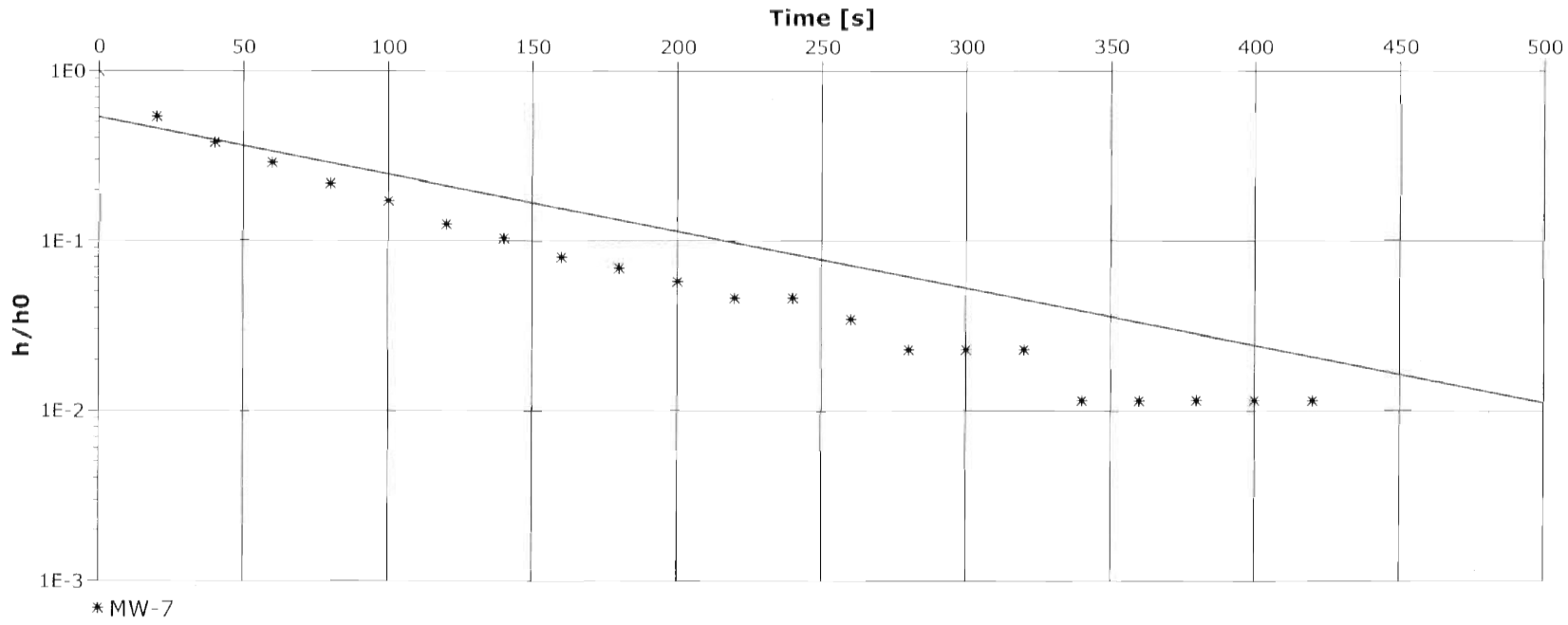
Slug Test Analysis Report

Project: 1200 King Road

Number: 261

Client: Penta Properties Inc.

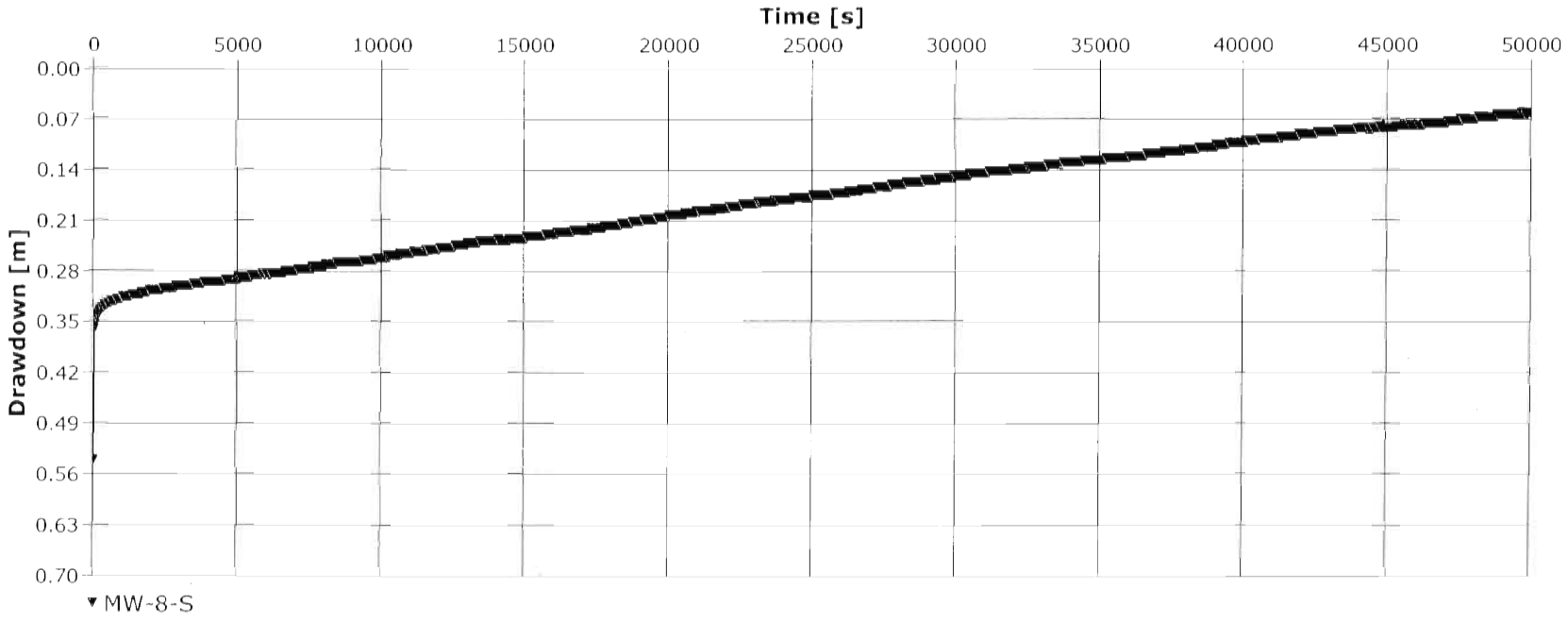
Location: Burlington, ON	Slug Test: MW-7 Withdrawal	Test Well: MW-7
Test conducted by: Kevin Slaine		Test date: 17/09/2013
Analysis performed by: David Slaine	Hvorslev	Date: 20/11/2013
Aquifer Thickness: 7.00 m		



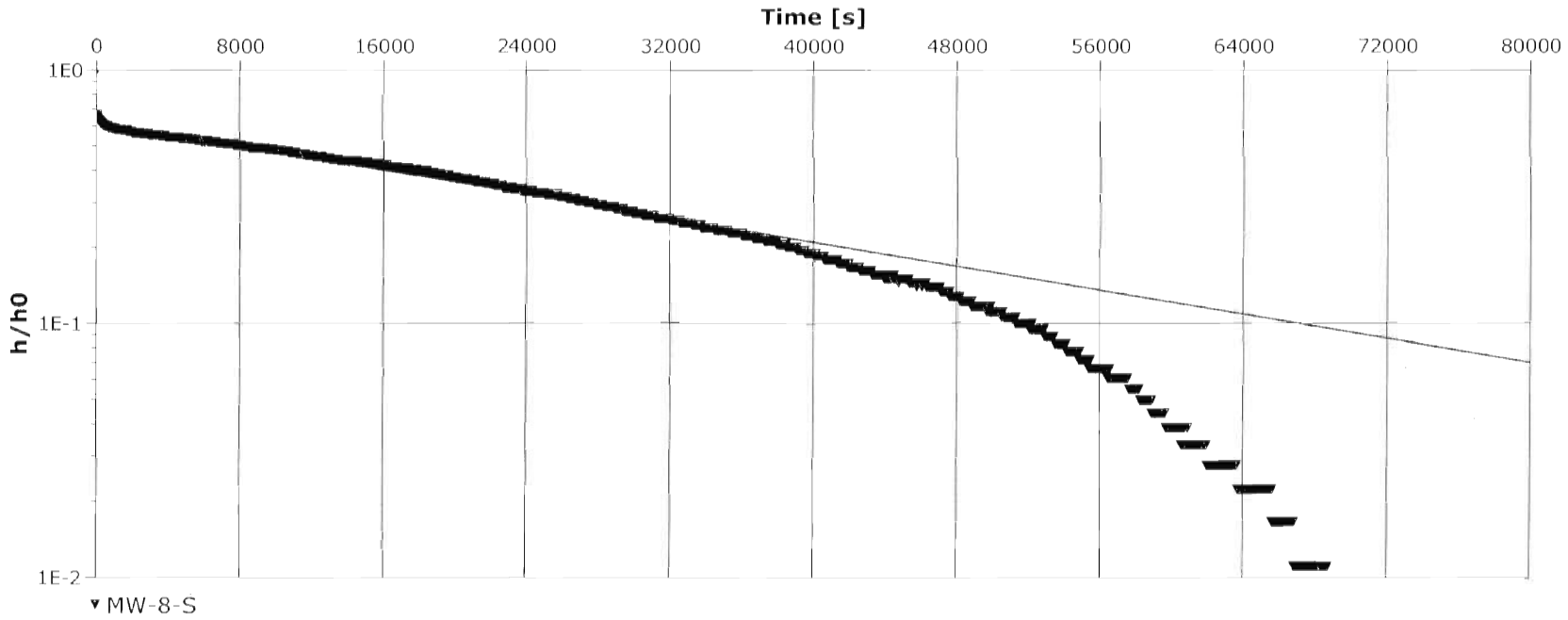
Calculation after Hvorslev

Observation well	K [m/s]
MW-7	2.25×10^{-6}

Terra-Dynamics Consulting **404 Queenston Street** **St. Catharines, ON L2P 2Y2** **www.terra-dynamics.com**	**Slug Test Analysis Report**	
	Project: 1200 King Road	
	Number: 261	
	Client: Penta Properties Inc.	
Location: Burlington, ON	Slug Test: MW-8-S Withdrawal	Test Well: MW-8-S
Test conducted by: Kevin Slaine		Test date: 20/11/2013
Analysis performed by: David Slaine	Time vs. Change in Water Level	Date: 20/11/2013
Aquifer Thickness: 7.00 m		



Terra-Dynamics Consulting **404 Queenston Street** **St. Catharines, ON L2P 2Y2** **www.terra-dynamics.com**	**Slug Test Analysis Report**	
	Project: 1200 King Road	
	Number: 261	
	Client: Penta Properties Inc.	
Location: Burlington, ON	Slug Test: MW-8-S Withdrawal	Test Well: MW-8-S
Test conducted by: Kevin Slaine		Test date: 20/11/2013
Analysis performed by: David Slaine	Hvorslev	Date: 20/11/2013
Aquifer Thickness: 7.00 m		



Calculation after Hvorslev

Observation well	K [m/s]
MW-8-S	7.94×10^{-9}

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www.terra-dynamics.com

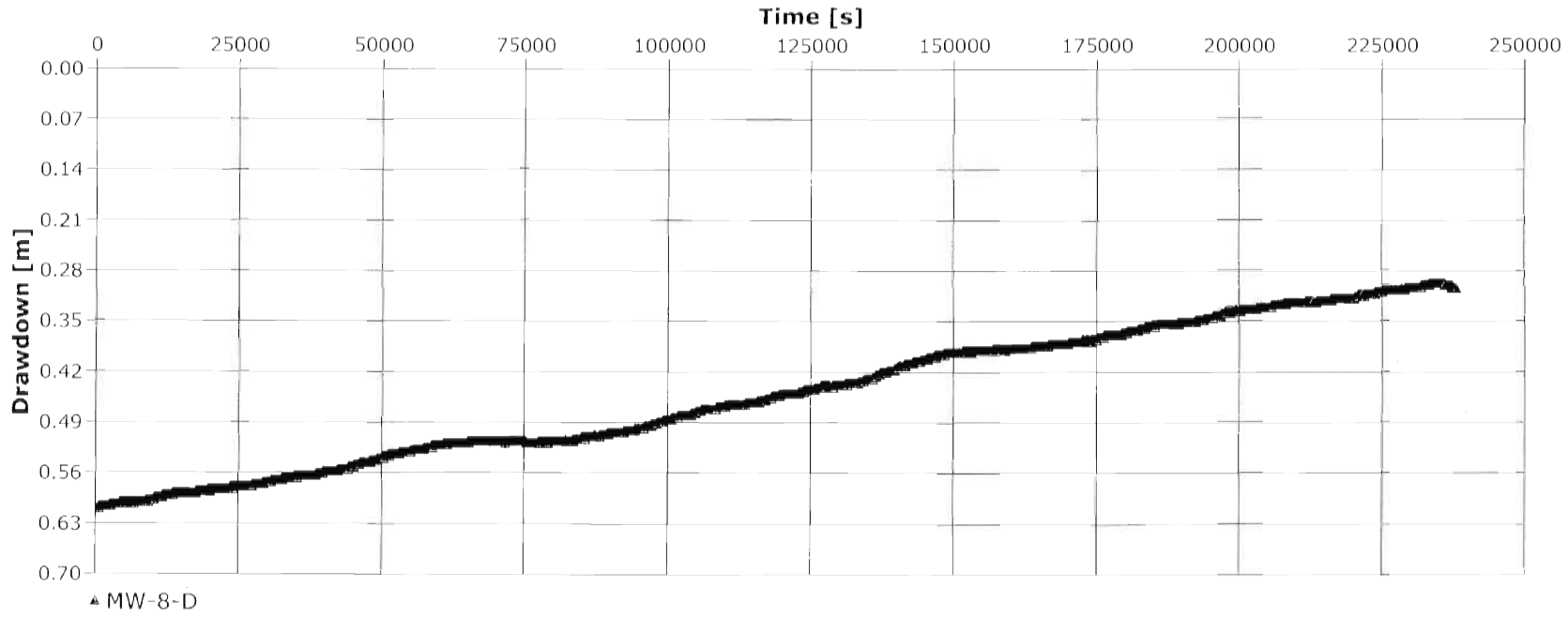
Slug Test Analysis Report

Project: 1200 King Road

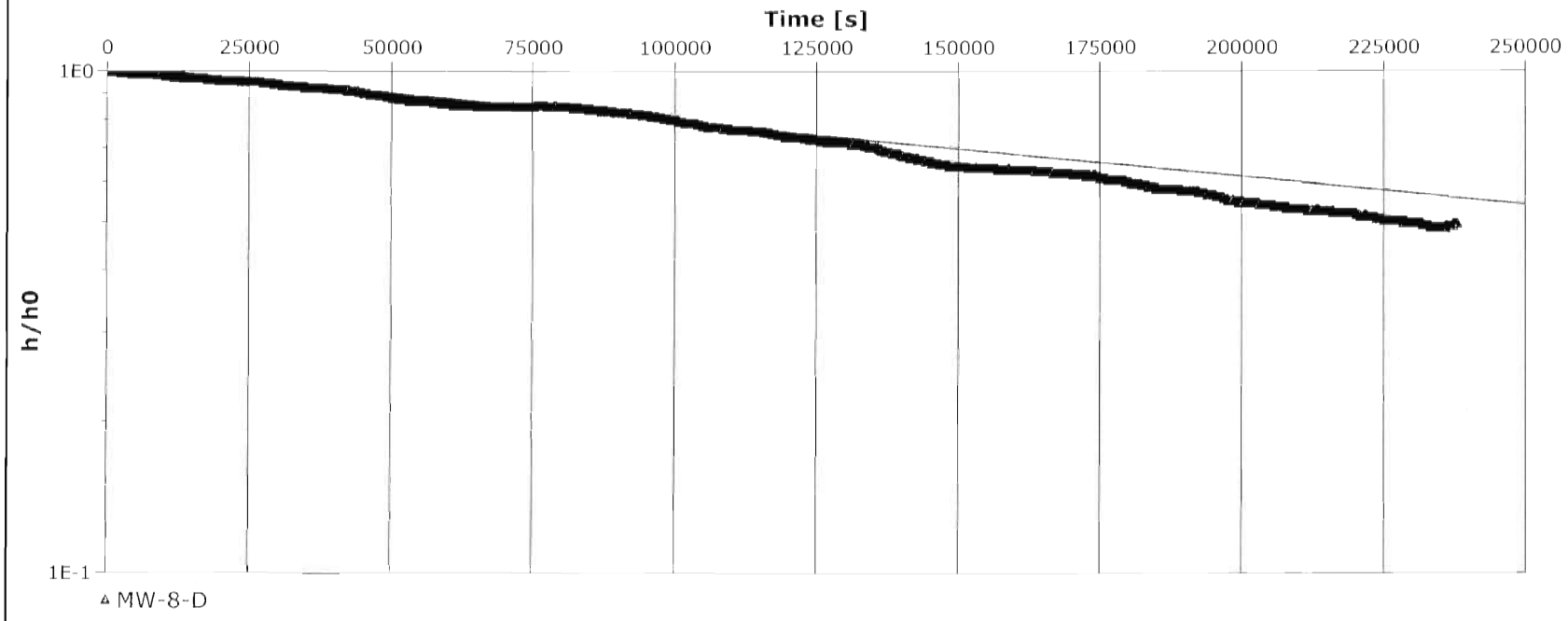
Number: 261

Client: Penta Properties Inc.

Location: Burlington, ON	Slug Test: MW-8-D Withdrawal	Test Well: MW-8-D
Test conducted by: Kevin Slaine		Test date: 17/09/2013
Analysis performed by: David Slaine	Time vs. Change in Water Level	Date: 20/11/2013
Aquifer Thickness: 1.30 m		



Terra-Dynamics Consulting **404 Queenston Street** **St. Catharines, ON L2P 2Y2** **www.terra-dynamics.com**	**Slug Test Analysis Report**	
	Project: 1200 King Road	
	Number: 261	
	Client: Penta Properties Inc.	
Location: Burlington, ON	Slug Test: MW-8-D Withdrawal	Test Well: MW-8-D
Test conducted by: Kevin Slaine		Test date: 17/09/2013
Analysis performed by: David Slaine	Hvorslev	Date: 20/11/2013
Aquifer Thickness: 1.30 m		



Calculation after Hvorslev

Observation well	K [m/s]
MW-8-D	3.24×10^{-9}

Appendix 4

Soil-Mat Engineers & Consultants Ltd.
Borehole Logs (2011/2013)

Project No: SM 114018-G

Project: 403 & King Road

Location: Burlington, Ontario

Client: Paletta International Corporation

Log of Borehole No. 1 [2011]

Borehole Location: See Drawing No. 1

Project Manager: Ian Shaw, P. Eng.

Soil-Mat

SUBSURFACE PROFILE

Depth (ft / m)	Elevation [m]	Description
0 / 0	104.66	Ground Surface
	104.36	**Topsoil** — Approximately 300 millimetres
	103.26	**Silty Clay** — Brownish red,trace sand and fine gravel, hard
2	102.56	**Silty Sand** — Brown, medium to fine grained, with some gravel, occasional thin silty clay seams, saturated, compact
		Silty Clay — Brown to grey, trace fine gravel, wet to saturated, firm to soft
4	100.86	**Silty Clay** — Grey, trace gravel and shale fragments, very stiff
6	98.76	
	98.26	**Sandy Silt** — Brownish red, some gravel, dense
		Silty Clay Till — Grey, occasional gravel, occasional shale fragments, hard
8	96.86	
	96.76	**Queenston Shale** — Red, severely weathered, hard
10		End of Borehole

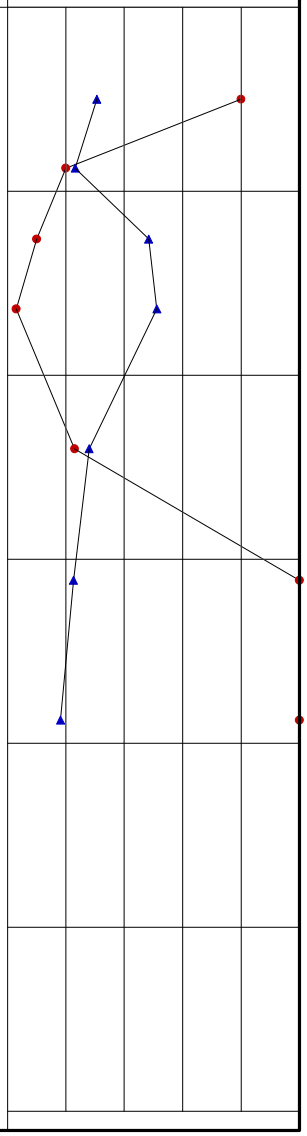
SAMPLE

Type	Number	Blow Counts	Blows/300mm	Recovery
SS	1	4,45,35	80	
SS	2	11,9,11 Wet Spoon	20	
SS	3	3,4,6 Wet Spoon	10	
SS	4	1,1,2 Wet Spoon	3	
SS	5	4,8,15 Wet Spoon	23	
SS	6	26, 50/75mm Wet Spoon	100+	
SS	7	36, 50/150mm Wet Spoon	100+	

PP (kgf/cm2) | U.Wt.(kN/m3) | Well Data

Moisture Content w% 10 20 30 40

Standard Penetration Test blows/300mm 20 40 60 80



NOTES:

1. Borehole advanced using solid stem continuous flight auger equipment on January 21, 2011 to termination at a depth of 7.9 metres.
2. Free groundwater at a depth of 1.5 metre on completion and borehole backfilled as per Ontario Regulation 903.
3. Soil samples will be discarded after three months unless otherwise directed by our client.

Drill Method: Solid Stem Auger

Drill Date: January 21, 2011

Hole Size: 150mm

SOIL-MAT ENGINEERS & CONSULTANTS LTD.
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e-mail: info@soil-mat.on.ca

Datum: Geodetic

Checked by: IS

Sheet: 1 of 1

Project No: SM 114018-G

Project: 403 & King Road

Location: Burlington, Ontario

Client: Paletta International Corporation

Log of Borehole No. 2 [2011]

Borehole Location: See Drawing No. 1

Project Manager: Ian Shaw, P. Eng.

Soil-Mat

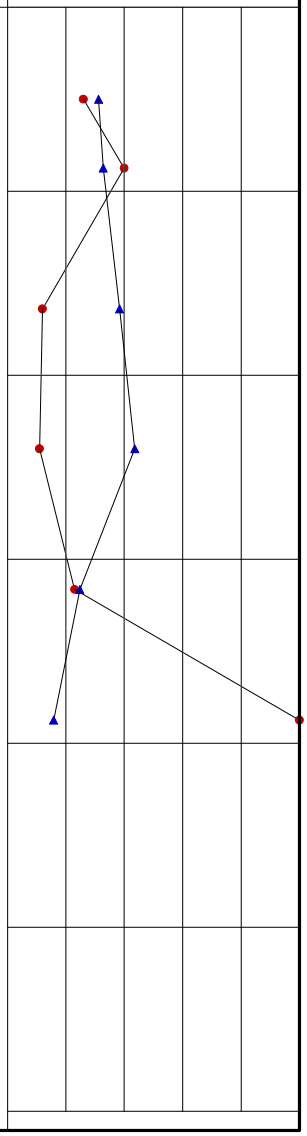
SUBSURFACE PROFILE

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)
		106.35		Ground Surface								
0	0			**Topsoil** Approximately 150 millimetres								
2				**Silty Clay** Brown, with some grey in the lower level, trace gravel and shale fragments, hard to stiff		SS	1	5,11,15	26			
4												
6	2					SS	2	11,25,15	40			
8												
10						SS	3	4,5,7	12			
12		102.55										
14	4			**Silty Clay** Grey, trace gravel, and shale fragments, stiff to firm								
16						SS	4	4,5,6	11			
18		100.85										
20	6			**Silty Clay Till** Grey to reddish grey, trace to some gravel and shale fragments, very stiff to hard		SS	5	6,9,14	23			
22												
24		98.85										
26	8	98.45		**Queenston Shale** Red, severely weathered, occasional more resistant grey layers, hard		SS	6	40, 50/150mm	100+			
28				End of Borehole								
30												
32	10											
34												
36												
38												

Moisture Content
w%
10 20 30 40

Standard Penetration Test
blows/300mm
20 40 60 80



NOTES:
1. Borehole advanced using solid stem continuous flight auger equipment on January 21, 2011 to termination at a depth of 7.9 metres.
2. Borehole dry on completion and backfilled as per Ontario Regulation 903.
3. Soil samples will be discarded after three months unless otherwise directed by our client.

