FINAL REPORT

Hydrogeological Assessment, Level 1 / 2 Water Resources Study

Proposed Port Colborne Quarries Pit #3 Extension

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1.0 INTRODUCTION

Golder Associates Ltd. (Golder) was retained by the Port Colborne Quarries (PCQ) to complete a hydrogeological study for a proposed expansion of the Port Colborne Quarry in Port Colborne, Ontario. PCQ, a division of Rankin Construction Inc. (Rankin) is proposing an extension to Pit 3 of their existing Port Colborne Quarry in order to continue mining of the aggregate resources.

In order to satisfy the requirements of the Ontario Aggregate Resources Act (ARA) with regard to a Category 2, Class “A” Quarry Below Water license application certain plans and studies are required to identify the effects of the proposed quarry and studies are required to identify land use impacts of the proposed quarry and to mitigate such effects so that established Ministry of the Environment, Conservation and Parks (MECP) thresholds are met. This includes the requirement for a Level 1/ 2 Water Resources Assessment. This report provides the hydrogeological component of the water resources assessment along with the hydrological assessment which is provided under separate cover.

The existing Port Colborne Quarry is located in the City of Port Colborne within the Regional Municipality of Niagara. The existing quarry is bounded by Second Concession Road to the north, Highway 140 to the west, Main Street East (Highway 3) to the south, and 200 metres (m) west of Carl Road to the east.

The proposed extension (Site) is situated directly east of the existing quarry and remains between Second Concession Road to the north and Highway 3 to the south and extends approximately 410 - 790 m east of Carl Road (see Figure 1). The Port Colborne Quarry Extension is located in Part of Lots 18 and 19 Concession 2, and Plan 59R-16702, Humberstone Township, Regional Municipality of Niagara and comprises 108.25 hectares (267.49 acres). The property is bordered by Second Concession Road to the north, Main Street East to the south, the existing Port Colborne quarry to the west and agricultural fields and Miller Road to the west. There is an estimated 40 to 50 million tonnes of limestone resources within the proposed extension. at the Site.

1.1 Required Land Use Approvals

In order for extraction to occur on the subject lands, the following approvals are required:

- Amendment to the Region of Niagara Official Plan 2014, to designate the lands as Licensed Pits and Quarries;
- Amendment to the City of Port Colborne Official Plan 2017, to re-designate the lands from Agricultural to Mineral Aggregate Operation;
- Amendment to the City of Port Colborne Zoning By-Law 6575/30/18, to rezone the lands from Agricultural (A) to Mineral Aggregate Operation (MAO); and,
- Application to the Ministry of Natural Resources and Forestry, under the Aggregate Resources Act for a Class A Category 2 Licence (Quarry Below Water).

1.1.1 Region of Niagara Official Plan (ROP) 2014

Policy 6.C.13 of the Region of Niagara ROP states: “Where a new pit or quarry or an extension to an existing licensed pit or quarry are to be located outside a Possible Aggregate Area, an amendment to this Plan is required.” As the subject lands are not within a Possible Aggregate Area, a Regional Official Plan Amendment through the Region of Niagara is required to identify the subject lands on Schedule D4 - Mineral Resources.

1.1.2 City of Port Colborne Official Plan (OP) 2017

Policy 10.2 of the City of Port Colborne OP states: “The establishment of a new or an expansion to an existing mineral aggregate operation shall require an amendment to this Plan…” Therefore, an Official Plan Amendment through the City of Port Colborne is required.

1.1.3 City of Port Colborne Zoning By-Law No. 6575/30/18:

The lands are currently zoned (A) Agricultural within the City’s Comprehensive Zoning By-Law. Extraction and related uses are not a permitted use. Therefore, the lands must be rezoned to (MAO) Mineral Aggregate Operations in order to permit extraction and all the permitted accessory uses. This requires an amendment to the City’s Zoning By-Law No. 6575/30/18.

1.1.4 Aggregate Resources Act

In addition to the above Planning Approvals, PCQ also requires approval for a Class A Category 2 (Quarry Below Water) License under the Aggregate Resources Act as processed through the Ministry of Natural Resources and Forestry.

