Hydrogeological Assessment

Flato Ida

Flato Ida Dundalk Inc.

3621 Highway 7 East, Suite 503, Markham ON L3R 5Z6

Prepared by:

SLR Consulting (Canada) Ltd.

100 Stone Road West, Suite 201, Guelph, ON N1G 5L3

SLR Project No.: 209.30125.00001

May 6, 2024

Revision: 0

Revision Record

Revision	Date	Prepared By	Checked By	Authorized By
0	May 6, 2024	Allison Vucenovic	Amanda Malatesta	Michael Venhuis

Statement of Limitations

This report has been prepared by SLR Consulting (Canada) Ltd. (SLR) for Flato Ida Dundalk Inc. (Client) in accordance with the scope of work and all other terms and conditions of the agreement between such parties. SLR acknowledges and agrees that the Client may provide this report to government agencies, interest holders, and/or Indigenous communities as part of project planning or regulatory approval processes. Copying or distribution of this report, in whole or in part, for any other purpose other than as aforementioned is not permitted without the prior written consent of SLR.

Any findings, conclusions, recommendations, or designs provided in this report are based on conditions and criteria that existed at the time work was completed and the assumptions and qualifications set forth herein.

This report may contain data or information provided by third party sources on which SLR is entitled to rely without verification and SLR does not warranty the accuracy of any such data or information.

Nothing in this report constitutes a legal opinion nor does SLR make any representation as to compliance with any laws, rules, regulations, or policies established by federal, provincial territorial, or local government bodies, other than as specifically set forth in this report. Revisions to legislative or regulatory standards referred to in this report may be expected over time and, as a result, modifications to the findings, conclusions, or recommendations may be necessary.

Executive Summary

As part of the Draft Plan of Subdivision and future Site Plan for the proposed Flato Ida residential subdivision, SLR Consulting (Canada) Ltd. (SLR) was retained by Flato Ida Dundalk Inc. (the 'Client') to complete a Hydrogeological Assessment for the subject properties located at 752212, 752226, and 752240 Ida Street in Dundalk, Ontario (the "Site"). These properties are proposed to be developed into a residential subdivision. The purpose of the Hydrogeological Assessment was to examine the hydrogeological characteristics of the Site by reviewing available geological and hydrogeological data to identify any hydrogeological constraints to development, and to provide hydrogeologic guidance when constructing the residential development.

As part of the Hydrogeological Assessment, eight (8) boreholes were advanced by SLR at the 752212 Ida Street property in August 2020 coincident with the Geotechnical Investigation completed by Soil Engineers Ltd. (SEL). Nine (9) additional boreholes were advanced across the remaining land parcels in April 2022. In total, 17 boreholes were advanced across the subject properties through the hydrogeological and geotechnical studies, of which 13 boreholes were completed as monitoring wells, two of which were completed as a nested set. One (1) nested pair of mini-piezometers (consisting of a shallow and deep counterpart) were installed within the wetland area south of the Site across Grey Road 9 (MP1-S/MP1-D) to investigate groundwater-surface water interactions.

The results of the drilling program indicated that the Site is underlain by a discontinuous surficial layer of undifferentiated sediments predominantly comprised of sand to silty sand located at surface overlain by topsoil. At select locations a discontinuous sandy gravel layer was also encountered. Underneath the undifferentiated sediment, the low permeable Elma Till was identified, composed of sandy silt to silty sand material. Based on the Oak Ridges Moraine Groundwater Program, the Till unit is underlain by bedrock. Boreholes advanced across the Site were terminated once the targeted depth of the shallow monitoring wells were reached. As such, bedrock was not encountered during drilling.

Groundwater elevations were measured on a monthly basis at monitors installed at the Site in August 2020 commencing in September 2020. Monitors installed in April 2022 were incorporated into the Groundwater Monitoring Program in May 2022. The most recent monitoring event occurred in March 2024. Water levels fluctuated on a seasonal basis where water levels were relatively shallow in the spring and decreased by approximately 1 m moving into the summer period. Groundwater was interpreted to flow generally in a southwesterly direction along the west portion of the Site and a southeasterly direction along the east portion of the Site. Groundwater elevations were comparable between the shallow and deep nested monitors, indicating that there were negligible hydraulic gradients. Data collected from the nested mini-piezometer location indicated that the wetland feature is primarily precipitation and runoff fed due to generally higher groundwater elevations in the shallower monitor.

It is recognized that portions of the Site are located within a Wellhead protection area (WHPA), an intake protection zone (IPZ), a significant groundwater recharge area SGRA, and a highly vulnerable aquifer (HVA). However, given the thickness of the till aquitard above the bedrock aquifer, there are no anticipated changes to the local water supply due to the proposed development.

There are several wells identified for water supply purposes within a 500 m radius of the site from the MECP Water Well Records (WWR) database. The water supply wells were screened within one of two units: the upper overburden aquifer and the deeper bedrock aquifer.

Wells advanced to depths greater than 20 m are not expected to be impacted by the construction of the subdivision. One water supply well located within a 500 m radius of the Site is screened in a sand gravel deposit located less than 30 mbgs. Should any complaint of well impact from residents be received during the construction of the proposed development, a private water well contingency plan would entail a response within 24 hours to the complaint of depleted or impacted water supply.

Table of Contents

Tables in Text

Appended Figures

Appendices

1.0 Introduction

SLR Consulting (Canada) Ltd. (SLR) was retained by Flato Ida Dundalk Inc. to conduct a Hydrogeological Assessment in support of a Draft Plan of Subdivision and future Site Plan for the proposed Flato Ida residential subdivision located in Dundalk, Ontario (referred to as the "Site"). The Site includes the properties located at 752212, 752226, and 752240 Ida Street (**Figure 1**). The Site is bounded by Grey Road 9 to the southeast and Ida Street to the northeast. These lands are currently subject to an approved Ministerial Zoning Order (MZO).

1.1 Study Objectives

The objective of the Hydrogeological Assessment is to characterize the hydrogeological conditions across the Site, identify any hydrogeological constraints to development and potential impacts of development on natural heritage features, and provide guidance on how to mitigate these impacts. This is completed through a review of relevant geologic and hydrogeologic information available through public records for the area or collected through borehole drilling and groundwater monitoring and sampling efforts. This report has been prepared for submission to the Township of Southgate, Saugeen Valley Conservation Authority (SVCA), and Grand River Conservation Authority (GRCA) to support the Draft Plan of Subdivision and future Site Plan Approval for the proposed development.

The specific objectives are summarized below:

- Document the geology, hydrostratigraphy, groundwater flow, and groundwater quality across the Study Area.
- Evaluate potential impacts with respect to Source Protection Plans.
- Assess overall potential impacts of the proposed development on the groundwater flow system.

1.2 Report Organization

This Hydrogeology Assessment report has been organized into eight sections following this introduction. Section 2 provides an overview of background information related to the development, previous investigations and regional geology and hydrogeology. Section 3 provides the field methodologies utilized during the assessment. Section 4 presents a review of the Site geologic and hydrogeologic conditions. Section 5 provides an assessment of the potential impacts of development on shallow groundwater features, potable wells and surface water features. Section 6 presents the conclusions and recommendations. Section 7 provides a closing statement and Section 8 presents the report references.

All Figures referenced throughout the report are presented within the text. Appendices A through E present the: Proposed Development Plan; Borehole Logs; Groundwater Data; AQTESOLV Analyses; and MECP Water Well Records, respectively.

2.0 Background

2.1 Proposed Development

The Site is irregular in shape and measures approximately 35.9 ha in size. The proposed development area measures approximately 18.7 ha, with the remaining 17.2 ha considered non-developable area. It is understood that the proposed development will contain single detached lots, apartment complex, pumping station, stormwater management (SWM) pond, parks, and areas of environmental protection. A copy of the proposed development plan is provided in **Appendix A**.

2.2 Site Description

The proposed Flato Ida residential subdivision lies on lands legally described as Parts of Lots 228, 229 and 230, Range 3 West of the Toronto and Sydenham Road Geographic Township of Proton, Township of Southgate, County of Grey. The Site is bounded by Grey Road 9 to the southeast and Ida Street to the northeast (**Figure 2**). Agricultural and vacant land is present to the northwest, with a forested area and associated wetland to the southwest. The Site, as well as the surrounding area, is used primarily for agricultural purposes, with scattered rural residences.

2.3 Regional setting

2.3.1 Topography and Drainage

The Site is gently undulating with a gentle decrease in ground surface elevation from north to south. A topographic high of 519 metres above sea level (masl) is located near the north end of the Site, with a topographic low of 509 masl at the southwestern boundary (**Figure 3**).

The Site is located on a drainage divide between the Saugeen River Watershed (SRW) and Upper Grand River Watershed (GRW), which are governed by the SVCA and GRCA, respectively.

A Willow Mineral Thicket Swamp is situated in the southern portion of the site abutting the property boundary to the south and east, and agricultural lands and cultural meadow to the north and west, respectively (**Figure 3**). Additionally, a large Poplar-Conifer Mineral Mixed Swamp wetland community is located at the south end of the site and extends to the west beyond the property boundary. An evaluation of the wetlands will be completed as part of the Environmental Impact Study (EIS), to be provided under separate cover (SLR, 2024).

In addition, a tributary to the Grand River headwater drainage feature (HDF) and its associated floodplain is located within the GRW (**Figure 3**). This drainage feature includes a pond at the headwaters, suggesting groundwater dependence. The drainage feature drains towards to the south towards a wetland south of Grey Road 9. Surface water was present within the drainage feature during spring monitoring and water levels near or above ground surface in wells adjacent to the feature (as discussed below) but dry during summer months.

2.3.2 Physiography

The Study Area lies within the Dundalk Till Plain physiographic region of southern Ontario (Chapman and Putnam, 1984).

The Dundalk Till Plain is a gently undulating, partially drumlinized and fluted surface, where the long axis of the drumlins are oriented in a southeastward direction. The Dundalk Till Plain supports extensive wetland complexes due to the presence of poorly drained depressions.

2.3.3 Regional Hydrostratigraphy

Surficial geology in the Dundalk area mainly consists of drumlinized till plains (Chapman and Putnam, 1984) comprised of the Elma Till (stony sandy silt to silt) and Catfish Creek Till (clayey silt and gravel).

There are isolated deposits of glaciolacustrine, glaciofluvial ice-contact and glaciofluvial outwash materials at surface and interbedded within the till plain. These sand and gravel deposits forms the Dundalk Aquifer (Saugeen Valley Source Protection Area, 2015). The extent and thickness of the Dundalk Aquifer is unknown, due to a lack of reliable well records for the area. It is noted that static water levels within the Dundalk Aquifer is close to ground surface.

The overburden material is underlain by bedrock aquifer units comprised of the Guelph, Eramosa, Goat Island and Gasport Formations (Golder, 2018).

2.3.4 Source Protection

Source Protection Plans (SPPs) have been implemented throughout the region to protect drinking water resources, as mandated by the *Ontario Clean Water Act*, 2006. The susceptibility of an aquifer to contamination is evaluated to identify the most vulnerable areas surrounding a drinking water source. There are four (4) types of vulnerable areas as defined by the *Ontario Clean Water Act*, 2006:

- Highly vulnerable aquifer (HVA): aquifers in which an external source is likely to have a significant adverse effect, this includes the land above the aquifer;
- Significant groundwater recharge area (SGRA): an area in which it is necessary to regulate or monitor drinking water threats, that could affect the recharge of an aquifer;
- Surface water intake protection zone (IPZ): an area related to a surface water intake area in which it is necessary to regulate or monitor drinking water threats; and
- Wellhead protection area (WHPA): an area related to a wellhead, within which it is necessary to regulate or monitor drinking water threats.

The Site is within both the Saugeen River Source Protection Plan and the Grand River Source Protection Plan. The Grand River Source Protection Plan has identified the eastern portion of the Site to be within an IPZ and SGRA (**Figure 4**). In addition, the Saugeen River Source Protection Plan has identified the western portion of the Site to be within a SGRA and highly vulnerable aquifer (**Figure 4**). The eastern portion of the Site is also located within a WHPA-D (**Figure 5**) representing a 25-year time-of-travel zone, with the nearest municipal well located approximately 550 m northeast of the Site boundary.

Groundwater and surface water resources within an IPZ, SGRA, HVA, and WHPA are relatively sensitive to chemical or pathogen contamination and / or changes in groundwater recharge. Although precautionary measures to protect groundwater and surface water must be applied on all projects, additional protection measures and related documentation may be required where study areas fall within these zones. These include maintenance of the site-wide water balance and limitations on the presence of potential contamination sources such as gas stations and dry cleaner facilities. Based on the current development plan, the Site development does not include any commercial facilities.

It is important to note that delineation of the vulnerable areas is based on regional mapping and does not consider site-specific conditions (i.e., type and thickness of the overlying material). The results of the drilling program indicates that the subsurface soils across the Site consist of a thin (1-2 m thick) sand to silty sand unit underlain by silty sand to sandy silt till.

Additionally, mapping indicates surficial geology consisting predominantly of sandy silt to silty sand till. The till unit was determined to have low hydraulic conductivity and therefore, the potential to impact deeper aquifers is limited.

A site-specific water balance has been completed by Crozier & Associates Consulting Engineers (“Crozier”) to document pre-development recharge rates, and to look for opportunities to promote the recharge of clean water to meet or exceed pre-development recharge rates. The site-specific water balance is presented under separate cover.

3.0 Methodology

3.1 Installation of Groundwater Monitors

Eight (8) boreholes were advanced at select locations across the 752212 Ida Street property in August 2020 coincident with the Geotechnical Investigation completed by Soil Engineers Ltd. (SEL). Nine (9) additional boreholes were advanced as part of additional investigations by SLR in April 2022 across the remaining land parcels after their acquisition by Flato Ida Dundalk Inc. The boreholes were drilled using a track-mounted drill rig with 0.20 m outer diameter hollow stem auger. A record of geological and hydrogeological conditions was logged during drilling using a split spoon sampler at approximately 0.76 m intervals down to the targeted depth of the monitoring well. At each borehole location, the soil stratigraphy and classification, moisture content, colour, appearance, soil structure (presence of laminations, heterogeneity, soil weathering, etc.), and odour was noted in general accordance with the Unified Soil Classification System.

Select borehole locations (**Figure 2**) were completed as monitoring wells, whereby nested monitoring wells consisting of a shallow and deep counterpart were installed at MW-7 and MW22-405. All monitoring wells were constructed with a 50-millimetre (mm) diameter polyvinyl chloride (PVC) well pipe. In general, the monitoring wells were constructed with No. 10 slotted PVC screen approximately 1.5 m long. Monitor ESA-1 was installed near a suspected aboveground storage tank (AST) and underground storage tank (UST) as part of a Phase 2 Environmental Site Assessment completed coincident with the additional drilling program in 2022 (SLR, 2022). A longer screen (3.0 m long) was installed at this location to allow for an assessment of potential petroleum impacts. The results of the Phase 2 Environmental Site Assessment are provided under separate cover and not discussed herein.

A sand pack was placed around and slightly above the well screen with the remaining upper portion of the borehole was sealed with bentonite. A steel monument casing was installed over the well at each monitoring location. Upon completion of the monitoring wells, the monitors were tagged and registered with the MECP as required by Ontario Regulation (O. Reg.) 903, as amended. Details of the monitoring well construction are summarized in **Table 3-1**. The locations of the monitoring wells are depicted in (**Figure 2)**, and borehole logs are provided in **Appendix B.**

One (1) nested pair of mini-piezometers (consisting of a shallow and deep counterpart) were installed within the wetland area south of the Site across Grey Road 9 (MP1-S/MP1-D). The mini-piezometers were installed to assess groundwater-surface water interactions within the wetland. The mini-piezometers were constructed with a 19 mm diameter steel pipe threaded onto an approximately 0.33 m long screened drive point piezometer tip, and were installed to the targeted depth through direct push. A pilot hole was not advanced prior to the installation; as such, the screened material at the mini-piezometers is unknown. The location of the mini-piezometers are shown on (**Figure 2)**.

Table 3-1: Monitoring Well Details

Monitor	Date of Installation	Ground Surface Elevation (masl)	Top of Pipe Elevation (masl)	Screen Interval (masl)	Screened Material
ESA-1	13-Apr-2022	514.2	515.2	512.6 - 509.6	Silty SAND TILL
MW22-401	13-Apr-2022	518.6	519.5	514.0 - 512.5	Silty SAND TILL
MW22-402	11-Apr-2022	516.8	517.7	512.3 - 510.7	Silty SAND TILL
MW22-403	11-Apr-2022	514.3	515.2	509.7 - 508.2	Sandy SILT TILL
MW22-404	13-Apr-2022	514.2	515.0	509.6 - 508.1	Silty SAND TILL
MW22-405-S	12-Apr-2022	512.1	513.1	507.5 – 506.0	Silty SAND TILL
MW22-405-D	12-Apr-2022	512.1	513.1	503.0 – 501.4	Silty SAND TILL
MW22-406	18-Apr-2022	511.5	512.3	507.2 – 505.7	Silty SAND TILL, SANDY GRAVEL
MW22-407	18-Apr-2022	509.5	510.5	505.0 – 503.5	Sandy SILT TILL
MW22-408	18-Apr-2022	509.3	510.3	504.7 – 503.2	Silty SAND with GRAVEL
MW-2	26-Aug-2020	513.5	514.3	510.6 – 509.1	Silty SAND TILL, SAND
MW-6	24-Aug-2020	514.8	515.5	511.9 – 510.4	Silty SAND TILL, SAND
MW-7-S	25-Aug-2020	512.1	512.7	510.7 – 509.2	Silty SAND TILL, SAND
MW-7-D	24-Aug-2020	512.1	512.7	507.5 – 505.9	Silty SAND TILL
MW-8	26-Aug-2020	513.6	514.5	511.7 – 510.1	Silty SAND TILL
MP-1-S	16-Oct-2020	510.6	511.4	–	–
MP-1-D	16-Oct-2020	510.5	511.9	–	–

3.2 Monitoring Well Development

Following installation, the monitoring wells were developed using dedicated tubing fitted with Waterra inertia foot valves.

The monitoring wells were developed to remove any soil fines that may have infiltrated into the monitoring well and its surrounding sand pack during the installation process, and to improve the hydraulic connection between the well and geologic materials. Due to slow recovery, each well was purged dry and allowed to recover. Water was subsequently removed from the monitoring well until discontinuous flow was produced for a second time.

3.3 Water Level Monitoring

Groundwater levels were manually collected on an approximately quarterly basis in each accessible monitor using a water level meter to collect baseline data prior to development. Groundwater monitoring commenced in September 2020 within the 752212 Ida Street land parcel, and the remaining monitors were incorporated into the program in May 2022. The most recent groundwater monitoring event occurred on March 7, 2024.

The surface water level and groundwater elevation were measured at the mini-piezometer location to assess groundwater-surface water interactions within the wetland area.

To support a more comprehensive understanding of the Site, select monitoring wells and mini-piezometers were instrumented with automated dataloggers to obtain continuous groundwater level readings at 12-hour intervals. A barologger was also deployed coincident with the dataloggers to measure changes in atmospheric pressure. Continuous water level measurements provide additional insight into the groundwater regime, particularly in response to precipitation events, as well as high-water level conditions. The dataloggers are downloaded every four (4) months while completing manual water level measurements on-Site. The datalogger was removed from the mini-piezometers in November 2021, and was subsequently monitored by manual measurements during the quarterly water level events. Dataloggers were removed from groundwater wells on November 1, 2023.

3.4 In-Situ Hydraulic Conductivity and Analysis

In-situ hydraulic conductivity tests were completed in select monitoring wells to establish the permeability (hydraulic conductivity) of the formation in which the wells are screened. Hydraulic conductivity is a parameter that describes the ability of soil to allow water to move through it. The lower the hydraulic conductivity, the less water will be able to move through. Aquifers, such as sandy or gravelly soils, typically have a hydraulic conductivity of 10^{-6} metres per second (m/s) or greater, whereas aquitards (clay or dense silt) have a hydraulic conductivity of 10^{-8} m/s or less.

The testing involved the slug test method, whereby a slug of known volume was removed (rising head test) from each well. The water levels were recorded during the addition, removal, and recovery stages of the slug test using a Diver datalogger temporarily installed in the monitor. The in-situ hydraulic conductivity test was completed once the water level recovered to 90% of static conditions. The slug tests were analyzed in AQTESOLV using the Bouwer-Rice method (1976) for unconfined aquifers.

3.5 Gas Monitoring

Gas probes were installed at four select monitors (ESA-1, MW-2, MW-6, MW-7-S) on March 1, 2024, to support the ongoing D4 Investigation for the Site (submitted under separate cover). At the time of installation, groundwater levels were above the well screen and gas monitoring was not feasible.

The potential for gas migration is greatest under frozen ground conditions, when combustible gases, if present, will tend to preferentially migrate laterally through the soils rather than vent through the overlying fill or cover material. Therefore, to assess for the presence and temporal variability of soil gas concentrations, it is recommended that soil gas monitoring occurs at minimum, during periods of low water table (Summer 2024) and frozen conditions (Winter 2024/2025).

4.0 Site Geology and Hydrogeology

4.1 Geology and Hydrostratigraphy

4.1.1 Surficial Geology

Based on a review of the Ontario Geological Survey mapping (OGS, 2010), surficial geology of the Site is primarily Elma Till, which is characterized as a stone-poor sandy silt to silty sand till. Localized glaciofluvial sand deposits are found along the western and southern property boundary within the wetland area (**Figure 6**).

Surficial geology of the Site was also characterized by advancing boreholes at select locations across the property. Borehole logs are provided in **Appendix B**. Geological cross-sections of the Site, as indicated in (**Figure 7)**, are presented in (**Figure 8** and **Figure 9)**.

Based on the results of the drilling program, a relatively thin (1–2 m thick) sand to silty sand unit was located at surface overlain by topsoil. At select locations (MW22-405, MW22-406, MW22-408), a discontinuous sandy gravel layer was encountered between depths of 1.5 mbgs to 6.8 mbgs, or about 510.6 masl to 502.5 masl.

A till unit was found underlying the sand to silty sand unit. The till unit is composed of sandy silt to silty sand material and was located at approximately 516.3 masl (2.3 mbgs) (MW22-401) to 506.2 masl (5.3 mbgs) (MW22-406). Interbedded within the till unit are discontinuous sand to sandy gravel lenses. The upper 3 to 5 m of the till unit is weathered, and shows root structures, fractures, and oxidized soils. This more permeable weathered soil hosts the water table, primarily due to poor drainage to depth. The glacial till is estimated to be approximately 35 m thick underneath the Site. The glacial till material serves as an aquitard protecting the underlying bedrock aquifer due to its low permeability and substantial thickness.

4.1.2 Bedrock Geology

Boreholes advanced across the Site were terminated once the targeted depth of the monitoring wells were reached. As such, bedrock was not encountered during drilling. However, a review of the MECP WWR database (**Figure 11**) indicates that the bedrock in the area generally lies between 26 mbgs (MECP well ID 2513888) to 74 mbgs (MECP well ID 2509298). There was also one well record (MECP well ID 2500875) that encountered bedrock at 112.5 mbgs. The bedrock consists mostly of dolostone/limestone. It is noted that one well (MECP well ID 2502018), located approximately 500 m northwest of the Site, encountered shale at 34 mbgs.