Drill Method: Solid Stem Auger

Drill Date: January 21, 2011

Hole Size: 150mm

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Sheet: 1 of 1

Project No: SM 114018-G

Project: 403 & King Road

Location: Burlington, Ontario

Client: Paletta International Corporation

Log of Borehole No. 3 [2011]

Borehole Location: See Drawing No. 1

Project Manager: Ian Shaw, P. Eng.

Soil-Mat

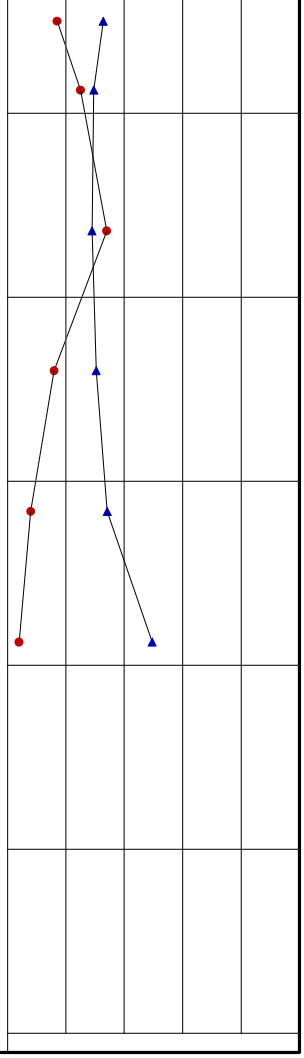
SUBSURFACE PROFILE

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)
		110.83		Ground Surface								
0	0			**Topsoil** Approximately 150 millimetres								
2				**Silty Clay** Reddish brown to brown, trace gravel and shale fragments, weathered, very stiff		SS	1	5,7,10	17			
4												
6	2					SS	2	8,11,14	25			
8		108.03										
10				Grey, trace gravel and shale fragments, hard to very stiff		SS	3	7,14,20	34			
12	4											
14												
16						SS	4	5,7,9	16			
		105.43										
18				**Silty Clay** Grey, trace fine gravel, 'wet', firm to soft								
20	6					SS	5	3,3,5	8			
22												
24												
26	8	102.73				SS	6	1,2,2	4			
				End of Borehole								
28												
30												
32	10											
34												
36												
38												

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

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



NOTES:

1. Borehole advanced using solid stem continuous flight auger equipment on January 21, 2011 to termination at a depth of 8.1 metres.
2. Borehole dry on completion and backfilled as per Ontario Regulation 903.
3. Soil samples will be discarded after three months unless otherwise directed by our client.

Drill Method: Solid Stem Auger

Drill Date: January 21, 2011

Hole Size: 150mm

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Sheet: 1 of 1

Project No: SM 114018-G

Project: 403 & King Road

Location: Burlington, Ontario

Client: Paletta International Corporation

Log of Borehole No. 4 [2011]

Borehole Location: See Drawing No. 1

Project Manager: Ian Shaw, P. Eng.

Soil-Mat

SUBSURFACE PROFILE

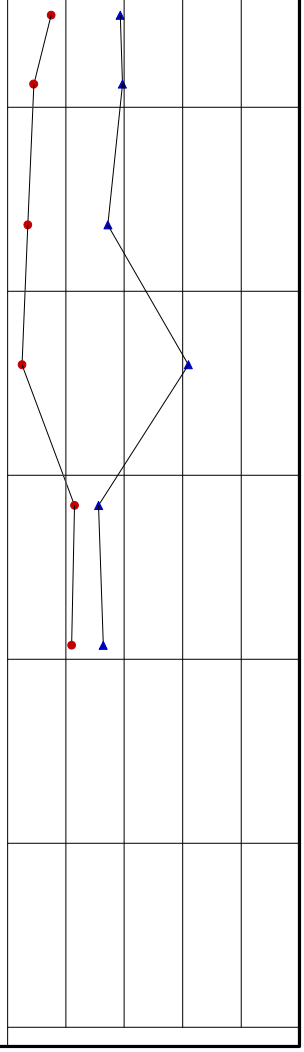
Depth (ft / m)	Elevation [m]	Description
0 / 0	112.71	Ground Surface
0 / 0		**Topsoil** — Approximately 100 millimetres
2 / 0		**Silty Clay** — Reddish brown to brown, trace gravel, thin coarse sand seams in the lower level, weathered, very stiff to stiff
14 / 4	108.41	**Clayey Silt** — Grey, some sand and fine gravel, trace to some organic material and black organic staining, 'wet', firm to soft
16 / 4	107.51	**Silty Clay Till** — Grey, trace to some gravel and shale fragments, very stiff
26 / 8	104.61	End of Borehole

SAMPLE

Type	Number	Blow Counts	Blows/300mm	Recovery	PP (kgf/cm2)	U.Wt.(kN/m3)
SS	1	5,7,8	15			
SS	2	3,4,5	9			
SS	3	2,3,4 Wet Spoon	7			
SS	4	3,3,2 Wet Spoon	5			
SS	5	5,9,14 Wet Spoon	23			
SS	6	6,10,12 Wet Spoon	22			

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

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



NOTES:

1. Borehole advanced using solid stem continuous flight auger equipment on January 21, 2011 to termination at a depth of 8.1 metres.
2. Free groundwater at a depth of 3 metres on completion and borehole backfilled as per Ontario Regulation 903.
3. Soil samples will be discarded after three months unless otherwise directed by our client.

Drill Method: Solid Stem Auger

Drill Date: January 21, 2011

Hole Size: 150mm

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Sheet: 1 of 1

Project No: SM 114018-G

Project: 403 & King Road

Location: Burlington, Ontario

Client: Paletta International Corporation

Log of Borehole No. 5 [2011]

Borehole Location: See Drawing No. 1

Project Manager: Ian Shaw, P. Eng.

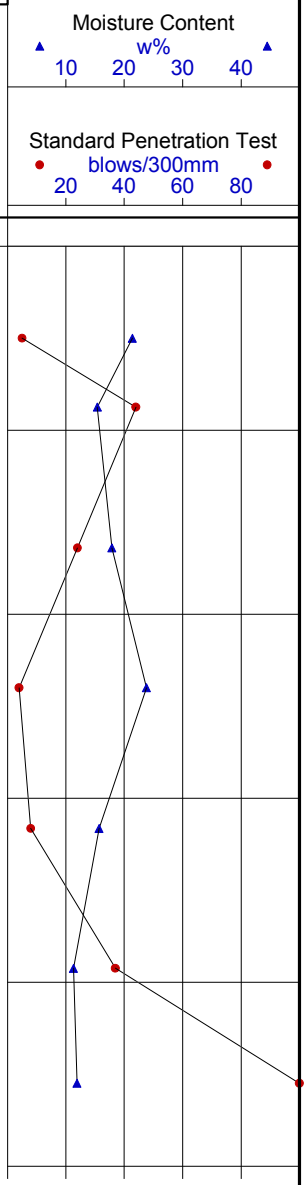
Soil-Mat

SUBSURFACE PROFILE

Depth (ft)	Depth (m)	Elevation [m]	Description
0	0	104.83	Ground Surface
			Topsoil — Approximately 200 millimetres
4		103.53	**Silty Sand** — Brown, with some gravel, trace clay, possibe fill, saturated, loose
6	2		**Silty Clay** — Brown to grey, trace gravel and shale fragments, weathered, hard to very stiff
14	4	100.83	**Silty Clay** — Grey, trace fine gravel, 'wet', soft to firm
22	6	97.83	**Silty Clay Till** — Grey, trace to some fine gravel and shale fragments, hard
28	8	96.03	
30		95.63	**Queenston Shale** — Red, severely weathered, occasional more resistant grey layers, hard
32	10		End of Borehole

SAMPLE

Type	Number	Blow Counts	Blows/300mm	Recovery	PP (kgf/cm2)	U.Wt.(kN/m3)
SS	1	4,1,4 Wet Spoon	5			
SS	2	14,20,24 Wet Spoon	44			
SS	3	5,10,14 Wet Spoon	24			
SS	4	2,2,2 Wet Spoon	4			
SS	5	2,3,5 Wet Spoon	8			
SS	6	7,15,22 Wet Spoon	37			
SS	7	50/75mm Wet Spoon	100+			



NOTES:

1. Borehole advanced using solid stem continuous flight auger equipment on January 21, 2011 to termination at a depth of 9.2 metres.
2. Free groundwater at a depth of 1 metre on completion and borehole backfilled as per Ontario Regulation 903.
3. Soil samples will be discarded after three months unless otherwise directed by our client.

Drill Method: Solid Stem Auger

Drill Date: January 21, 2011

Hole Size: 150mm

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Sheet: 1 of 1

Project No: SM 114018-G

Project: 403 & King Road

Location: Burlington, Ontario

Client: Paletta International Corporation

Log of Borehole No. 6 [2011]

Borehole Location: See Drawing No. 1

Project Manager: Ian Shaw, P. Eng.

Soil-Mat

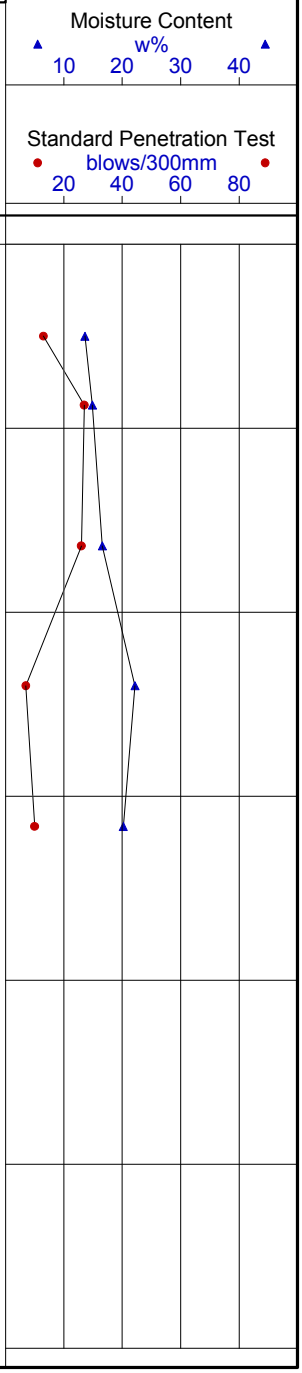
SUBSURFACE PROFILE

Depth (ft)	Depth (m)	Elevation [m]	Description
0	0	103.25	Ground Surface
			Topsoil Approximately 100 millimetres
		101.85	**Silty Clay Fill** Brown, with gravel, occasional medium to coarse grained sand, stiff
	2		**Silty Clay** Brown to grey, trace to some fine gravel and shale fragments, weathered, very stiff
	4	99.25	**Silty Clay** Grey, trace fine gravel and shale fragments, 'wet', firm
	6	96.75	End of Borehole
	8		
	10		

NOTES:
1. Borehole advanced using solid stem continuous flight auger equipment on January 21, 2011 to termination at a depth of 6.5 metres.
2. Borehole dry on completion backfilled as per Ontario Regulation 903.
3. Soil samples will be discarded after three months unless otherwise directed by our client.

SAMPLE

Type	Number	Blow Counts	Blows/300mm	Recovery	PP (kgf/cm2)	U.Wt.(kN/m3)
SS	1	6,6,7	13			
SS	2	7,12,15	27			
SS	3	7,11,15	26			
SS	4	3,3,4	7			
SS	5	3,4,6	10			



Drill Method: Solid Stem Auger

Drill Date: January 21, 2011

Hole Size: 150mm

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Sheet: 1 of 1

Project No: SM 114018-G

Project: 403 & King Road

Location: Burlington, Ontario

Client: Paletta International Corporation

Log of Borehole No. 7 [2011]

Borehole Location: See Drawing No. 1

Project Manager: Ian Shaw, P. Eng.

Soil-Mat

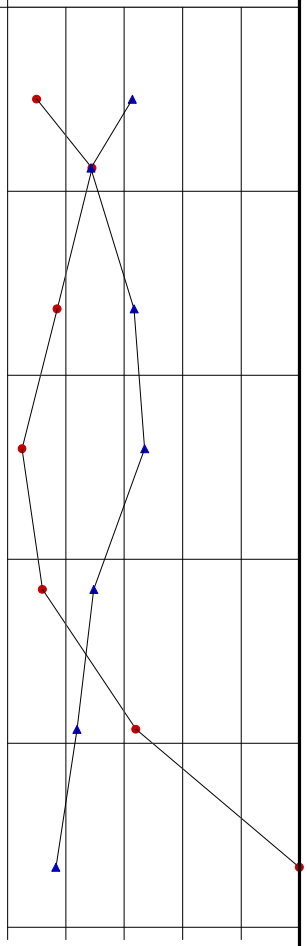
SUBSURFACE PROFILE

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)
		102.88		Ground Surface								
0	0			**Silty Clay** Brownish red, some fine gravel, possible fill, stiff								
4		101.58				SS	1	2,4,6	10			
6	2			**Silty Clay** Brown to grey, trace to some fine gravel, weathered, very stiff		SS	2	11,14,15	29			
10						SS	3	7,8,9	17			
12		98.88										
14	4			**Silty Clay** Grey, trace fine gravel, 'wet', soft to stiff		SS	4	2,2,3	5			
18												
20	6					SS	5	5,5,7	12			
22		96.18										
24				**Silty Clay Till** Grey, trace to some fine gravel and shale fragments, hard								
26	8					SS	6	8,16,28	44			
28												
30		93.33				SS	7	17,32, 50/100mm	100+			
32	10			End of Borehole								
34												
36												
38												

Moisture Content
w%
10 20 30 40

Standard Penetration Test
blows/300mm
20 40 60 80



NOTES:
1. Borehole advanced using solid stem continuous flight auger equipment on January 21, 2011 to termination at a depth of 9.55 metres.
2. Borehole dry on completion and backfilled as per Ontario Regulation 903.
3. Soil samples will be discarded after three months unless otherwise directed by our client.

Drill Method: Solid Stem Auger

Drill Date: January 21, 2011

Hole Size: 150mm

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Sheet: 1 of 1

Project No: SM 114018-G

Project: 403 & King Road

Location: Burlington, Ontario

Client: Paletta International Corporation

Log of Borehole No. 8 [2011]

Borehole Location: See Drawing No. 1

Project Manager: Ian Shaw, P. Eng.

Soil-Mat

SUBSURFACE PROFILE

Depth (ft)	Depth (m)	Elevation [m]	Description
0	0	103.42	Ground Surface
			Topsoil Approximately 150 millimetres
			Silty Clay Reddish brown to brown to grey, trace to some fine gravel, weathered, very stiff
		99.42	
			Silty Clay Till Grey, trace to some fine gravel and shale fragments, very stiff to hard
		96.92	
			End of Borehole

NOTES:
1. Borehole advanced using solid stem continuous flight auger equipment on January 21, 2011 to termination at a depth of 6.5 metres.

2. Free groundwater at a depth of 5.5 metres on completion and borehole backfilled as per Ontario Regulation 903.

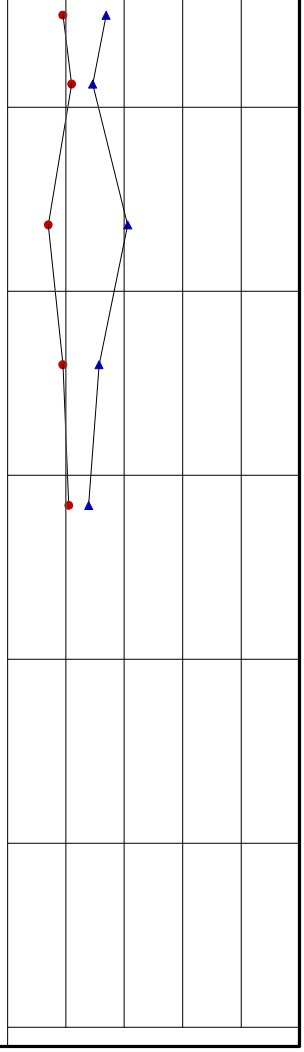
3. Soil samples will be discarded after three months unless otherwise directed by our client.

SAMPLE

Type	Number	Blow Counts	Blows/300mm	Recovery	PP (kgf/cm2)	U.Wt.(kN/m3)
SS	1	7,9,10	19			
SS	2	4,8,14	22			
SS	3	4,6,8 Wet Spoon	14			
SS	4	6,7,12 Wet Spoon	19			
SS	5	5,8,13 Wet Spoon	21			

Moisture Content w% 10 20 30 40

Standard Penetration Test blows/300mm 20 40 60 80



Drill Method: Solid Stem Auger

Drill Date: January 21, 2011

Hole Size: 150mm

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Sheet: 1 of 1

Project No: SM 135134-G

Project: 1200 King Road

Location: Burlington, Ontario

Client: Penta Properties Inc.

Log of Borehole No. 1

Project Manager: SR Sears, P. Eng.

Borehole Location: See Drawing No. 1

: ::

Soil-Mat

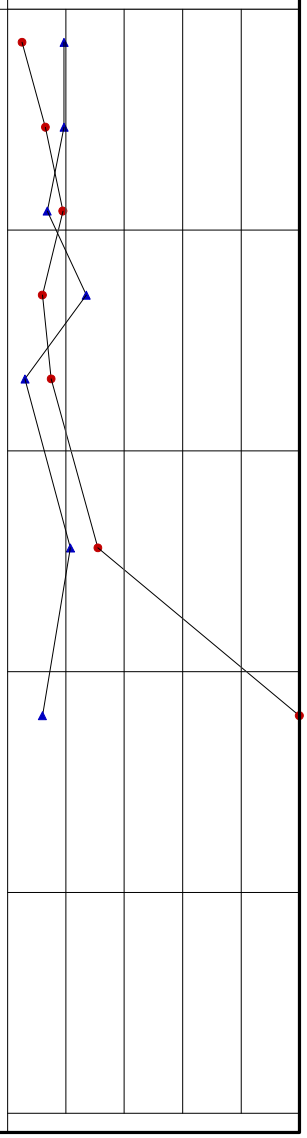
SUBSURFACE PROFILE

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)
0	0	104.49		Ground Surface								
0	0			**Topsoil** Approximately 50 millimetres over		SS	1	1,2,3,4	5			
2						SS	2	4,6,7,7	13			
6	2					SS	3	5,8,11,13	19		>4.5	
8						SS	4	3,4,8,8	12		>4.5	
10				**Silty Clay** Reddish brown to greyish brown below 1.5m depth level, mottled and weathered in some layers,with traces of to some, fine to medium Gravel and shale fragments, firm to hard		SS	5	4,6,9,14	15		>4.5	
12	4											
16						SS	6	8,12,19,25	31		>4.5	
18												
20	6					SS	7	13,50/2"	100		>4.5	
22		97.78		End of Borehole								
24				NOTES: 1. Borehole was advanced using solid stem auger equipment on July 4, 2013 to termination at a depth of 6.7 metres. 2. Borehole was recorded as 'wet' at a depth of 1.8 metres 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.								
26	8											
28												
30												
32												

Moisture Content
w%
10 20 30 40

Standard Penetration Test
blows/300mm
20 40 60 80



Drill Method: Solid Stem Augers

Drill Date: July 4, 2013

Hole Size: 150 mm

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Datum: Geodetic

Checked by: SRS

Sheet: 1 of 1

Project No: SM 135134-G

Project: 1200 King Road

Location: Burlington, Ontario

Client: Penta Properties Inc.

Log of Borehole No. 2

Project Manager: SR Sears, P. Eng.

Borehole Location: See Drawing No. 1

: ::

Soil-Mat

SUBSURFACE PROFILE

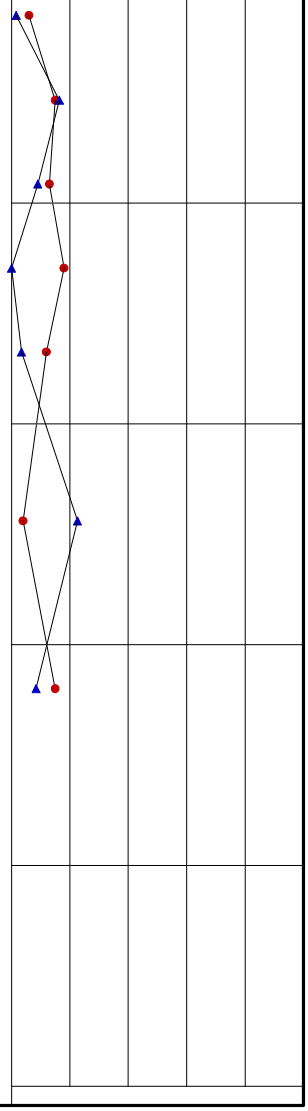
Depth (ft)	Depth (m)	Elevation [m]	Description
0	0	104.38	Ground Surface
0	0		**Topsoil** Approximately 75 millimetres over
2			
4			
6	2		
8			
10			**Silty Clay** Reddish brown to greyish brown below 2 metre depth level, mottled and weathered in upper levels, with occasional red sand seams in the lower levels, traces of fine to medium Gravel and shale fragments, firm to very stiff
12	4		
14			
16			
18			
20	6		
22		97.67	End of Borehole
24			NOTES: 1. Borehole was advanced using solid stem auger equipment on July 4, 2013 to termination at a depth of 6.7 metres. 2. Borehole was recorded as 'wet' at a depth of 4.3 metres 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.
26	8		
28			
30			
32			

SAMPLE

Type	Number	Blow Counts	Blows/300mm	Recovery	PP (kgf/cm2)	U.Wt.(kN/m3)
SS	1	2,2,4,6	6			
SS	2	6,7,8,10	15		>4.5	
SS	3	2,3,10,17	13		>4.5	
SS	4	7,8,10,12	18		>4.5	
SS	5	3,5,7,8	12		3.0	
SS	6	1,2,2,3	4			
SS	7	3,6,9,14	15		3.5	

Moisture Content w% 10 20 30 40

Standard Penetration Test blows/300mm 20 40 60 80



Drill Method: Solid Stem Augers

Drill Date: July 4, 2013

Hole Size: 150 mm

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Sheet: 1 of 1

Project No: SM 135134-G

Project: 1200 King Road

Location: Burlington, Ontario

Client: Penta Properties Inc.

Log of Borehole No. 3

Project Manager: SR Sears, P. Eng.

Borehole Location: See Drawing No. 1

: ::

Soil-Mat

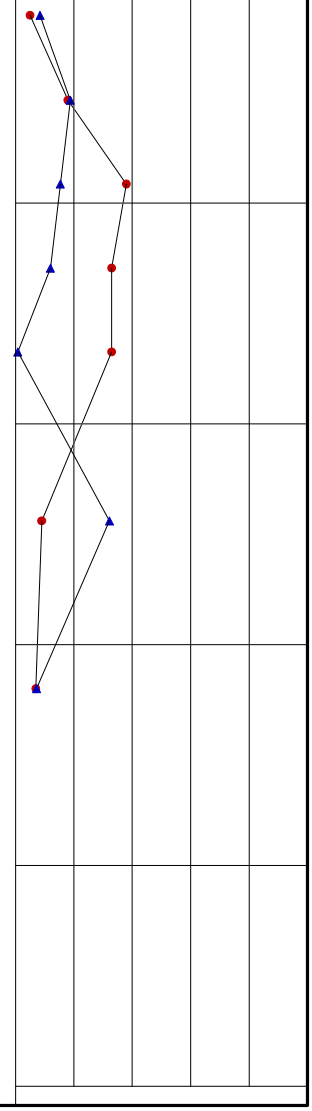
SUBSURFACE PROFILE

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)
		107.36		Ground Surface								
0	0			**Topsoil** Approximately 75 millimetres over		SS	1	2,2,2,3	5			
2		106.45		**Sand** Reddish brown, medium to coarse in gradation, with traces of to some Silt and traces of fine to medium Gravel, loose to compact		SS	2	8,8,10,13	18		>4.5	
4						SS	3	11,17,21, 28	38		>4.5	
6	2					SS	4	9,14,19,25	33		>4.5	
8						SS	5	7,14,19,25	33		>4.5	
10												
12	4			**Silty Clay** Brown to grey below 5.5 metre depth level, with traces of fine to coarse Gravel and shale fragments, hard to firm		SS	6	3,3,6,7	9		3.75	
14												
16						SS	7	2,3,4,4	7			
18	6											
20												
22		100.65		End of Borehole								
24				NOTES: 1. Borehole was advanced using solid stem auger equipment on July 4, 2013 to termination at a depth of 6.7 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.								
26	8											
28												
30												
32												

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

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



Drill Method: Solid Stem Augers

Drill Date: July 4, 2013

Hole Size: 150 mm

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Sheet: 1 of 1

Project No: SM 135134-G

Project: 1200 King Road

Location: Burlington, Ontario

Client: Penta Properties Inc.

Log of Borehole No. 4

Project Manager: SR Sears, P. Eng.

Borehole Location: See Drawing No. 1

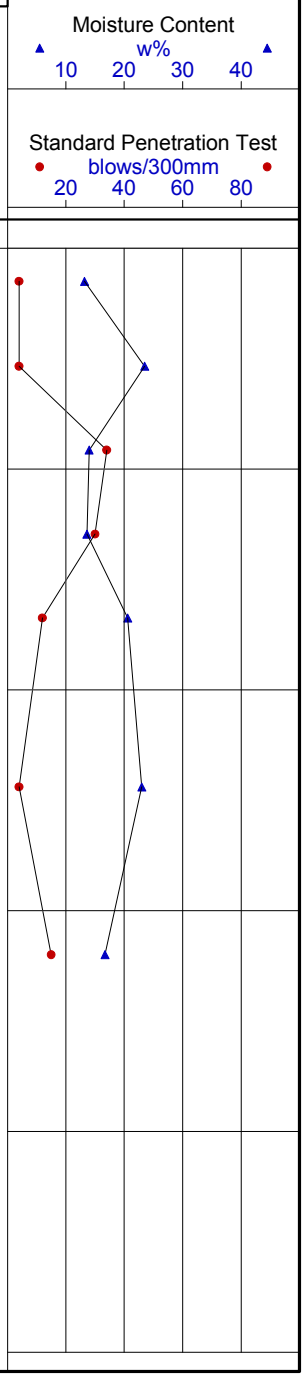
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Soil-Mat

SUBSURFACE PROFILE

SAMPLE

Depth (ft)	Depth (m)	Elevation [m]	Description	Well Data	Type	Number	Blow Counts	Blows/300mm	Recovery	PP (kgf/cm2)	U.Wt.(kN/m3)
0	0	104.37	Ground Surface								
0	0		**Topsoil** Approximately 75 millimetres over		SS	1	1,2,2,2	4			
2		103.40	**Sand** Reddish brown, medium to coarse in gradation, with traces of to some Silt and traces of fine to medium Gravel, loose to very loose		SS	2	1,2,2,8	4		>4.5	
6	2				SS	3	11,15,19, 24	34		>4.5	
8					SS	4	9,13,17,19	30		>4.5	
10					SS	5	3,5,7,9	12		4.0	
12	4		**Silty Clay** Brown to grey below 4 metre depth level, mottled and weathered in upper levels, with traces of fine to medium Gravel and shale fragments, hard to firm								
16					AS	6	2,2,2,3	4			
20	6				SS	7	3,6,9,12	15		2.5	
22		97.66	End of Borehole								
24			NOTES: 1. Borehole was advanced using solid stem auger equipment on July 4, 2013 to termination at a depth of 6.7 metres.								
26	8		2. Borehole was recorded as 'dry' upon completion of drilling and backfilled as per Ontario Regulation 903.								
28			3. Soil samples will be discarded after 3 months unless otherwise directed by our client.								
30											
32											



Drill Method: Solid Stem Augers

Drill Date: July 4, 2013

Hole Size: 150 mm

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Sheet: 1 of 1

Project No: SM 135134-G

Project: 1200 King Road

Location: Burlington, Ontario

Client: Penta Properties Inc.

Log of Borehole No. 5

Project Manager: SR Sears, P. Eng.

Borehole Location: See Drawing No. 1

: ::

Soil-Mat

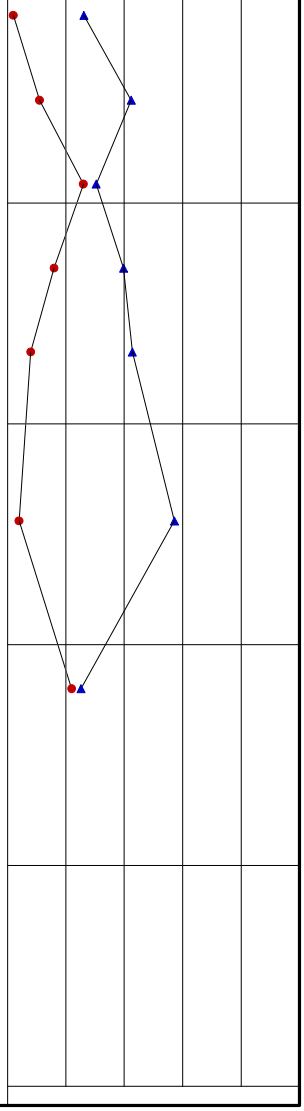
SUBSURFACE PROFILE

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)
		104.01		Ground Surface								
0	0			**Topsoil** Approximately 75 millimetres over								
2		103.04		**Sand** Reddish brown, medium to coarse in gradation, with traces of to some Silt, very loose to loose		SS	1	1,1,1,1	2			
4						SS	2	3,4,7,7	11		>4.5	
6	2					SS	3	8,12,14,17	26		>4.5	
8						SS	4	4,7,9,11	16		>4.5	
10						SS	5	2,3,5,7	8		3.0	
12	4			**Silty Clay** Brown to grey below 3 metre depth level, with mottling and weathering in upper levels, with traces of fine to medium Gravel and shale fragments, very stiff to firm								
14												
16						SS	6	1,2,2,3	4			
18												
20	6					SS	7	8,8,14,16	22		>4.5	
22		97.30		End of Borehole								
24				NOTES: 1. Borehole was advanced using solid stem auger equipment on July 4, 2013 to termination at a depth of 6.7 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.								
26	8											
28												
30												
32												

Moisture Content w% 10 20 30 40

Standard Penetration Test blows/300mm 20 40 60 80



Drill Method: Solid Stem Augers

Drill Date: July 4, 2013

Hole Size: 150 mm

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Sheet: 1 of 1

Project No: SM 135134-G

Project: 1200 King Road

Location: Burlington, Ontario

Client: Penta Properties Inc.

Log of Borehole No. 6

Project Manager: SR Sears, P. Eng.

Borehole Location: See Drawing No. 1

: 593484.00m E **::** 4797000.00m N

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)
		111.19		Ground Surface								
0	0			**Topsoil** Approximately 175 millimetres over		SS	1		-			
2		110.22		**Sand** Brown, fine to medium in gradation, with traces of, to some, Silt, traces of fine to medium Gravel.		SS	2		-			
4		109.67				SS	3		-			
6	2			**Silty Clay** Reddish brown, with traces of, to some, fine to coarse Gravel, trace of organic.								
8				End of Borehole								
10												
12	4											
14												
16												
18												
20	6											
22												
24												
26	8											
28												
30												
32												

Moisture Content
w%
10 20 30 40

Standard Penetration Test
blows/300mm
20 40 60 80

NOTES:
1. Borehole was advanced using Pionjar-driven percussion drill equipment on September 20, 2013 to refusal at a depth of 1.5 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: Pionjar

Drill Date: Sept. 20, 2013

Hole Size: 25mm

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Sheet: 1 of 1

Project No: SM 135134-G

Project: 1200 King Road

Location: Burlington, Ontario

Client: Penta Properties Inc.

Log of Borehole No. 7

Project Manager: SR Sears, P. Eng.

Borehole Location: See Drawing No. 1

: 593331.00m E **::** 4796811.00m N

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)
		111.84		Ground Surface								
0	0			***Topsoil*** Approximately 200 millimetres over		SS	1		-			
2				***Sand Fill*** Brown, 'reworked' in appearance, fine to medium in gradation, with traces of, to some, Silt and fine to coarse Gravel, occasional rootlets.		SS	2		-			
4		110.64				SS	3		-			
6	2	110.16		***Silty Clay*** Reddish brown, traces of, to some, fine to coarse Gravel, traces of Shale fragments.								
8				End of Borehole								
10												
12	4											
14												
16												
18												
20	6											
22												
24												
26	8											
28												
30												
32												

Moisture Content w% 10 20 30 40

Standard Penetration Test blows/300mm 20 40 60 80

NOTES:
1. Borehole was advanced using Pionjar-driven percussion drill equipment on September 20, 2013 to refusal at a depth of 1.7 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: Pionjar

Drill Date: Sept. 20, 2013

Hole Size: 25mm

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Sheet: 1 of 1

Project No: SM 135134-G

Project: 1200 King Road

Location: Burlington, Ontario

Client: Penta Properties Inc.

Log of Borehole No. 8

Project Manager: SR Sears, P. Eng.

Borehole Location: See Drawing No. 1

: 593170.00m E **::** 4796716.00m N

Soil-Mat

SUBSURFACE PROFILE

Depth ft	Depth m	Elevation [m]	Description
0	0	109.36	Ground Surface
0	0	109.06	**Topsoil** Approximately 125 millimetres over
2			**Clayey Silt** Red, with occasional rootlets and organic staining.
6	2	107.36	**Clayey Sand** Reddish brown, medium to coarse in gradation, with traces of fine to coarse Gravel.
			End of Borehole

NOTES:
1. Borehole was advanced using Pionjar-driven percussion drill equipment on September 20, 2013 to refusal at a depth of 2.0 metres.

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

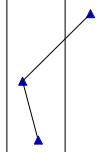
3. Soil samples will be discarded after 3 months unless otherwise directed by our client.

SAMPLE

Type	Number	Blow Counts	Blows/300mm	Recovery	PP (kgf/cm2)	U.Wt.(kN/m3)
SS	1		-			
SS	2		-			
SS	3		-			
SS	4		-			

Moisture Content w% 10 20 30 40

Standard Penetration Test blows/300mm 20 40 60 80



Drill Method: Pionjar

Drill Date: Sept. 20, 2013

Hole Size: 25mm

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Sheet: 1 of 1

Project No: SM 135134-G

Project: 1200 King Road

Location: Burlington, Ontario

Client: Penta Properties Inc.

Log of Borehole No. 9

Project Manager: SR Sears, P. Eng.

Borehole Location: See Drawing No. 1

: 593089.00m E **::** 4796530.00m N

Soil-Mat

SUBSURFACE PROFILE

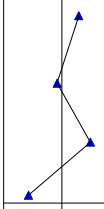
Depth (ft)	Depth (m)	Elevation [m]	Symbol	Description	Well Data
0	0	107.63		Ground Surface	
				Topsoil Approximately 125 millimetres over	
2				**Clayey Sand Fill** Brown, fine to medium in gradation, with traces of Silt and fine to coarse Gravel, rootlets in the upper level.	
6	2	105.63		End of Borehole	
8					
10				NOTES: 1. Borehole was advanced using Pionjar-driven percussion drill equipment on September 20, 2013 to refusal at a depth of 2.0 metres.	
12	4			2. Borehole was recorded as 'dry' upon completion of drilling and backfilled as per Ontario Regulation 903.	
14					
16				3. Soil samples will be discarded after 3 months unless otherwise directed by our client.	
18					
20	6				
22					
24					
26	8				
28					
30					
32					

SAMPLE

Type	Number	Blow Counts	Blows/300mm	Recovery	PP (kgf/cm2)	U.Wt.(kN/m3)
SS	1		-			
SS	2		-			
SS	3		-			
SS	4		-			

Moisture Content
w%
10 20 30 40

Standard Penetration Test
blows/300mm
20 40 60 80



Drill Method: Pionjar

Drill Date: Sept. 20, 2013

Hole Size: 25mm

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Sheet: 1 of 1

Project No: SM 135134-G

Project: 1200 King Road

Location: Burlington, Ontario

Client: Penta Properties Inc.

Log of Borehole No. 10

Project Manager: SR Sears, P. Eng.

Borehole Location: See Drawing No. 1

: 592989.00m E **::** 4796500.00m N

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)
		109.56		Ground Surface								
0	0			***Topsoil*** Approximately 150 millimetres over ***Sand Fill*** Brown, fine to coarse in gradation, with traces of fine to medium Gravel.		SS	1		-			
2						SS	2		-			
4						SS	3		-			
		107.76		End of Borehole								
6	2											
8												
10												
12	4											
14												
16												
18												
20	6											
22												
24												
26	8											
28												
30												
32												

Moisture Content w% 10 20 30 40

Standard Penetration Test blows/300mm 20 40 60 80

NOTES:
1. Borehole was advanced using Pionjar-driven percussion drill equipment on September 20, 2013 to refusal at a depth of 1.8 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: Pionjar

Drill Date: Sept. 20, 2013

Hole Size: 25mm

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Sheet: 1 of 1

Appendix 5

DS Consultants Ltd. Geotechnical Borehole/Monitoring Well Logs (2024)

DS CONSULTANTS LTD.
Geotechnical ◆ Environmental ◆ Materials ◆ Hydrogeology

LOG OF BOREHOLE BH24-7

PROJECT: Preliminary Geotechnical Investigation
CLIENT: Alinea Land Corporation
PROJECT LOCATION: 1200 King Road, Burlington, ON
DATUM: Geodetic
BH LOCATION: See Drawing 1 N 4797296.61 E 593460

DRILLING DATA
Method: Hollow Stem Auger/Mud Rotary
Diameter: 200mm
Date: Feb-22-2024

REF. NO.: 23-487-602
ENCL NO.: 2

(m) ELEV / DEPTH	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	"N" BLOWS/0.3 m	GROUND WATER CONDITIONS	ELEVATION
113.3							
0.0	**FILL:** silty clay to clayey silt, trace rootlets, trace brick pieces, reddish brown, moist, stiff trace slag-like & clay tile like pieces at 0.15m		1	SS	8		113
			2	SS	9		112
111.8							
1.5	**CLAYEY SILT TO SILTY CLAY:** trace sand, trace gravel, reddish brown, moist, stiff		3	SS	10		
			4	SS	8	▽ W. L. 111.0 m Mar 05, 2024	111
			5	SS	10		110
	trace black organic alluvial material at 4.8m		6	SS	10		109
107.3							108
6.0	**SILTY CLAY TILL:** trace to some sand, trace gravel, trace cobble/boulders, grey, moist, very stiff to hard		7	SS	23		107
			8	SS	37		106
							105

DYNAMIC CONE PENETRATION RESISTANCE PLOT
20 40 60 80 100

SHEAR STRENGTH (kPa)
○ UNCONFINED + FIELD VANE & Sensitivity
● QUICK TRIAXIAL × LAB VANE
20 40 60 80 100

PLASTIC LIMIT w_P | NATURAL MOISTURE CONTENT w | LIQUID LIMIT w_L
WATER CONTENT (%)
10 20 30

POCKET PEN. (Cu) (kPa)

NATURAL UNIT WT (kN/m³)

REMARKS AND GRAIN SIZE DISTRIBUTION (%)
GR SA SI CL

Continued Next Page

GROUNDWATER ELEVATIONS
Measurement 1st ▽ 2nd ▼ 3rd ▼ 4th ▼

GRAPH NOTES
+ 3, × 3: Numbers refer to Sensitivity
○ ε=3% Strain at Failure

DS SOIL LOG-2021-FINAL 23-487-602.GPJ DS.GDT 24-3-12

LOG OF BOREHOLE BH24-7

PROJECT: Preliminary Geotechnical Investigation
CLIENT: Alinea Land Corporation
PROJECT LOCATION: 1200 King Road, Burlington, ON
DATUM: Geodetic
BH LOCATION: See Drawing 1 N 4797296.61 E 593460

DRILLING DATA
Method: Hollow Stem Auger/Mud Rotary
Diameter: 200mm
Date: Feb-22-2024

REF. NO.: 23-487-602
ENCL NO.: 2

ELEV / DEPTH (m)	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	BLOWS / 0.3 m "N"	GROUND WATER CONDITIONS	ELEVATION	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH (kPa) ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE & Sensitivity × LAB VANE (20 40 60 80 100)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L / WATER CONTENT (%) (10 20 30)	POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (kN/m³)	REMARKS AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
	SILTY CLAY TILL: trace to some sand, trace gravel, trace cobble/boulders, grey, moist, very stiff to hard(Continued)		9	SS	20		104					6 16 51 27
102.8							103					
10.5	**SANDY SILT TILL:** trace clay, trace gravel, trace cobble fragment, reddish brown, moist, very dense		10	SS	50/ 50mm		102					
101.3												
12.0	**CLAYEY SILT TILL/SHALE COMPLEX:** trace sand, trace		11	SS	50/ 100mm		101					
101.0												
12.3	weathered shale pieces, trace gravel, reddish brown, moist, hard		R1	RC								
100.7	**SHALE BEDROCK:** Queenstion Formation, reddish brown, weathered		R2	RC								
12.6												
100.3	Limestone zone											
13.0	TCR=100%, SCR=50%, RQD=0% Hard layers=100%, Maximum hard layer thickness=250mm		R3	RC			100					
99.7	TCR=0%, SCR=0%, RQD=0% Hard layers=0%, Maximum hard											
99.6	layer thickness=0mm		R4	RC								
13.7	no recovery											
14	TCR=0%, SCR=0%, RQD=0% Hard layers=25%, Maximum hard		R5	RC								
99.1	layer thickness=0mm											
14.2	weathered shale with fractured limestone zone						99					
	TCR=100%, SCR=75%, RQD=0% Hard layers=0%, Maximum hard layer thickness=0mm		R6	RC								
15	TCR=23%, SCR=23%, RQD=0% Hard layers=28%, Maximum hard layer thickness=100mm (Limestone zone)											
97.8	TCR=100%, SCR=98%, RQD=82%						98					
15.5	Hard layers=2%, Maximum hard layer thickness=25mm											
	END OF BOREHOLE:											

Notes:
1) 50mm dia. monitoring well installed upon completion.
2) Water Level Readings:

Date:	Water Level(mbgl):
Mar. 5, 2024	2.3

GROUNDWATER ELEVATIONS
Measurement 1st 2nd 3rd 4th

GRAPH NOTES: +3, ×3: Numbers refer to Sensitivity; ○ ε=3% Strain at Failure

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LOG OF BOREHOLE BH24-8

PROJECT: Preliminary Geotechnical Investigation
CLIENT: Alinea Land Corporation
PROJECT LOCATION: 1200 King Road, Burlington, ON
DATUM: Geodetic
BH LOCATION: See Drawing 1 N 4797123.47 E 593652.88

DRILLING DATA
Method: Hollow Stem Auger/Mud Rotary
Diameter: 200mm
Date: Feb-14-2024

REF. NO.: 23-487-602
ENCL NO.: 3

ELEV / DEPTH (m)	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	BLOWS / 0.3 m "N"	GROUND WATER CONDITIONS	ELEVATION	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH (kPa) ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE & Sensitivity × LAB VANE (20 40 60 80 100)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L / WATER CONTENT (%) (10 20 30)	POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (kN/m³)	REMARKS AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
104.4												
104.2 / 0.2	**TOPSOIL:** 200mm											
0.2 / 103.6	**SILTY SAND:** trace clay, trace gravel, reddish brown, wet, loose		1	SS	7		104					
0.8 / 102.5	**SAND AND GRAVEL TO GRAVELLY SAND:** trace silt, trace clay, brown to reddish brown, wet, compact		2	SS	29		103					
			3	SS	14							
1.9	**SILTY CLAY TILL:** some sand, trace gravel, brown to grey, moist, stiff to hard trace weathered shale fragments at 2.3m grey below 2.6m		4	SS	22		102					
			5	SS	32		101					2 10 46 42
			6	SS	12		100					
			7	SS	15		99					
			8	SS	27		98					3 19 49 29
95.2							97					
9.2 / 93.6	**SANDY SILT TILL:** some clay, trace gravel, trace shale fragments, reddish brown, moist, very dense		9	SS	50/ 5mm		96					
							95					
			10	SS	50/ 5mm		94					
10.8	**SANDY SILT TILL/SHALE COMPLEX:** some clay, frequent weathred shale fragments, reddish brown, moist, very dense						93					

Continued Next Page

GROUNDWATER ELEVATIONS
Measurement 1st 2nd 3rd 4th

GRAPH NOTES: $+^3$, $\times^3$: Numbers refer to Sensitivity; ○ ε=3% Strain at Failure

DS SOIL LOG-2021-FINAL 23-487-602.GPJ DS.GDT 24-3-12

LOG OF BOREHOLE BH24-8

PROJECT: Preliminary Geotechnical Investigation
CLIENT: Alinea Land Corporation
PROJECT LOCATION: 1200 King Road, Burlington, ON
DATUM: Geodetic
BH LOCATION: See Drawing 1 N 4797123.47 E 593652.88

DRILLING DATA
Method: Hollow Stem Auger/Mud Rotary
Diameter: 200mm
Date: Feb-14-2024

REF. NO.: 23-487-602
ENCL NO.: 3

(m) ELEV / DEPTH	DESCRIPTION	STRATA PLOT	SAMPLES: NUMBER	TYPE	BLOWS/0.3 m "N"	GROUND WATER CONDITIONS	ELEVATION	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH (kPa): ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE & Sensitivity × LAB VANE (20 40 60 80 100)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L — WATER CONTENT (%) (10 20 30)	POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (kN/m³)	REMARKS AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
	SANDY SILT TILL/SHALE COMPLEX: some clay, frequent weathred shale fragments, reddish brown, moist, very dense(Continued)		11	SS	100/130mm		92		○			
13 90.8							91					
13.6 90.0	**SHALE BEDROCK:** Queenston Formation, reddish brown, weathered		12	SS	100/75mm							
13.8 14	TCR=100%, SCR=100%, RQD=93% Hard layers=20%, Maximum hard layer thickness=50mm		R1	RC			90					
15 89.1												
15.3	TCR=100%, SCR=98%, RQD=98% Hard layers=15%, Maximum hard layer thickness=50mm		R2	RC			89					
16 87.6							88					
16.8	**END OF BOREHOLE:**											

GROUNDWATER ELEVATIONS
Measurement 1st 2nd 3rd 4th

GRAPH NOTES: $+^3$, $\times^3$: Numbers refer to Sensitivity; ○ ε=3% Strain at Failure

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LOG OF BOREHOLE BH24-13

PROJECT: Preliminary Geotechnical Investigation
CLIENT: Alinea Land Corporation
PROJECT LOCATION: 1200 King Road, Burlington, ON
DATUM: Geodetic
BH LOCATION: See Drawing 1 N 4797421.13 E 593952.02

DRILLING DATA
Method: Solid Stem Auger
Diameter: 150mm
Date: Feb-13-2024

REF. NO.: 23-487-602
ENCL NO.: 4

(m) ELEV / DEPTH	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	"N" BLOWS / 0.3 m	GROUND WATER CONDITIONS	ELEVATION	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH (kPa) ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE & Sensitivity × LAB VANE (20 40 60 80 100)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L — WATER CONTENT (%) (10 20 30)	POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (kN/m³)	REMARKS AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
103.5												
0.0 / 103.2	**TOPSOIL:** 230mm											
0.2 / 102.5	**FILL:** silty clay, trace rootlets, trace gravel, reddish brown, moist, very stiff		1	SS	15		103					
1.0	**CLAYEY SILT TO SILTY CLAY:** some sand, trace gravel, reddish brown, moist, very stiff silty sand lenses at 1.5m		2	SS	15		102					
2 / 101.2			3	SS	22							
2.3	**SILTY CLAY TILL:** some sand, trace gravel, grey, moist, firm to hard		4	SS	22		101					
3			5	SS	14		100					
4							99					
5			6	SS	6							
6							98					
7			7	SS	10		97					
8			8	SS	47		96					
9							95					
93.8			10	SS	15		94					
9.7	**END OF BOREHOLE:** Notes: 1) Borehole wet at bottom on completion of drilling.											

GROUNDWATER ELEVATIONS
Measurement 1st 2nd 3rd 4th

GRAPH NOTES
+ 3, × 3: Numbers refer to Sensitivity
○ ε=3% Strain at Failure

DS SOIL LOG-2021-FINAL 23-487-602.GPJ DS.GDT 24-3-12

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LOG OF BOREHOLE BH24-14

PROJECT: Preliminary Geotechnical Investigation
CLIENT: Alinea Land Corporation
PROJECT LOCATION: 1200 King Road, Burlington, ON
DATUM: Geodetic
BH LOCATION: See Drawing 1 N 4797689.31 E 593908.31

DRILLING DATA
Method: Solid Stem Auger
Diameter: 150mm
Date: Feb-13-2024

REF. NO.: 23-487-602
ENCL NO.: 5

ELEV / DEPTH (m)	DESCRIPTION	NUMBER	TYPE	BLOWS / 0.3 m "N"	ELEVATION
105.5					
105.4 0.0	**TOPSOIL:** 180mm				
0.2	**FILL:** silty clay, trace rootlets, trace sand, reddish brown, moist, stiff	1	SS	11	105
104.7					
0.8	**SILTY CLAY TILL:** some sand, trace gravel, reddish brown to grey, moist, very stiff to hard	2	SS	16	
1	weathered shale fragments at 1.5m	3	SS	19	104
2	grey below 2.3m	4	SS	18	103
3		5	SS	20	102
4		6	SS	15	101
5		7	SS	43	100
6					
7		8	SS	50/ 50mm	99
8					98
96.8	weathered shale inclusions at 8.5m	9	SS	50/ 25mm	97
8.7	**END OF BOREHOLE:** Notes: 1) Borehole wet at bottom on completion of drilling.				