Source Protection documents from the GRCA indicates that the bedrock is composed of 88 m of both the Guelph Formation and the Gasport Formation (Lake Erie Region Source Protection Committee, 2021). The Guelph Formation consists of porous, fine to medium crystalline, medium to massive irregularly bedded dolostone, while the underlying Gasport Formation consists of thick- to massive-bedded, fine to coarse-grained dolostone and dolomitic limestone (Armstrong, 2010).

4.2 Groundwater Monitoring

4.2.1 Groundwater Levels

Groundwater level measurements were recorded at monitors MW-2, MW-6, MW-7-S/D, MW-8 and MP1-S/D commencing in September 2020 with the most recent monitoring event occurring in March 2024. Monitors ESA-1, MW22-401, MW22-402, MW22-403, MW22-404, MW22-405-S/D, MW22-406, MW22-407, and MW22-408 were incorporated into the Groundwater Monitoring Program in May 2022. Monitors MP1-S/D, MW-6, MW-7-S/D, MW22-405-S/D, MW22-406, and MW22-408 were instrumented with dataloggers to collect continuous water level measurements at 12-hour intervals. Groundwater elevations measured within the monitoring wells and mini-piezometers are provided in **Table C-1** to **C-2**, **Appendix C**, and hydrographs are provided in **Appendix C**.

Groundwater elevations across the Site ranged between -0.7 mbgs to 3.9 mbgs, or 507.2 masl to 517.7 masl, and subtly followed surface topography, where the highest and lowest water levels were consistently observed at MW22-401 (northern portion of the Site) and MW22-407 (southern portion of the Site), respectively.

During the groundwater monitoring period, water levels were observed to display seasonality. Groundwater elevations were highest in the spring season with levels at or near ground surface, and slowly declined over the course of the summer. Groundwater levels can be seen rising following the fall season and appear relatively stable until the following spring.

Noted periods of drawdown occurred in June 2021 and August 2021 in MW-7 S/D and MW-6 (**Appendix C**). Additionally, MW-6 exhibited a drawdown in February 2021 and February 2022, which was not seen in MW-7. A general declining trend in water levels was observed in all monitoring wells with data loggers between May and September 2022. Groundwater levels exhibit increasing trends until the following December. A decrease is again observed in summer 2023 with subsequent increasing trends in fall up to logger removal from the wells in November 2023.

Groundwater monitoring results within the wetlands on the southwestern portion of the Site suggest that high water levels are present during the spring, with the low permeable soils providing limited infiltration. During the warmer summer months, the water table drops and no groundwater input is provided to the wetland. However, within the larger wetland/woodland swamp, the soils consist of a more permeable sands and gravels pocket, which collects drainage from the Site (both surface water and groundwater). But due to the limited extent of the surficial sand and gravel zone (**Figure 6**), the water has no outlet to drain, and results in saturated conditions throughout the year.

4.2.2 Horizontal Groundwater Flow

The interpreted groundwater contours for spring 2023, representing a generally high-water table position, are presented in (**Figure 10)**. Water levels during spring conditions are of particular interest as it typically represents the highest groundwater elevations and will therefore inform the engineering design of residential development. The interpreted groundwater flow direction is primarily in southwesterly direction along the west portion of the Site and a southeasterly direction along the east portion of the Site. It is noted that there is a watershed drainage divide that runs through the centre of the Site in a north-south direction. The horizontal component of groundwater flow during the spring season travels in the weathered upper till, surficial sand, silty sand, and sand with gravel.

4.2.3 Vertical Groundwater Flow

Vertical hydraulic gradients were calculated between the shallow and deep monitors at the nested monitoring well locations to assess groundwater discharge/recharge conditions. Vertical hydraulic gradients were also calculated at the mini-piezometer location to assess groundwater-surface water interactions within the wetland located east of the Site. The vertical hydraulic gradients are provided in **Table C-3, Appendix C.**

Groundwater elevations were comparable (**Figure C-1, Appendix C**) between the shallow and deep monitor at nested monitoring wells MW22-405 and MW-7, indicating that there were negligible (i.e., 0.00 to 0.03 m/m) hydraulic gradients. The shallow and deep monitors at each nested monitoring well locations were screened within the silty sand to sandy silt till unit, suggesting that there was consistently negligible vertical movement within the till.

At mini-piezometer location MP1, groundwater elevations were generally higher in the shallow monitor compared to its deeper counterpart. This indicates that the wetland feature is primarily precipitation and runoff fed. During the spring season following snowmelt and during large precipitation events, there are sporadic groundwater contributions to the wetland.

4.3 Hydraulic Conductivity

In-situ hydraulic conductivity tests were completed at two (2) groundwater monitoring wells at the Site. The results of the hydraulic conductivity tests are provided in **Table 4-1**, and the AQTESOLV analysis are provided in **Appendix D**.

Table 4-1: Hydraulic Conductivity

Monitor	Hydraulic Conductivity (m/s)	Screened Strata
MW22-405-S	8.2×10^{-8}	Silty SAND TILL
MW22-405-D	1.8×10^{-8}	Silty SAND TILL

The geometric mean hydraulic conductivity for the tested monitoring wells is 3.8×10^{-8} m/s, with a measured range of 1.8×10^{-8} to 8.2×10^{-8} m/s. This corresponds to the upper weathered portion of the glacial till. A deeper monitor, located within a nearby development area located approximately 800 m north of the Site, was screened within the unweathered glacial till aquitard and was found to have a hydraulic conductivity 30 times lower than the upper material at 7.6×10^{-10} m/s (SLR, 2023). The results are consistent with those reported by Freeze and Cherry (1979) for similar soils.

4.4 MECP Water Well Record Database

Well records from the MECP WWR database were reviewed[1] to assess the stratigraphy and water use of wells located within a 500 m radius of the Site. The locations of the wells are shown in (**Figure 10)**, and a summary is provided in **Appendix E**. Copies of the well records are provided in **Appendix E**.

[1] The MECP WWR database was reviewed in April 2024.

Forty-three (43) MECP records were identified for wells listed to be within 500 m of the property. Twenty-three (23) of those records were for wells for water supply purposes, sixteen (16) were observation/monitoring wells or test holes, and four (4) were noted to be abandoned. The water supply wells were screened within one of two units: the upper overburden aquifer and the deeper bedrock aquifer.

The bedrock aquifer is composed of both the Guelph Dolostone Formation and the underlying Gasport Dolostone Formation. Based on available MECP well records, the bedrock surface generally lies between 26 mbgs (MECP well ID 2513888) to 74 mbgs (MECP well ID 2509298). The upper bedrock is inferred to be of low permeability, and the municipal production zone lies in the middle of the sequence. Municipal Wells D3, D4 and D5 are located approximately 550 m, 2000 m, and 100 m, respectively, northeast of the Site boundary (**Figure 5**). There is also one local residential well within 500 m of the Site that is screened in a sand gravel deposit located less than 30 mbgs. Residential water wells are a relatively low draw on the groundwater and given the thickness of the overlying till aquitard, is not expected to be affected by the proposed development.

5.0 Impact Assessment for Potential Receptors

The following section presents an evaluation of potential impacts on groundwater resources and surface water resources for the Site.

5.1 Shallow Groundwater Features

Groundwater elevations across the Site are relatively shallow, generally less than 2 mbgs with levels close to surface in the spring. Water levels fluctuated on a seasonal basis. Groundwater levels near surface were noted in some wells during the spring season. Water levels generally follow ground surface elevations where the highest and lowest groundwater elevations were consistently observed within the northern and southern portion of the property, respectively. Interpreted groundwater flow direction is primarily in southwesterly direction along the west portion of the Site and a southeasterly direction along the east portion of the Site.

During the spring season, water level is hosted by the surficial sand, silty sand, and sand and gravel layer, and dropped into the underlying till unit in the drier period. The weathered till unit has an estimated hydraulic conductivity of 3.8×10^{-8} m/s. It is noted that there are no vertical groundwater movement within the till unit, and as such, this is considered a relatively impermeable material. Based on a review of the MECP WWR records, the till unit extends to approximately 35 mbgs. The hydraulic conductivity of the unweathered till aquitard is estimated at 7.6×10^{-10} m/s, approximately 30 times lower than the weathered till.

Given that the till unit is relatively thick and is interpreted to be impermeable, there are no anticipated impacts to the underlying bedrock aquifer due to the proposed development.

To prevent leakage of groundwater into basements, it is anticipated that import fill is required to keep the basements above the high water table. It is understood that as a precaution, each basement will be designed to be surrounded by a foundation drain, which is considered normal practice within Township of Southgate. Typically, these are set to a minimum of 0.3 m above the measured high water table, assuming water levels could rise at some point in the future. The imported fill should be of the same hydraulic conductivity, or greater, than the native soil to prevent “wicking” up the water table to a higher elevation.

The design of the stormwater pond will have to consider the depth of the water table. Based on the groundwater elevations measured within the nested wells at MW7, there is negligible vertical groundwater movement. Instead, groundwater predominantly flows horizontally within the surficial sand, and silty sand till unit. With the aquifer soils conveying groundwater laterally, there is a danger of groundwater inflow occupying storage capacity of the SWM Pond. More importantly, the seepage has the potential to affect sidewall stability causing slumpage across the aquifer soils in the short to midterm. The results of this study should be reviewed by a Geotechnical Engineer to provide guidance on SWM Pond design.

5.2 Potable wells

The Village of Dundalk relies on groundwater supply from wells screened within the dolostone bedrock that extends under the Site. The well capture zones have been documented by the Lake Erie Region Source Protection Committee and extend under the southeastern portion of the proposed development within the bedrock. The upper bedrock is inferred to be of low permeability, and the municipal production zone lies in the middle of the sequence. Municipal Wells D3, D4, and D5 are located approximately 550 m, 2000 m, and 1000 m, respectively, northeast of the Site.

However, given the thickness of the aquitard soils at this Site, and the fact that there will be no onsite sewage disposal through private septic beds, no impact to the groundwater quality in the aquifer is expected. Additionally, it is expected that pre-development recharge will have to be maintained in the post-development condition.

Rurally there are several surrounding individual residential private wells that tap into the dolostone bedrock and have been drilled to depths of approximately 26 mbgs to 113 mbgs. These residential water wells are a relatively low draw on the groundwater and given the thickness of the overlying aquitard, are not expected to be affected by the proposed development provided groundwater recharge is maintained.

Monitoring wells have been installed at the property as part of the Site-specific investigations to document stabilized groundwater conditions. Monitoring is on-going and is planned to continue through construction. When the monitoring wells are determined to be no longer required, or if they are determined to be at risk of damage from Site grading and construction, the wells should be properly decommissioned in accordance with O. Reg. 903. Decommissioning a well which is no longer in use helps ensure the safety of those in the vicinity of the well, prevents surface water infiltration into an aquifer via the well, prevents the vertical movement of water within a well, conserves aquifer yield and hydraulic head, and can potentially remove a physical hazard.

5.3 Surface Water Features

A wetland/significant woodland is located in the southwest end of the Site, as well as a Willow Mineral Thicket Swamp. No significant upward groundwater springs are present, likely because the whole Site sits on a major topographic divide and there is no way to generate upward groundwater pressures. A fluctuating groundwater table helps sustains the vegetation, with the water levels within monitors MW22-406, MW22-407 and MW22-408, located adjacent to these wetland areas near or above surface in the wetter spring months. As the water table drops in the summer months, there is no groundwater contributions to the wetland. However, more porous sand and gravel soils are present at surface within the larger wetland/significant woodland, and is connected at depth to the wetland thicket. The sand and gravel unit is a pocket surrounded by surficial sandy silt till, and therefore has limited capacity to drain. Therefore, water collects within the glaciofluvial pocket and causes saturated conditions within the woodlot for extended periods of time throughout the year. It is anticipated that if the Site water balance is maintained by carefully implementing mitigation measures, the wetland will not be adversely affected by development of the Site.

6.0 Conclusion

The purpose of the Hydrogeological Assessment was to identify any hydrogeologic constraints to development. Based on the above results of the investigation and discussion, the following conclusions are presented.

- The Site is underlain by surficial sand to silty sand deposits up to 2 m thick. Underneath the surficial aquifer deposits is a sandy silt to silty sand till. The upper unweathered portion of the till unit has an estimated average hydraulic conductivity of 3.8×10^{-8} m/s.
- The Site lies along a watershed drainage divide that runs through the centre of the Site in a north-south direction.
- Groundwater is interpreted to flow primarily in a southwesterly direction along the western portion of the Site and a southeasterly direction along the eastern portion of the Site.
- Currently, highest groundwater level conditions were recorded during the spring 2023 sampling event.
- No upward groundwater springs are present, likely because the whole Site sits on a major topographic divide and there is no way to generate upward groundwater pressures.
- Gas caps were installed at select monitors on March 7, 2024. To assess for the presence and temporal variability of soil gas concentrations, it is recommended that soil gas monitoring occurs at minimum, during periods of low water table (Summer 2024) and frozen conditions (Winter 2024/2025).
- It is recognized that portions of the Site are located within a WHPA, IPZ SGRA, and HVA. However, given the thickness of the till aquitard above the bedrock aquifer, there are no anticipated changes to the local water supply due to the proposed development.
- Municipal well D3, D4, and D5 are located approximately 550 m, 2000 m, and 1000 m, respectively, northeast of the Site. There are no anticipated hydrogeological impacts due to the proximal distance of the municipal wells to the proposed development area and thickness of the till aquitard below the Site.
- There are several surrounding individual residential private wells that are screened in the dolostone bedrock or overburden aquifer units. The residential water wells are a relatively low draw on the groundwater and given the thickness of the overlying clay aquitard, is not expected to be affected by the proposed development provided groundwater recharge is maintained.
- The wetlands in the southeastern portion of the Site are sustained by high groundwater levels in the spring, and residual moisture in the tension saturated zone above the water table in the drier months.
- The sand and gravel soils found in the southwestern portion of the Site are expected to contribute some lateral groundwater flow that serves to in part replenish water to the larger wetland/significant woodland. Provided the Site water balance is maintained the wetlands are not expected to be adversely affected by development of the Site.

7.0 Closure

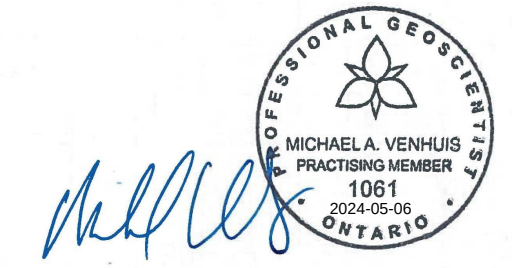
We trust that this report satisfies your requirements at this time.

Regards,

SLR Consulting (Canada) Ltd.

Allison Vucenovic, M.Sc., G.I.T.
Environmental Scientist

Amanda Malatesta, M.Sc., P.Geo.
Hydrogeologist



Michael Venhuis, M.Sc., P.Geo.
Senior Hydrogeologist

8.0 References

Armstrong, D.K., Carter, T.R. 2010. The Subsurface Paleozoic Stratigraphy of Southern Ontario. Ontario Geological Survey, Mines and Minerals.

Bouwer, H., Rice, R.C. 1976. A slug test method for determining hydraulic conductivity of unconfined aquifers with completely or partially penetrating wells. Water Resources research, 12 (3), 423-428.

Chapman, L.J., Putnam, D.F. 1984. The physiography of southern Ontario, third edition. Ontario Ministry of Natural Resources.

Freeze, A.R., Cherry, J.A. 1979. Groundwater. Prentice-Hall Inc., Englewood Cliffs, New Jersey.

Golder Associates (Golder). 2018. Village of Dundalk – WHPA Delineation and Vulnerability Scoring. Report Number 1786493.

Lake Erie Region Source Protection Committee. 2018. Source Water Protection Updated Technical Study for Dundalk Well D5. Revised SPC-18-04-06.

Lake Erie Region Source Protection Committee. 2021. Grand River Source Protection Area – Approved Assessment Report.

Ontario Geological Survey (OGS). 2010. Surficial geology of Southern Ontario, Miscellaneous Release--Data 128-REV.

Ontario Geological Survey (OGS). 2011. Bedrock Geology of Ontario, 1:250 000 scale, Miscellaneous Release Data 126-Revision 1.

Saugeen Valley Source Protection Area. 2015. Appendix E – Approved Assessment Report: Chapter 3 Water Quantity Stress Assessment.

SLR. 2022. Phase II Environmental Site Assessment – DRAFT. 752212, 752226 and 752240 Ida Street, Dundalk, Ontario.

SLR. 2023. Hydrogeological Assessment. Glenelg Phase 3. Dundalk, Ontario.

SLR. 2024. Environmental Impact Study. Flato Ida Street, Dundalk, Ontario.

Figures

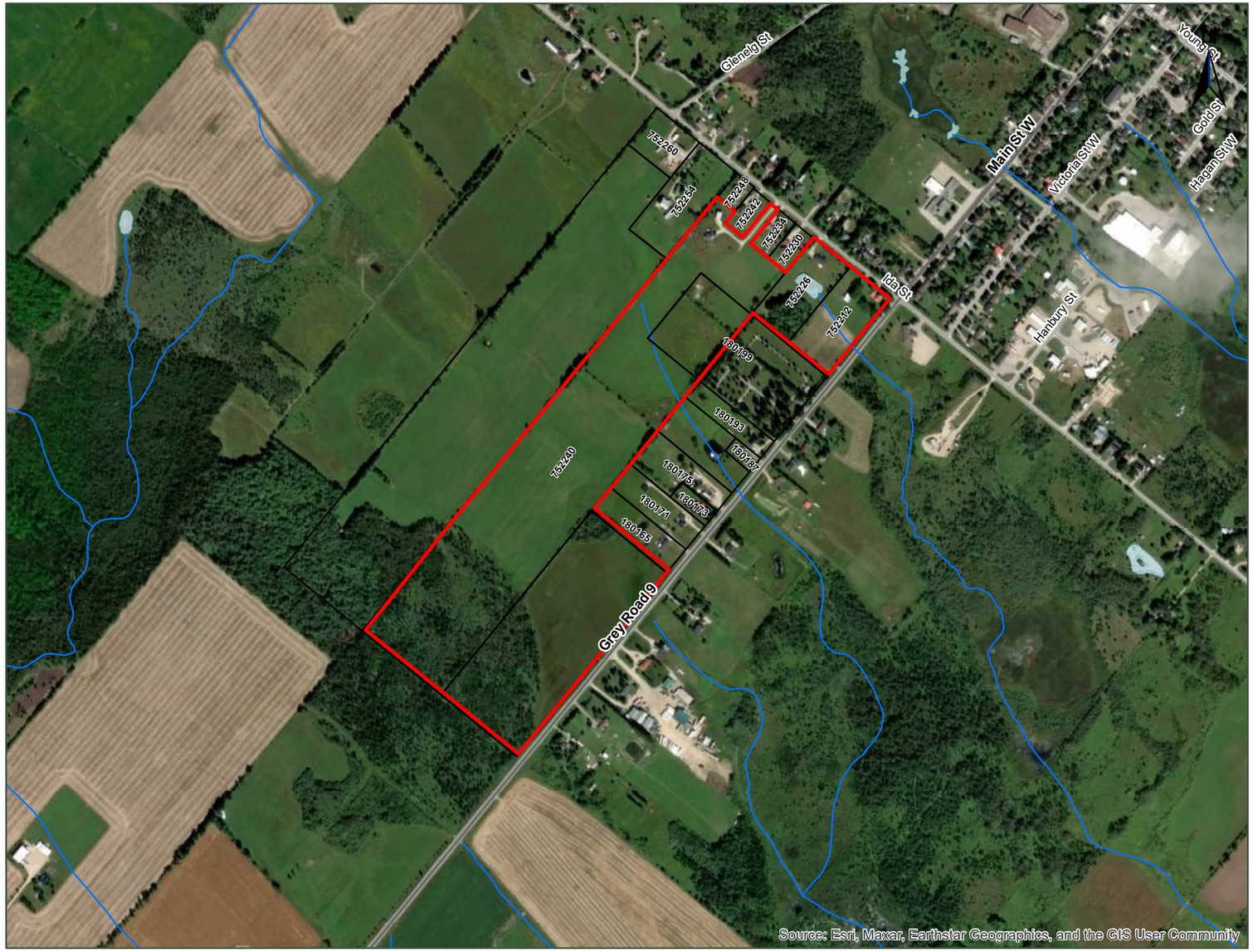
Hydrogeological Assessment

Flato Ida

Flato Ida Dundalk Inc.