GROUND WATER CONDITIONS

DYNAMIC CONE PENETRATION RESISTANCE PLOT
20 40 60 80 100

SHEAR STRENGTH (kPa)
○ UNCONFINED + FIELD VANE & Sensitivity
● QUICK TRIAXIAL × LAB VANE
20 40 60 80 100

PLASTIC LIMIT w_P | NATURAL MOISTURE CONTENT w | LIQUID LIMIT w_L
WATER CONTENT (%)
10 20 30

POCKET PEN. (Cu) (kPa)

NATURAL UNIT WT (kN/m³)

REMARKS AND GRAIN SIZE DISTRIBUTION (%)
GR SA SI CL

GROUNDWATER ELEVATIONS
Measurement 1st 2nd 3rd 4th

GRAPH NOTES
+3, ×3: Numbers refer to Sensitivity
○ ε=3% Strain at Failure

DS SOIL LOG-2021-FINAL 23-487-602.GPJ DS.GDT 24-3-12

DS CONSULTANTS LTD.
Geotechnical ◆ Environmental ◆ Materials ◆ Hydrogeology

LOG OF BOREHOLE BH24-16

PROJECT: Preliminary Geotechnical Investigation
CLIENT: Alinea Land Corporation
PROJECT LOCATION: 1200 King Road, Burlington, ON
DATUM: Geodetic
BH LOCATION: See Drawing 1 N 4797793.95 E 593971.77

DRILLING DATA
Method: Hollow Stem Auger/Mud Rotary
Diameter: 200mm
Date: Feb-15-2024

REF. NO.: 23-487-602
ENCL NO.: 6

ELEV / DEPTH (m)	DESCRIPTION	NUMBER	TYPE	BLOWS/0.3 m "N"	GROUND WATER CONDITIONS	ELEVATION
104.5 / 0.0	**TOPSOIL:** 200mm					
0.2 / 103.5	**FILL:** silty clay, trace rootlets, trace gravel, reddish brown and grey, moist, stiff to very stiff	1	SS	12		104
		2	SS	16	W. L. 103.6 m Mar 05, 2024	103
1.0	**SILTY CLAY:** trace sand, trace gravel, reddish brown to grey, moist, very stiff to hard	3	SS	42		
	grey below 1.8m	4	SS	17		102
		5	SS	17		101
100.0						
4.5	**SILTY CLAY TILL:** trace sand, trace gravel, trace cobble fragments, grey, moist, very stiff to hard	6	SS	29		100
		7	SS	50/75mm		99
96.8						98
7.7	**SHALE BEDROCK:** Queenston Formation, reddish brown, weathered TCR=100%, SCR=92%, RQD=58% Hard layers=15%, Maximum hard layer thickness=50mm	8	SS	50/100mm		97
		R1	RC			96
95.3						
9.2	TCR=98%, SCR=83%, RQD=57% Hard layers=17%, Maximum hard layer thickness=75mm	R2	RC			95
93.8						94
10.7	**END OF BOREHOLE:** Notes: 1) 50mm dia. monitoring well installed upon completion. 2) Water Level Readings: Date: Water Level(mbgl): Mar. 5, 2024 0.9					

DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100)
SHEAR STRENGTH (kPa) (20 40 60 80 100)
○ UNCONFINED + FIELD VANE & Sensitivity
● QUICK TRIAXIAL × LAB VANE

PLASTIC LIMIT w_P | NATURAL MOISTURE CONTENT w | LIQUID LIMIT w_L
WATER CONTENT (%) (10 20 30)

POCKET PEN. (Cu) (kPa)
NATURAL UNIT WT (kN/m³)

REMARKS AND GRAIN SIZE DISTRIBUTION (%)

GR	SA	SI	CL
2	7	46	45

GROUNDWATER ELEVATIONS
Measurement 1st ▽ 2nd ▼ 3rd ▼ 4th ▼

GRAPH NOTES: +3, ×3: Numbers refer to Sensitivity; ○ ε=3% Strain at Failure

DS SOIL LOG-2021-FINAL 23-487-602.GPJ DS.GDT 24-3-12

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LOG OF BOREHOLE BH24-17

PROJECT: Preliminary Geotechnical Investigation
CLIENT: Alinea Land Corporation
PROJECT LOCATION: 1200 King Road, Burlington, ON
DATUM: Geodetic
BH LOCATION: See Drawing 1 N 4797641.88 E 594114.42

DRILLING DATA
Method: Solid Stem/Mud Rotary
Diameter: 150mm
Date: Feb-17-2024

REF. NO.: 23-487-602
ENCL NO.: 7

(m) ELEV / DEPTH	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	BLOWS / 0.3 m "N"	GROUND WATER CONDITIONS	ELEVATION
103.8							
0.0	**POSSIBLE FILL:** silty clay to clayey silt, trace rootlets, trace topsoil, black organic stain, reddish brown, moist, firm		1	SS	7		
102.9							103
1 0.9	**POSSIBLE FILL:** silty sand, trace rootlets, reddish brown, moist, compact		2	SS	11		
102.3							
1.5	**CLAYEY SILT TO SILTY CLAY:** trace sand, trace gravel, brown to greyish brown, moist, very stiff silty sand seam at 1.9m		3	SS	18	▽	102
2			4	SS	21	W. L. 101.6 m Mar 05, 2024	
3			5	SS	24		101
4			6	SS	15		100
5							99
6 97.8							
6.0	**SILTY CLAY TILL:** some sand to sandy, trace gravel, trace cobble/boulders, grey, moist, very stiff to hard		7	SS	17		98
7							
8			8	SS	34		97
9			9	SS	64		96
10							95
93.1							94
10.7	**GRAVEL AND BOULDERS:** with silty clay inclusions		10	SS	50/ 130mm		93
11 92.5							
11.3 92.2	**SHALE BEDROCK:** Queenston formation, reddish brown, weathered		R1	RC			92
11.6 12	TCR=16%, SCR=16%, RQD=0%						

Continued Next Page

DYNAMIC CONE PENETRATION RESISTANCE PLOT
20 40 60 80 100

SHEAR STRENGTH (kPa)
○ UNCONFINED + FIELD VANE & Sensitivity
● QUICK TRIAXIAL × LAB VANE
20 40 60 80 100

PLASTIC LIMIT w_P | NATURAL MOISTURE CONTENT w | LIQUID LIMIT w_L
WATER CONTENT (%)
10 20 30

POCKET PEN. (Cu) (kPa)

NATURAL UNIT WT (kN/m³)

REMARKS AND GRAIN SIZE DISTRIBUTION (%)

GR	SA	SI	CL
5	21	47	27

GROUNDWATER ELEVATIONS
Measurement 1st ▽ 2nd ▼ 3rd ▼ 4th ▼

GRAPH NOTES
+ 3, × 3: Numbers refer to Sensitivity
○ ε=3% Strain at Failure

LOG OF BOREHOLE BH24-17

PROJECT: Preliminary Geotechnical Investigation
CLIENT: Alinea Land Corporation
PROJECT LOCATION: 1200 King Road, Burlington, ON
DATUM: Geodetic
BH LOCATION: See Drawing 1 N 4797641.88 E 594114.42

DRILLING DATA
Method: Solid Stem/Mud Rotary
Diameter: 150mm
Date: Feb-17-2024

REF. NO.: 23-487-602
ENCL NO.: 7

(m) ELEV / DEPTH	DESCRIPTION	STRATA PLOT	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: "N" BLOWS/0.3 m	GROUND WATER CONDITIONS	ELEVATION	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH (kPa): ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE & Sensitivity × LAB VANE (20 40 60 80 100)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L / WATER CONTENT (%) (10 20 30)	POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (kN/m³)	REMARKS AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
91.4	Hard layers=1%, Maximum hard layer thickness=10mm		R2	RC								
12.4	TCR=46%, SCR=46%, RQD=31% Hard layers=15%, Maximum hard layer thickness=50mm(Continued)						91					
13	TCR=100%, SCR=56%, RQD=52% Hard layers=6%, Maximum hard layer thickness=50mm		R3	RC								
89.9							90					
13.9	**END OF BOREHOLE:** Notes: 1) 50mm dia. monitoring well installed during drilling. 2) Water Level Readings: Date: Water Level(mbgl): Mar. 5, 2024 2.2											

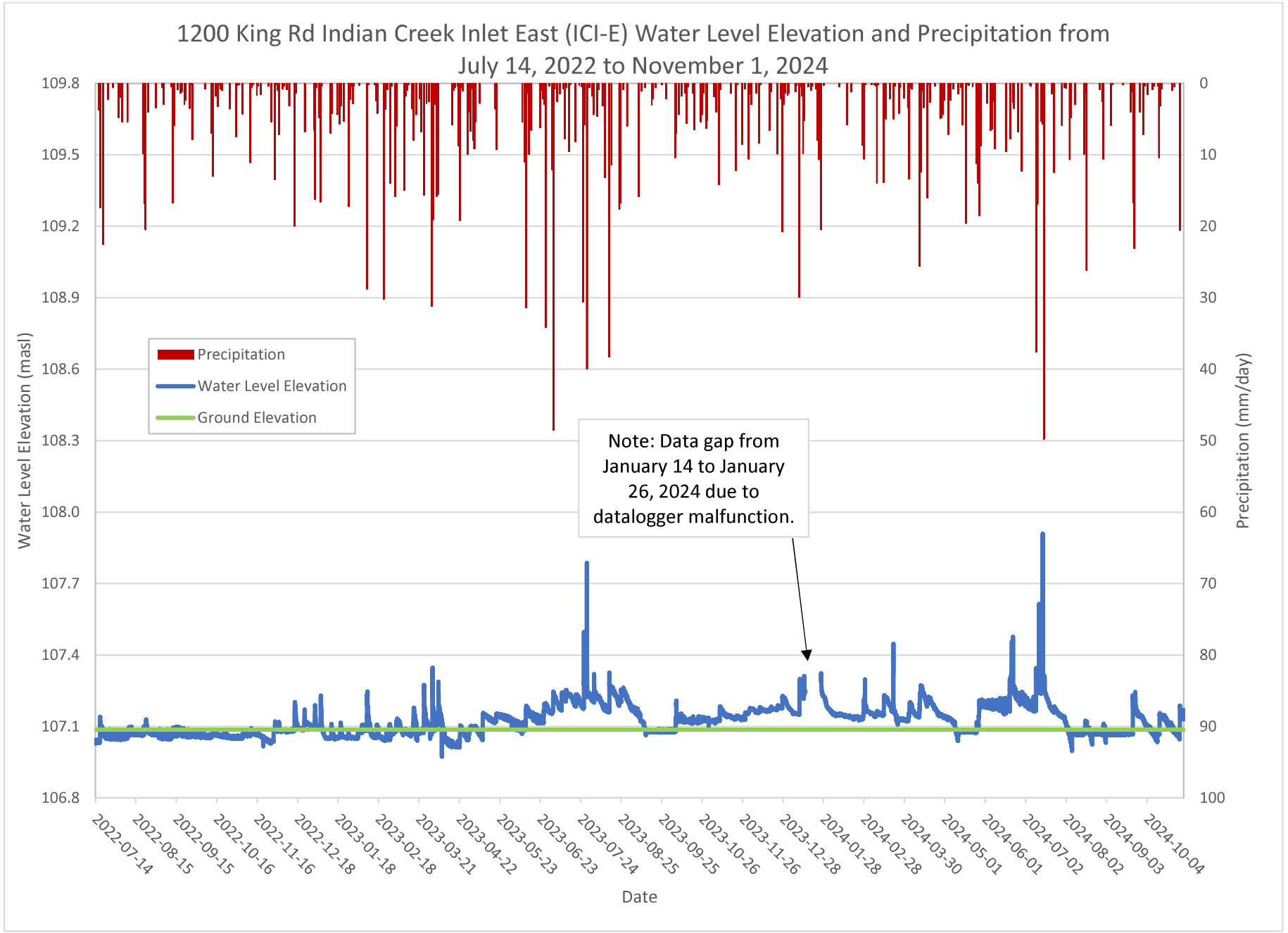
GROUNDWATER ELEVATIONS
Measurement 1st 2nd 3rd 4th

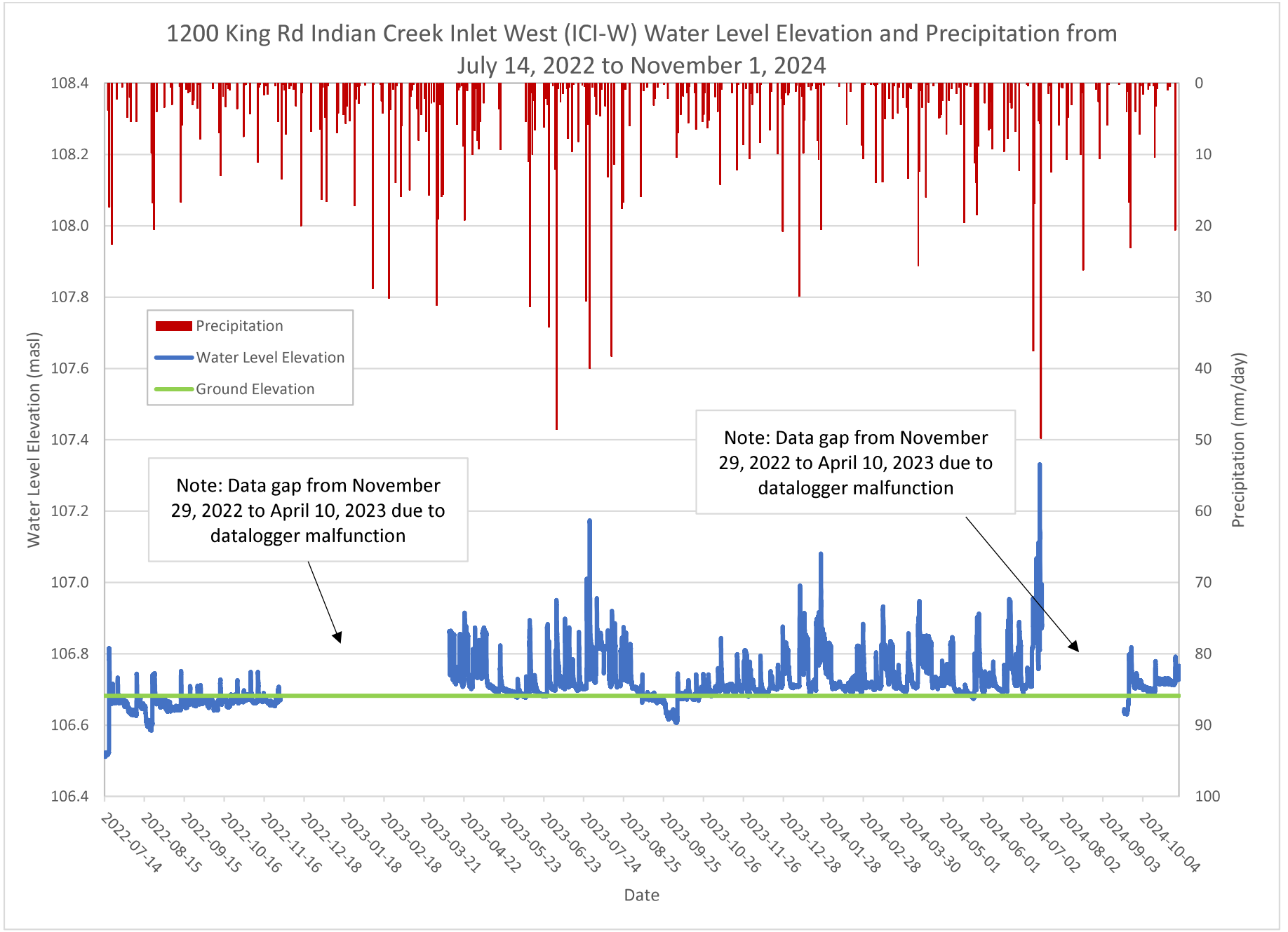
GRAPH NOTES: $+^3$, $\times^3$: Numbers refer to Sensitivity; ○ ε=3% Strain at Failure

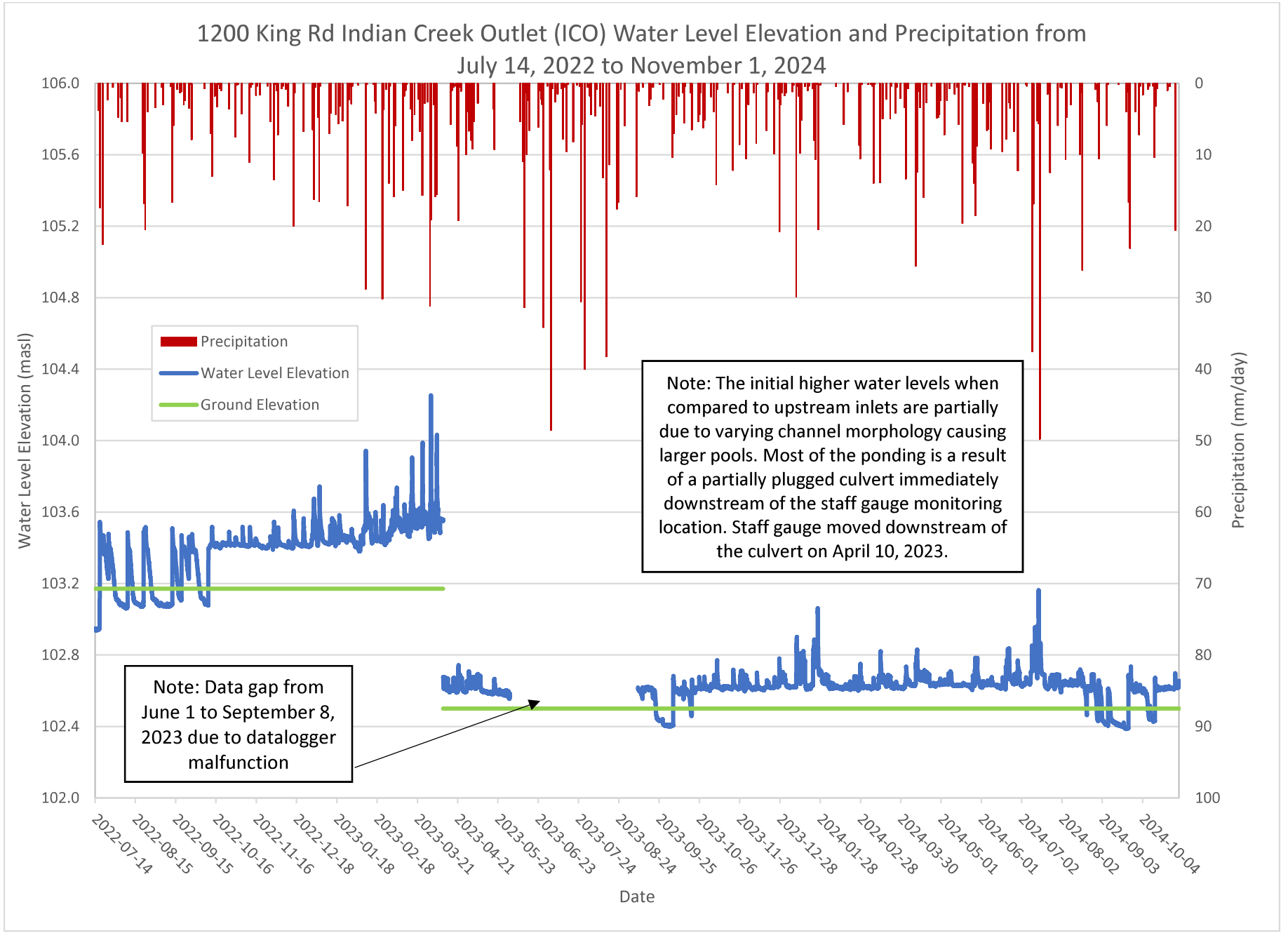
DS SOIL LOG-2021-FINAL 23-487-602.GPJ DS.GDT 24-3-12

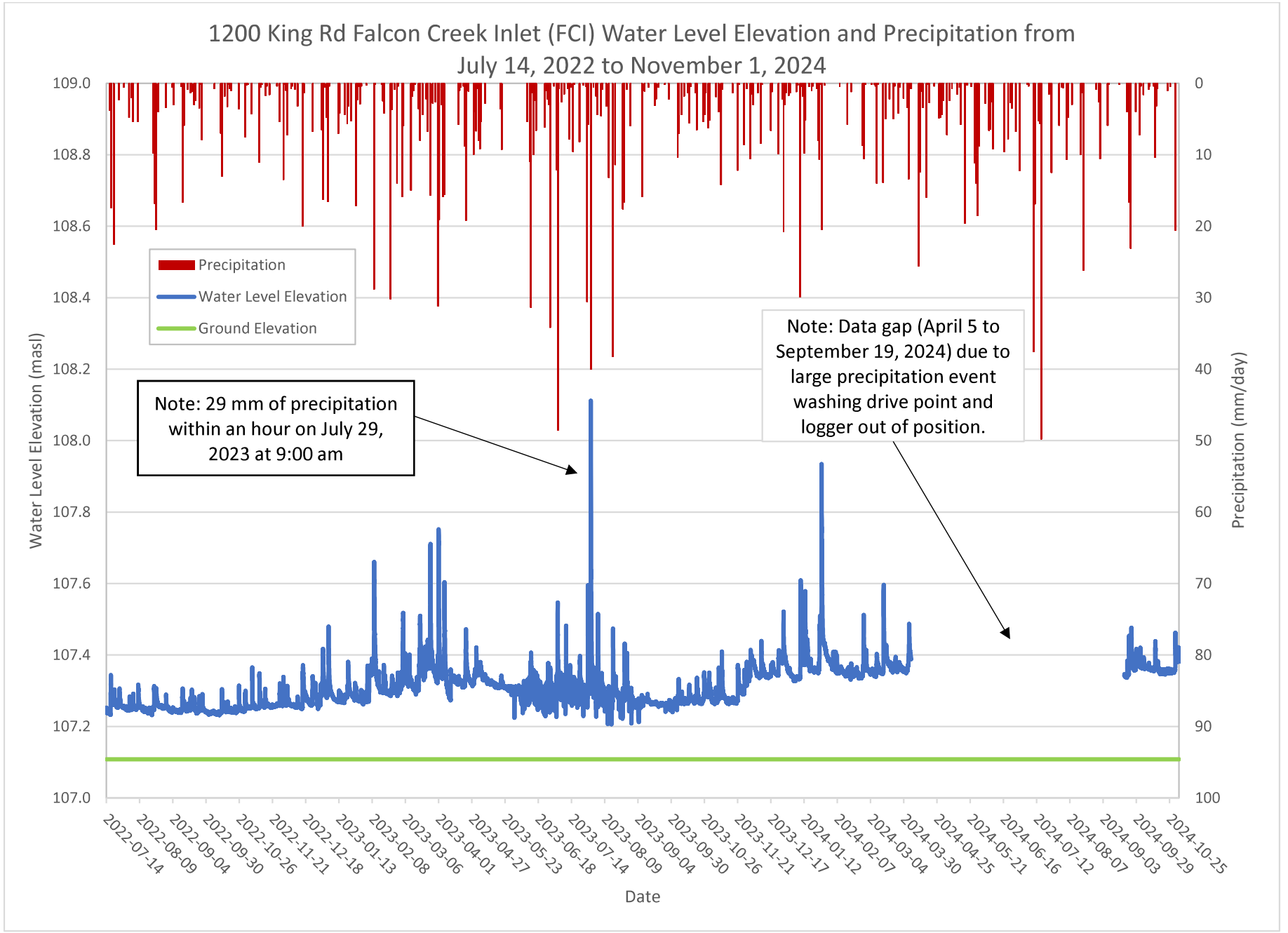
Appendix 6

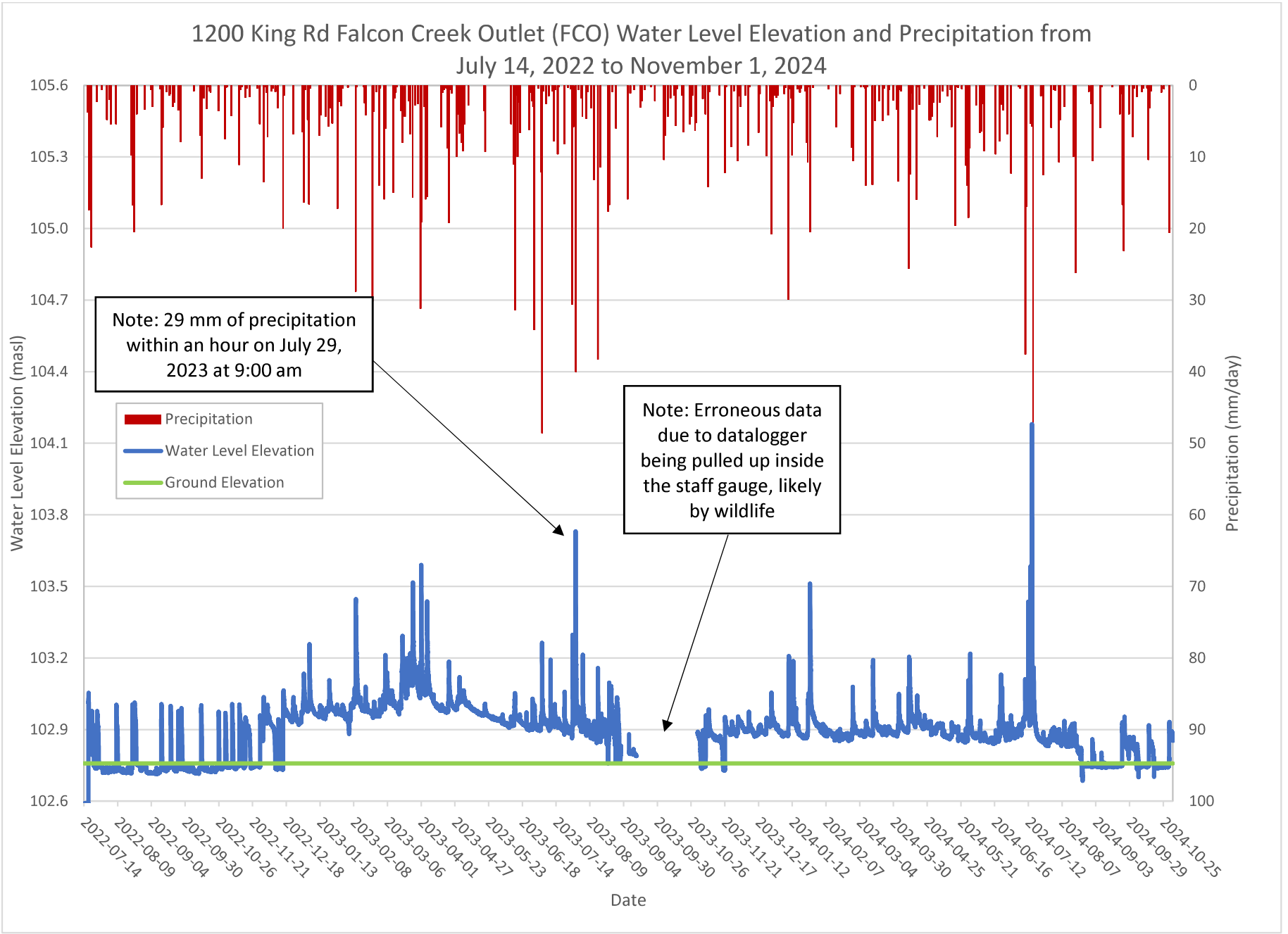
Hyetographs for Surface Water Staff Gauge Locations