SLR Project No.: 209.30125.00001

May 6, 2024



NOTES:
DATA SOURCE: LAND INFORMATION ONTARIO

LEGEND:

SITE BOUNDARY

PARCEL

0 50 100 200 300 m

SCALE 1:10,000
PAGE SIZE 11 x 17
NAD 1983 UTM Zone 17N

THIS MAP IS FOR CONCEPTUAL PURPOSES ONLY
AND SHOULD NOT BE USED FOR NAVIGATION

FLATO IDA DUNDALK INC.
FLATO IDA
DUNDALK, ONTARIO, CANADA

HYDROGEOLOGICAL ASSESSMENT

SITE LOCATION

SLR

FIGURE NO:
1

DATE: April 30, 2024

PROJECT NO: 209.V30125.00001

Last Saved: April 30, 2024 10:53:03 AM by tgraham

GIS PATH: G:_Projects\FLATO\Dundalk\1_Maps\RPT\209_30125\Ida Street\Hydrog_Assess_2023\209_V30125_01_SiteLocation_rev0.mxd

LEGEND:

- SITE BOUNDARY
- MONITORING WELL
- MINI-PIEZOMETER
- BOREHOLE
- GAS MONITOR
- PERMANENT WATERCOURSE
- DRAINAGE DIVIDE

NOTES:
BASEDATA:
ONTARIO MINISTRY OF NATURAL RESOURCES, LAND INFORMATION ONTARIO (LIO)

0 50 100 200 300 m

SCALE 1:4,500
PAGE SIZE 11 x 17
NAD 1983 UTM Zone 17N

THIS MAP IS FOR CONCEPTUAL PURPOSES ONLY AND SHOULD NOT BE USED FOR NAVIGATION

FLATO IDA DUNDALK INC.
FLATO IDA
DUNDALK, ONTARIO, CANADA

HYDROGEOLOGICAL ASSESSMENT

SITE PLAN

SLR

FIGURE NO:
2

DATE: April 30, 2024

PROJECT NO: 209.V30125.00001

LEGEND:

- SITE BOUNDARY
- PERMANENT WATERCOURSE
- SURFACE CONTOUR (1M)
- UNEVALUATED WETLAND
- DRAINAGE DIVIDE
- WETLAND VERIFIED BY GRCA - NOT SURVEYED

NOTES:
BASEDATA:
ONTARIO MINISTRY OF NATURAL RESOURCES, LAND INFORMATION ONTARIO (LIO)
CONTOURS:
SWOOP 2015

0 37.5 75 150 225 m

SCALE 1:4,500
PAGE SIZE 11 x 17
NAD 1983 UTM Zone 17N

THIS MAP IS FOR CONCEPTUAL PURPOSES ONLY AND SHOULD NOT BE USED FOR NAVIGATION

FLATO IDA DUNDALK INC.
FLATO IDA
DUNDALK, ONTARIO, CANADA

HYDROGEOLOGICAL ASSESSMENT

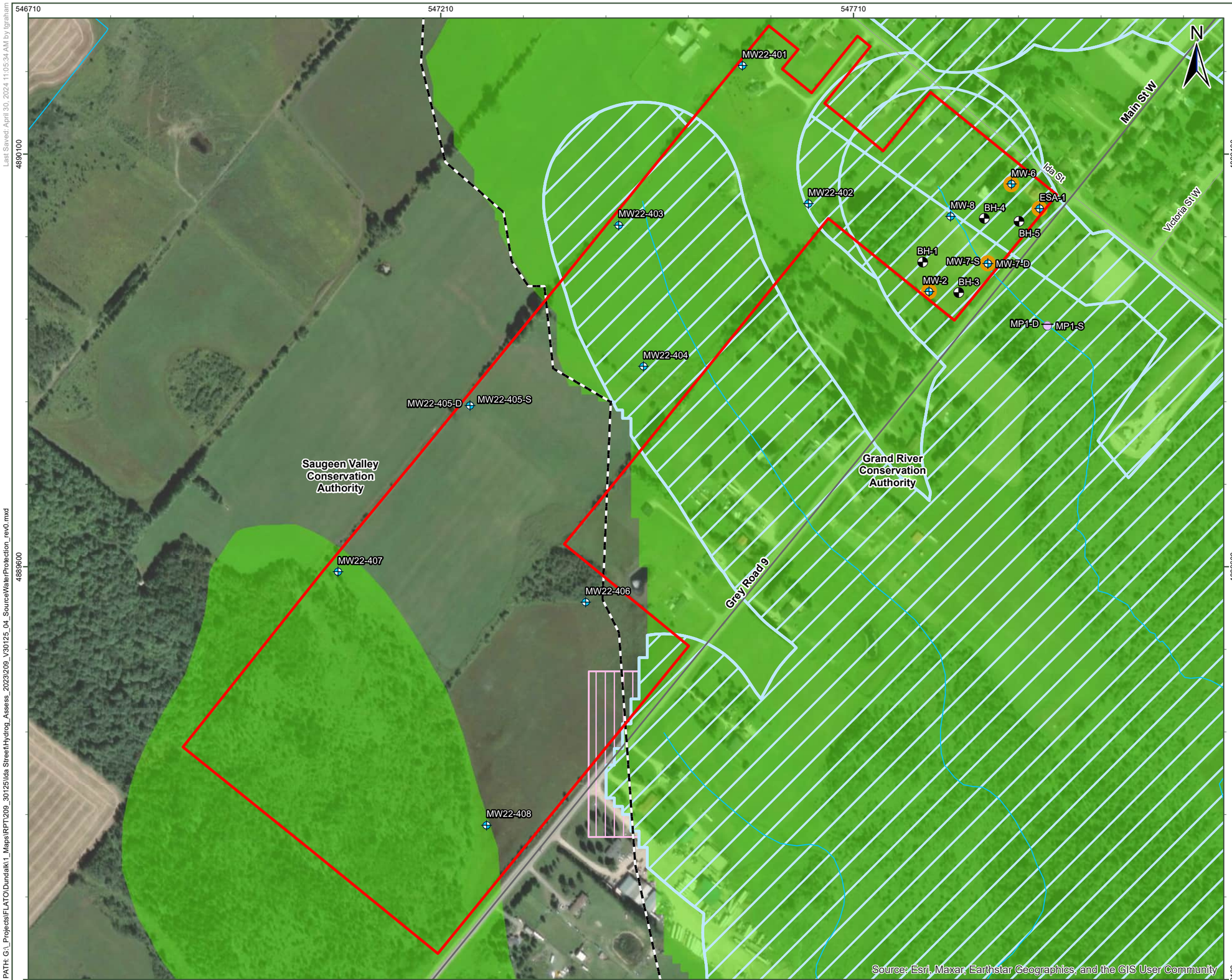
SITE TOPOGRAPHY

SLR

FIGURE NO:
3

DATE: April 30, 2024

PROJECT NO: 209.V30125.00001



LEGEND:

- SITE BOUNDARY
- MONITORING WELL
- MINI-PIEZOMETER
- BOREHOLE
- GAS MONITOR
- CONSERVATION AUTHORITY BOUNDARY
- INTAKE PROTECTION ZONE 3
- HIGHLY VULNERABLE AQUIFERS
- SIGNIFICANT GROUNDWATER RECHARGE AREA
- PERMANENT WATERCOURSE

NOTES:
BASEDATA:
ONTARIO MINISTRY OF NATURAL RESOURCES, LAND INFORMATION ONTARIO (LIO)

0 37.5 75 150 225 m

SCALE 1:4,500
PAGE SIZE 11 x 17
NAD 1983 UTM Zone 17N

THIS MAP IS FOR CONCEPTUAL PURPOSES ONLY AND SHOULD NOT BE USED FOR NAVIGATION

FLATO IDA DUNDALK INC.
FLATO IDA
DUNDALK, ONTARIO, CANADA

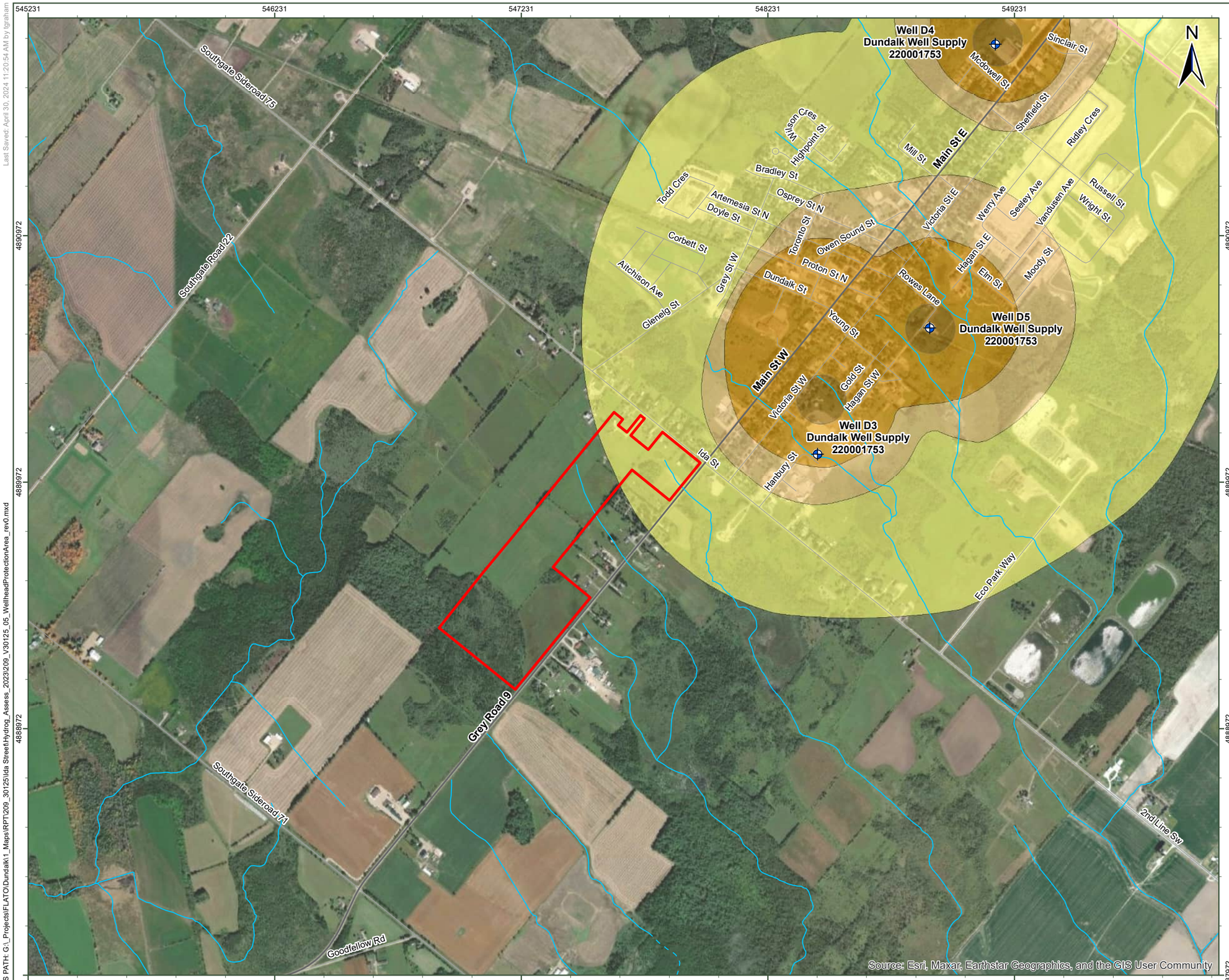
HYDROGEOLOGICAL ASSESSMENT

SOURCE WATER PROTECTION

SLR

FIGURE NO:
4

DATE: April 30, 2024
PROJECT NO: 209.V30125.00001



LEGEND:

- SITE BOUNDARY
- INTERMITTENT WATERCOURSE
- PERMANENT WATERCOURSE

WELLHEAD PROTECTION AREA

- A
- B
- C
- D

PERMITS TO TAKE WATER

NOTES:

BASEDATA:
ONTARIO MINISTRY OF NATURAL RESOURCES, LAND INFORMATION ONTARIO (LIO)

WELLHEAD PROTECTION AREA:
GRAND RIVER CONSERVATION AUTHORITY
CONTAINS INFORMATION MADE AVAILABLE UNDER GRAND RIVER CONSERVATION AUTHORITY'S OPEN DATA LICENCE V2.0.

0 125 250 500 750 m

SCALE 1:15,000
PAGE SIZE 11 x 17
NAD 1983 UTM Zone 17N

THIS MAP IS FOR CONCEPTUAL PURPOSES ONLY
AND SHOULD NOT BE USED FOR NAVIGATION

FLATO IDA DUNDALK INC.
FLATO IDA
DUNDALK, ONTARIO, CANADA

HYDROGEOLOGICAL ASSESSMENT

WELLHEAD PROTECTION AREA

SLR

FIGURE NO:
5

DATE: April 30, 2024

PROJECT NO: 209.V30125.00001

Last Saved: April 30, 2024 11:14:26 AM by tgraham

GIS PATH: G:_Projects\FLATO\Dundalk\1_Maps\RPT\209_30125\Ida Street\Hydrog_Assess_20231209_V30125_06_SurficialGeology_rev0.mxd

LEGEND:

- SITE BOUNDARY
- MONITORING WELL
- MINI-PIEZOMETER
- BOREHOLE
- GAS MONITOR
- WETLAND VERIFIED BY GRCA - NOT SURVEYED
- PERMANENT WATERCOURSE
- UNEVALUATED WETLAND
- 5B: STONE-POOR, CARBONATE-DERIVED SILTY TO SANDY TILL
- 7A: SANDY DEPOSITS

NOTES:

BASEDATA:
ONTARIO MINISTRY OF NATURAL RESOURCES, LAND INFORMATION ONTARIO (LIO)

0 37.5 75 150 225 m

SCALE 1:4,500
PAGE SIZE 11 x 17
NAD 1983 UTM Zone 17N

THIS MAP IS FOR CONCEPTUAL PURPOSES ONLY AND SHOULD NOT BE USED FOR NAVIGATION

FLATO IDA DUNDALK INC.
FLATO IDA
DUNDALK, ONTARIO, CANADA

HYDROGEOLOGICAL ASSESSMENT

SURFICIAL GEOLOGY

SLR

FIGURE NO:
6

DATE: April 30, 2024

PROJECT NO: 209.V30125.00001

546656 547156 547656 548156

4890105 4889605

B' A' A B

N

Main St W Mcauley St Ida St Victoria St W Hanbury St Grey Road 9

2506846 2509298 2508359 2500875 7140441 7426733 MW22-401 2516764 7426723 MW22-402 7426726 MW22-403 MW-6 MW-3 BH-4 ESA-1 BH-5 2512662 BH-1 MW-7-S MW-7-D 2500899 7333654 BH-3 MW-2 MP1-D MP1-S 7426721 7426731 MW22-404 2508036 2509474 2503762 2516266 7224832 MW22-405-S 7426730 MW22-405-D 7426728 7426732 MW22-407 7426729 MW22-406 2513366 2514390 2515539 2513888 2506130 7426727 MW22-408 7119170 2506305 2504542

Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community

LEGEND:

- SITE BOUNDARY
- MONITORING WELL
- MINI-PIEZOMETER
- BOREHOLE
- GAS MONITOR

MECP WELL LOCATION (WWIS, 2024)

- LIVESTOCK
- MONITORING
- PUBLIC
- DOMESTIC
- OTHER
- UNCLASSIFIED
- PERMANENT WATERCOURSE

NOTES:
BASEDATA:
ONTARIO MINISTRY OF NATURAL RESOURCES, LAND INFORMATION ONTARIO (LIO)
WATER WELL INFORMATION SYSTEM (WWIS)
LAST UPDATED: MARCH 31, 2023

0 37.5 75 150 225 m

SCALE 1:5,000
PAGE SIZE 11 x 17
NAD 1983 UTM Zone 17N

THIS MAP IS FOR CONCEPTUAL PURPOSES ONLY
AND SHOULD NOT BE USED FOR NAVIGATION

FLATO IDA DUNDALK INC.
FLATO IDA
DUNDALK, ONTARIO, CANADA

HYDROGEOLOGICAL ASSESSMENT

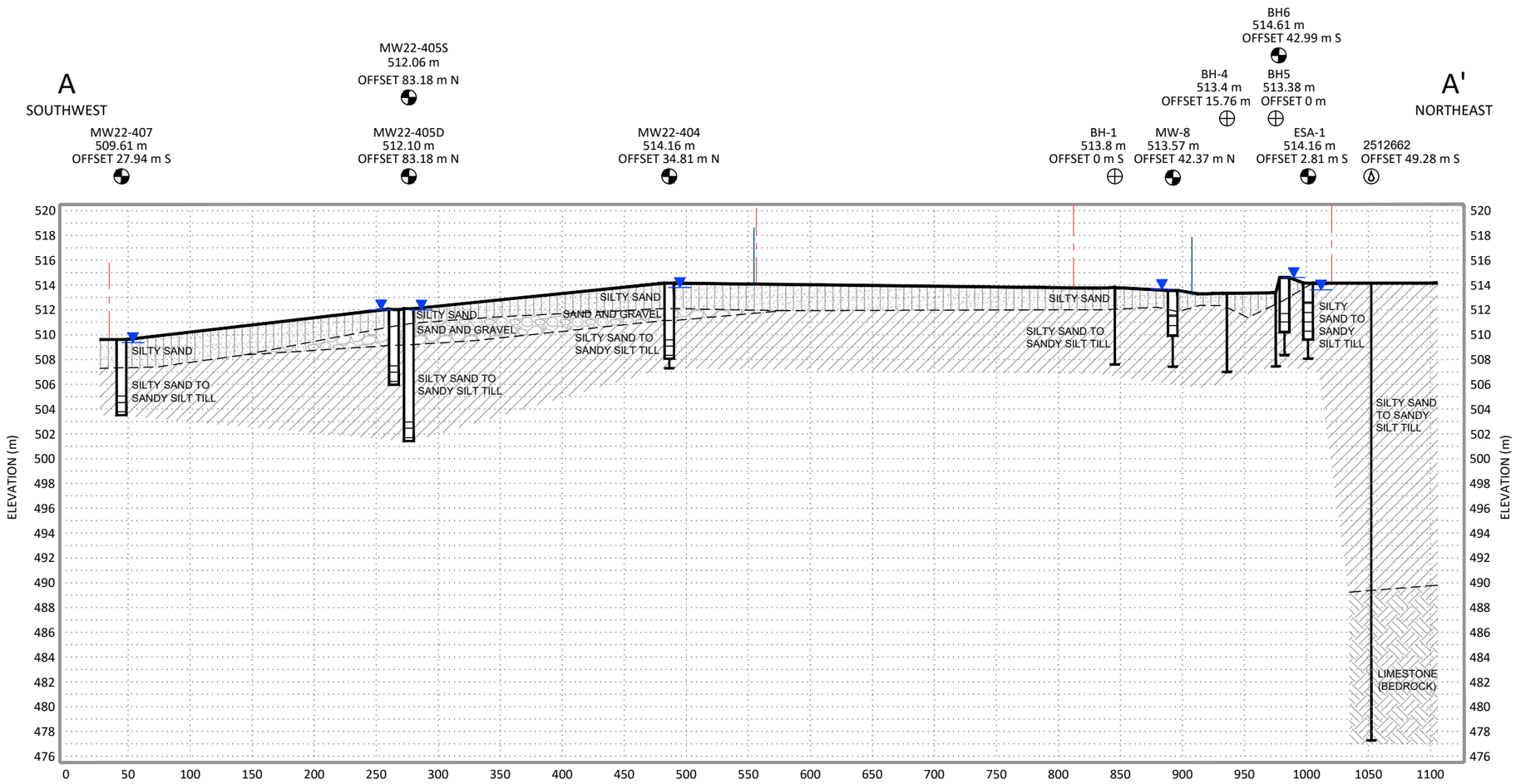
GEOLOGICAL CROSS-SECTION LOCATIONS

SLR

FIGURE NO:
7

DATE: April 30, 2024

PROJECT NO: 209.V30125.00001



LEGEND:

- PROPERTY BOUNDARY
- PERMANENT WATERCOURSE
- BOREHOLE
- MONITORING WELL
- WATER WELL
- WATER LEVEL (MARCH 23, 2023)
- SILTY SAND
- SAND AND GRAVEL
- SILTY SAND TO SANDY SILT TILL
- LIMESTONE (BEDROCK)
- WELL
- SCREENED INTERVAL
- BOREHOLE OR TESTPIT
- END OF HOLE

NOTES:

NOT A LEGAL SURVEY. DO NOT USE FOR CONSTRUCTION.

CROSS SECTION WAS CREATED BASED ON BOREHOLES ADVANCED AT THE SITE. STRATIGRAPHY HAS BEEN INTERPRETED AND EXTRAPOLATED BETWEEN LOCATIONS AND MAY VARY FROM THOSE SHOWN.

0 2.5 5 10 15 20 25 m

VERTICAL SCALE 1:400

0 25 50 100 150 200 250 m

HORIZONTAL SCALE 1:4,000

FLATO IDA DUNDALK INC.
FLATO IDA
DUNDALK, ONTARIO, CANADA

HYDROGEOLOGICAL ASSESSMENT

GEOLOGICAL CROSS SECTION A-A'

SLR

FIGURE NO:
8

DATE: April 30, 2024

PROJECT NO: 209.30125.00001

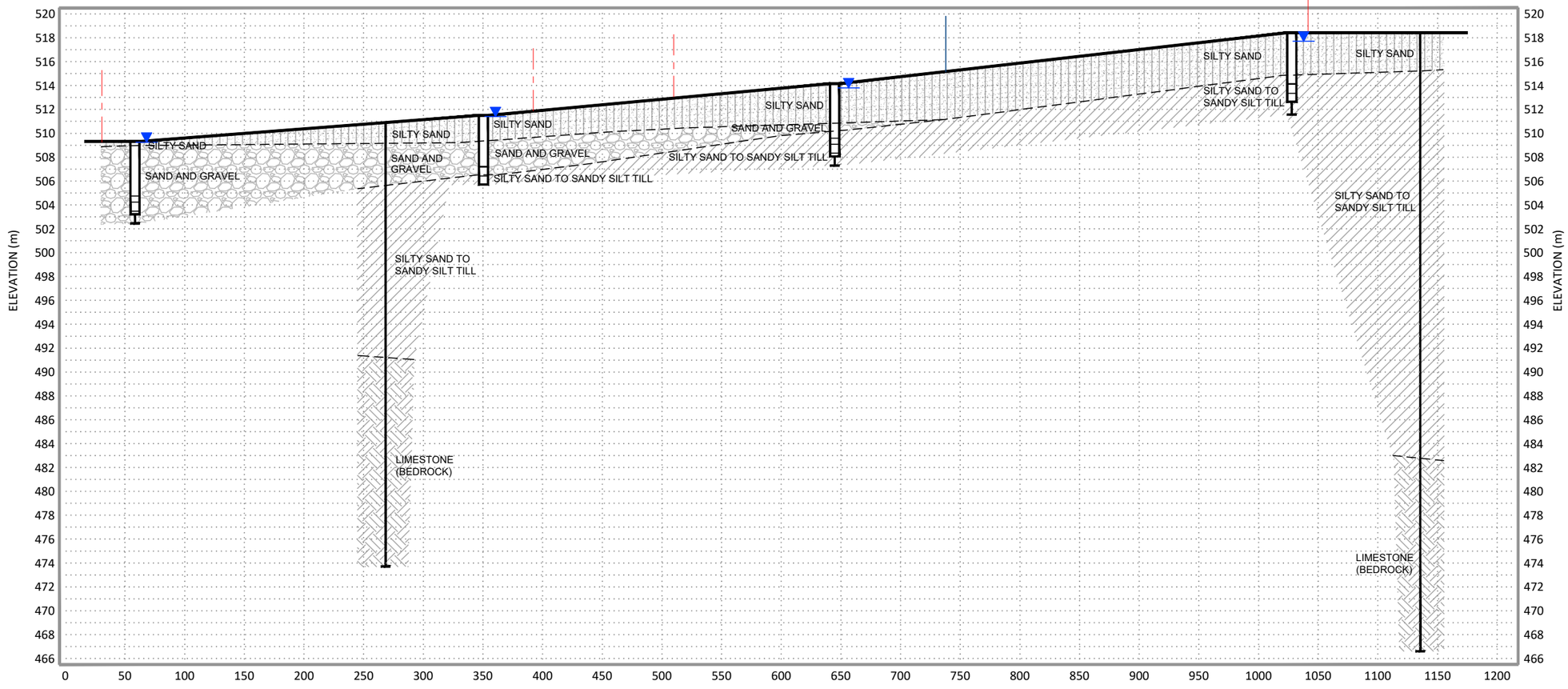
Cadfile name: S_209-30125-00001-A2.dwg

B

SOUTHWEST

B'

NORTHEAST



LEGEND:

- PROPERTY BOUNDARY
- PERMANENT WATERCOURSE
- BOREHOLE
- MONITORING WELL
- WATER WELL
- WATER LEVEL (MARCH 23, 2023)
- SILTY SAND
- SAND AND GRAVEL
- SILTY SAND TO SANDY SILT TILL
- LIMESTONE (BEDROCK)
- WELL
- SCREENED INTERVAL
- BOREHOLE OR TESTPIT
- END OF HOLE

NOTES:

NOT A LEGAL SURVEY. DO NOT USE FOR CONSTRUCTION.

CROSS SECTION WAS CREATED BASED ON BOREHOLES ADVANCED AT THE SITE. STRATIGRAPHY HAS BEEN INTERPRETED AND EXTRAPOLATED BETWEEN LOCATIONS AND MAY VARY FROM THOSE SHOWN.