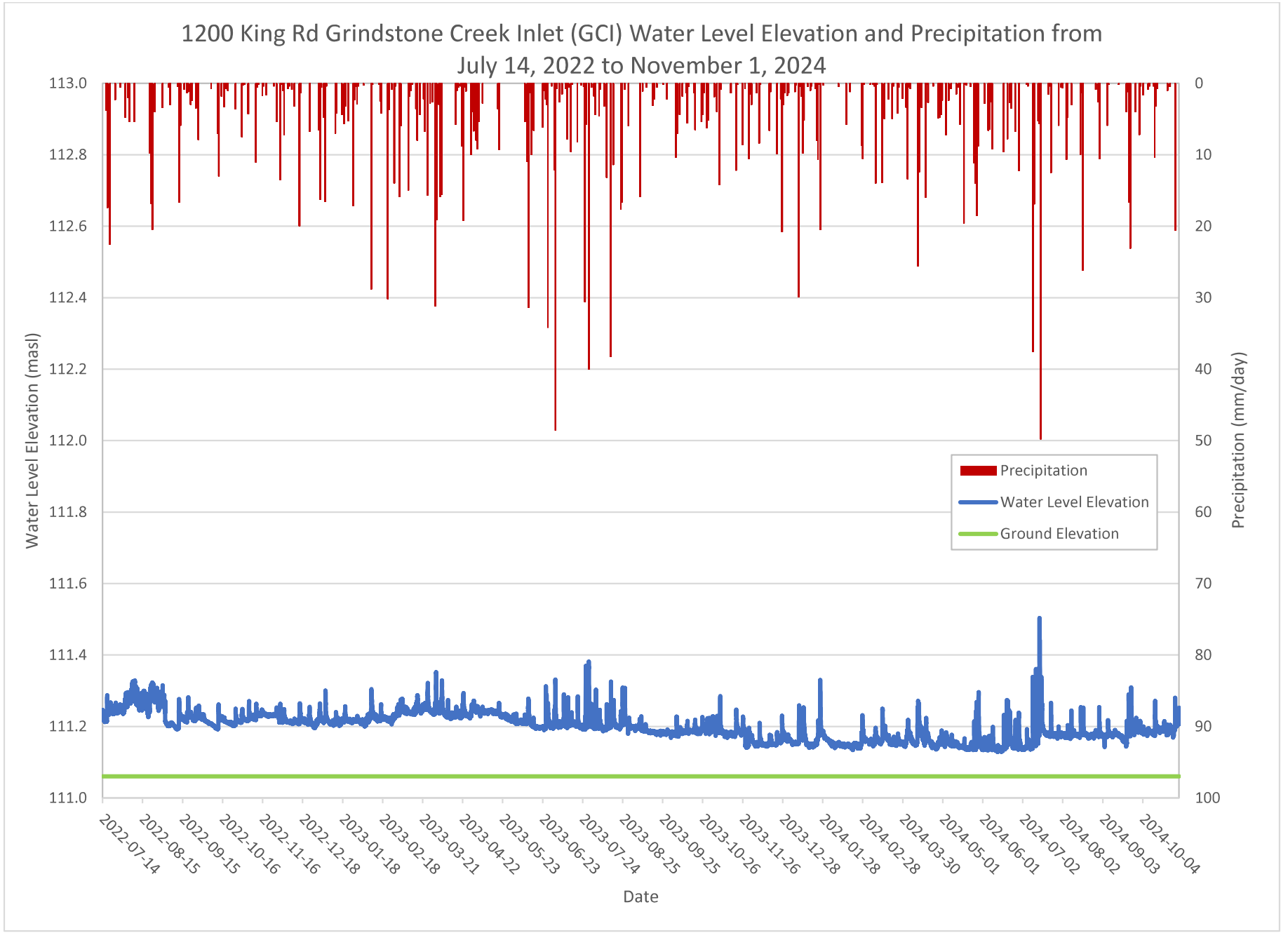

1200 King Rd Indian Creek Inlet East (ICI-E) Water Level Elevation and Precipitation from July 14, 2022 to November 1, 2024
Water Level Elevation (masl)
Precipitation (mm/day)
Precipitation
Water Level Elevation
Ground Elevation
Note: Data gap from January 14 to January 26, 2024 due to datalogger malfunction.
Date

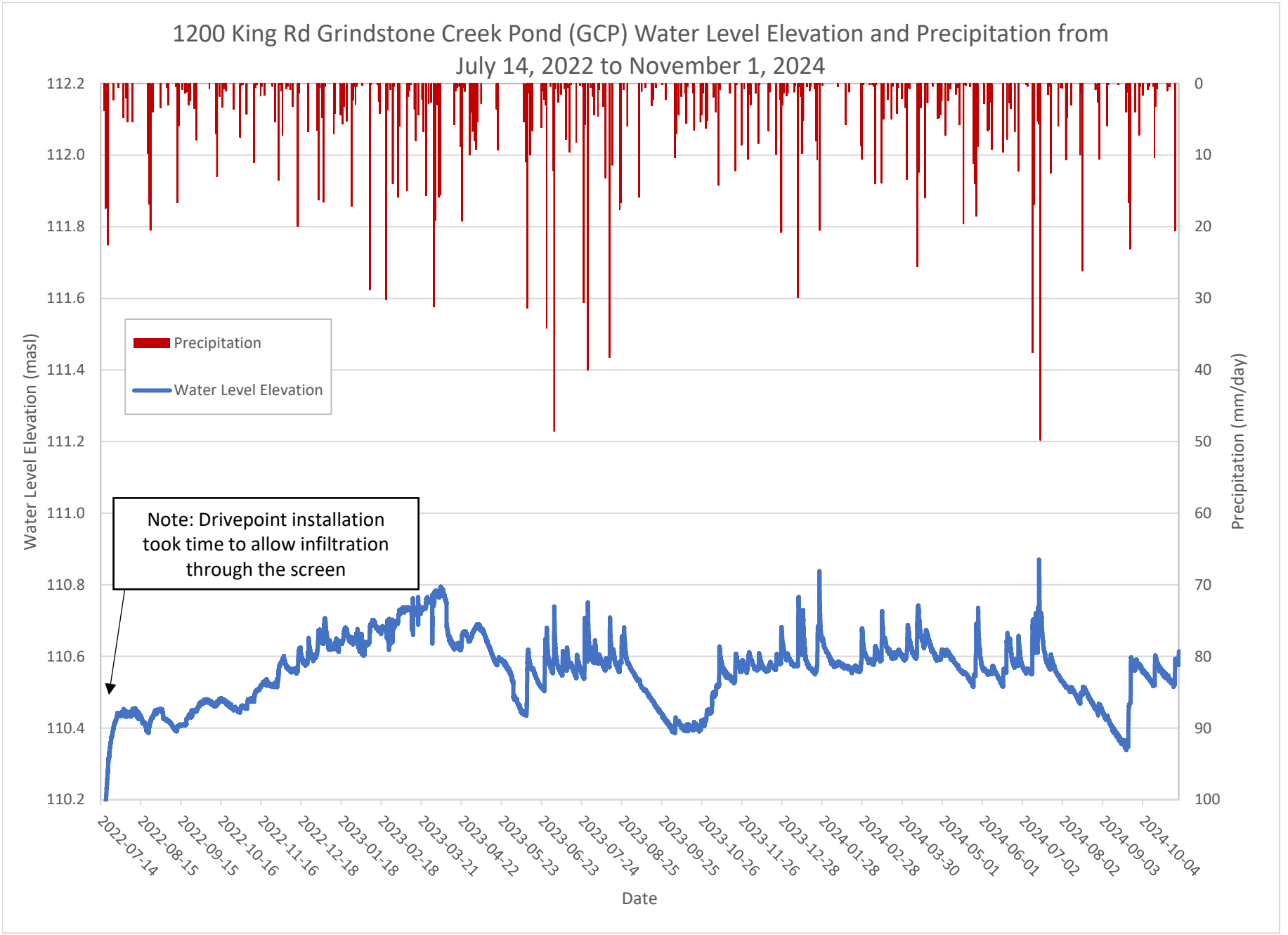

1200 King Rd Indian Creek Inlet West (ICI-W) Water Level Elevation and Precipitation from July 14, 2022 to November 1, 2024
Water Level Elevation (masl)
Precipitation (mm/day)
Date
Precipitation
Water Level Elevation
Ground Elevation
Note: Data gap from November 29, 2022 to April 10, 2023 due to datalogger malfunction
Note: Data gap from November 29, 2022 to April 10, 2023 due to datalogger malfunction
108.4
108.2
108.0
107.8
107.6
107.4
107.2
107.0
106.8
106.6
106.4
0
10
20
30
40
50
60
70
80
90
100
2022-07-14
2022-08-15
2022-09-15
2022-10-16
2022-11-16
2022-12-18
2023-01-18
2023-02-18
2023-03-21
2023-04-22
2023-05-23
2023-06-23
2023-07-24
2023-08-25
2023-09-25
2023-10-26
2023-11-26
2023-12-28
2024-01-28
2024-02-28
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2024-09-03
2024-10-04

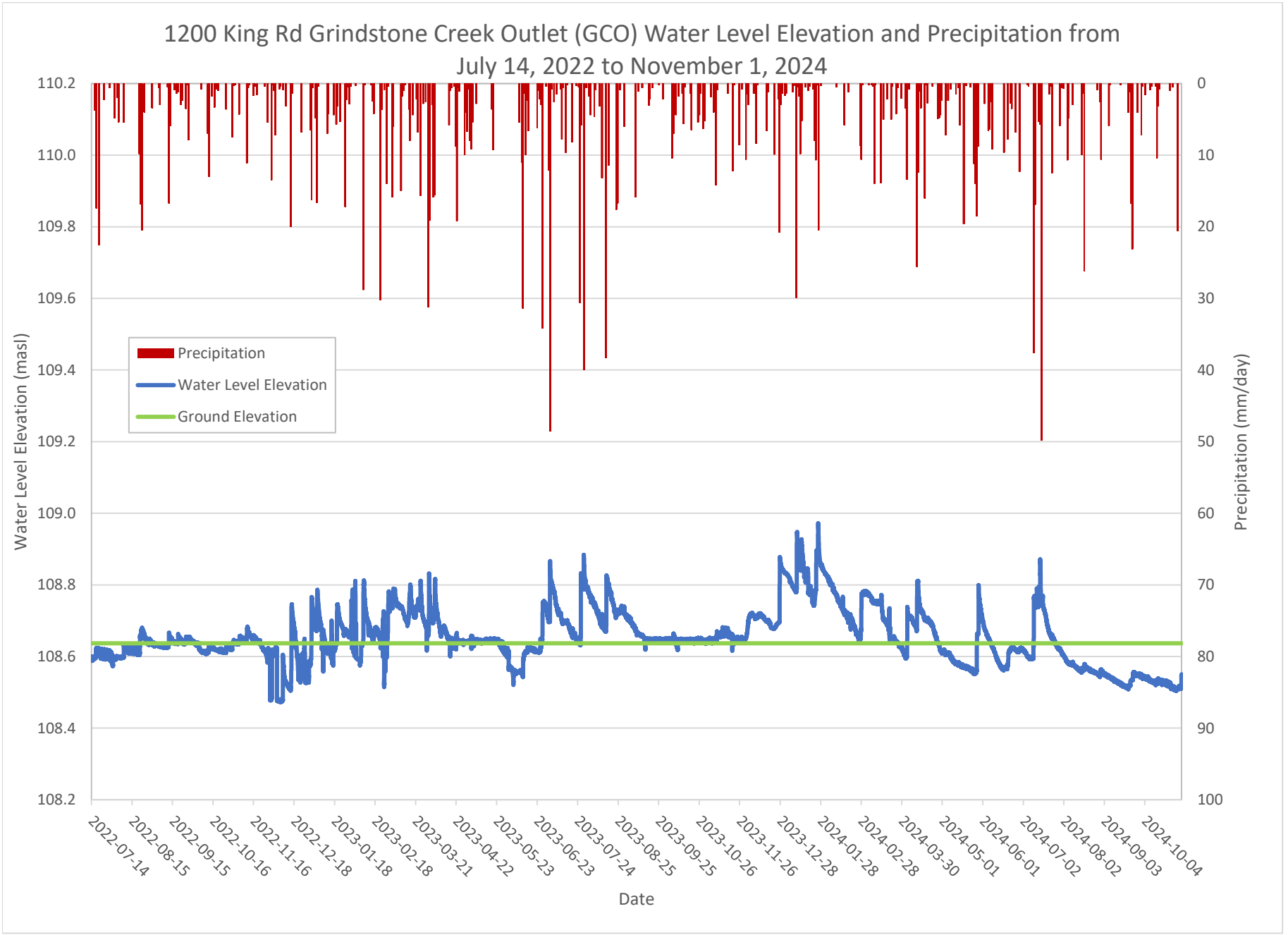

1200 King Rd Indian Creek Outlet (ICO) Water Level Elevation and Precipitation from July 14, 2022 to November 1, 2024
Water Level Elevation (masl)
Precipitation (mm/day)
Date
Precipitation
Water Level Elevation
Ground Elevation
Note: The initial higher water levels when compared to upstream inlets are partially due to varying channel morphology causing larger pools. Most of the ponding is a result of a partially plugged culvert immediately downstream of the staff gauge monitoring location. Staff gauge moved downstream of the culvert on April 10, 2023.
Note: Data gap from June 1 to September 8, 2023 due to datalogger malfunction
106.0
105.6
105.2
104.8
104.4
104.0
103.6
103.2
102.8
102.4
102.0
0
10
20
30
40
50
60
70
80
90
100
2022-07-14
2022-08-15
2022-09-15
2022-10-16
2022-11-16
2022-12-18
2023-01-18
2023-02-18
2023-03-21
2023-04-21
2023-05-23
2023-06-23
2023-07-24
2023-08-24
2023-09-25
2023-10-26
2023-11-26
2023-12-28
2024-01-28
2024-02-28
2024-03-30
2024-05-01
2024-06-01
2024-07-02
2024-08-02
2024-09-03
2024-10-04

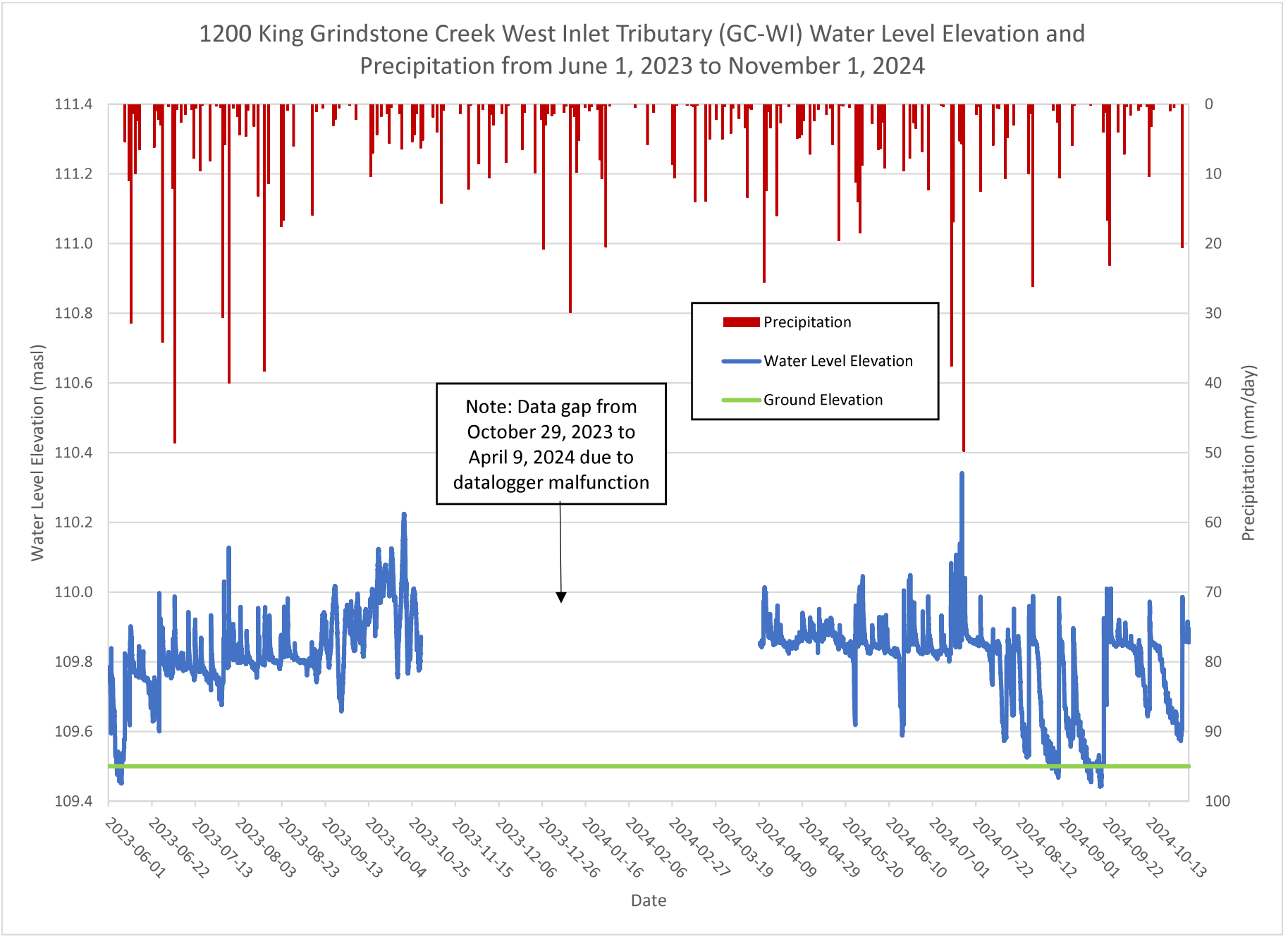

1200 King Rd Falcon Creek Inlet (FCI) Water Level Elevation and Precipitation from July 14, 2022 to November 1, 2024
Water Level Elevation (masl)
Precipitation (mm/day)
Date
Precipitation
Water Level Elevation
Ground Elevation
Note: 29 mm of precipitation within an hour on July 29, 2023 at 9:00 am
Note: Data gap (April 5 to September 19, 2024) due to large precipitation event washing drive point and logger out of position.
109.0
108.8
108.6
108.4
108.2
108.0
107.8
107.6
107.4
107.2
107.0
0
10
20
30
40
50
60
70
80
90
100
2022-07-14
2022-08-09
2022-09-04
2022-09-30
2022-10-26
2022-11-21
2022-12-18
2023-01-13
2023-02-08
2023-03-06
2023-04-01
2023-04-27
2023-05-23
2023-06-18
2023-07-14
2023-08-09
2023-09-04
2023-09-30
2023-10-26
2023-11-21
2023-12-17
2024-01-12
2024-02-07
2024-03-04
2024-03-30
2024-04-25
2024-05-21
2024-06-16
2024-07-12
2024-08-07
2024-09-03
2024-09-29
2024-10-25


1200 King Rd Falcon Creek Outlet (FCO) Water Level Elevation and Precipitation from July 14, 2022 to November 1, 2024
Water Level Elevation (masl)
Precipitation (mm/day)
Date
Precipitation
Water Level Elevation
Ground Elevation
Note: 29 mm of precipitation within an hour on July 29, 2023 at 9:00 am
Note: Erroneous data due to datalogger being pulled up inside the staff gauge, likely by wildlife
105.6
105.3
105.0
104.7
104.4
104.1
103.8
103.5
103.2
102.9
102.6
0
10
20
30
40
50
60
70
80
90
100
2022-07-14
2022-08-09
2022-09-04
2022-09-30
2022-10-26
2022-11-21
2022-12-18
2023-01-13
2023-02-08
2023-03-06
2023-04-01
2023-04-27
2023-05-23
2023-06-18
2023-07-14
2023-08-09
2023-09-04
2023-09-30
2023-10-26
2023-11-21
2023-12-17
2024-01-12
2024-02-07
2024-03-04
2024-03-30
2024-04-25
2024-05-21
2024-06-16
2024-07-12
2024-08-07
2024-09-03
2024-09-29
2024-10-25


1200 King Rd Grindstone Creek Inlet (GCI) Water Level Elevation and Precipitation from July 14, 2022 to November 1, 2024
Water Level Elevation (masl)
Precipitation (mm/day)
Date
Precipitation
Water Level Elevation
Ground Elevation
113.0
112.8
112.6
112.4
112.2
112.0
111.8
111.6
111.4
111.2
111.0
0
10
20
30
40
50
60
70
80
90
100
2022-07-14
2022-08-15
2022-09-15
2022-10-16
2022-11-16
2022-12-18
2023-01-18
2023-02-18
2023-03-21
2023-04-22
2023-05-23
2023-06-23
2023-07-24
2023-08-25
2023-09-25
2023-10-26
2023-11-26
2023-12-28
2024-01-28
2024-02-28
2024-03-30
2024-05-01
2024-06-01
2024-07-02
2024-08-02
2024-09-03
2024-10-04

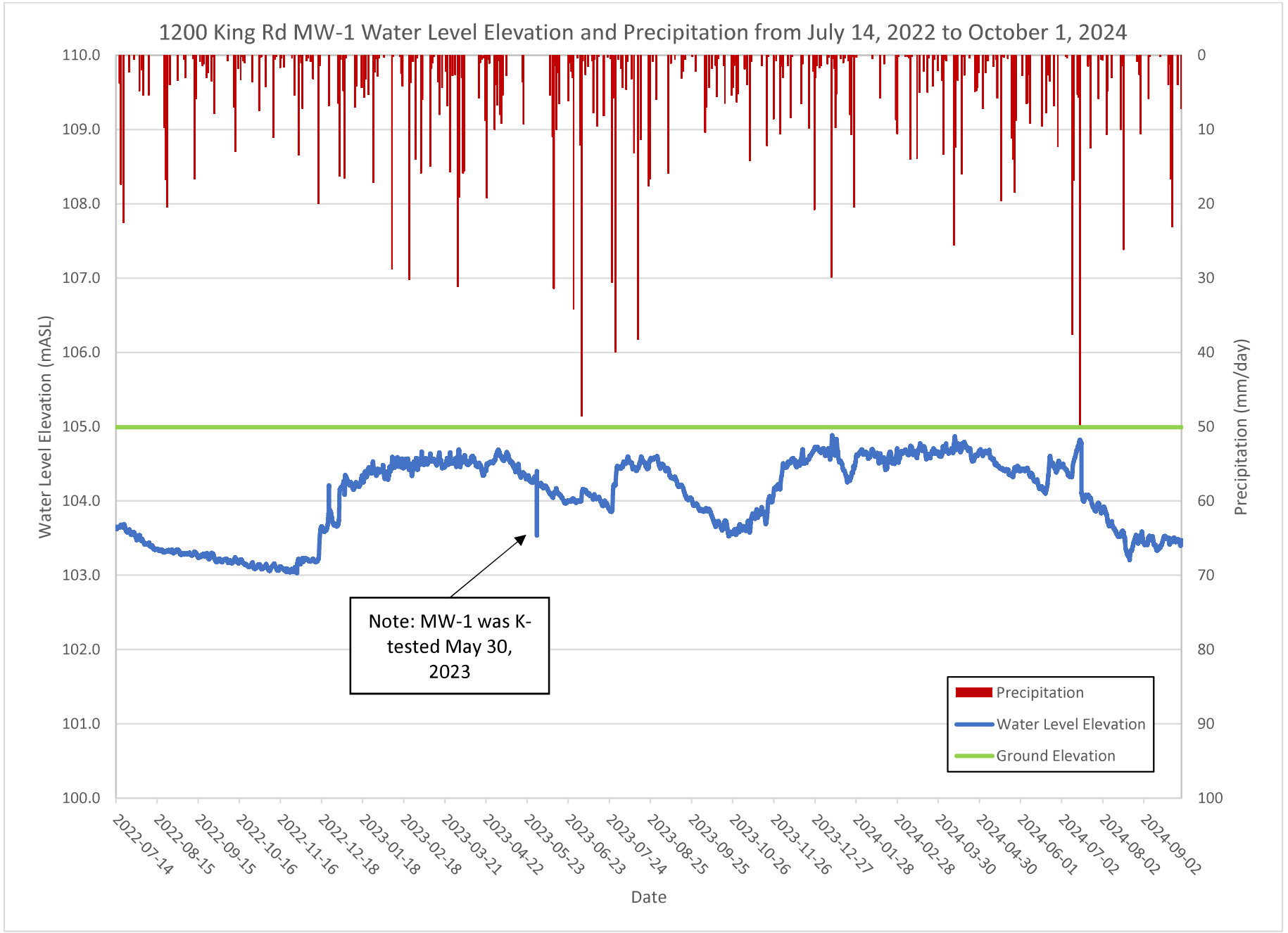

1200 King Rd Grindstone Creek Pond (GCP) Water Level Elevation and Precipitation from July 14, 2022 to November 1, 2024
Water Level Elevation (masl)
Precipitation (mm/day)
Precipitation
Water Level Elevation
Note: Drivepoint installation took time to allow infiltration through the screen
Date

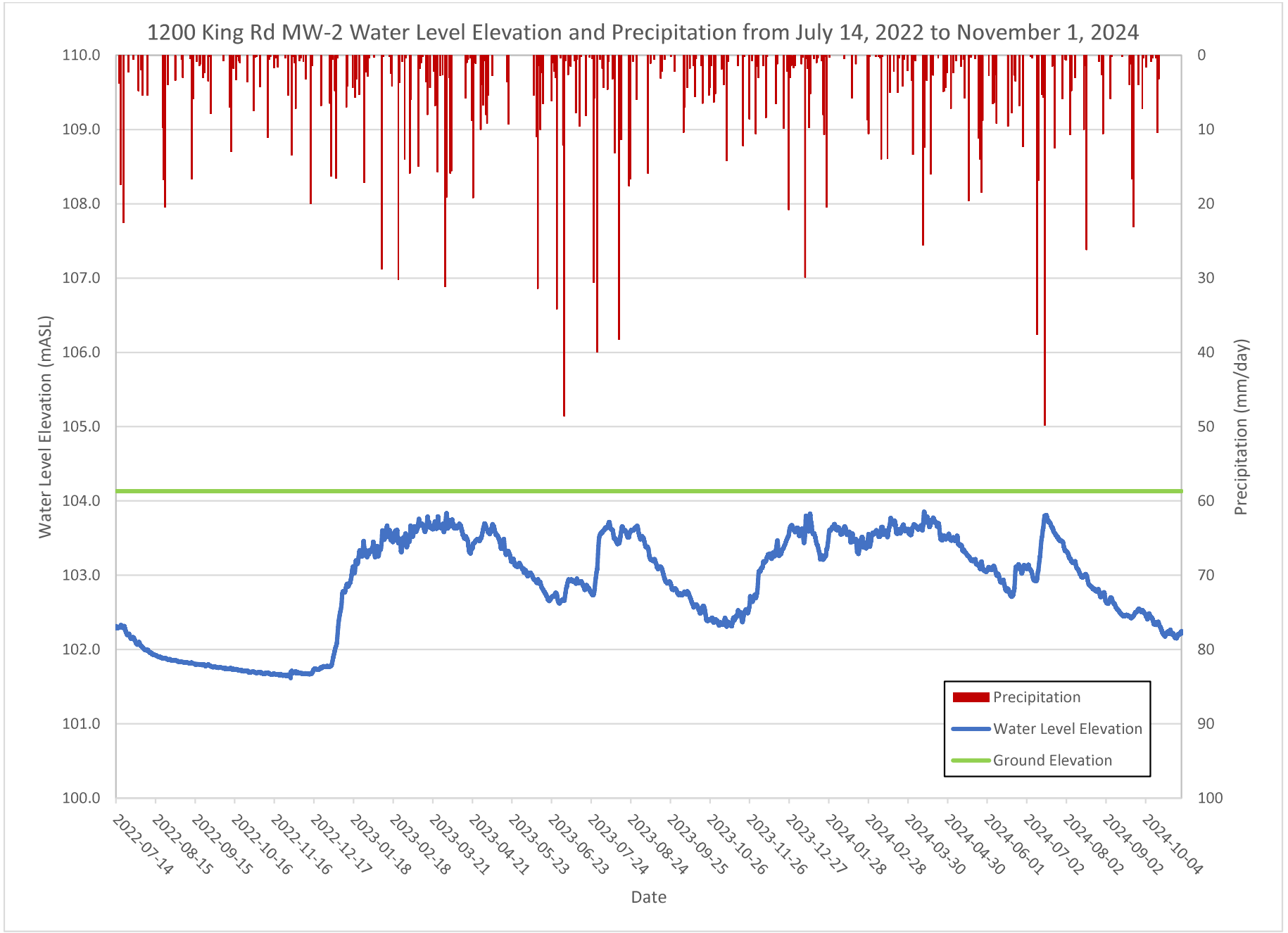

1200 King Rd Grindstone Creek Outlet (GCO) Water Level Elevation and Precipitation from July 14, 2022 to November 1, 2024
Water Level Elevation (masl)
Precipitation (mm/day)
Precipitation
Water Level Elevation
Ground Elevation
110.2
110.0
109.8
109.6
109.4
109.2
109.0
108.8
108.6
108.4
108.2
0
10
20
30
40
50
60
70
80
90
100
2022-07-14
2022-08-15
2022-09-15
2022-10-16
2022-11-16
2022-12-18
2023-01-18
2023-02-18
2023-03-21
2023-04-22
2023-05-23
2023-06-23
2023-07-24
2023-08-25
2023-09-25
2023-10-26
2023-11-26
2023-12-28
2024-01-28
2024-02-28
2024-03-30
2024-05-01
2024-06-01
2024-07-02
2024-08-02
2024-09-03
2024-10-04
Date

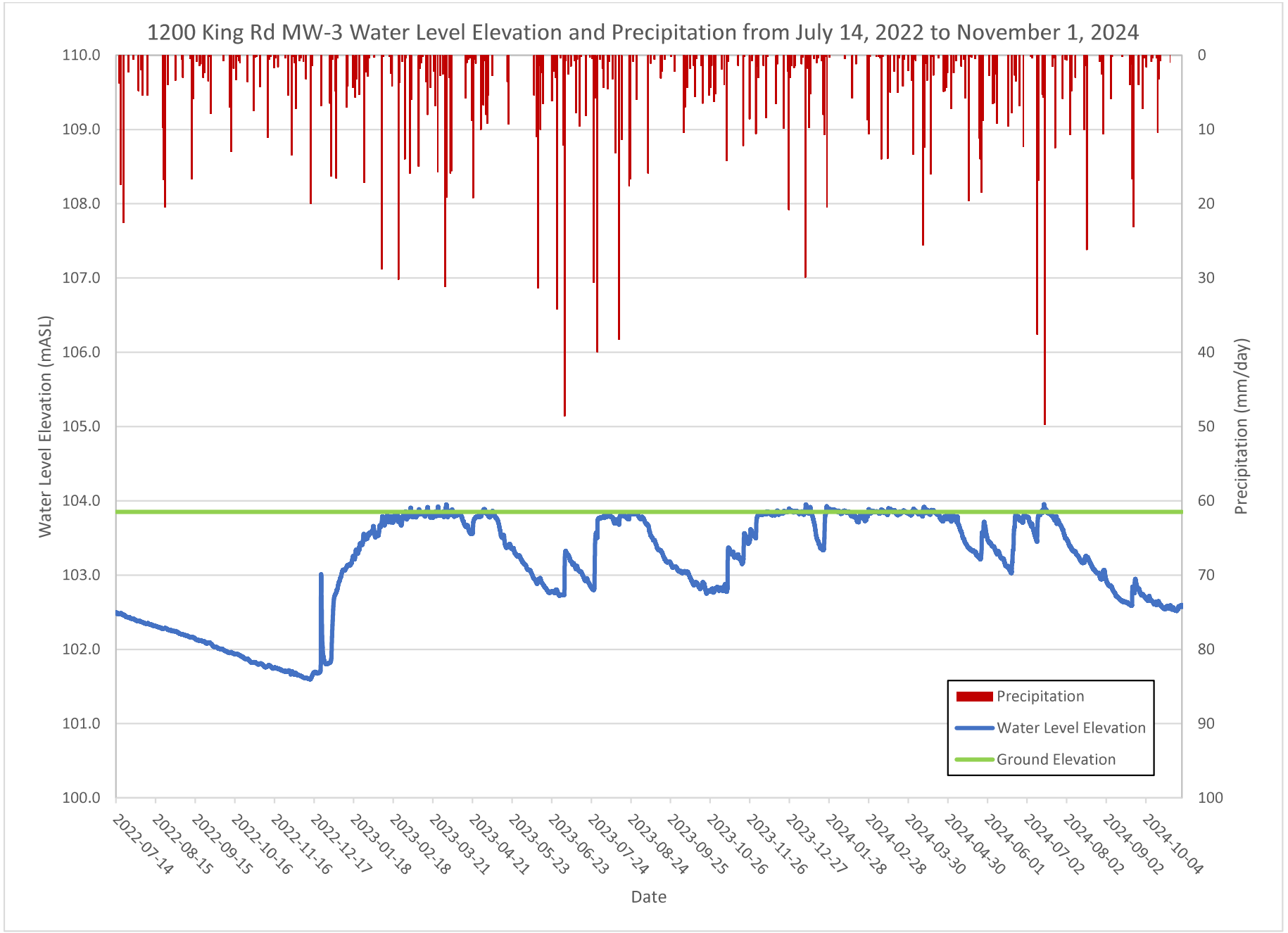

1200 King Grindstone Creek West Inlet Tributary (GC-WI) Water Level Elevation and Precipitation from June 1, 2023 to November 1, 2024
Water Level Elevation (masl)
Precipitation (mm/day)
Date
Precipitation
Water Level Elevation
Ground Elevation
Note: Data gap from October 29, 2023 to April 9, 2024 due to datalogger malfunction
111.4
111.2
111.0
110.8
110.6
110.4
110.2
110.0
109.8
109.6
109.4
0
10
20
30
40
50
60
70
80
90
100
2023-06-01
2023-06-22
2023-07-13
2023-08-03
2023-08-23
2023-09-13
2023-10-04
2023-10-25
2023-11-15
2023-12-06
2023-12-26
2024-01-16
2024-02-06
2024-02-27
2024-03-19
2024-04-09
2024-04-29
2024-05-20
2024-06-10
2024-07-01
2024-07-22
2024-08-12
2024-09-01
2024-09-22
2024-10-13

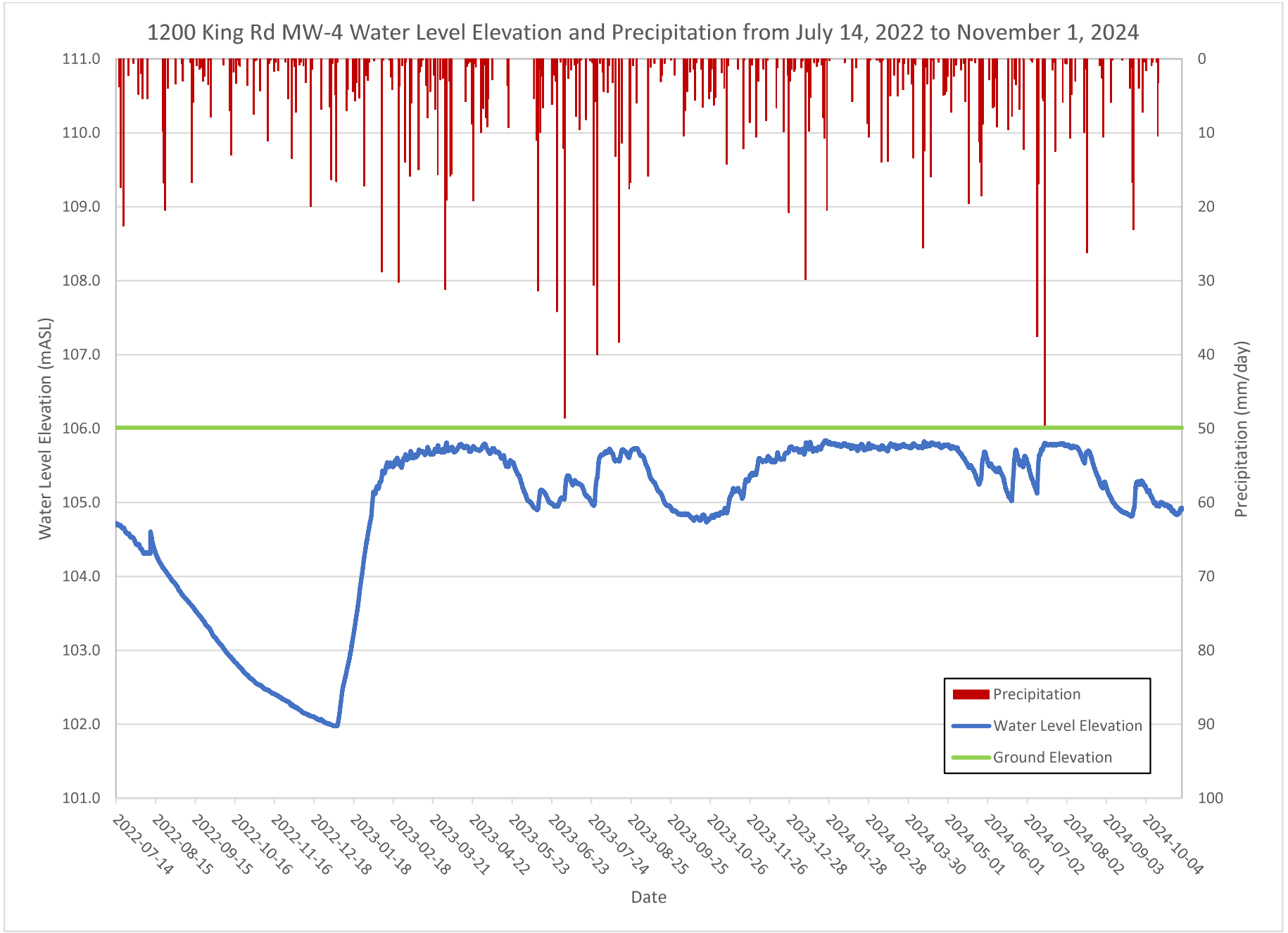
Appendix 7

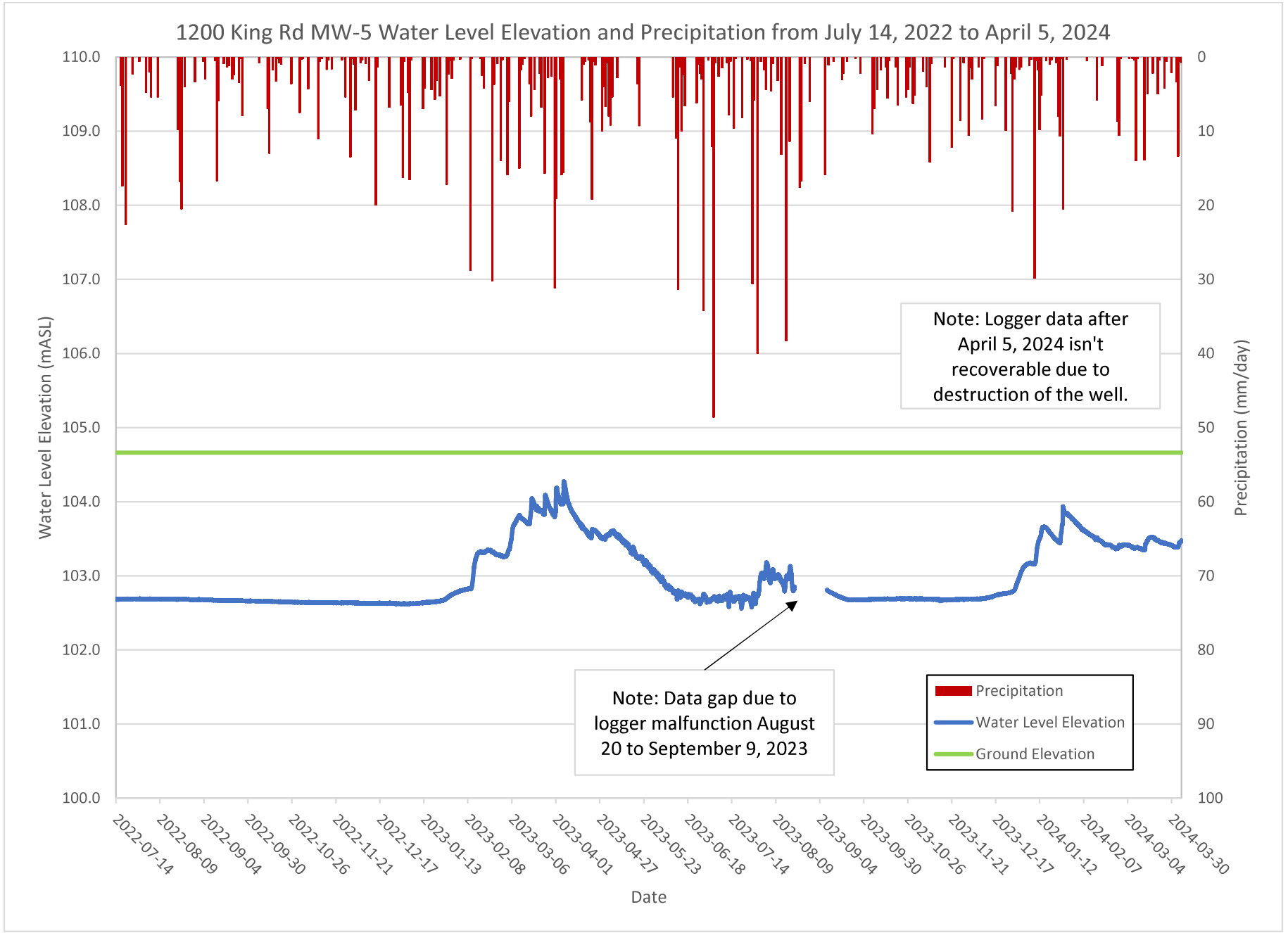
Hyetographs: Monitoring Wells MW-1, MW-2, MW-3, MW-4, MW-5, MW-6-D, MW-6-S, MW-7, MW-8-D, MW-8-S

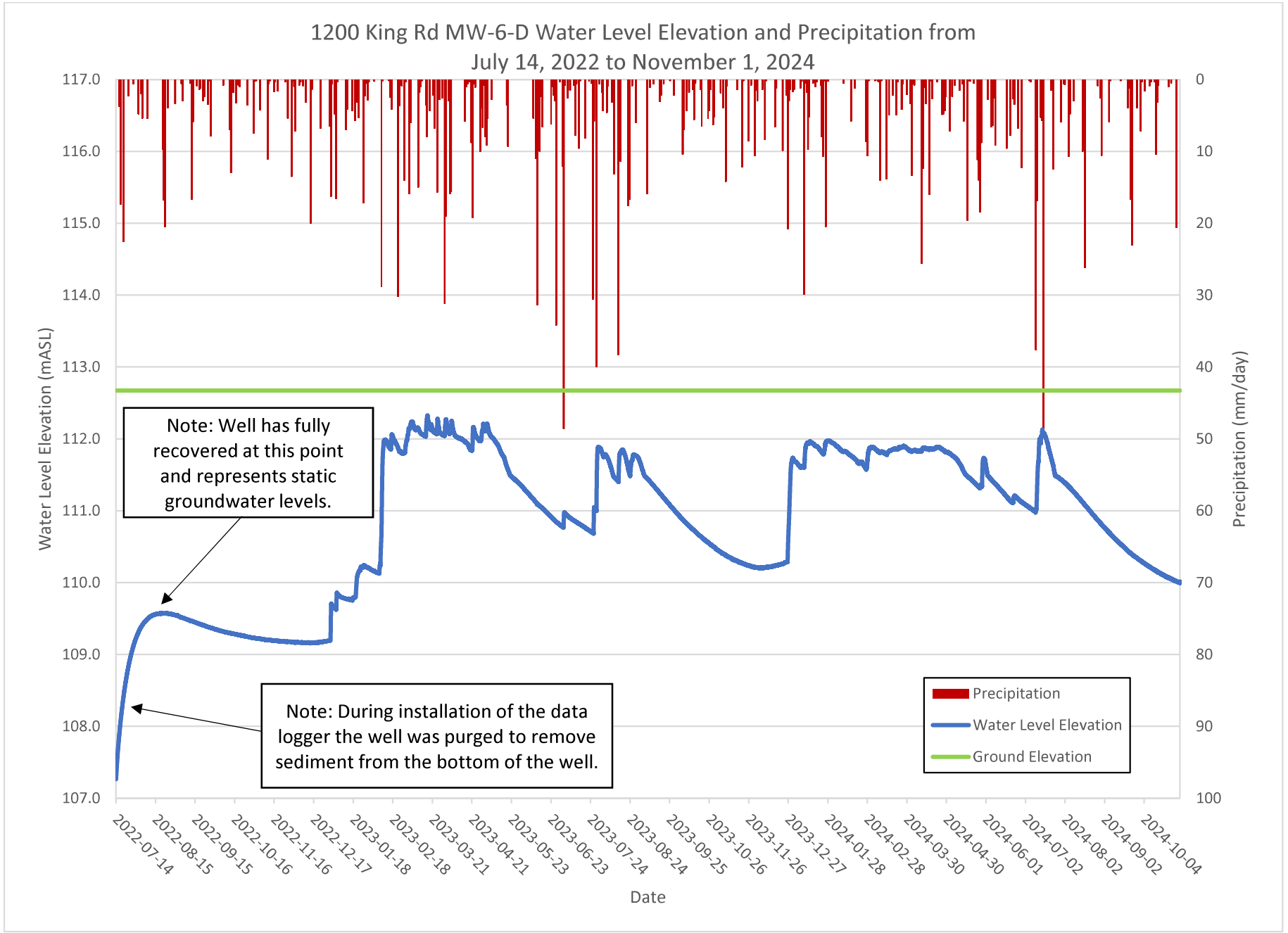

1200 King Rd MW-1 Water Level Elevation and Precipitation from July 14, 2022 to October 1, 2024
Water Level Elevation (mASL)
Precipitation (mm/day)
Date
Note: MW-1 was K-tested May 30, 2023
Precipitation
Water Level Elevation
Ground Elevation