0 2.5 5 10 15 20 25 m

VERTICAL SCALE 1:400

0 25 50 100 150 200 250 m

HORIZONTAL SCALE 1:4,000

FLATO IDA DUNDALK INC.
FLATO IDA
DUNDALK, ONTARIO, CANADA

HYDROGEOLOGICAL ASSESSMENT

GEOLOGICAL CROSS SECTION B-B'

SLR

FIGURE NO: **9**

DATE: April 30, 2024

PROJECT NO: 209.30125.00001

Cadfile name: S_209-30125-00001-A2.dwg

546701 547201 547701

4890111 4889611

MW22-401 517.72
MW22-402 516.69
MW22-403 514.07
MW22-404 513.80
MW22-405-D 512.00
MW22-405-S
MW22-406 511.39
MW22-407 509.37
MW22-408 509.24
MW-6 514.62
MW-8 513.66
ESA-1 513.62
MW-7-D 512.06
MW-7-S
MW-2 512.75
MP1-D 510.63
MP1-S

517 516 515 514 513 512 511 510

Main St W
Ida St
Victoria St W
Grey Road 9

N

Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community

LEGEND:

- SITE BOUNDARY
- MONITORING WELL
- MINI-PIEZOMETER
- INFERRED GROUNDWATER ELEVATION CONTOUR
- INFERRED GROUNDWATER FLOW DIRECTION
- 513.80 GROUNDWATER ELEVATION (MARCH 28, 2023)

NOTES:

BASEDATA:
ONTARIO MINISTRY OF NATURAL RESOURCES, LAND INFORMATION ONTARIO (LIO)

GROUNDWATER ELEVATION CONTOURS AND GROUNDWATER FLOW DIRECTIONS ARE BASED ON INTERPRETATION AND EXTRAPOLATION BETWEEN MEASUREMENTS AT THE MONITORING WELL LOCATIONS SHOWN AND FOR THE DATE NOTED. AS A RESULT, THE GROUNDWATER ELEVATION CONTOURS AND GROUNDWATER FLOW DIRECTIONS ARE INFERRED BETWEEN THOSE MEASURED AT THE MONITORING WELLS AND ACTUAL GROUNDWATER LEVELS AND FLOW DIRECTIONS MAY VARY FROM THOSE SHOWN.

0 37.5 75 150 225 m

SCALE 1:4,500
PAGE SIZE 11 x 17
NAD 1983 UTM Zone 17N

THIS MAP IS FOR CONCEPTUAL PURPOSES ONLY AND SHOULD NOT BE USED FOR NAVIGATION

FLATO IDA DUNDALK INC.
FLATO IDA
DUNDALK, ONTARIO, CANADA

HYDROGEOLOGICAL ASSESSMENT

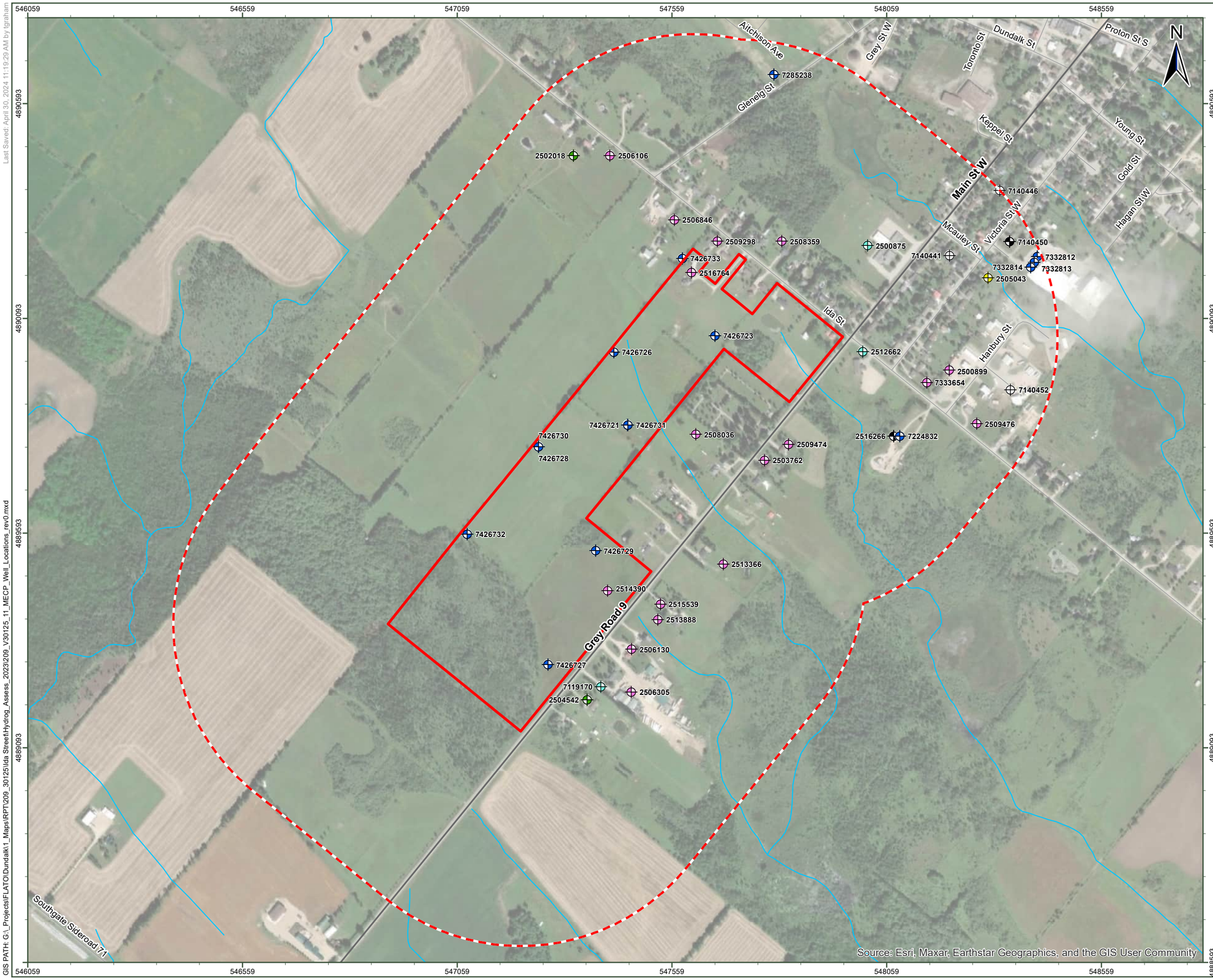
INTERPRETED GROUNDWATER FLOW DIRECTION - MARCH 2023

SLR

FIGURE NO:
10

DATE: April 30, 2024

PROJECT NO: 209.V30125.00001



Last Saved: April 30, 2024 11:19:29 AM by tgraham

GIS PATH: G:_Projects\FLATO\Dundalk\1_Maps\RPT\209_30125\Ida StreetHydrog_Assess_2023\209_V30125_11_MECP_Well_Locations_rev0.mxd

LEGEND:

- SITE BOUNDARY

MECP WELL LOCATION (WWIS, 2024)

- LIVESTOCK
- MUNICIPAL
- MONITORING
- PUBLIC
- DOMESTIC
- OTHER
- UNCLASSIFIED
- PERMANENT WATERCOURSE

NOTES:

BASEDATA:
ONTARIO MINISTRY OF NATURAL RESOURCES, LAND INFORMATION ONTARIO (LIO)
WATER WELL INFORMATION SYSTEM (WWIS)
LAST UPDATED: MARCH 31, 2023

0 75 150 300 450 m

SCALE 1:8,500
PAGE SIZE 11 x 17
NAD 1983 UTM Zone 17N

THIS MAP IS FOR CONCEPTUAL PURPOSES ONLY AND SHOULD NOT BE USED FOR NAVIGATION

FLATO IDA DUNDALK INC.
FLATO IDA
DUNDALK, ONTARIO, CANADA

HYDROGEOLOGICAL ASSESSMENT

MECP WELL LOCATIONS

SLR

FIGURE NO:
11

DATE: April 30, 2024

PROJECT NO: 209.V30125.00001

Appendix A Development Plan

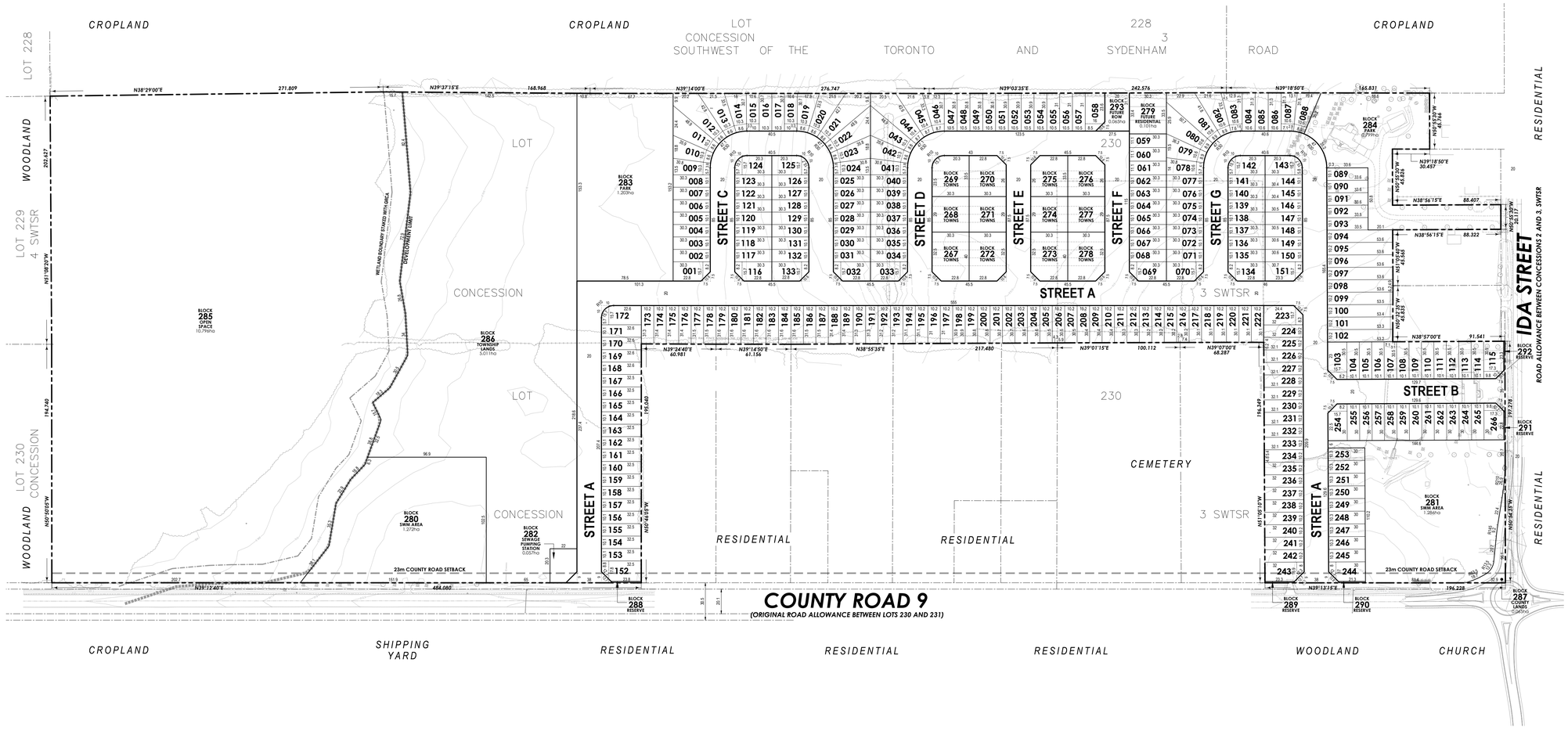
Hydrogeological Assessment

Flato Ida

Flato Ida Dundalk Inc.

SLR Project No.: 209.30125.00001

May 6, 2024



LAND USE SUMMARY

LAND USE	LOT / BLOCK #	UNITS	AREA
SINGLE DETACHED - 10.1m LOTS	001-266	266	9.454ha
TOWNHOUSE - 6.5m UNITS	267-278	52	1.218ha
FUTURE RESIDENTIAL	279	3	0.101ha
STORMWATER MANAGEMENT AREA	280, 281		2.558ha
SEWAGE PUMPING STATION	282		0.057ha
PARK	283, 284		2.002ha
OPEN SPACE	285		10.796ha
TOWNSHIP LANDS	286		5.011ha
COUNTY LANDS	287		0.065ha
0.3m RESERVE	288-292		0.003ha
FUTURE RIGHT OF WAY	293		0.065ha
RIGHT OF WAY	A, B, C, D, E, F, G		4.610ha
TOTALS		321	35.940ha

LEGAL DESCRIPTION

PART OF LOTS 229 AND 230
CONCESSION 3, SOUTHWEST OF THE TORONTO AND SYDENHAM ROAD
GEOGRAPHIC TOWNSHIP OF PROTON
TOWNSHIP OF SOUTHGATE
COUNTY OF GREY

OWNER'S CERTIFICATE

I HEREBY AUTHORIZE MACNAUGHTON HERMSEN BRITTON CLARKSON PLANNING LIMITED TO SUBMIT THIS PLAN FOR APPROVAL.

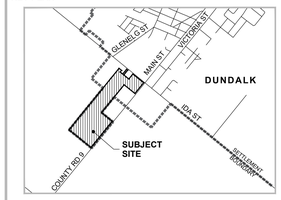
DATE: _____ _____

SURVEYOR'S CERTIFICATE

I HEREBY CERTIFY THAT THE BOUNDARIES OF THE LAND TO BE SUBDIVIDED ON THIS PLAN AND THEIR RELATIONSHIP TO THE ADJACENT LANDS ARE ACCURATELY AND CORRECTLY SHOWN.

DATE: _____ _____

KEY PLAN



LEGEND

- PROJECT BOUNDARY LINE
- RIGHT OF WAY LINE
- BLOCK LINE
- LOT LINE
- PARCEL FABRIC

REVISION No.	DATE	ISSUED / REVISION	BY

ADDITIONAL INFORMATION REQUIRED UNDER SECTION 51(17) OF THE PLANNING ACT R.S.O. 1990 C.P.13 AS AMENDED

- **A.** AS SHOWN
- **B.** AS SHOWN
- **C.** AS SHOWN
- **D.** 321 SINGLE RESIDENTIAL LOTS
- **E.** AS SHOWN
- **F.** AS SHOWN
- **G.** AS SHOWN
- **H.** MUNICIPAL WATER SUPPLY
- **I.** SANDY SILT/SILTY SAND DEPOSITS WITH LOCALIZED SAND LAYERS
- **J.** AS SHOWN
- **K.** ALL SERVICES AS REQUIRED (WATER, SANITARY, STORMWATER, HYDRO)
- **L.** AS SHOWN

MHBC PLANNING URBAN DESIGN & LANDSCAPE ARCHITECTURE
113 COLLIER STREET, BARRIE, ON, L4M 1H2 | P: 705.728.0045 | WWW.MHBCPLAN.COM

STAMP

DATE	APR. 30, 2024
FILE No.	15184AC
SCALE	1:1,800 (ARCH D)
DRAWN BY	M.M.
CHECKED BY	K.C.
OTHER	

PROJECT

FLATO IDA
FLATO IDA DUNDALK INC.
3621 HIGHWAY 7 EAST, SUITE 503
MARKHAM, ON L3R 0G6
P:(905) 479-9292 F:(905) 429-9165
WWW.FLATOGROUP.COM

NORTH

FILE NAME
DRAFT
PLAN OF SUBDIVISION

DWG No. 1 of 1

SCALE BAR
0 9 18 27 36 45 60 90 135 180m
MEASUREMENTS SHOWN ON THIS PLAN ARE IN METRES AND CAN BE CONVERTED TO FEET BY DIVIDING BY 0.3048

N:\Southgate\752212 Ida Street, Dundalk – 15184AC\Drawings\Draft Plan\CAD\15184AC – Draft Plan – 2024-04-30.dwg

Appendix B Borehole Logs

Hydrogeological Assessment

Flato Ida

Flato Ida Dundalk Inc.

SLR Project No.: 209.30125.00001

May 6, 2024

LIST OF ABBREVIATIONS AND DESCRIPTION OF TERMS

The abbreviations and terms commonly employed on the borehole logs and figures, and in the text of the report, are as follows:

SAMPLE TYPES

AS Auger sample
CS Chunk sample
DO Drive open (split spoon)
DS Denison type sample
FS Foil sample
RC Rock core (with size and percentage recovery)
ST Slotted tube
TO Thin-walled, open
TP Thin-walled, piston
WS Wash sample

PENETRATION RESISTANCE

Dynamic Cone Penetration Resistance:

A continuous profile showing the number of blows for each foot of penetration of a 2-inch diameter, 90° point cone driven by a 140-pound hammer falling 30 inches.

Plotted as '—●—'

Standard Penetration Resistance or 'N' Value:

The number of blows of a 140-pound hammer falling 30 inches required to advance a 2-inch O.D. drive open sampler one foot into undisturbed soil.

Plotted as '○'

WH Sampler advanced by static weight
PH Sampler advanced by hydraulic pressure
PM Sampler advanced by manual pressure
NP No penetration

SOIL DESCRIPTION

Cohesionless Soils:

'N' (blows/ft)	Relative Density
0 to 4	very loose
4 to 10	loose
10 to 30	compact
30 to 50	dense
over 50	very dense

Cohesive Soils:

Undrained Shear Strength (ksf)	'N' (blows/ft)	Consistency
less than 0.25	0 to 2	very soft
0.25 to 0.50	2 to 4	soft
0.50 to 1.0	4 to 8	firm
1.0 to 2.0	8 to 16	stiff
2.0 to 4.0	16 to 32	very stiff
over 4.0	over 32	hard

Method of Determination of Undrained Shear Strength of Cohesive Soils:

x 0.0 Field vane test in borehole; the number denotes the sensitivity to remoulding

△ Laboratory vane test

□ Compression test in laboratory

For a saturated cohesive soil, the undrained shear strength is taken as one half of the undrained compressive strength

METRIC CONVERSION FACTORS

1 ft = 0.3048 metres
1lb = 0.454 kg
1 inch = 25.4 mm
1ksf = 47.88 kPa

JOB NO.: 2008-S025 # LOG OF BOREHOLE NO.: 1

FIGURE NO.: 1

PROJECT DESCRIPTION: Proposed Buildings

METHOD OF BORING: Flight-Auger Solid-Stem

PROJECT LOCATION: 752212 Ida Street, Township of Southgate (Dundalk)

DRILLING DATE: August 25, 2020

El. (m) / Depth (m)	SOIL DESCRIPTION	SAMPLES Number	Type	N-Value	Depth Scale (m)	Dynamic Cone (blows/30 cm) 10 30 50 70 90 / Shear Strength (kN/m²) 50 100 150 200 / Penetration Resistance (blows/30 cm) 10 30 50 70 90	Atterberg Limits PL LL / Moisture Content (%) 10 20 30 40	WATER LEVEL
513.8	Ground Surface							
0.0	**20 cm TOPSOIL**	1A	DO	9	0		40	Dry on completion
		1B					14	
513.2	**EARTH FILL**							
0.6	brown silty sand, some gravel scattered topsoil							
	Brown, loose to very dense	2	DO	7	1		11	
	SILTY SAND TILL							
	trace clay, some gravel to gravelly							
	occ. sand seams and layers, cobbles and boulders							
	weathered	3	DO	13			10	
					2			
		4	DO	43			7	
		5	DO	50/NP	3		10	
					4			
		6	DO	65			7	
					5			
507.6		7	DO	50/15	6		6	
6.2	**END OF BOREHOLE**				7			
					8			

Soil Engineers Ltd.

JOB NO.: 2008-S025 # LOG OF BOREHOLE NO.: BH/MW 2 **FIGURE NO.:** 2

PROJECT DESCRIPTION: Proposed Buildings

METHOD OF BORING: Flight-Auger Hollow-Stem

PROJECT LOCATION: 752212 Ida Street, Township of Southgate (Dundalk)

DRILLING DATE: August 26, 2020

El. (m) / Depth (m)	SOIL DESCRIPTION	SAMPLES Number	Type	N-Value	Depth Scale (m)	Dynamic Cone (blows/30 cm) 10 30 50 70 90 / Shear Strength (kN/m²) 50 100 150 200 / Penetration Resistance (blows/30 cm) 10 30 50 70 90	Atterberg Limits PL LL / Moisture Content (%) 10 20 30 40	WATER LEVEL
513.2	Ground Surface							
0.0	**20 cm TOPSOIL**	1A	DO	7	0		34	
		1B					27	
512.6 / 0.6	**EARTH FILL** dark brown sandy silt, some clay and gravel, pockets of topsoil. Brown, loose to very dense							
		2	DO	7	1		12	
	SILTY SAND TILL trace clay, some gravel to gravelly occ. sand seams and layers, cobbles and boulders							
		3	DO	4			13	
	weathered				2			
		4	DO	32			9	
					3			
		5	DO	51			11	
	sand layer	6	CS				11	
		7	DO	83	4		9	
		8	DO	50/15			8	
					5			
		9	DO	52/15			8	
					6			
		10	DO	60/15			7	
506.8 / 6.4	**END OF BOREHOLE**				7			
	Installed 50 mm Ø monitoring well to 4.6 m 1.5 m screen from 3.1 to 4.6 m Sand backfill from 2.5 to 4.6 m Bentonite seal from 0.0 to 2.5 m Provided with a monument casing				8			Water Level @ El. 511.7 m on completion

Soil Engineers Ltd.

JOB NO.: 2008-S025 # LOG OF BOREHOLE NO.: 3

FIGURE NO.: 3

PROJECT DESCRIPTION: Proposed Buildings

METHOD OF BORING: Flight-Auger Solid-Stem

PROJECT LOCATION: 752212 Ida Street, Township of Southgate (Dundalk)

DRILLING DATE: August 25, 2020

El. (m) / Depth (m)	SOIL DESCRIPTION	SAMPLES Number	Type	N-Value	Depth Scale (m)	Dynamic Cone (blows/30 cm) 10 30 50 70 90 / Shear Strength (kN/m²) 50 100 150 200 / Penetration Resistance (blows/30 cm) 10 30 50 70 90	Atterberg Limits PL LL / Moisture Content (%) 10 20 30 40	WATER LEVEL
512.5 0.0	Ground Surface **25 cm TOPSOIL**	1A 1B	DO	6	0		47 16	
511.6 0.9	**EARTH FILL** brown silty sand, trace of clay, some gravel, scattered topsoil Brown, compact to very dense	2	DO	10	1		16	
	SILTY SAND TILL trace clay, some gravel to gravelly occ. sand seams and layers, cobbles and boulders weathered	3	DO	13	2		13	
		4	DO	29	3		9	
		5	DO	25	4		11	
		6	DO	50/15	5		8	
506.1 6.4		7	DO	50/15	6		8	
	END OF BOREHOLE				7 8			

Water Level @ El. 511.3 m on completion

Soil Engineers Ltd.