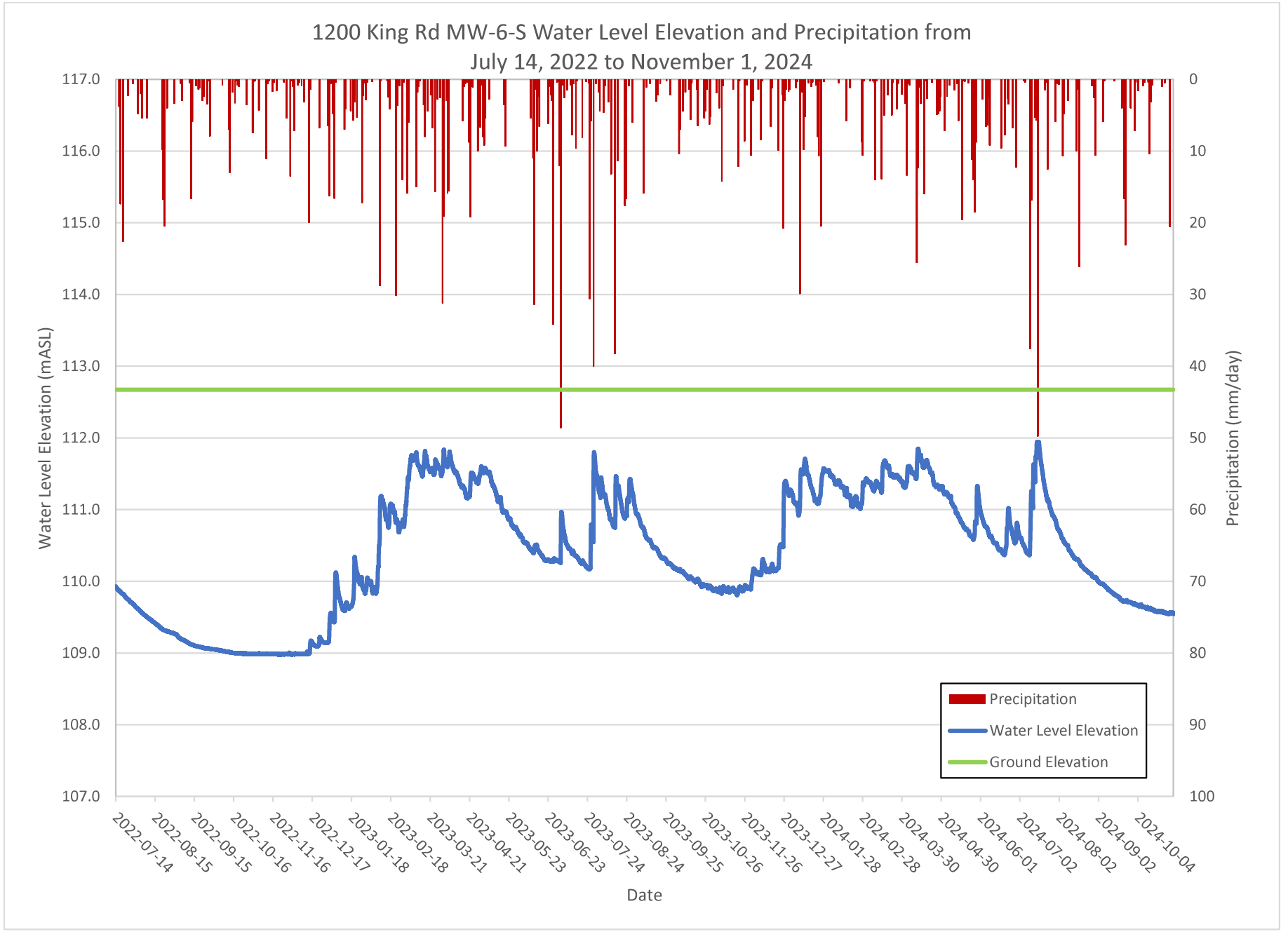

1200 King Rd MW-2 Water Level Elevation and Precipitation from July 14, 2022 to November 1, 2024
Water Level Elevation (mASL)
Precipitation (mm/day)
Date
Precipitation
Water Level Elevation
Ground Elevation

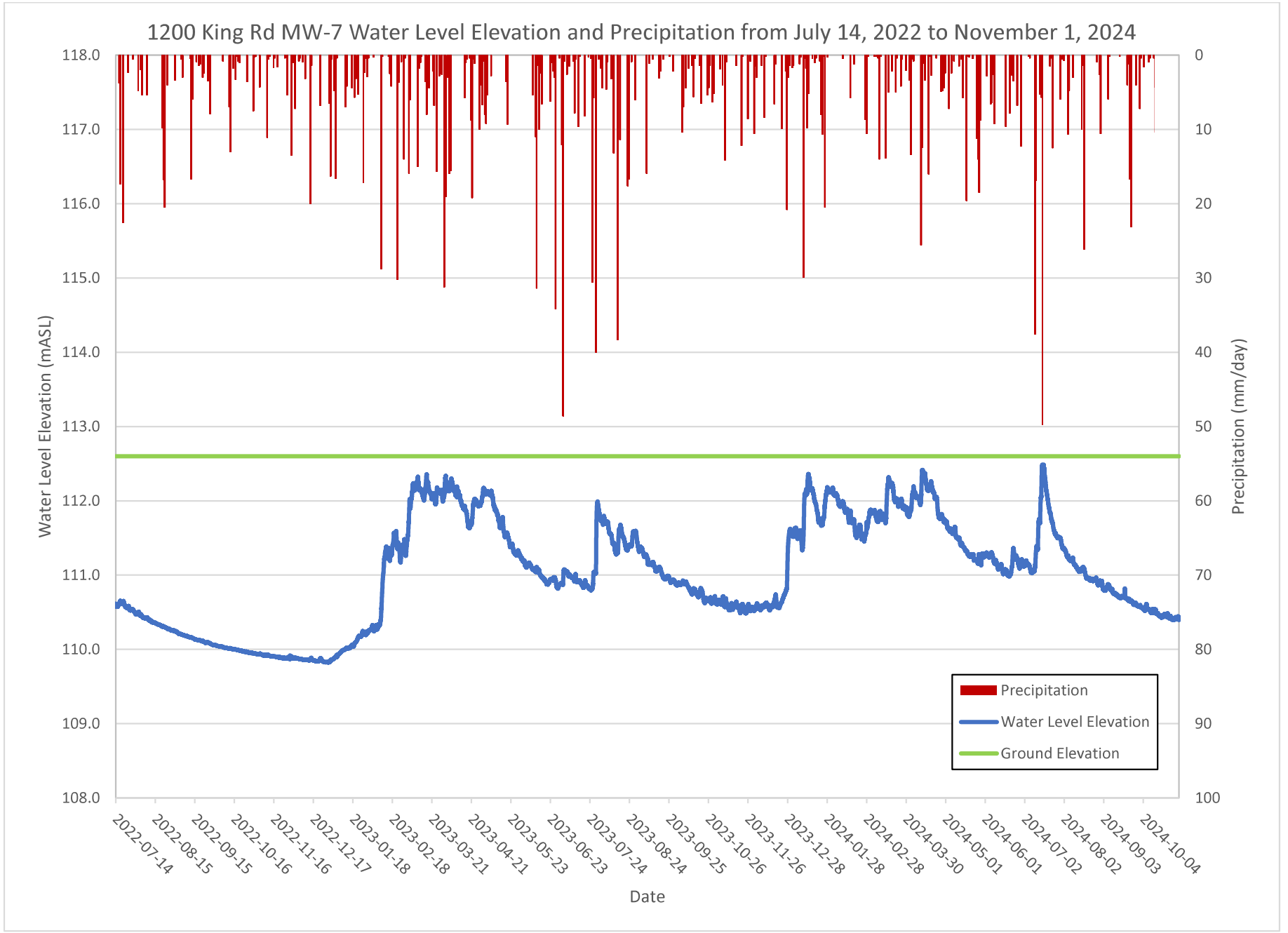

1200 King Rd MW-3 Water Level Elevation and Precipitation from July 14, 2022 to November 1, 2024
Water Level Elevation (mASL)
Precipitation (mm/day)
Date
Precipitation
Water Level Elevation
Ground Elevation

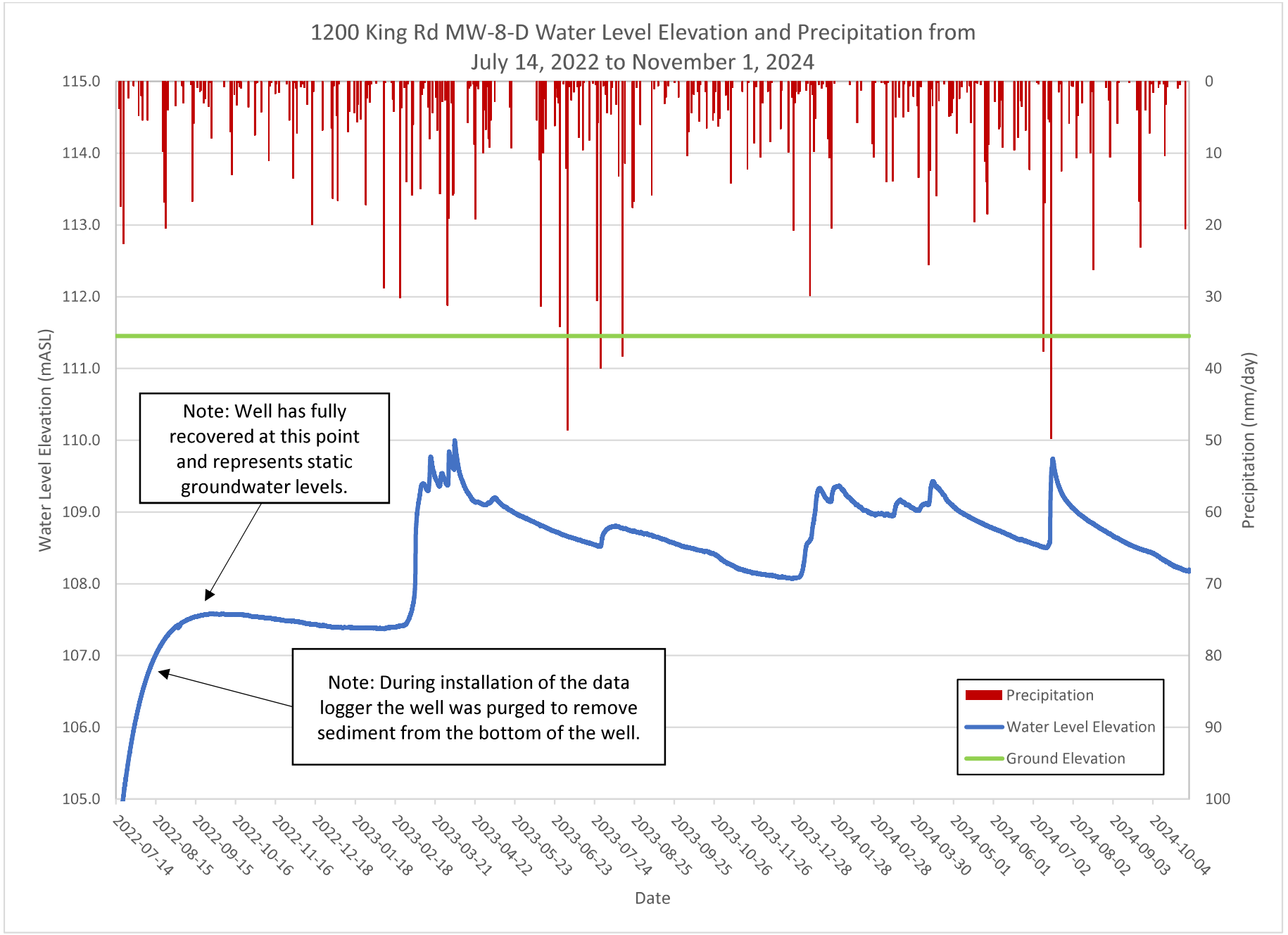

1200 King Rd MW-4 Water Level Elevation and Precipitation from July 14, 2022 to November 1, 2024
Water Level Elevation (mASL)
Precipitation (mm/day)
Date
111.0
110.0
109.0
108.0
107.0
106.0
105.0
104.0
103.0
102.0
101.0
0
10
20
30
40
50
60
70
80
90
100
2022-07-14
2022-08-15
2022-09-15
2022-10-16
2022-11-16
2022-12-18
2023-01-18
2023-02-18
2023-03-21
2023-04-22
2023-05-23
2023-06-23
2023-07-24
2023-08-25
2023-09-25
2023-10-26
2023-11-26
2023-12-28
2024-01-28
2024-02-28
2024-03-30
2024-05-01
2024-06-01
2024-07-02
2024-08-02
2024-09-03
2024-10-04
Precipitation
Water Level Elevation
Ground Elevation

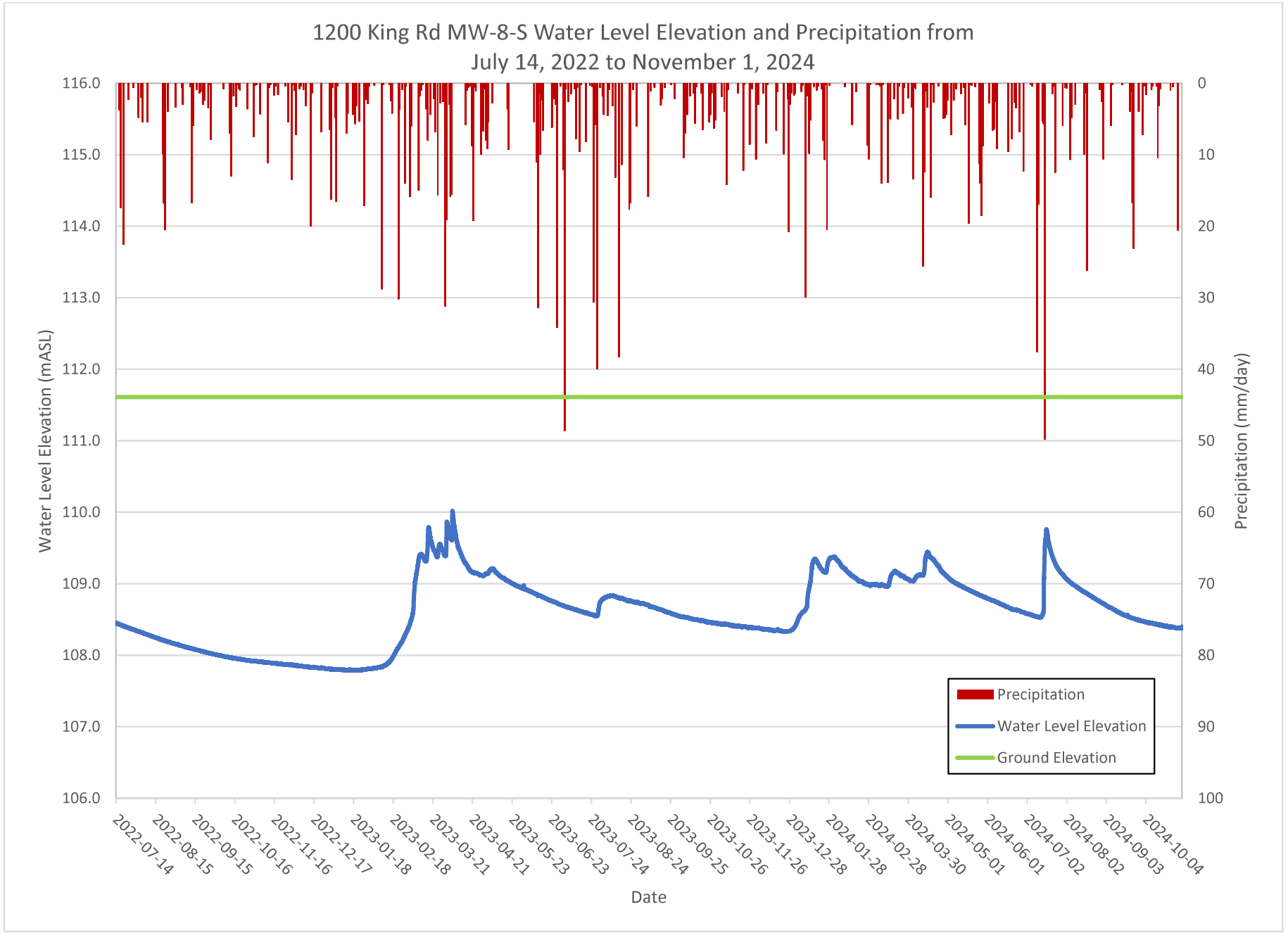

1200 King Rd MW-5 Water Level Elevation and Precipitation from July 14, 2022 to April 5, 2024
Water Level Elevation (mASL)
Precipitation (mm/day)
Date
Note: Logger data after April 5, 2024 isn't recoverable due to destruction of the well.
Note: Data gap due to logger malfunction August 20 to September 9, 2023
Precipitation
Water Level Elevation
Ground Elevation


1200 King Rd MW-6-D Water Level Elevation and Precipitation from July 14, 2022 to November 1, 2024
Water Level Elevation (mASL)
Precipitation (mm/day)
Date
Note: Well has fully recovered at this point and represents static groundwater levels.
Note: During installation of the data logger the well was purged to remove sediment from the bottom of the well.
Precipitation
Water Level Elevation
Ground Elevation


1200 King Rd MW-6-S Water Level Elevation and Precipitation from
July 14, 2022 to November 1, 2024
Water Level Elevation (mASL)
Precipitation (mm/day)
Date
Precipitation
Water Level Elevation
Ground Elevation
117.0
116.0
115.0
114.0
113.0
112.0
111.0
110.0
109.0
108.0
107.0
0
10
20
30
40
50
60
70
80
90
100
2022-07-14
2022-08-15
2022-09-15
2022-10-16
2022-11-16
2022-12-17
2023-01-18
2023-02-18
2023-03-21
2023-04-21
2023-05-23
2023-06-23
2023-07-24
2023-08-24
2023-09-25
2023-10-26
2023-11-26
2023-12-27
2024-01-28
2024-02-28
2024-03-30
2024-04-30
2024-06-01
2024-07-02
2024-08-02
2024-09-02
2024-10-04


1200 King Rd MW-7 Water Level Elevation and Precipitation from July 14, 2022 to November 1, 2024
Water Level Elevation (mASL)
Precipitation (mm/day)
Date
118.0
117.0
116.0
115.0
114.0
113.0
112.0
111.0
110.0
109.0
108.0
0
10
20
30
40
50
60
70
80
90
100
2022-07-14
2022-08-15
2022-09-15
2022-10-16
2022-11-16
2022-12-17
2023-01-18
2023-02-18
2023-03-21
2023-04-21
2023-05-23
2023-06-23
2023-07-24
2023-08-24
2023-09-25
2023-10-26
2023-11-26
2023-12-28
2024-01-28
2024-02-28
2024-03-30
2024-05-01
2024-06-01
2024-07-02
2024-08-02
2024-09-03
2024-10-04
Precipitation
Water Level Elevation
Ground Elevation


1200 King Rd MW-8-D Water Level Elevation and Precipitation from July 14, 2022 to November 1, 2024
Water Level Elevation (mASL)
Precipitation (mm/day)
Date
Note: Well has fully recovered at this point and represents static groundwater levels.
Note: During installation of the data logger the well was purged to remove sediment from the bottom of the well.
Precipitation
Water Level Elevation
Ground Elevation


1200 King Rd MW-8-S Water Level Elevation and Precipitation from
July 14, 2022 to November 1, 2024
Water Level Elevation (mASL)
Precipitation (mm/day)
Date
Precipitation
Water Level Elevation
Ground Elevation
116.0
115.0
114.0
113.0
112.0
111.0
110.0
109.0
108.0
107.0
106.0
0
10
20
30
40
50
60
70
80
90
100
2022-07-14
2022-08-15
2022-09-15
2022-10-16
2022-11-16
2022-12-17
2023-01-18
2023-02-18
2023-03-21
2023-04-21
2023-05-23
2023-06-23
2023-07-24
2023-08-24
2023-09-25
2023-10-26
2023-11-26
2023-12-28
2024-01-28
2024-02-28
2024-03-30
2024-05-01
2024-06-01
2024-07-02
2024-08-02
2024-09-03
2024-10-04

Appendix 8

Groundwater Velocity Calculations

Appendix 8. Groundwater Calculations

Appendix 8.1 Evaluation of Horizontal Groundwater Velocity in the Silty Clay and Clay Till Aquitard Southerly Towards Hamilton Harbour

The horizontal average linear groundwater velocity (v) in the silty clay and clay till-based aquitard between approximately Highway 403 southerly towards the Candian National Railway tracks (see Figures 2 and 3) can be evaluated by the following equation as per Freeze and Cherry (1979):

$$v = -Ki_H/n$$

where K is the hydraulic conductivity of the overburden. The geometric mean of nine hydraulic conductivity tests in the clay aquitard was calculated to be 9.3×10^{-9} m/sec. The horizontal hydraulic gradient (i_H) was measured between MW-6-Shallow near Highway 403 and MW-5 near the CNR tracks as the change in hydraulic head over the change in distance of dh/dl. For the April 9, 2014 groundwater measurements, this equals a head decrease of 111.71 – 103.78 metres above sea level (masl) (see Table 2) over an approximate distance of 165 m or a horizontal hydraulic gradient of 0.048. The porosity (n) was determined from literature (Freeze and Cherry, 1979) for clay-based soils at 0.40 or 40%.

Therefore, the average linear horizontal velocity can be determined as follows:

$v = (9.3 \times 10^{-9}$ m/sec) x (0.048) / 0.40
$= 1.11 \times 10^{-9}$ m/sec
= 0.04 m/year

Appendix 8.2 Evaluation of Vertical Groundwater Velocity Through the Clay-based Aquitard to the Queenston Shale Bedrock

The vertical average linear groundwater velocity (v) in through the silty clay and clay-based till aquitard to the Queenston Shale can be evaluated at Monitoring Well MW-8 Shallow and Deep by using the following equation as per Freeze and Cherry (1979):

$$v = -Ki_v/n$$

where K is the geometric mean of the nine clay aquitard hydraulic conductivity tests or 9.3×10^{-9} m/sec. The vertical hydraulic gradient (i_v) as measured between MW-8-S and MW-8-D as the vertical change in hydraulic head over the change in vertical distance of dh/dl. For the April 9, 2014 groundwater measurements (see Table 2), this equals a downward decrease in hydraulic head of 108.57 – 108.21 masl = 0.36 over an approximate distance of 10.34 m – 3.04 m = 7.30 m (see Borehole Logs for MW-8-S&D) or a vertical hydraulic gradient of 0.049. The porosity (n) was determined from literature (Freeze and Cherry, 1979) for the cay-based soils at 0.40 or 40%.