JOB NO.: 2008-S025 # LOG OF BOREHOLE NO.: 4

FIGURE NO.: 4

PROJECT DESCRIPTION: Proposed Buildings

METHOD OF BORING: Flight-Auger Hollow-Stem

PROJECT LOCATION: 752212 Ida Street, Township of Southgate (Dundalk)

DRILLING DATE: August 25, 2020

El. (m) / Depth (m)	SOIL DESCRIPTION	SAMPLES Number	Type	N-Value	Depth Scale (m)	Dynamic Cone (blows/30 cm) 10 30 50 70 90 / Shear Strength (kN/m²) 50 100 150 200 / Penetration Resistance (blows/30 cm) 10 30 50 70 90	Atterberg Limits PL LL / Moisture Content (%) 10 20 30 40	WATER LEVEL
513.4	Ground Surface							
0.0	**30 cm TOPSOIL**	1A	DO	5	0		39	
		1B					18	
	EARTH FILL brown sandy silt, some clay and gravel, scattered topsoil							
512.6 / 0.8	Brown, compact to very dense	2	DO	15	1		18	
	SILTY SAND TILL weathered trace clay, some gravel to gravelly occ. sand seams and layers, cobbles and boulders							
		3	DO	29	2		9	
		4	DO	30/NP			8	
		5	DO	50/15	3		6	
					4			
		6	DO	60/15			6	
					5			
					6			
		7	DO	55/15			6	
507.0 / 6.4	**END OF BOREHOLE**				7			
					8			

Dry on completion

Soil Engineers Ltd.

JOB NO.: 2008-S025 # LOG OF BOREHOLE NO.: 5

FIGURE NO.: 5

PROJECT DESCRIPTION: Proposed Buildings

METHOD OF BORING: Flight-Auger Solid-Stem

PROJECT LOCATION: 752212 Ida Street, Township of Southgate (Dundalk)

DRILLING DATE: August 24, 2020

El. (m) / Depth (m)	SOIL DESCRIPTION	SAMPLES Number	Type	N-Value	Depth Scale (m)
513.4	Ground Surface				
0.0	**25 cm TOPSOIL**	1A	DO	8	0
		1B			
0.6	**EARTH FILL** brown sandy silt some clay and gravel scattered topsoil Brown, loose to very dense	2	DO	4	1
	SILTY SAND TILL trace clay, some gravel to gravelly occ. sand seams and layers, cobbles and boulders weathered	3	DO	10	2
		4	DO	24	3
		5	DO	45	
		6	DO	50/15	4
		7	DO	60	5
		8	DO	50/15	
507.5					6
5.9	**END OF BOREHOLE** **Refusal on Augering**				7
					8

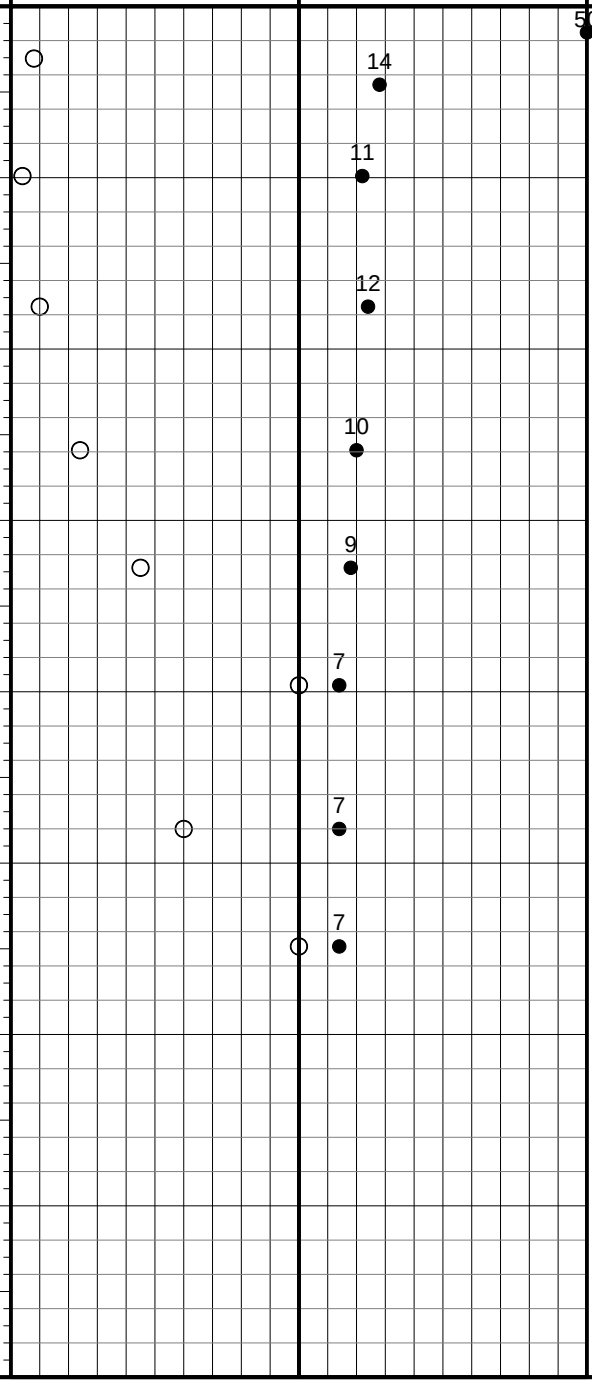
Dynamic Cone (blows/30 cm) 10 30 50 70 90

Shear Strength (kN/m²) 50 100 150 200

Penetration Resistance (blows/30 cm) 10 30 50 70 90

Atterberg Limits PL LL

Moisture Content (%) 10 20 30 40



WATER LEVEL

Water Level @ El. 512.5 m on completion

Soil Engineers Ltd.

JOB NO.: 2008-S025 # LOG OF BOREHOLE NO.: BH/MW 6 **FIGURE NO.:** 6

PROJECT DESCRIPTION: Proposed Buildings

METHOD OF BORING: Flight-Auger Hollow-Stem

PROJECT LOCATION: 752212 Ida Street, Township of Southgate (Dundalk)

DRILLING DATE: August 24, 2020

El. (m) / Depth (m)	SOIL DESCRIPTION	SAMPLES Number	Type	N-Value	Depth Scale (m)	Dynamic Cone (blows/30 cm) 10 30 50 70 90 / Shear Strength (kN/m²) 50 100 150 200 / Penetration Resistance (blows/30 cm) 10 30 50 70 90	Atterberg Limits PL LL / Moisture Content (%) 10 20 30 40	WATER LEVEL
514.5	Ground Surface							
0.0	**43 cm TOPSOIL**	1A	DO	3	0		27	
		1B					15	
513.9 / 0.6	**EARTH FILL** brown sandy silt, some clay and gravel, scattered topsoil Brown, loose to very dense	2	DO	5	1		12	
	SILTY SAND TILL trace clay, some gravel to gravelly occ. sand seams and layers, cobbles and boulders weathered	3	DO	9	2		10	
		4	DO	23			9	
		5	DO	47	3		10	
	fine sand layer	6A 6B	DO	50/15	4		21 9	
		7	DO	55/15			9	
		8	DO	50/15	5		8	
508.3		9	DO	100/15	6		9	
6.2	**END OF BOREHOLE**							
	Backfill hole with holeplug from 4.8 to 6.2 m, Sand Fill from 4.6 to 4.8 m Installed 50 mm Ø monitoring well to 4.6 m 1.5 m screen from 3.1 to 4.6 m Sand backfill from 2.5 to 4.6 m Bentonite seal from 0.0 to 2.5 m Provided with a monument casing				7			
					8			

JOB NO.: 2008-S025 # LOG OF BOREHOLE NO.: BH/MW 7S ***FIGURE NO.:*** 7A

PROJECT DESCRIPTION: Proposed Buildings

METHOD OF BORING: Flight-Auger Hollow-Stem

PROJECT LOCATION: 752212 Ida Street, Township of Southgate (Dundalk)

DRILLING DATE: August 24, 2020

El. (m) / Depth (m)	SOIL DESCRIPTION	SAMPLES: Number	SAMPLES: Type	SAMPLES: N-Value	Depth Scale (m)	Dynamic Cone (blows/30 cm) 10 30 50 70 90 / Shear Strength (kN/m²) 50 100 150 200 / Penetration Resistance (blows/30 cm) 10 30 50 70 90	Atterberg Limits PL LL / Moisture Content (%) 10 20 30 40	WATER LEVEL
511.9 0.0	Ground Surface **23 cm TOPSOIL**				0			
511.3 0.6	**EARTH FILL** brown sandy silt, some clay, pockets of topsoil Brown							
	SILTY SAND TILL weathered trace clay, gravellyl occ. sand seams and layers, cobbles and boulders				1 2			
509.2 2.7	**END OF BOREHOLE** Installed 50 mm Ø monitoring well to 2.7 m 1.5 m screen from 1.2 to 2.7 m Sand backfill from 0.6 to 2.7 m Bentonite seal from 0.0 to 0.6 m Provided with a monument casing				3 4 5 6 7 8			

JOB NO.: 2008-S025 # LOG OF BOREHOLE NO.: BH/MW 7D **FIGURE NO.:** 7B

PROJECT DESCRIPTION: Proposed Buildings

METHOD OF BORING: Flight-Auger Hollow-Stem

PROJECT LOCATION: 752212 Ida Street, Township of Southgate (Dundalk)

DRILLING DATE: August 24, 2020

El. (m) / Depth (m)	SOIL DESCRIPTION	SAMPLES Number	Type	N-Value	Depth Scale (m)	Dynamic Cone (blows/30 cm) 10 30 50 70 90 / Shear Strength (kN/m²) 50 100 150 200 / Penetration Resistance (blows/30 cm) 10 30 50 70 90	Atterberg Limits PL LL / Moisture Content (%) 10 20 30 40	WATER LEVEL
511.9	Ground Surface							
0.0	**23 cm TOPSOIL**	1A	DO	2/46	0		48	
		1B					19	
511.3	**EARTH FILL**							
0.6	brown sandy silt, some clay, pockets of topsoil							
	Brown, loose to very dense	2	DO	5	1		12	
	SILTY SAND TILL weathered							
	trace clay, some gravel to gravelly occ. sand seams and layers, cobbles and boulders	3	DO	17	2		8	
		4A	DO	34			13	
		4B					10	
		5	DO	58	3		9	
		6	DO	50/15	4		9	
		7	DO	83	5		8	
	silty fine sand layer	8A	DO	68			9	
		8B					9	
505.7		9	DO	55/15	6		9	
6.2	**END OF BOREHOLE**				7			
	Installed 50 mm Ø monitoring well to 6.1 m 1.5 m screen from 4.6 to 6.1 m Sand backfill from 4.0 to 6.1 m Bentonite seal from 0.0 to 4.0 m Provided with a monument casing				8			Water Level @ El. 508.9 m on completion

Soil Engineers Ltd.

JOB NO.: 2008-S025 # LOG OF BOREHOLE NO.: BH/MW 8 **FIGURE NO.:** 8

PROJECT DESCRIPTION: Proposed Buildings

METHOD OF BORING: Flight-Auger Hollow-Stem

PROJECT LOCATION: 752212 Ida Street, Township of Southgate (Dundalk)

DRILLING DATE: August 26, 2020

El. (m) / Depth (m)	SOIL DESCRIPTION	SAMPLES Number	Type	N-Value	Depth Scale (m)
513.5 / 0.0	Ground Surface				
	20 cm TOPSOIL	1A	DO	4	0
		1B			
512.9 / 0.6	**EARTH FILL** brown sandy silt, pockets of topsoil Brown, loose to very dense				
	SILTY SAND TILL trace clay, gravelly occ. sand seams and layers, cobbles and boulders	2	DO	6	1
	weathered	3	DO	9	2
		4	DO	68	
		5	DO	60/15	3
		6	DO	50/15	4
		7	DO	70/15	5
		8	DO	50/8	
507.4 / 6.1	**END OF BOREHOLE**	9	DO	50/5	6
	Installed 50 mm Ø monitoring well to 3.7 m 1.5 m screen from 2.2 to 3.7 m Sand backfill from 1.6 to 3.7 m Bentonite seal from 0.0 to 1.6 m Provided with a monument casing				7
					8

Dynamic Cone (blows/30 cm): 10 30 50 70 90

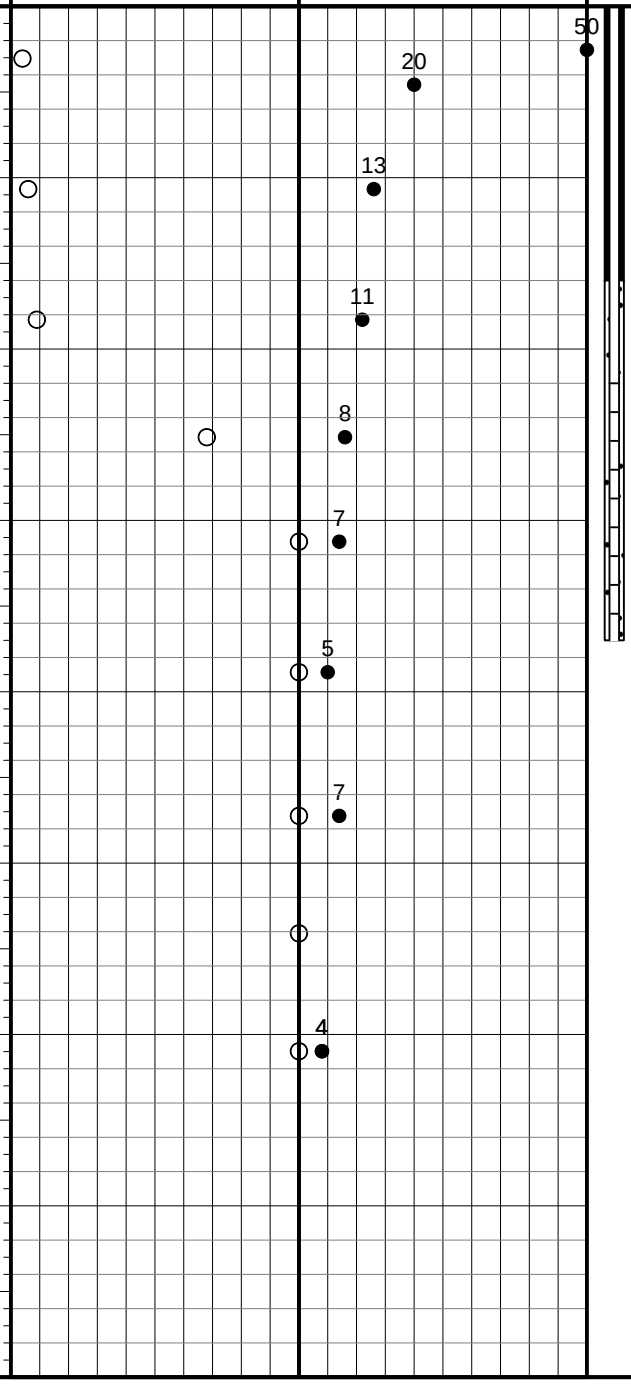
Shear Strength (kN/m²): 50 100 150 200

Penetration Resistance (blows/30 cm): 10 30 50 70 90

Atterberg Limits: PL — LL

Moisture Content (%): 10 20 30 40

WATER LEVEL



Soil Engineers Ltd.

BOREHOLE LOG

SLR CONSULTING (CANADA) LTD.

CLIENT: **Flato Ida Dundalk Inc.**
PROJECT: **HydroG Assessment**
ADDRESS: **Flato Ida**
SLR JOB NO: **209.30125.00001**

BOREHOLE NO: **MW-2**
SURFACE ELEVATION: **513.48 m**
UTM COORDINATES: **4889927.942 N**, **547803.843 E**

DEPTH (m)	ELEVATION (m)	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE ID	% Recovery	SOIL TYPE	TEST DATA: SPT Count	TEST DATA: % Moisture	WELL COMPLETION	WATER LEVEL	WELL COMPLETION NOTES	ELEVATION (m)
0	513.48	**TOPSOIL**									steel casing, stickup, jplug	
	513.25	Fine sandy silt, trace medium sand, trace roots. Dark brown, moist, soft.		1A	65		7	33.7				
		SAND		1B				26.6				
	512.72	Silty fine sand, trace medium sand, trace subangular to subrounded gravel. Brown with orange mottling, low plasticity, moist, loose.										
1	512.62	**TILL**		2	27		7	11.6			bentonite seal	513
		Silty fine sand, trace medium and coarse sand, trace subangular to subrounded gravel. Light brown, low plasticity, moist, compact.										
		At 0.86 m, change to trace clay. Medium plasticity, wet.		3	58		4	12.7				512
2												
	510.91			4	75		32	9.4				511
	510.86	From 2.57 m to 2.62 m, cobble fragments. At 2.62 m, change to trace cobble. Moist.										
3	510.43	At 3.05 m, change to low plasticity, wet, dense.		5	100		>50	10.8				
	509.82											510
		SAND									silica sand 50mm 010 slot PVC pipe	
	509.52	Medium and coarse sand, some subrounded gravel, trace fine sand, trace silt. Brown, wet, loose.		6	100		>50	11.1				
4		**TILL**										
	508.91	Silty fine sand, trace medium and coarse sand, trace clay, trace subangular to subrounded gravel, trace cobble. Light brown, low plasticity, wet, dense.		7	100		50	9.2			end cap	509
		At 4.57 m, change to greyish brown, medium plasticity.										
5												
	508.15	At 5.33 m, change to moist.		8	100		>50	7.9				508
6												
				9	100		>50	8.2				

End of borehole at 507.08 m

Well Completion Details:
Screened interval from 510.58 m to 509.06 m
Elevation at top of pipe (TOP) = 514.30 m

Groundwater Information:
Depth to groundwater from TOP = 2.09 m (8/26/2020)

Borehole backfilled with drill cuttings, moved over and redrilled to desired well depth and installed well.

DRILLING METHOD: Hollow Stem Auger Drilling
BOREHOLE DIAMETER: 0.1016 m (OD)
DRILL DATE: 2020 August 26
LOGGED BY: MW
DRILLED BY: Walker Drilling Ltd.

Notes: SPLIT SPOON

SLR CONSULTING (CANADA) LTD.

CLIENT: **Flato Ida Dundalk Inc.**
PROJECT: **HydroG Assessment**
ADDRESS: **Flato Ida**
SLR JOB NO: **209.30125.00001**

BOREHOLE LOG

BOREHOLE NO: **BH-5**
SURFACE ELEVATION: 513.38 m
UTM COORDINATES 4890024.991 N 547910.671 E

DEPTH (m)	ELEVATION (m)	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE ID	% Recovery	SOIL TYPE	TEST DATA: SPT Count	TEST DATA: % Moisture	BOREHOLE COMPLETION	WATER LEVEL	WELL COMPLETION NOTES	ELEVATION (m)
0	513.38	**TOPSOIL**										513
	513.15	Fine sandy silt, trace roots. Dark brown, moist, soft.		1A	100		8	50.0				
	512.96	**SAND** Silty fine sand, trace medium sand, trace clay, trace subangular gravel. Light brown with orange mottling, moist, compact.		1B				14.1				
1		**TILL** Fine sandy silt, trace medium and coarse sand, trace clay, trace subrounded to subangular gravel. Light brown, medium plasticity, wet, firm.		2	13		4	10.7				512
				3	85		10	11.5				
2	511.09	At 2.29 m, change to silty fine sand, trace cobble. Moist, compact.		4	100		24	9.8				511
3	510.07	From 3.31 m to 3.38 m, change to fine sandy silt. Wet.		5	100		45	9			backfilled with drill cuttings	510
	509.57	At 3.81 m, change to greyish brown.		6	100		50	6.6				
4				7	100		>50	6.8				509
5				8	100		50	6.9				508
		End of borehole at 507.44 m										

DRILLING METHOD: Hollow Stem Auger Drilling
BOREHOLE DIAMETER: 0.1016 m (OD)
DRILL DATE: 2020 August 24
LOGGED BY: MW
DRILLED BY: Walker Drilling Ltd.

Notes: SPLIT SPOON

BOREHOLE LOG

SLR CONSULTING (CANADA) LTD.

CLIENT: **Flato Ida Dundalk Inc.**
PROJECT: **HydroG Assessment**
ADDRESS: **Flato Ida**
SLR JOB NO: **209.30125.00001**

BOREHOLE NO: **MW-6**
SURFACE ELEVATION: **514.77 m**
UTM COORDINATES: **4890069.822 N** **547900.406 E**

DEPTH (m)	ELEVATION (m)	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE ID	% Recovery	SOIL TYPE	TEST DATA: SPT Count	TEST DATA: % Moisture	WELL COMPLETION	WATER LEVEL	WELL COMPLETION NOTES	ELEVATION (m)
0	514.77	**TOPSOIL** Fine sandy silt, trace roots. Dark brown, moist, soft.		1A	75		3	26.6			steel casing, stickup, jplug	
	514.36	**SAND** Silty fine sand, trace medium sand, trace gravel. Brown, moist, compact.		1B				15				514
	513.98	**TILL** Fine sandy silt, trace clay, trace subrounded to subangular gravel, trace clay. Light brown, wet, firm.		2	50		5	12.1				
1	513.25	At 1.52 m, change to trace medium sand.		3	83		9	9.8			bentonite seal	513
	512.48	At 2.29 m, change to silty fine sand, trace medium and coarse sand, trace cobble. Trace orange mottling, low plasticity.		4	71		23	8.7				512
2	511.70	**SAND** Fine sand, trace medium and coarse sand, occasional subrounded gravel. Light brown, horizontal laminations, wet, dense.		5	82		47	9.7				
	511.65	**TILL** Silty fine sand, trace medium and coarse sand, trace clay, trace subrounded to subangular gravel, trace cobble. Light brown with trace orange mottling, medium plasticity, wet, compact.		6A	100		50	20.9			silica sand 50mm 010 slot PVC pipe	511
	510.96	**SAND** Fine sand, trace medium sand, trace silt, occasional subrounded gravel. Light brown, wet, compact.		7	92		>50	8.7			end cap	510
	510.66	**TILL** Silty fine sand, trace medium sand, trace subrounded to subangular gravel, trace cobble. Light brown, low plasticity, wet, dense. At 4.57 m, change to trace clay. Greyish brown, medium plasticity.		8	100		50	7.9			backfilled with bentonite	
3	510.20			9	100		>50	8.8				509
4												
5												
6												

End of borehole at 508.52 m

Well Completion Details:
Screened interval from 511.87 m to 510.35 m
Elevation at top of pipe (TOP) = 515.54 m

Groundwater Information:
Depth to groundwater from TOP = 1.72 m (8/26/2020)

DRILLING METHOD: Hollow Stem Auger Drilling
BOREHOLE DIAMETER: 0.1016 m (OD)
DRILL DATE: 2020 August 24
LOGGED BY: MW
DRILLED BY: Walker Drilling Ltd.

Notes: SPLIT SPOON

SLR CONSULTING (CANADA) LTD.

CLIENT: **Flato Ida Dundalk Inc.**
PROJECT: **HydroG Assessment**
ADDRESS: **Flato Ida**
SLR JOB NO: **209.30125.00001**

BOREHOLE LOG

BOREHOLE NO: **MW-7-D**
SURFACE ELEVATION: 512.05 m
UTM COORDINATES 4889968.18 N 547878.55 E

DEPTH (m)	ELEVATION (m)	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE ID	% Recovery	SOIL TYPE	TEST DATA: SPT Count	TEST DATA: % Moisture	WELL COMPLETION	WATER LEVEL	WELL COMPLETION NOTES	ELEVATION (m)
0	512.05	**TOPSOIL**									steel casing, stickup, jplug	512
	511.85	Fine sandy silt, trace roots. Dark brown, moist, soft.		1A	83		2	48.1				
		SILT		1B				19.4				
	511.44	Sandy silt, trace clay, trace gravel. Brown with orange mottling, moist, firm.										
1		**TILL**		2	33		5	12.4				511
		Silty fine sand, trace medium sand, trace clay, trace subrounded to subangular gravel. Light brown, medium plasticity, moist, compact.										
	510.53	At 1.52 m, change to wet.										
	510.35	At 1.70 m, change to some gravel, trace cobble. Low plasticity.		3	46		17	8.1				
2												510
	509.76	**SAND**									bentonite seal	
	509.60	Coarse sand, some subrounded to subangular gravel, trace medium sand, trace fine sand. Light brown, wet, loose.		4A	83		34	13.4				
		TILL										
3		Silty fine sand, trace medium sand, trace clay, trace subrounded to subangular gravel, trace cobble. Light brown, low plasticity, wet, compact.		5	78		>50	8.6				509
	508.24	At 3.81 m, change to greyish brown.		6	92		50	8.6				
4												508
	507.28	At 4.78 m, change to moist, dense.		7	100		>50	7.5				
5												507
											silica sand 50mm 010 slot PVC pipe	
	506.41	**SAND**		8A	100		>50	9.0				
		Fine sand, trace medium sand, trace silt, occasional subrounded gravel. Light brown, non plastic, moist, compact.										
6	506.11											506
				9	100		>50	8.7			end cap	
		TILL										
		Silty fine sand, trace medium sand, trace clay, trace subrounded to subangular gravel, trace cobble. Greyish brown, low plasticity, moist, dense.										
		End of borehole at 505.78 m										

Well Completion Details:
Screened interval from 507.45 m to 505.93 m
Elevation at top of pipe (TOP) = 512.69 m

Groundwater Information:
Depth to groundwater from TOP = 1.08 m (8/26/2020)

DRILLING METHOD: Hollow Stem Auger Drilling
BOREHOLE DIAMETER: 0.1016 m (OD)
DRILL DATE: 2020 August 24
LOGGED BY: MW
DRILLED BY: Walker Drilling Ltd.

Notes: SPLIT SPOON

SLR CONSULTING (CANADA) LTD.

CLIENT: **Flato Ida Dundalk Inc.**
PROJECT: **HydroG Assessment**
ADDRESS: **Flato Ida**
SLR JOB NO: **209.30125.00001**

BOREHOLE LOG

BOREHOLE NO: MW-7-S
SURFACE ELEVATION: 512.07 m
UTM COORDINATES 4889968.18 N 547878.55 E

DEPTH (m)	ELEVATION (m)	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE ID	% Recovery	SOIL TYPE	TEST DATA: ■SPT Count (10 20 30 40 50) ◆ % Moisture (20 40 60 80 100)	WELL COMPLETION	WATER LEVEL	WELL COMPLETION NOTES	ELEVATION (m)
	512.07	For Lithology, see BH7D borehole log.								steel casing, stickup, jplug	512
										bentonite seal	
1											511
2										silica sand 50mm 010 slot PVC pipe	510
3										end cap	
		End of borehole at 509.02 m Well Completion Details: Screened interval from 510.70 m to 509.17 m Elevation at top of pipe (TOP) = 512.74 m Groundwater Information: Depth to groundwater from TOP = 1.13 m (8/26/2020)									

DRILLING METHOD: Hollow Stem Auger Drilling
BOREHOLE DIAMETER: 0.1016 m (OD)
DRILL DATE: 2020 August 25
LOGGED BY: MW
DRILLED BY: Walker Drilling Ltd.

Notes:

Sheet 1 of 1

SLR BOREHOLE LOG (MOISTURE) 241.20015.00005_MW_V4_2023-05-05.GPJ SLR_CAN V5.2 MOISTURE.GDT 23/5/5

SLR CONSULTING (CANADA) LTD.

CLIENT: **Flato Ida Dundalk Inc.**
PROJECT: **HydroG Assessment**
ADDRESS: **Flato Ida**
SLR JOB NO: **209.30125.00001**

BOREHOLE LOG

BOREHOLE NO: **MW-8**
SURFACE ELEVATION: 513.64 m
UTM COORDINATES 4890027.264 N 547827.938 E

DEPTH (m)	ELEVATION (m)	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE ID	% Recovery	SOIL TYPE	TEST DATA: SPT Count / % Moisture	WELL COMPLETION	WATER LEVEL	WELL COMPLETION NOTES	ELEVATION (m)
0	513.64	**TOPSOIL**								steel casing, stickup, jplug	
	513.45	Fine sandy silt, trace clay, trace roots. Dark brown, medium plasticity, moist, soft.		1A	58		4 / 65.1				
				1B			19.5				
	513.03	**SAND**									513
	512.81	Silty fine sand, trace medium sand, trace clay, occasional subrounded to subangular gravel. Brown with trace orange mottling, medium plasticity, moist, loose.									
1	512.75	**TILL**		2	29		6 / 13.1			bentonite seal	
		Silty fine sand, trace medium sand, trace subrounded to subangular gravel. Light brown, moist, compact.									
		SAND		3	46		9 / 11				512
		Fine sand, trace medium sand. Brown, wet, compact.									
2		**TILL**									
	511.35	Silty fine sand, trace medium sand, trace clay, trace subrounded to subangular gravel. Light brown, low plasticity, moist, compact.		4	78		>50 / 8			silica sand 50mm 010 slot PVC pipe	511
		At 2.29 m, change to trace cobble fragments. Dense.									
3	510.59	At 3.05 m, change to dry. From 3.05 m to 3.20 m, hit cobble layer.		5	100		50 / 7.2				
				6	100		50 / 5.2			end cap	510
4											
				7	83		>50 / 6.5				509
5	508.31	NO RECOVERY			0		50				
											508
6	507.70	**TILL**		9	25		50 / 4.3				
		Silty fine sand, trace medium sand, trace clay, trace subrounded to subangular gravel, trace cobble. Light brown, low plasticity, dry, dense.									
		End of borehole at 507.49 m									

Well Completion Details:
Screened interval from 511.66 m to 510.13 m
Elevation at top of pipe (TOP) = 514.51 m

Groundwater Information:
Depth to groundwater from TOP = 4.24 m (8/26/2020)

Borehole backfilled with drill cuttings, moved over and redrilled to desired well depth and installed well.

DRILLING METHOD: Hollow Stem Auger Drilling
BOREHOLE DIAMETER: 0.1016 m (OD)
DRILL DATE: 2020 August 26
LOGGED BY: MW
DRILLED BY: Walker Drilling Ltd.

Notes: SPLIT SPOON
NO RECOVERY

SLR CONSULTING (CANADA) LTD.

CLIENT: **Flato Ida Dundalk Inc.**
PROJECT: **HydroG Assessment**
ADDRESS: **Flato Ida**
SLR JOB NO: **209.30125.00001**

Monitoring Well LOG

BOREHOLE NO: **ESA-1**
SURFACE ELEVATION: 514.16 m

DEPTH (m)	ELEVATION (m)	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE ID	% Recovery	SOIL TYPE	TEST DATA: ■SPT Count (10 20 30 40 50) ◆ % Moisture (20 40 60 80100)	WELL COMPLETION	WATER LEVEL	WELL COMPLETION NOTES	ELEVATION (m)
0	514.16	**TOPSOIL** Dark brown, organics (rootlets), moist, soft		0-2.5	75.0		5				514
	513.73	**Silty SAND TILL** Fine-medium, brown, trace silt, soft, moist		*2.5-5 / DUP-1C	33.3		6			bentonite seal	
1											513
	512.64	**Silty SAND TILL** Silty, light brown, gravel (sub-angular), trace clay, dense, moist to dry		*5-7.5	70.8		12				
2											512
				*7.5-10	50.0		>50			silica sand 50 mm 010 slot PVC pipe	
3				10-12.5	50.0		49				511
4				12.5-15	12.5		>50				510
				15-17.5	12.5		>50			end cap	
5										bentonite seal	509
				17.5-20	50.0		>50				
6											

End of monitoring well at 508.06 m

Well Completion Details:
Screened interval from 512.64 m to 509.59 m
Elevation at top of pipe (TOP) = 515.16 m

Groundwater Information:
Depth to groundwater from TOP = 2.44 m (July 13, 2022)

* denotes soil sample taken for lab analysis

DRILLING METHOD: Hollow Stem Auger Drilling
BOREHOLE DIAMETER: 0.2 m (OD)

DRILL DATE: 2022 April 13
LOGGED BY: RH
DRILLED BY: Geo-Environmental

Notes: SPLIT SPOON

SLR CONSULTING (CANADA) LTD.

CLIENT: **Flato Ida Dundalk Inc.**
PROJECT: **HydroG Assessment**
ADDRESS: **Flato Ida**
SLR JOB NO: **209.30125.00001**

Monitoring Well LOG

BOREHOLE NO: MW22-401
SURFACE ELEVATION: 518.60 m

DEPTH (m)	ELEVATION (m)	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE ID	% Recovery	SOIL TYPE	TEST DATA: ■SPT Count (10 20 30 40 50) ◆ % Moisture (20 40 60 80 100)	WELL COMPLETION	WATER LEVEL	WELL COMPLETION NOTES	ELEVATION (m)
0	518.60	**TOPSOIL** Dark brown, organict (rootlets), soft, moist								silica sand	
	518.32	**SAND** Fine-medium, some gravel, some silt, brown, soft, moist		0-2.5	45.8		4				518
1				*2.5-5	33.3		8				
				*5-7.5	50.0		8				517
2											
	516.31	**Silty SAND TILL** Silty fine sand, gravel (sub-angular/sub-rounded), orange mottling, light brown, dense, dry		7.5-10	83.3		33			bentonite seal	516
3				10-12.5	75.0		48		▼		
	514.79	No orange mottling, wet, loose									515
4				12.5-15	58.3		40				
				15-17.5	29.2		>50				514
5										silica sand 50 mm 010 slot PVC pipe	
				17.5-20	0		>50				513
6											
		End of monitoring well at 512.50 m Well Completion Details: Screened interval from 514.03 m to 512.50 m Elevation at top of pipe (TOP) = 519.50 m Groundwater Information: Depth to groundwater from TOP = 4.28 m (July 13, 2022) * denotes soil sample taken for lab analysis								end cap	

DRILLING METHOD: Hollow Stem Auger Drilling
BOREHOLE DIAMETER: 0.2 m (OD)
DRILL DATE: 2022 April 13
LOGGED BY: RH
DRILLED BY: Geo-Environmental

Notes: SPLIT SPOON

SLR CONSULTING (CANADA) LTD.

CLIENT: **Flato Ida Dundalk Inc.**
PROJECT: **HydroG Assessment**
ADDRESS: **Flato Ida**
SLR JOB NO: **209.30125.00001**

Monitoring Well LOG

BOREHOLE NO: **MW22-402**
SURFACE ELEVATION: 516.82 m

DEPTH (m)	ELEVATION (m)	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE ID	% Recovery	SOIL TYPE	TEST DATA: SPT Count / % Moisture	WELL COMPLETION	WATER LEVEL	WELL COMPLETION NOTES	ELEVATION (m)
0	516.82	**TOPSOIL** Brown, moist, soft		0-1	50.0		SPT 15			silica sand	
	516.52	**Silty SAND TILL** Silty, gravel (sub-angular), trace clay, some organics, brown, moist, soft-dense, increasing gravel content with depth		2.5-3.0	45.8		SPT 5				516
1											
				5.5-6.5	83.3		SPT 15				515
2										bentonite seal	
				7.5-10	100.0		SPT >50				514
3											
				11-12	79.2		SPT >50				513
4											
				14-15	50.0		SPT >50				512
5											
				17-17.5	33.3		SPT >50			silica sand 50 mm 010 slot PVC pipe	
				18-20	100.0		SPT >50				511
6										end cap silica sand	
				20.5-22.5	87.5		SPT >50			bentonite seal	510

End of monitoring well at 509.96 m

Well Completion Details:
Screened interval from 512.25 m to 510.72 m
Elevation at top of pipe (TOP) = 517.68 m

Groundwater Information:
Depth to groundwater from TOP = 2.95 m (July 13, 2022)

* denotes soil sample taken for lab analysis

DRILLING METHOD: Hollow Stem Auger Drilling
BOREHOLE DIAMETER: 0.2 m (OD)
DRILL DATE: 2022 April 11
LOGGED BY: RH
DRILLED BY: Geo-Environmental

Notes: SPLIT SPOON

SLR CONSULTING (CANADA) LTD.

CLIENT: **Flato Ida Dundalk Inc.**
PROJECT: **HydroG Assessment**
ADDRESS: **Flato Ida**
SLR JOB NO: **209.30125.00001**

Monitoring Well LOG

BOREHOLE NO: **MW22-403**
SURFACE ELEVATION: 514.27 m

DEPTH (m)	ELEVATION (m)	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE ID	% Recovery	SOIL TYPE	TEST DATA: SPT Count (■) / % Moisture (◆)	WELL COMPLETION	WATER LEVEL	WELL COMPLETION NOTES	ELEVATION (m)
0	514.27	**TOPSOIL**									
	514.02	Dark brown, some organics (rootlets), soft, moist								silica sand	
		SAND									
		Fine-medium, brown, trace clay, soft, moist		1-2.5	66.7		4				514
	513.51	**Sandy SILT TILL**									
1		Silty, light brown, gravel (sub-angular), trace clay, soft, moist, increasing gravel content with depth		4.5-5	20.8		5				513
2				6.5-7.5	37.5		24				
	511.98	Cobbles, dry, dense								bentonite seal	512
3				9-10	66.7		>50				
				11.5-12.5	58.3		>50				511
4				14-15	62.5		>50				
				16.5-17.5	50.0		>50				510
5	508.94	Moist from 5.33 m to EOH								silica sand 50 mm 010 slot PVC pipe	
				19-20	66.7		>50				509
6										end cap silica sand	
										bentonite seal	508
	507.49	~~Largest cobble at 6.78 m~~		22-22.5	37.5		>50				

End of monitoring well at 507.41 m

Well Completion Details:
Screened interval from 509.70 m to 508.17 m
Elevation at top of pipe (TOP) = 515.21 m

Groundwater Information:
Depth to groundwater from TOP = 2.79 m (July 13, 2022)

* denotes soil sample taken for lab analysis

DRILLING METHOD: Hollow Stem Auger Drilling
BOREHOLE DIAMETER: 0.2 m (OD)
DRILL DATE: 2022 April 11
LOGGED BY: RH
DRILLED BY: Geo-Environmental

Notes: SPLIT SPOON

SLR CONSULTING (CANADA) LTD.

CLIENT: **Flato Ida Dundalk Inc.**
PROJECT: **HydroG Assessment**
ADDRESS: **Flato Ida**
SLR JOB NO: **209.30125.00001**

Monitoring Well LOG

BOREHOLE NO: **MW22-404**
SURFACE ELEVATION: 514.16 m

DEPTH (m)	ELEVATION (m)	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE ID	% Recovery	SOIL TYPE	TEST DATA: ■SPT Count (10 20 30 40 50) ◆ % Moisture (20 40 60 80 100)	WELL COMPLETION	WATER LEVEL	WELL COMPLETION NOTES	ELEVATION (m)
0	514.16	**TOPSOIL**									514
	513.96	Dark brown, organics (rootlets), moist, soft									
		SAND		0-2.5	66.7		4			silica sand	
		Brown, some silt, organics, (rootlets), moist, soft									
	513.40	**Silty SAND**									
1		Medium sand, brown, orange mottling, gravel (sub-angular/angular), soft, compact, wet		*2.5-5 / DUP-1B	66.7		12		▼		513
	512.64	**Silty SAND TILL**									
		Medium-fine silty sand, some gravel (sub-angular/angular), compact/dense, wet		*5-7.5	75.0		44				
2											512
	511.87	No recovery			0		>50			bentonite seal	
3	511.11	**Gravelly SAND**									511
		Grey-brown, gravel (sub-angular/angular), some silt, wet, loose		10-12.5	91.7		>50				
	510.30	**Silty SAND TILL**									
4		Silty fine sand, gravel (sub-angular/angular), grey-brown, dry, dense		12.5-15	66.7		>50				510
				15-17.5	54.2		>50				
5										silica sand 50 mm 010 slot PVC pipe	509
				17.5-20	70.8		>50				
6										end cap silica sand	508
				20-22.5	0		>50			bentonite seal	

End of monitoring well at 507.30 m

Well Completion Details:
Screened interval from 509.59 m to 508.06 m
Elevation at top of pipe (TOP) = 515.00 m

Groundwater Information:
Depth to groundwater from TOP = 1.77 m (July 13, 2022)

* denotes soil sample taken for lab analysis

DRILLING METHOD: Hollow Stem Auger Drilling
BOREHOLE DIAMETER: 0.2 m (OD)
DRILL DATE: 2022 April 13
LOGGED BY: RH
DRILLED BY: Geo-Environmental

Notes: SPLIT SPOON
NO RECOVERY

SLR CONSULTING (CANADA) LTD.

CLIENT: **Flato Ida Dundalk Inc.**
PROJECT: **HydroG Assessment**
ADDRESS: **Flato Ida**
SLR JOB NO: **209.30125.00001**

Monitoring Well LOG

BOREHOLE NO: **MW22-405-D**
SURFACE ELEVATION: 512.10 m

DEPTH (m)	ELEVATION (m)	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE ID	% Recovery	SOIL TYPE	TEST DATA: ■SPT Count (10 20 30 40 50) ◆ % Moisture (20 40 60 80100)	WELL COMPLETION	WATER LEVEL	WELL COMPLETION NOTES	ELEVATION (m)
0	512.10	**TOPSOIL**								silica sand	512
	511.87	Dark brown, organics (rootlets), moist, soft									
		SAND		1.5-2.5	70.8		4				
	511.34	Medium sand, light brown, organics (rootlets), moist, soft									
1		Silty fine sand with gravel (sub-angular), light brown, moist, soft		*2.5-5 / DUP-1A	58.3		9				511
	510.58	**Silty SAND with GRAVEL**									
		Silty fine sand with gravel (sub-angular), trace clay, light brown, moist-dry, soft		*5-7.5	37.5		12				
2											510
				7.5-10	75.0		22				
3	509.05										
	508.99	**Gravelly SAND**		10-12.5	66.7		>50				509
		Coarse sand and gravel (sub-angular), some fine sand, trace silt, light brown, wet, loose									
		Silty SAND TILL									
4		Silty fine sand with gravel (sub-angular), trace clay, light brown-grey, dry, dense		12.5-15	79.2		>50				508
										bentonite seal	
5				15-17.5	66.7		>50				507
				17.5-20	45.8		>50				
6											506
				20-22.5	37.5		>50				
7				2.5-25	87.5		50				505
				25-27.5	70.8		>50				
8											504
				27.5-30	58.3		>50				
9											503
					0		>50				
10				32.5-35	0		47			silica sand 50 mm 010 slot PVC pipe	502
										end cap	
		End of monitoring well at 501.43 m									

Well Completion Details:
Screened interval from 502.96 m to 501.43 m
Elevation at top of pipe (TOP) = 513.05 m

Groundwater Information:
Depth to groundwater from TOP = 2.81 m (July 13, 2022)

* denotes soil sample taken for lab analysis

DRILLING METHOD: Hollow Stem Auger Drilling
BOREHOLE DIAMETER: 0.2 m (OD)
DRILL DATE: 2022 April 12
LOGGED BY: RH
DRILLED BY: Geo-Environmental

Notes: SPLIT SPOON
NO RECOVERY

SLR CONSULTING (CANADA) LTD.

CLIENT: **Flato Ida Dundalk Inc.**
PROJECT: **HydroG Assessment**
ADDRESS: **Flato Ida**
SLR JOB NO: **209.30125.00001**

Monitoring Well LOG

BOREHOLE NO: **MW22-405-S**
SURFACE ELEVATION: 512.06 m

DEPTH (m)	ELEVATION (m)	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE ID	% Recovery	SOIL TYPE	TEST DATA: ■SPT Count (10 20 30 40 50) ◆ % Moisture (20 40 60 80100)	WELL COMPLETION	WATER LEVEL	WELL COMPLETION NOTES	ELEVATION (m)
0	512.06	**TOPSOIL** Dark brown, organics (rootlets), moist, soft								silica sand	512
	511.83	**SAND** Medium sand, light brown, organics (rootlets), moist, soft		1.5-2.5	70.8		4				
	511.30	Silty fine sand with gravel (sub-angular), light brown, moist, soft		*2.5-5 / DUP-1A	58.3		9				
1											511
	510.54	**Silty SAND with GRAVEL** Silty fine sand with gravel (sub-angular), trace clay, light brown, moist-dry, soft		*5-7.5	37.5		12				
2										bentonite seal	510
				7.5-10	75.0		22				
3	509.01										509
	508.95	**Gravelly SAND** Coarse sand and gravel (sub-angular), some fine sand, trace silt, light brown, wet, loose		10-12.5	66.7		>50				
		Silty SAND TILL Silty fine sand with gravel (sub-angular), trace clay, light brown-grey, dry, dense									
4				12.5-15	79.2		>50				508
				15-17.5	66.7		>50				
5										silica sand 50 mm 010 slot PVC pipe	507
				17.5-20	45.8		>50				
6										end cap	506
		End of monitoring well at 505.96 m Well Completion Details: Screened interval from 507.49 m to 505.96 m Elevation at top of pipe (TOP) = 513.05 m Groundwater Information: Depth to groundwater from TOP = 2.79 m (July 13, 2022) * denotes soil sample taken for lab analysis MW22-405S was straight drilled adjacent to MW22-405D									

DRILLING METHOD: Hollow Stem Auger Drilling
BOREHOLE DIAMETER: 0.2 m (OD)
DRILL DATE: 2022 April 12
LOGGED BY: RH
DRILLED BY: Geo-Environmental

Notes: SPLIT SPOON

Sheet 1 of 1

SLR BOREHOLE LOG (MOISTURE) 209.30125.00001_2023-05-05.GPJ SLR_CAN V5.2 MOISTURE.GDT 23/5/5

SLR CONSULTING (CANADA) LTD.