Therefore, the average linear vertical velocity can be determined as follows:

$v = (9.3 \times 10^{-9}$ m/sec) x (0.049) / 0.40
$= 1.1 \times 10^{-9}$ m/sec
= 0.03 m/year

Appendix 9

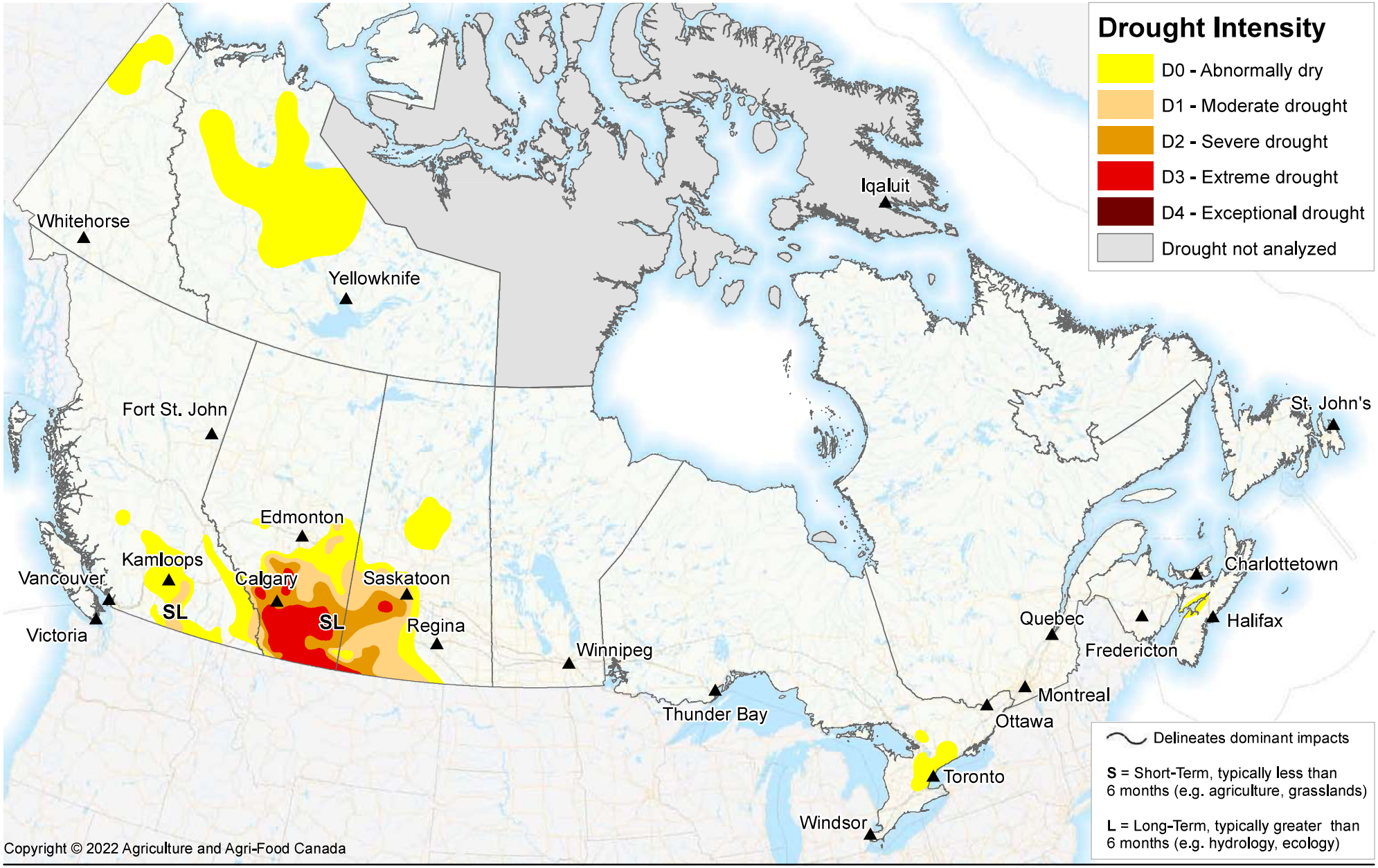
Select 2022 Canada Drought Monitor Maps

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Canada

Canadian Drought Monitor

Conditions as of May 31, 2022



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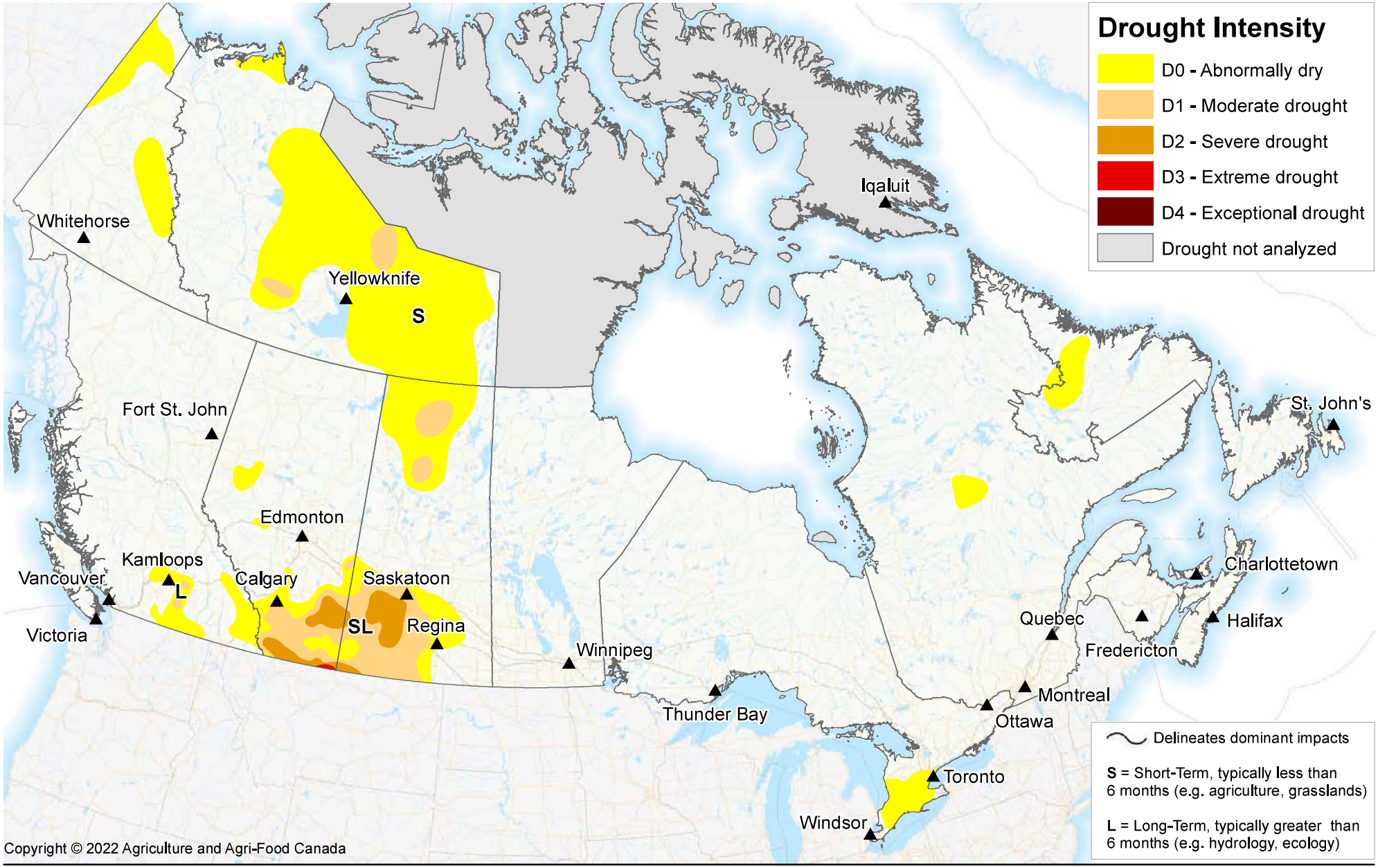
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Canada

Canadian Drought Monitor

Conditions as of June 30, 2022



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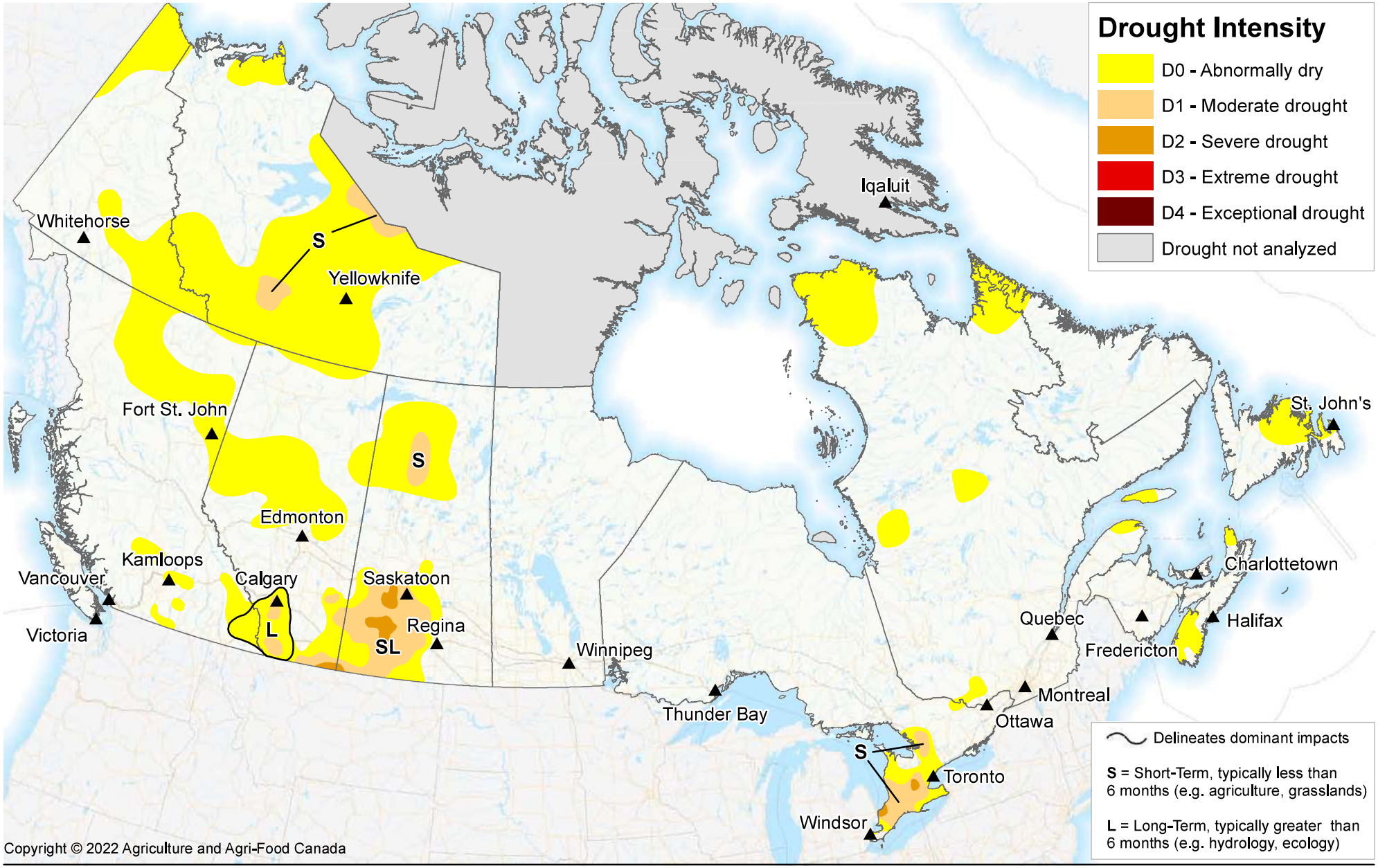
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Canadian Drought Monitor

Conditions as of July 31, 2022



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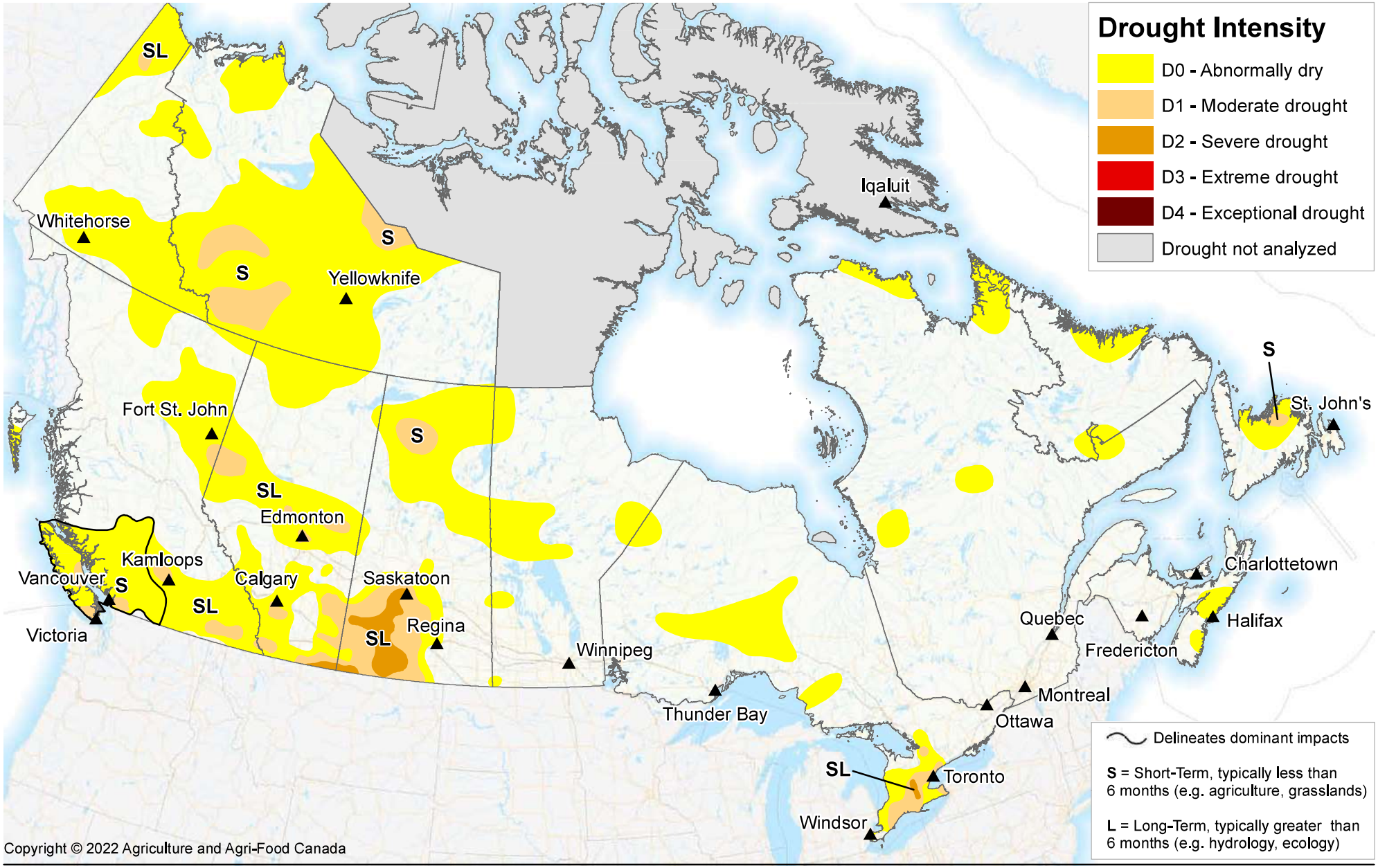
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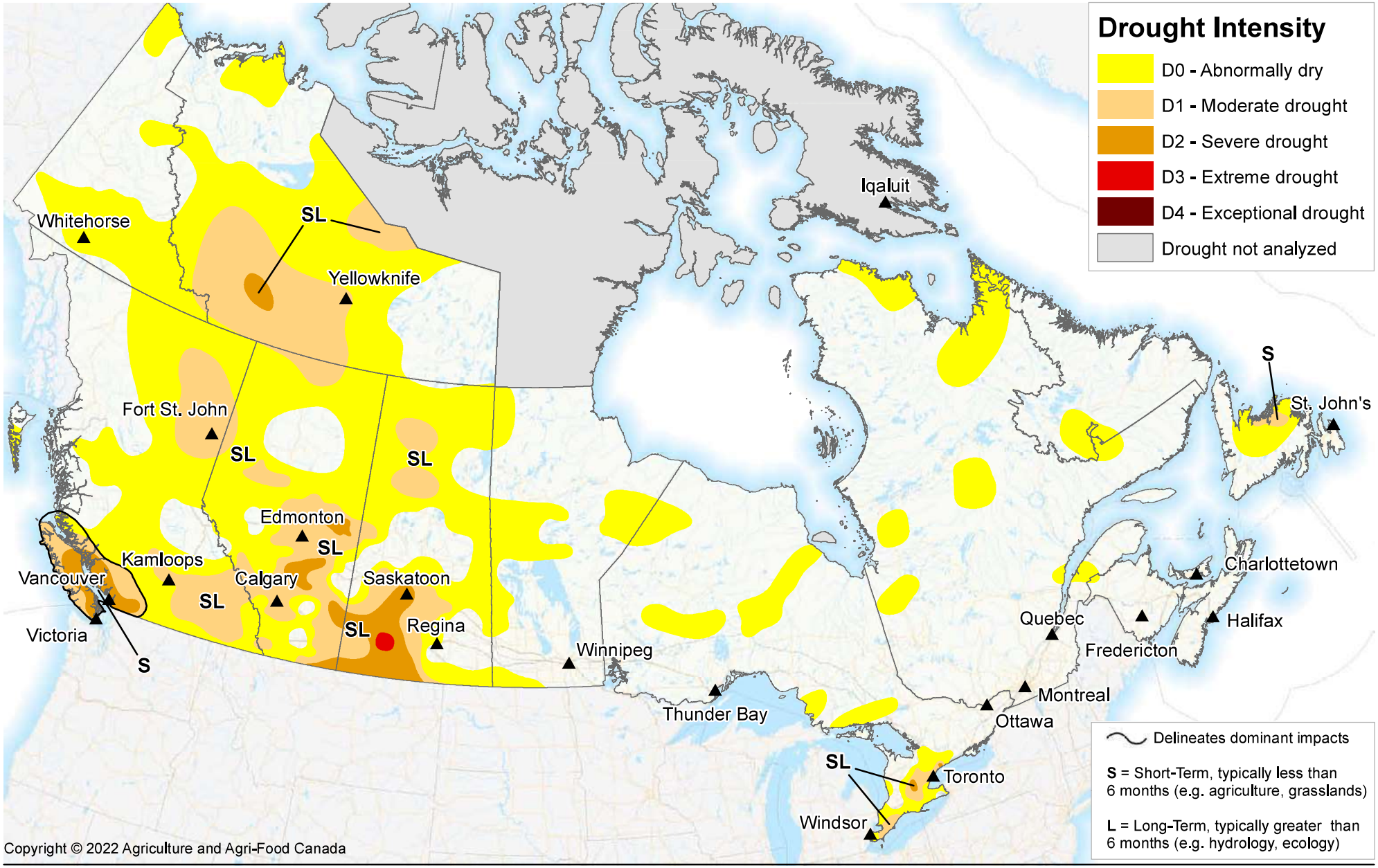
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Canada

Canadian Drought Monitor

Conditions as of September 30, 2022



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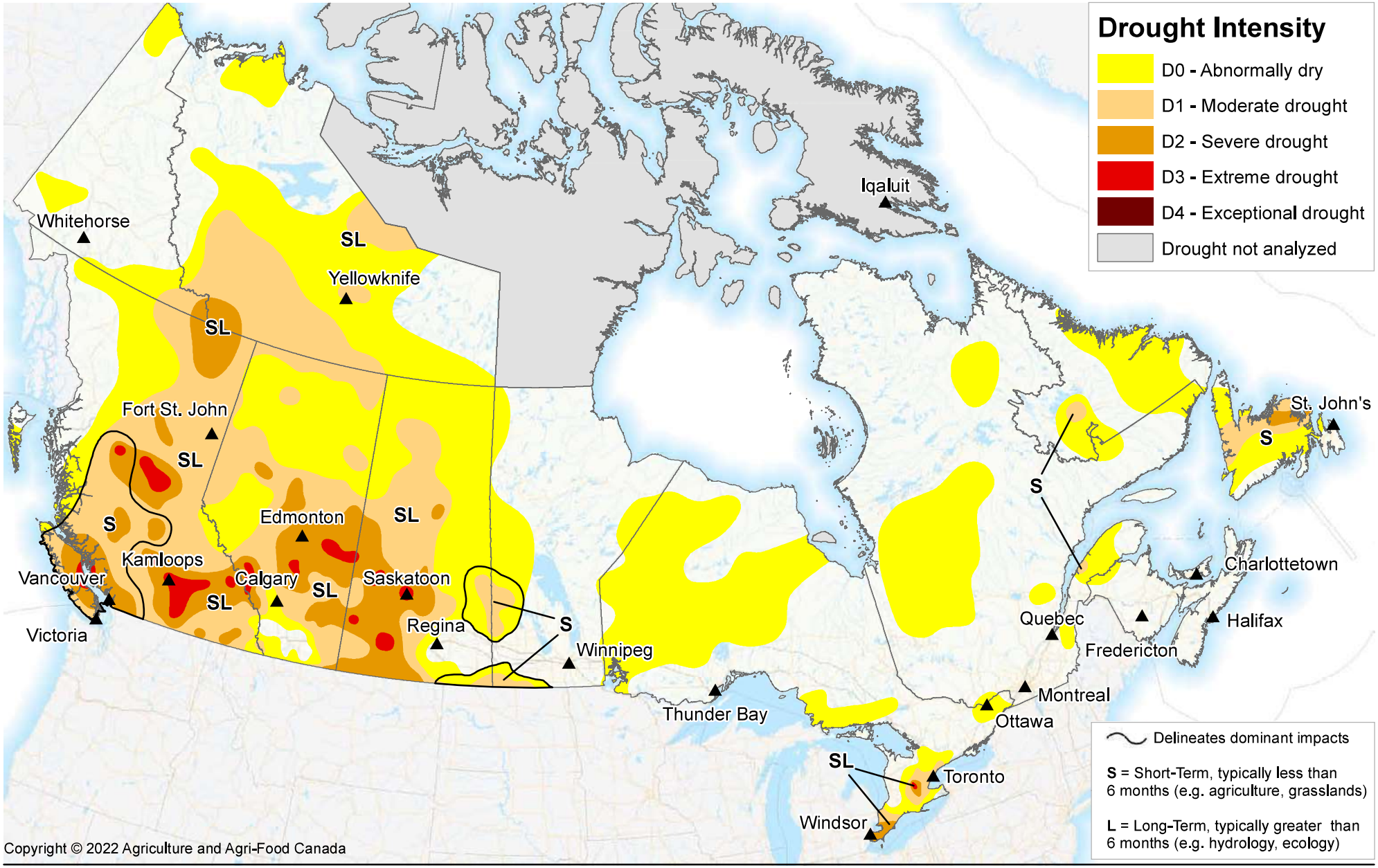
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Canada

Canadian Drought Monitor

Conditions as of October 31, 2022



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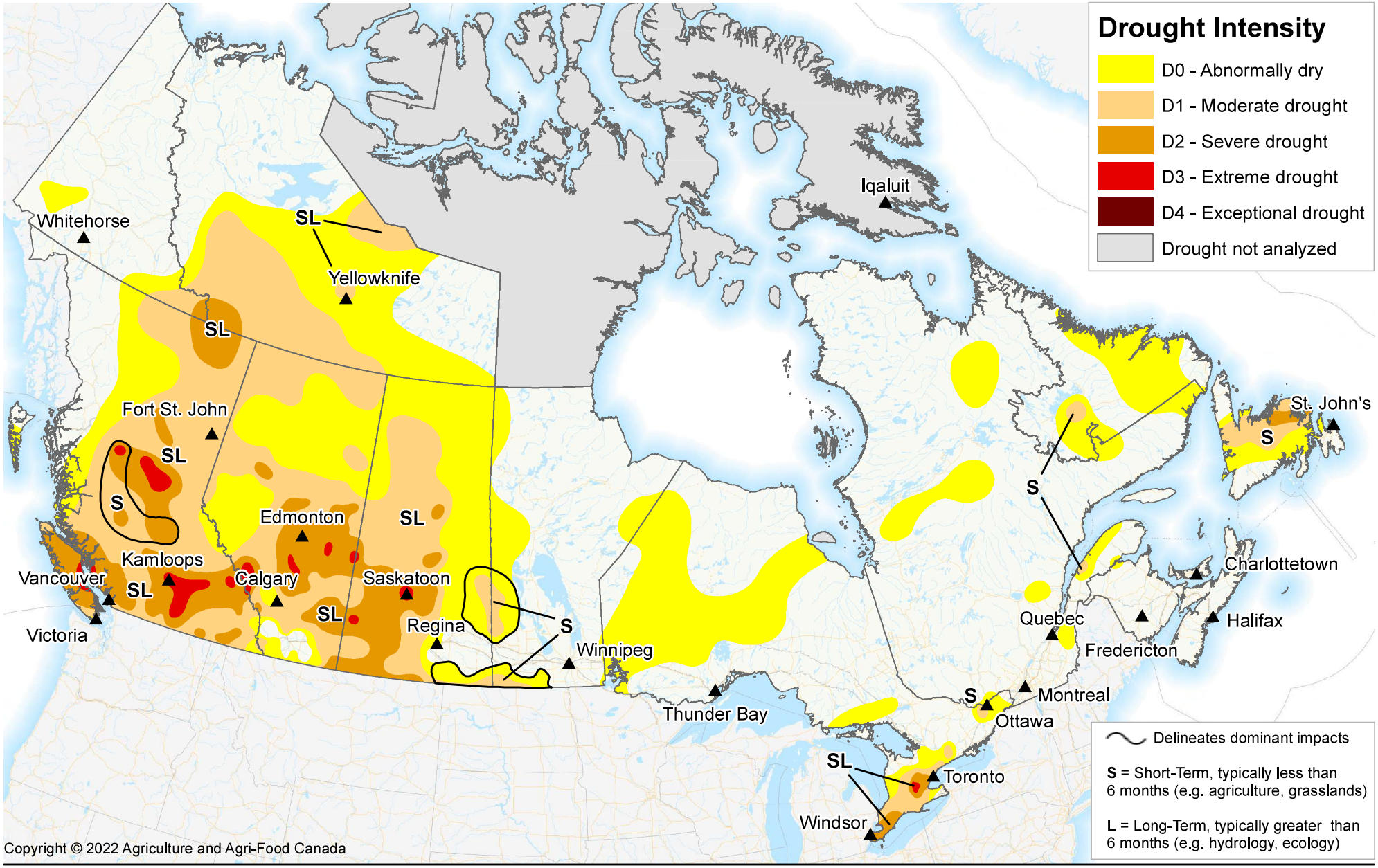
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Canada

Canadian Drought Monitor

Conditions as of November 30, 2022



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