CLIENT: **Flato Ida Dundalk Inc.**
PROJECT: **HydroG Assessment**
ADDRESS: **Flato Ida**
SLR JOB NO: **209.30125.00001**

Monitoring Well LOG

BOREHOLE NO: MW22-406
SURFACE ELEVATION: 511.50 m

DEPTH (m)	ELEVATION (m)	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE ID	% Recovery	SOIL TYPE	TEST DATA: SPT Count / % Moisture	WELL COMPLETION	WATER LEVEL	WELL COMPLETION NOTES	ELEVATION (m)
0	511.50	**TOPSOIL**								cement	
	511.40	**SAND** Fine sand, trace silt, trace organics, brown, grey mottling, moist, soft, loose		0-2.5	66.7		4				511
	510.74	**Silty SAND** Grey, brown mottling, silty, trace gravel, trace clay, cobbles, moist, firm, compact		2.5-5	62.5		5				
1				5-7.5	54.2		9				510
2										bentonite seal	
	509.21	**Silty SAND and GRAVEL** Brown-grey, silty, gravelly, moist, firm, compact Dry		7.5-10	100.0		36				509
3	509.01			10-12.5	100.0		35				508
	507.69	**GRAVEL** Brown-grey, crushed rock/gravel (angular), trace silt, saturated, loose		12.5-15	41.7		40				
4	506.93	**FINE SAND**									507
	506.78	Brown, gravel, saturated, loose **GRAVEL** Brown, angular, trace fine sand, trace cobble, wet, loose		15-17.5	54.2		36			silica sand 50 mm 010 slot PVC pipe	
5	506.17	**Silty SAND TILL** Brown-grey, silty, some gravel, dry, dense		17.5-19	66.7		>50			end cap	506
		End of monitoring well at 505.71 m Well Completion Details: Screened interval from 507.23 m to 505.71 m Elevation at top of pipe (TOP) = 512.31 m Groundwater Information: Depth to groundwater from TOP = 1.92 m (July 13, 2022) * denotes soil sample taken for lab analysis									

DRILLING METHOD: Hollow Stem Auger Drilling
BOREHOLE DIAMETER: 0.2 m (OD)
DRILL DATE: 2022 April 18
LOGGED BY: MJ
DRILLED BY: Geo-Environmental

Notes: SPLIT SPOON

SLR CONSULTING (CANADA) LTD.

CLIENT: **Flato Ida Dundalk Inc.**
PROJECT: **HydroG Assessment**
ADDRESS: **Flato Ida**
SLR JOB NO: **209.30125.00001**

Monitoring Well LOG

BOREHOLE NO: MW22-407
SURFACE ELEVATION: 509.61 m

DEPTH (m)	ELEVATION (m)	SOIL DESCRIPTION	SAMPLE ID	% Recovery	TEST DATA: SPT Count (■) / % Moisture (◆)	WELL COMPLETION NOTES	ELEVATION (m)
0	509.61	**TOPSOIL**				cement	509
	509.38	**Silty SAND** Brown, silty, trace cobble, moist, soft	0-2.5	37.5	7		
1			2.5-5	16.7	6		
	508.09	Occasional gravel, compact					508
2			5-7.5	70.8	12		
	507.32	**Sandy SILT TILL** Grey-brown, gravelly (sub-angular/angular), trace silt, dry-moist, firm, compact	7.5-10	83.3	>50	bentonite seal	507
3			10-12.5	41.7	>50		506
4			12.5-15	100.0	>50		
			15-17.5	95.8	>50		505
5						silica sand 50 mm 010 slot PVC pipe	
			17.5-20	70.8	>50		504
6						end cap	

End of monitoring well at 503.51 m

Well Completion Details:
Screened interval from 505.04 m to 503.51 m
Elevation at top of pipe (TOP) = 510.46 m

Groundwater Information:
Depth to groundwater from TOP = 2.46 m (July 13, 2022)

* denotes soil sample taken for lab analysis

DRILLING METHOD: Hollow Stem Auger Drilling
BOREHOLE DIAMETER: 0.2 m (OD)

DRILL DATE: 2022 April 18
LOGGED BY: MJ
DRILLED BY: Geo-Environmental

Notes: SPLIT SPOON

SLR BOREHOLE LOG (MOISTURE) 209.30125.00001_2023-05-05.GPJ SLR_CAN V5.2 MOISTURE.GDT 23/5/5

SLR CONSULTING (CANADA) LTD.

CLIENT: **Flato Ida Dundalk Inc.**
PROJECT: **HydroG Assessment**
ADDRESS: **Flato Ida**
SLR JOB NO: **209.30125.00001**

Monitoring Well LOG

BOREHOLE NO: MW22-408
SURFACE ELEVATION: 509.31 m

DEPTH (m)	ELEVATION (m)	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE ID	% Recovery	SOIL TYPE	TEST DATA: ■SPT Count (10 20 30 40 50) ◆ % Moisture (20 40 60 80 100)	WELL COMPLETION	WATER LEVEL	WELL COMPLETION NOTES	ELEVATION (m)
0	509.31	**TOPSOIL**								cement	509
	509.18	**Silty SAND with GRAVEL** Brown, silty, some gravel, trace clay, trace organics, moist-wet, occasional cobbles, loose-dense, increasing gravel content with depth		*0-5	100.0		5				
1											508
				5-7.5	45.8		9				
2											
	507.02	Saturated, hard, compact		*7.5-10	70.8		21			bentonite seal	507
3	506.26	Set, very hard, very dense		10-12.5	75.0		>50				506
4				12.5-15	70.8		>50				505
				15-17.5	37.5		>50				
5	503.98	**Gravelly Silty SAND** Brown-grey, moist-wet, dense, soft		17.5-20	62.5		>50			silica sand 50 mm 010 slot PVC pipe	504
6				20-22.5	16.7		>50			end cap silica sand bentonite seal	503

End of monitoring well at 502.45 m

Well Completion Details:
Screened interval from 504.74 m to 503.21 m
Elevation at top of pipe (TOP) = 510.28 m

Groundwater Information:
Depth to groundwater from TOP = 2.18 m (July 13, 2022)

* denotes soil sample taken for lab analysis

DRILLING METHOD: Hollow Stem Auger Drilling
BOREHOLE DIAMETER: 0.2 m (OD)
DRILL DATE: 2022 April 18
LOGGED BY: MJ
DRILLED BY: Geo-Environmental

Notes: SPLIT SPOON

Appendix C Groundwater Data

Hydrogeological Assessment

Flato Ida

Flato Ida Dundalk Inc.

SLR Project No.: 209.30125.00001

May 6, 2024

Table C-1: Groundwater Elevations in Monitoring Wells

Monitor ID	Units	25-Sep-20	16-Nov-20	5-Apr-21	5-Jul-21	9-Sep-21	3-Nov-21	13-May-22	13-Jul-22	20-Sep-22	25-Nov-22	28-Mar-23	1-Nov-23	7-Mar-24
ESA-1	mbgs	-	-	-	-	-	-	0.79	1.46	1.72	1.16	0.54	-	0.64
	masl	-	-	-	-	-	-	513.37	512.70	512.44	513.00	513.62	-	513.52
MW22-401	mbgs	-	-	-	-	-	-	2.40	3.38	3.86	3.63	0.89	-	1.25
	masl	-	-	-	-	-	-	516.20	515.22	514.74	514.97	517.72	-	517.35
MW22-402	mbgs	-	-	-	-	-	-	1.37	2.09	3.29	3.19	0.14	-	0.55
	masl	-	-	-	-	-	-	515.45	514.73	513.54	513.64	516.69	-	516.27
MW22-403	mbgs	-	-	-	-	-	-	0.89	1.85	2.61	1.40	0.20	-	0.28
	masl	-	-	-	-	-	-	513.38	512.42	511.66	512.87	514.07	-	513.99
MW22-404	mbgs	-	-	-	-	-	-	1.14	0.93	2.31	1.40	0.36	-	0.43
	masl	-	-	-	-	-	-	513.02	513.23	511.85	512.76	513.80	-	513.73
MW22-405-S	mbgs	-	-	-	-	-	-	0.81	1.80	2.55	1.82	0.04	0.56	0.09
	masl	-	-	-	-	-	-	511.25	510.26	509.51	510.24	512.02	511.50	511.97
MW22-405-D	mbgs	-	-	-	-	-	-	0.85	1.86	2.63	1.91	0.11	0.69	0.22
	masl	-	-	-	-	-	-	511.25	510.24	509.47	510.20	511.99	511.41	511.88
MW22-406	mbgs	-	-	-	-	-	-	0.33	1.11	1.76	0.93	0.11	0.48	0.15
	masl	-	-	-	-	-	-	511.17	510.39	509.74	510.57	511.39	511.02	511.35
MW22-407	mbgs	-	-	-	-	-	-	-0.44	1.51	2.34	1.21	0.15	-	0.18
	masl	-	-	-	-	-	-	509.95	508.00	507.17	508.30	509.37	-	509.33
MW22-408	mbgs	-	-	-	-	-	-	0.33	1.21	1.23	0.12	0.07	0.07	0.07
	masl	-	-	-	-	-	-	508.98	508.10	508.08	509.19	509.24	509.24	509.24
BH-2	mbgs	1.17	0.76	0.96	1.27	1.07	0.93	1.11	1.71	2.41	1.92	0.73	-	0.88
	masl	512.32	512.72	512.52	512.22	512.41	512.56	512.37	511.77	511.07	511.56	512.75	-	512.60
BH-6	mbgs	0.64	0.03	0.10	0.51	0.21	0.09	0.51	1.36	1.84	1.26	0.15	0.82	0.20
	masl	514.13	514.74	514.67	514.26	514.56	514.69	514.26	513.41	512.93	513.51	514.62	513.96	514.57
BH-7-S	mbgs	0.25	-0.01	0.02	0.12	0.01	-0.02	-	0.45	0.73	0.05	0.02	0.05	0.03
	masl	511.82	512.08	512.05	511.95	512.06	512.09	-	511.62	511.35	512.02	512.06	512.02	512.04
BH-7-D	mbgs	0.22	0.00	0.01	0.22	-0.01	-0.02	0.14	0.58	0.72	0.04	0.00	0.03	0.03
	masl	511.83	512.05	512.04	511.83	512.06	512.07	511.91	511.47	511.33	512.01	512.05	512.02	512.02
BH-8	mbgs	0.47	-0.03	0.01	0.22	0.01	0.01	0.31	0.90	1.23	0.53	-0.02	-	-0.01
	masl	513.17	513.67	513.63	513.42	513.63	513.63	513.33	512.74	512.41	513.11	513.66	-	513.65

Notes: mbgs metres below ground surface
masl metres below sea level
Monitors MW22-401 to MW22-408 was installed in April 2022; as such, water levels prior to this data are unavailable.

Table C-2: Groundwater Elevations in Mini-Piezometers

Monitor ID	Units	25-Sep-20	16-Nov-20	5-Apr-21	5-Jul-21	9-Sep-21	3-Nov-21	13-May-22	13-Jul-22	20-Sep-22	25-Nov-22	28-Mar-23	1-Nov-23	7-Mar-24
MP1-S	mbgs	n.d.	-0.09	-0.17	-0.26	-0.04	-0.05	-0.02	0.09	0.27	-0.06	-0.08	-	-0.05
	masl	n.d.	510.64	510.72	510.81	510.59	510.61	510.57	510.46	510.28	510.61	510.63	-	510.60
MP1-D	mbgs	n.d.	0.00	0.92	0.08	-0.19	-0.70	-0.04	0.78	0.86	0.25	-0.12	-	-0.23
	masl	n.d.	510.52	509.60	510.44	510.71	511.22	510.56	509.74	509.66	510.27	510.64	-	510.75

Notes:
mbgs metres below ground surface
masl metres below sea level

Table C-3: Vertical Hydraulic Gradients

Monitor ID	25-Sep-20	16-Nov-20	5-Apr-21	5-Jul-21	9-Sep-21	3-Nov-21	13-May-22	13-Jul-22	20-Sep-22	25-Nov-22	28-Mar-23	1-Nov-23	7-Mar-24
MP101													
Shallow monitor (masl)	-	510.64	510.72	510.81	510.59	510.61	510.57	510.46	510.28	510.61	510.63	-	510.60
Deep monitor (masl)	-	510.52	509.60	510.44	510.71	511.22	510.56	509.74	509.66	510.27	510.64	-	510.75
Hydraulic gradient (m/m)	-	0.11	-	0.33	-0.11	-0.55	0.01	0.65	0.56	0.31	0.00	-	-0.13
MW22-405													
Shallow monitor (masl)	-	-	-	-	-	-	511.25	510.26	509.51	510.24	512.02	512.02	511.97
Deep monitor (masl)	-	-	-	-	-	-	511.25	510.24	509.47	510.20	511.99	511.99	511.88
Hydraulic gradient (m/m)	-	-	-	-	-	-	0.00	0.00	0.01	0.01	0.01	0.01	0.02
BH-7													
Shallow monitor (masl)	511.82	512.08	512.05	511.95	512.06	512.09	-	511.62	511.35	512.02	512.06	512.02	512.04
Deep monitor (masl)	511.83	512.05	512.04	511.83	512.06	512.07	511.91	511.47	511.33	512.01	512.05	512.02	512.02
Hydraulic gradient (m/m)	0.00	0.01	0.00	0.03	0.00	0.00	-	0.03	0.00	0.00	0.00	0.00	0.00

Notes: Positive hydraulic gradients indicates downward groundwater movement (i.e., recharge conditions)

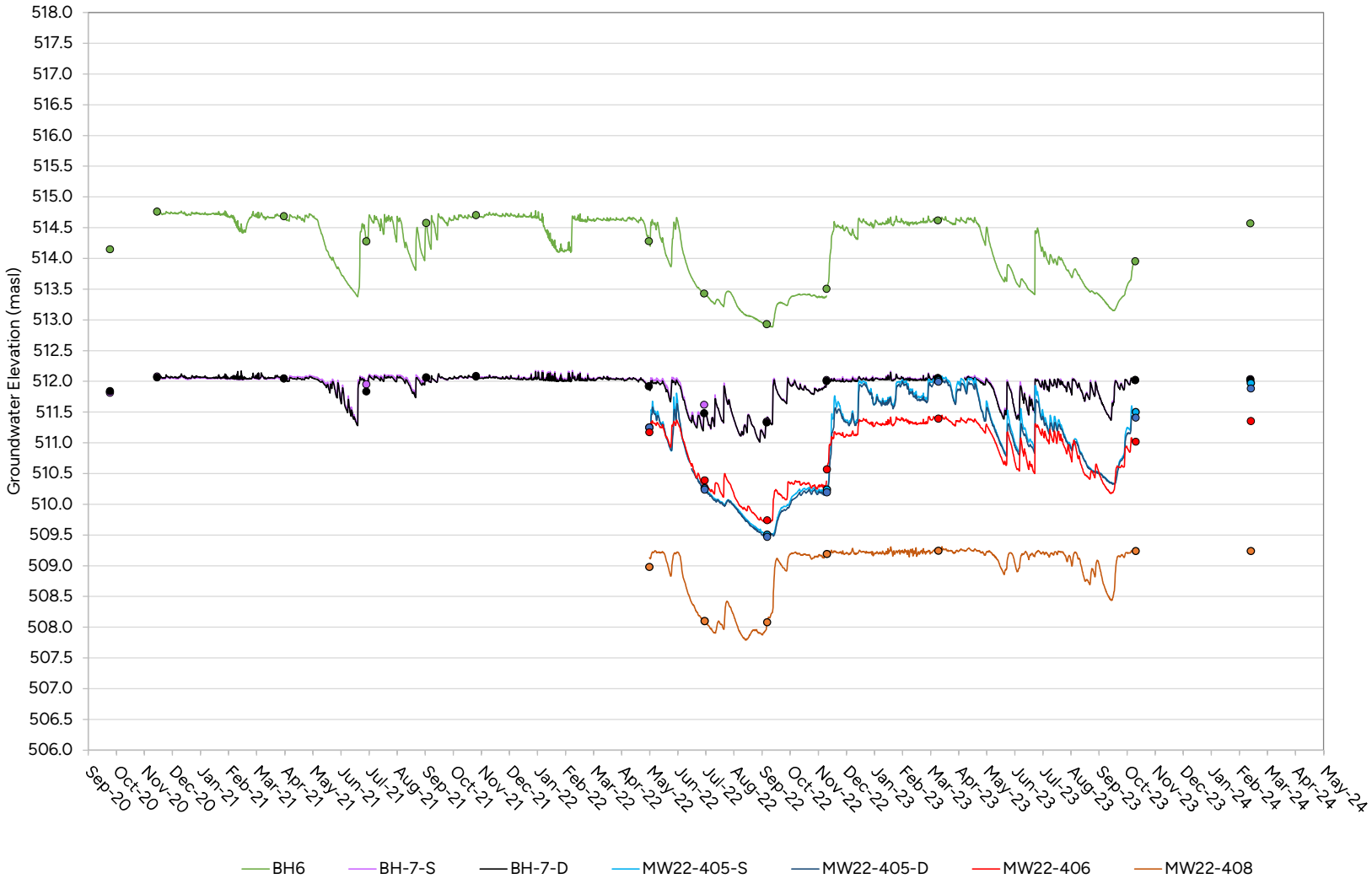


Figure C-1

Hydrograph - Continuous Groundwater Elevations in Monitoring Wells

Flato Ida

SLR

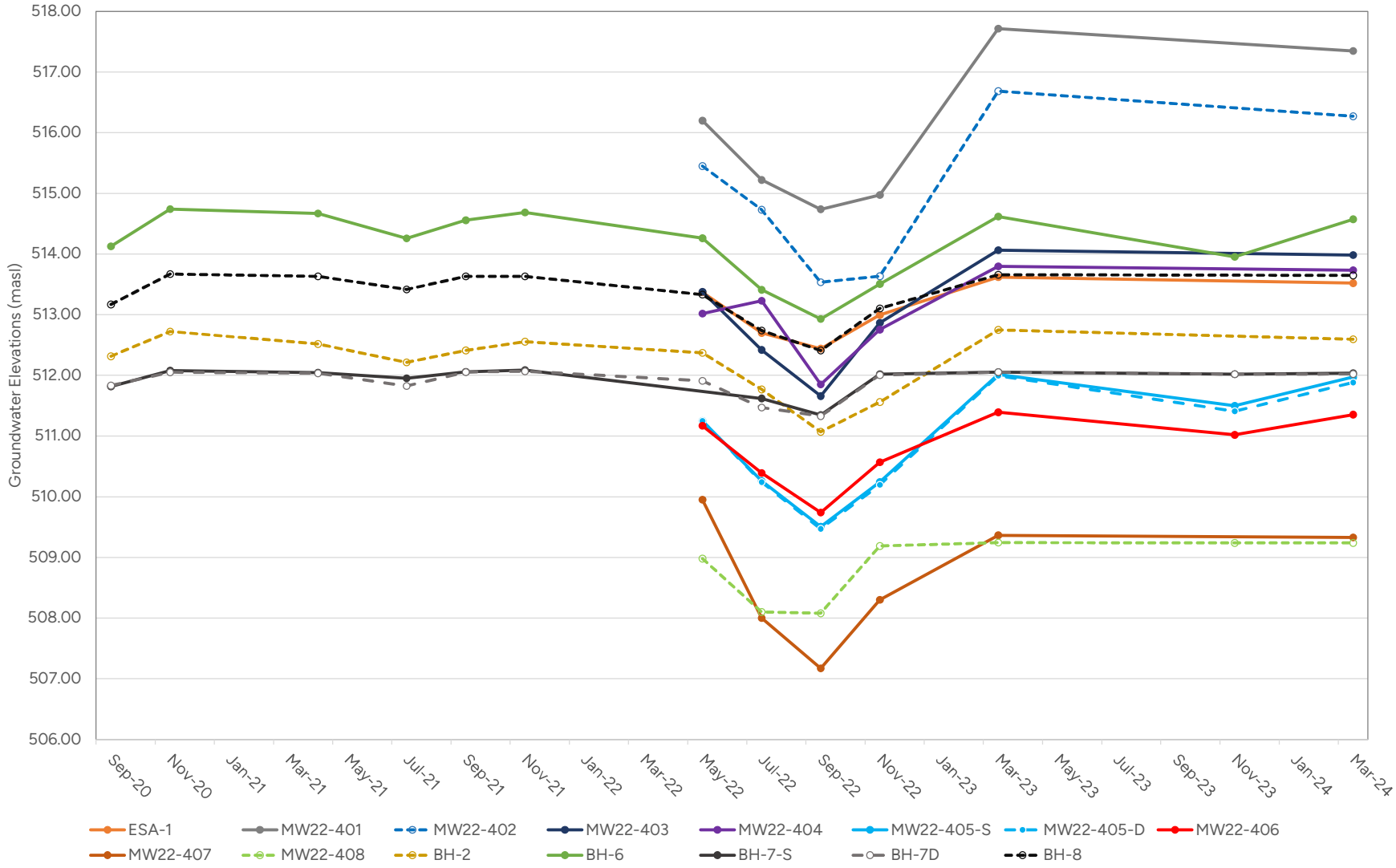
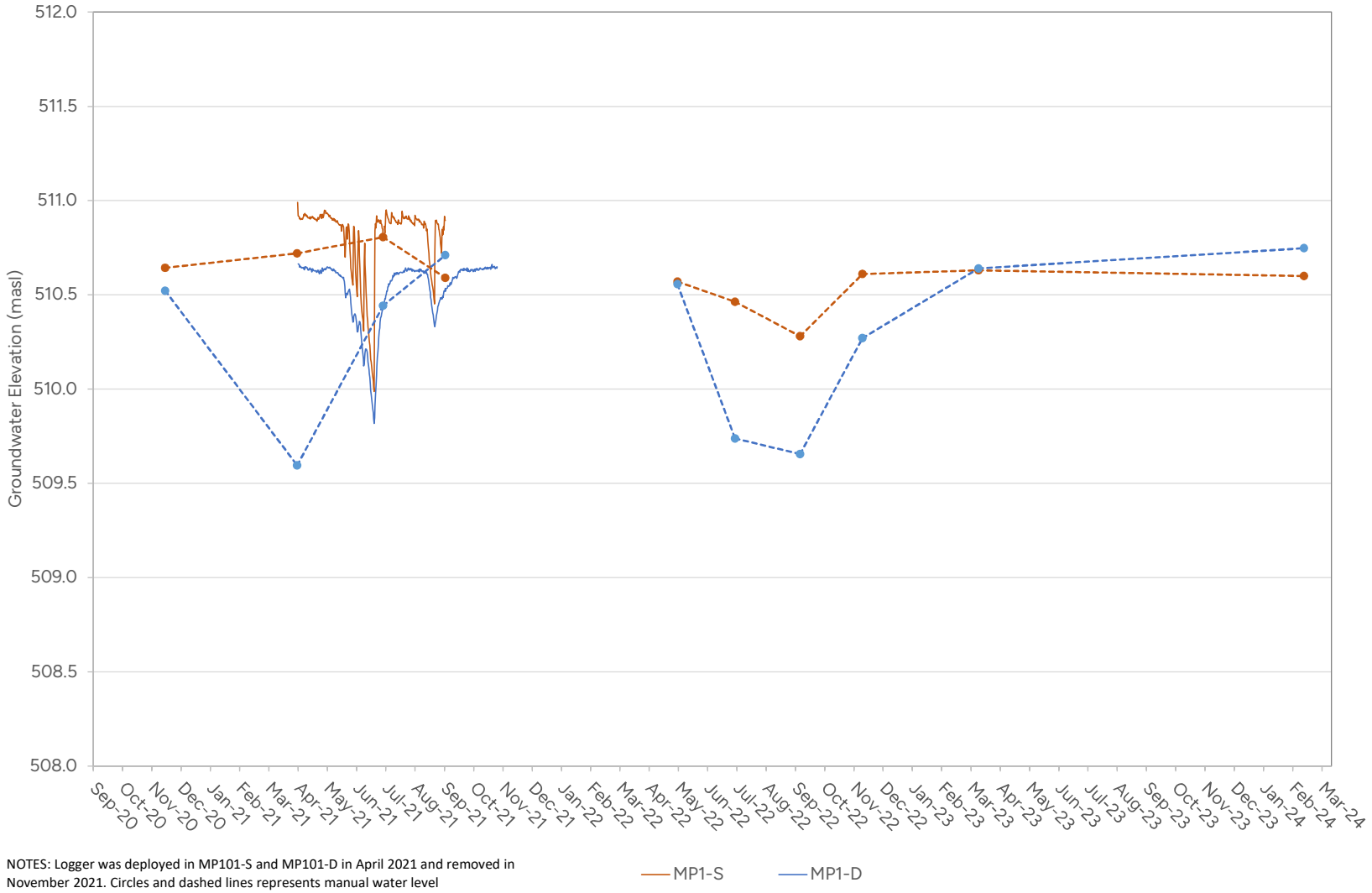


Figure C-2

Hydrograph - Manual Groundwater Elevations in Monitoring Wells

Flato Ida



NOTES: Logger was deployed in MP101-S and MP101-D in April 2021 and removed in November 2021. Circles and dashed lines represents manual water level measurements

Figure C-3	Hydrograph - Continuous Groundwater Elevations in Mini-Piezometers Flato Ida	SLR

Appendix D Hydraulic Conductivity

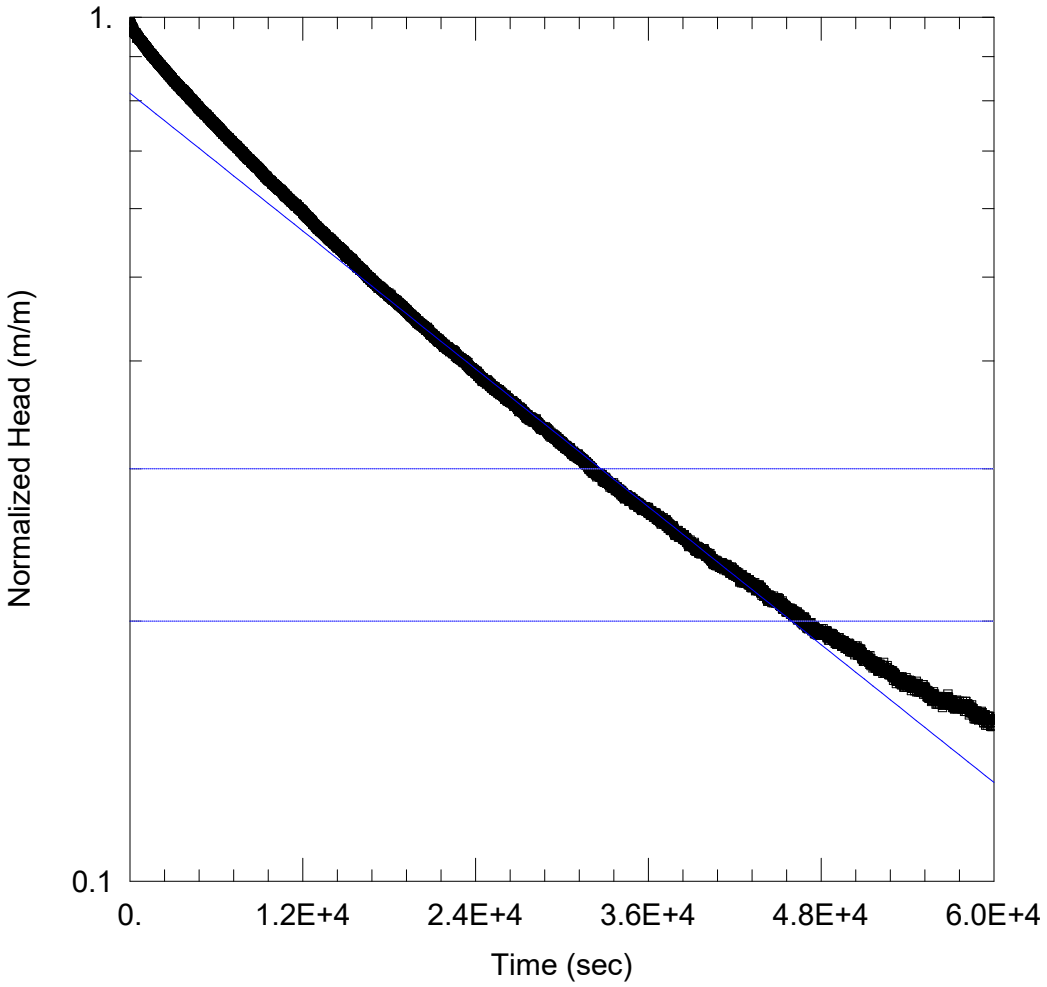
Hydrogeological Assessment

Flato Ida

Flato Ida Dundalk Inc.

SLR Project No.: 209.30125.00001

May 6, 2024



WELL TEST ANALYSIS

Data Set: N:\...\MW22-405D_JH.aqt
Date: 07/29/22 Time: 12:16:09

PROJECT INFORMATION

Company: SLR Consulting (Canada) Ltd.
Client: Flato Ida Dundalk Inc.
Project: 209.30125.00001
Location: Flato Ida
Test Well: MW22-405-D

AQUIFER DATA

Saturated Thickness: 9.12 m Anisotropy Ratio (Kz/Kr): 1.

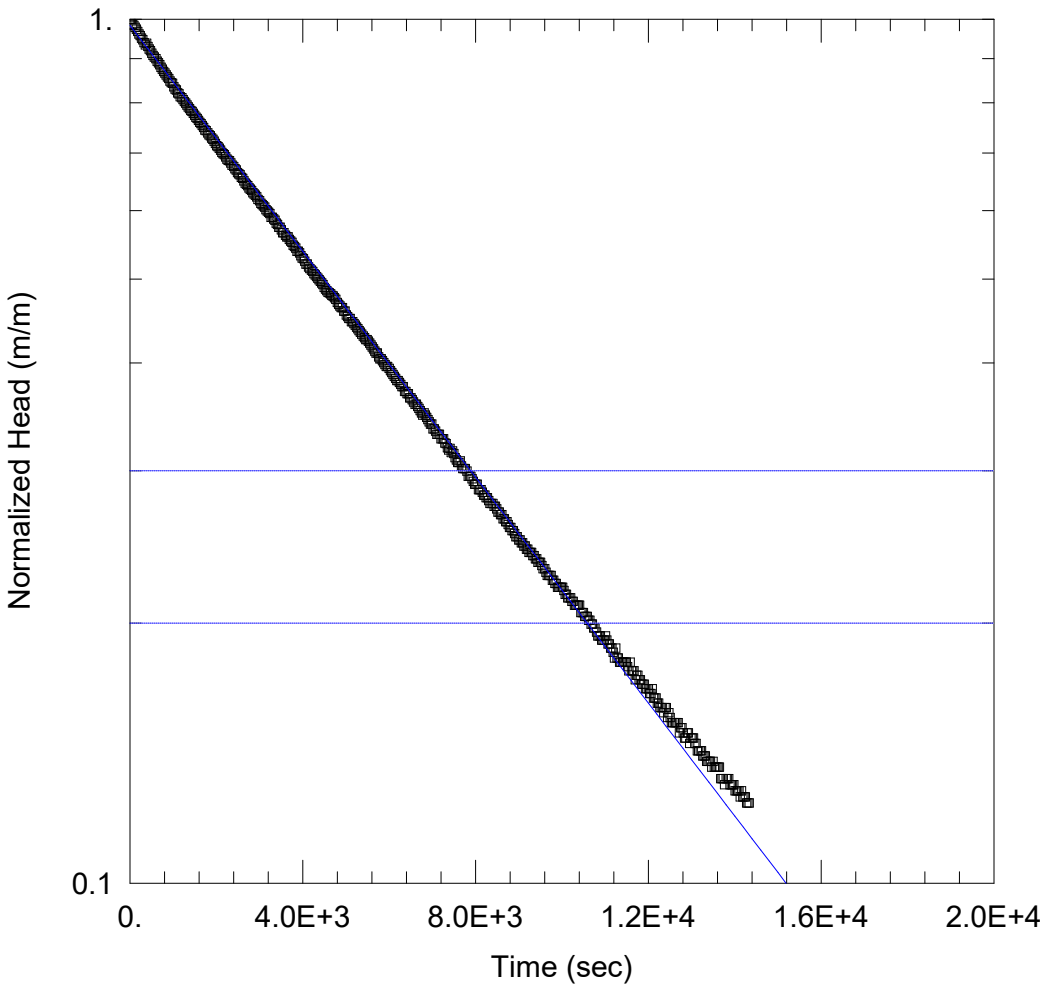
WELL DATA (MW22-405D)

Initial Displacement: 1.754 m
Total Well Penetration Depth: 9.12 m
Casing Radius: 0.0254 m
Static Water Column Height: 9.12 m
Screen Length: 1.524 m
Well Radius: 0.1016 m

SOLUTION

Aquifer Model: Unconfined Solution Method: Bouwer-Rice

K = 1.882E-8 m/sec y0 = 1.433 m



WELL TEST ANALYSIS

Data Set: N:\...\MW22-405S_JH.aqt
Date: 07/29/22 Time: 12:17:15

PROJECT INFORMATION

Company: SLR Consulting (Canada) Ltd.
Client: Flato Ida Dundalk Inc.
Project: 209.30125.00001
Location: Flato Ida
Test Well: MW22-405-S

AQUIFER DATA

Saturated Thickness: 4.595 m Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (MW22-405S)

Initial Displacement: 1.333 m
Total Well Penetration Depth: 4.595 m
Casing Radius: 0.0254 m
Static Water Column Height: 4.595 m
Screen Length: 1.524 m
Well Radius: 0.1016 m

SOLUTION

Aquifer Model: Unconfined Solution Method: Bouwer-Rice

K = 8.2E-8 m/sec y0 = 1.31 m

Appendix E MECP Water Well Records

Hydrogeological Assessment

Flato Ida

Flato Ida Dundalk Inc.

SLR Project No.: 209.30125.00001

May 6, 2024

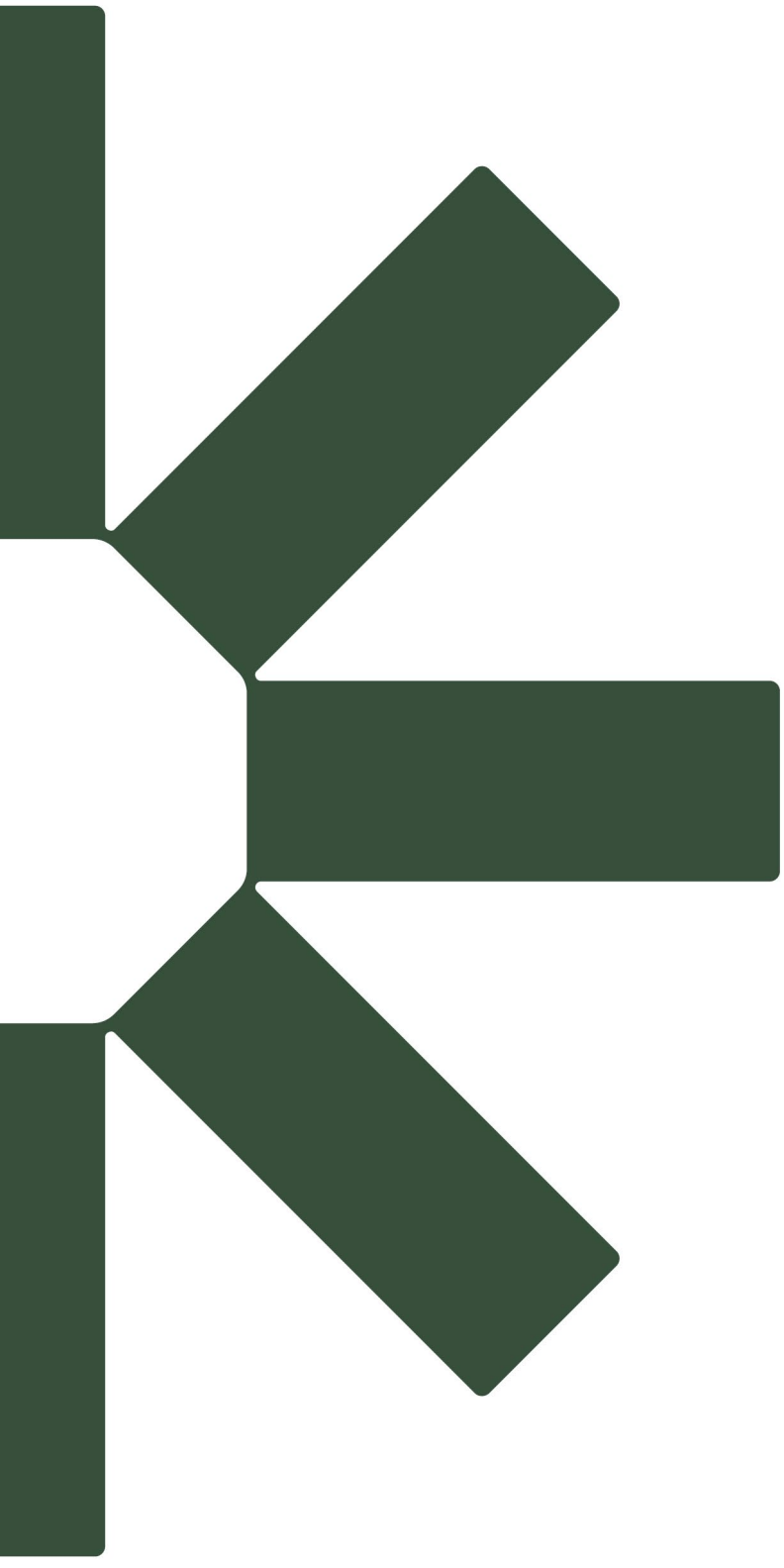
Table E-1: MECP Water Well Record Summary

WELL ID	TAG	DATE COMPLETED	DEPTH (M)	BOTTOM LITHOLOGY	STATUS	WATER USE	DEPTH WATER FOUND (M)	STATIC LEVEL (M)	PUMPING RATE (LPS)
2500875		4/1/1953	112.5	ROCK	Water Supply	Public	112.5	5.5	1.137
2500899		1/14/1967	18.3	GRAVEL	Water Supply	Domestic	18.3	1.8	1.137
2502018		8/20/1952	34.1	SHALE	Water Supply	Livestock	34.1	3.4	1.895
2503762		5/12/1972	37.8	ROCK	Water Supply	Domestic	35.1	6.1	0.606
2504542		3/6/1974	28	ROCK	Water Supply	Livestock	27.4	2.4	1.516
2505043		3/18/1975	86.9	ROCK	Water Supply	Municipal	34.7	7.9	13.568
2506106		6/28/1977	71.3	LIMESTONE	Water Supply	Domestic	54.9	12.5	0.455
2506130		7/7/1977	32	LIMESTONE	Water Supply	Domestic	31.1	6.4	2.274
2506305		11/14/1977	30.2	LIMESTONE	Water Supply	Domestic	29.6	3.4	1.895
2506846		3/24/1979	51.8	LIMESTONE	Water Supply	Domestic	51.8	9.1	0.455
2508036		11/21/1983	42.7	LIMESTONE	Water Supply	Domestic	42.7	8.2	0.379
2508359		8/6/1984	70.1	LIMESTONE	Water Supply	Domestic	68.6	10.7	0.758
2509298		8/29/1987	74.4	LIMESTONE	Water Supply	Domestic	74.4	11.9	0.379
2509474		7/12/1988	52.7	LIMESTONE	Water Supply	Domestic	52.7	11.3	0.379
2509476		6/2/1988	30.8	LIMESTONE	Water Supply	Domestic	30.8	8.5	0.91
2512662		9/22/1994	36.9	LIMESTONE	Water Supply	Public	29.3	7.3	0.758
2513366		9/12/1997	55.5	LIMESTONE	Water Supply	Domestic	35.1	15.2	0.303
2513888		5/31/1999	25.9	LIMESTONE	Water Supply	Domestic	25.3	4.6	0.606
2514390		8/22/2000	37.2	LIMESTONE	Water Supply	Domestic	24.1	6.7	0.531
2515539		6/9/2003	35.7	LIMESTONE	Water Supply	Domestic	27.4	6.1	4.548
2516266	A011038	10/23/2004	5.5	TILL	Observation Wells				
2516764	A030200	10/13/2005	48.8	LIMESTONE	Water Supply	Domestic	48.8	15.2	0.758
7119170	A073231	10/28/2008	35.4	LIMESTONE	Water Supply	Public	29.0	5.2	4.548
7140441		2/7/2010	0		Abandoned-Other	Other		0.8	
7140446		2/7/2010	0		Abandoned-Other	Other		0.7	
7140450		2/7/2010	0		Abandoned-Other			0.6	
7140452		2/1/2010	0		Abandoned-Other	Other		1	
7224832	A134613	6/26/2014	6.1	SAND	Observation Wells	Monitoring	3.0		
7285238	A210321	11/17/2016	7.6	CLAY	Observation Wells	Monitoring	4.0		
7332812	A161132	7/20/2018	6.1	SILT	Monitoring and Test Hole	Monitoring			
7332813	A237960	7/20/2018	4.6	SILT		Monitoring			
7332814	A241019	7/20/2018	6.1	SILT	Monitoring and Test Hole	Monitoring			
7333654	A250373	5/16/2019	0		Water Supply	Domestic		2.3	1.137
7426721	A347533	4/18/2022	4.6	SILT	Test Hole	Monitoring			
7426723	A347544	4/18/2022	6.1	SILT	Test Hole	Monitoring	5.3		
7426726	A347545	4/18/2022	6.1	SILT	Test Hole	Monitoring	5.3		
7426727	A347562	4/18/2022	6.1	SILT	Test Hole	Monitoring	1.5		
7426728	A347565	4/18/2022	10.7	SILT	Test Hole	Monitoring	5.3		
7426729	A347532	4/15/2022	6.1	SILT	Observation Wells	Monitoring	1.5		
7426730	A347543	4/18/2022	6.1	SILT	Test Hole	Monitoring	5.3		
7426731	A347559	4/18/2022	6.1	SILT	Test Hole	Monitoring	5.3		
7426732	A347564	4/18/2022	6.1	SILT	Observation Wells	Monitoring	1.5		
7426733	A347558	4/18/2022	6.1	SILT	Test Hole	Monitoring			

Table E-2: MECP Water Well Record Formations

WELL ID	LAYER	FORMATION	FORMATION END DEPTH (M)
2500875	1	CLAY	24.38
	2	GRAVEL	31.09
	3	ROCK	112.47
2500899	1	TOPSOIL	0.30
	2	HARDPAN	15.24
	3	GRAVEL	18.29
2502018	1	TOPSOIL	0.91
	2	HARDPAN	24.38
	3	MEDIUM SAND	26.82
	4	LIMESTONE	33.53
	5	SHALE	34.14
2503762	1	TOPSOIL	0.61
	2	HARDPAN	7.62
	3	HARDPAN	25.91
	4	SAND	30.48
	5	ROCK	37.80
2504542	1	TOPSOIL	0.91
	2	HARDPAN	10.67
	3	CLAY	24.38
	4	GRAVEL	27.43
	5	ROCK	28.04
2505043	1	TOPSOIL	0.61
	2	HARDPAN	8.53
	3	HARDPAN	23.47
	4	CLAY	28.04
	5	ROCK	34.75
	6	ROCK	44.20
	7	ROCK	57.91
	8	ROCK	86.87
2506106	1	TOPSOIL	0.30
	2	CLAY	7.01
	3	HARDPAN	37.19
	4	LIMESTONE	39.32
	5	LIMESTONE	46.94
	6	LIMESTONE	51.21
	7	LIMESTONE	53.95
	8	LIMESTONE	65.53
	9	SANDSTONE	67.97
	10	LIMESTONE	71.32
2506130	1	GRAVEL	8.23
	2	HARDPAN	29.57
	3	LIMESTONE	32.00
2506305	1	TOPSOIL	0.61
	2	CLAY	9.14
	3	HARDPAN	27.43
	4	LIMESTONE	30.18
2506846	1	TOPSOIL	0.61
	2	CLAY	3.35
	3	HARDPAN	35.97
	4	LIMESTONE	51.82
2508036	1	CLAY	7.32
	2	HARDPAN	15.54
	3	GRAVEL	31.39
	4	LIMESTONE	42.67
2508359	1	TOPSOIL	0.30
	2	CLAY	9.14
	3	HARDPAN	33.53
	4	LIMESTONE	57.30
	5	LIMESTONE	70.10
2509298	1	TOPSOIL	0.30
	2	CLAY	4.27
	3	CLAY	22.25
	4	HARDPAN	34.75
	5	LIMESTONE	74.37
2509474	1	TOPSOIL	0.30
	2	CLAY	8.53
	3	HARDPAN	23.77
	4	LIMESTONE	52.73

WELL ID	LAYER	FORMATION	FORMATION END DEPTH (M)
2509476	1	CLAY	8.53
	2	HARDPAN	28.04
	3	LIMESTONE	30.78
2512662	1	CLAY	2.74
	2	BOULDERS	3.96
	3	HARDPAN	24.69
	4	LIMESTONE	36.88
2513366	1	CLAY	7.62
	2	HARDPAN	28.96
	3	LIMESTONE	55.47
2513888	1	CLAY	6.71
	2	CLAY	23.16
	3	LIMESTONE	25.91
2514390	1	CLAY	19.81
	2	LIMESTONE	37.19
2515539	1	CLAY	3.35
	2	SILT	13.72
	3	CLAY	23.47
	4	LIMESTONE	35.66
2516266	1		4.57
	2	TILL	5.49
2516764	1	FILL	0.61
	2	CLAY	35.97
	3	LIMESTONE	48.77
7119170	1	FILL	0.61
	2	CLAY	11.28
	3	SILT	25.30
	4	LIMESTONE	35.36
7140441			
7140446			
7140450			
7140452			
7224832	1	TOPSOIL	3.05
	2	SAND	6.10
7285238	1	SAND	4.57
	2	SAND	6.10
	3	CLAY	7.62
7332812	1		
	2	GRAVEL	1.83
	3	SILT	6.10
7332813	1		
	2	GRAVEL	1.83
	3	SILT	4.57
7332814	1		
	2	GRAVEL	1.83
	3	SILT	6.10
7333654			
7426721	1	TOPSOIL	1.52
	2	SILT	4.57
7426723	1	FILL	0.76
	2	SILT	6.10
7426726	1	FILL	0.76
	2	SILT	6.10
7426727	1	TOPSOIL	1.52
	2	SILT	6.10
7426728	1	TOPSOIL	1.52
	2	SILT	10.67
7426729	1	TOPSOIL	1.52
	2	SILT	6.10
7426730	1	FILL	1.52
	2	SILT	6.10
7426731	1	FILL	0.91
	2	SILT	6.10
7426732	1	TOPSOIL	1.52
	2	SILT	6.10
7426733	1	FILL	1.52
	2	SILT	6.10



Making Sustainability Happen