The proposed quarry will be excavated to the same stratigraphic horizon, corresponding to the top of bluish-grey shale on the base of the adjacent pit. This corresponds to a range of elevations from approximately 165 to 168 metres above sea level (masl). The proposed quarry consists of approximately 43,730,850 tonnes of limestone resource within the extraction limits. Golder completed the installation of 20 monitoring wells on the original proposed expansion property (Site) in order to determine the bedrock geology and the hydrogeological conditions prior to purchase of the property. PCQ purchased additional property in 2017 and 2018 which has been included in this license application.

1.2 Permit to Take Water (PTTW) Monitoring Program

A monitoring program is being completed for the existing Port Colborne Quarry Site. The existing quarry is being monitored as part of the conditions of Permit to Take Water (PTTW) No. 7675-8MBQBB, which allows for a total maximum daily withdrawal volume of 8,640,000 litres.

The existing PTTW report includes the following:

- Preparation of a water budget;
- Groundwater level monitoring;
- Measurement of sump water levels; and,
- A summary of well interference complaints.

The ECA monitoring includes the following:

- Collection of water discharge samples and analysis for hydrogen sulphite, total suspended solids (TSS), total oil and grease;
- Assessment of the effectiveness of TSS control measures; and,
- A summary of operational problems, maintenance, and corrective actions.

This PTTW includes monitoring of groundwater levels and evaluation of the potential water well interference as well as a summary of response to any well interference complaints. The PTTW documents that were reviewed as part of the hydrogeological work program for the proposed extension include:

- WSP, 2013, 2012 Annual Compliance Report, Port Colborne Quarries, March 2013;
- WSP, 2014, Port Colborne Quarries 2013 Annual Compliance Report, March 2014;
- WSP, 2015, Port Colborne Quarries 2014 Annual Compliance Report, March 2015;
- WSP, 2016, Port Colborne Quarries 2015 Annual Compliance Report, March 2016;
- WSP, 2017, Port Colborne Quarries 2016 Annual Compliance Report, March 2017;
- WSP, 2018, Port Colborne Quarries 2017 Annual Compliance Report, March 2018; and,
- WSP, 2019, Port Colborne Quarries 2018 Annual Compliance Report, March 2019.

This information in these monitoring reports was considered as part of the preparation of the work program.

2.0 REGIONAL SETTING

The existing Port Colborne Quarry is located in the City of Port Colborne within the Regional Municipality of Niagara. The existing quarry is bounded by Second Concession Road to the north, Highway 140 to the west, Main Street East (Highway 3) to the south, and 200 m west of Carl Road to the east. The Site is situated directly east of the existing quarry and remains between Second Concession Road to the north and Highway 3 to the south and extends approximately 400 m east of Carl Road (see Figure 1) along Second Concession. The southern edge of the Site extends 200 m east of Carl Road. The Port Colborne Quarry and Site are located in the vicinity of the buried Onondaga Escarpment.

2.1 Physiography

The areas surrounding the existing quarry and the Site are predominately flat to slightly undulating agricultural lands and woodlots with rural residential development along the various concession roads in the vicinity of the Site. Quarrying was focused within this specific area due to the presence of flat lying dolostone bedrock at or very near ground surface that is of high quality for the production of construction aggregates.

The general terrain associated with the existing quarry and the Site comprises a flat landscape of limited topographical relief characterised by gently undulating agricultural lands and woodlots. Local intervening areas with low, poorly drained conditions also occur within the drainage courses. Overall, the topographic relief in the quarry vicinity varies between approximately 180 to 185 masl gradually sloping southward towards Lake Erie.

2.2 Surficial Geology

The regional distribution of surficial deposits in the vicinity of the Site, based on Ontario Geological Survey (OGS) mapping, is shown on Figure 2. The regional surficial geology of the Port Colborne Quarry area is known as the Haldimand Clay Plain and is comprised of shallow overburden overlying the dolostone bedrock of the buried Onondaga Escarpment. The surficial deposits that are found around the Port Colborne Quarry area are comprised of predominantly massive, well-laminated clays. In some areas, coarse-textured glaciolacustrine deposits are also found. The thickness of the surficial deposits encountered across the Site during the drilling program ranged from approximately 0.5 m to 10.5 m.

2.3 Bedrock Geology

The regional distribution of bedrock formations is shown on Figure 3, which shows that the site area is underlain by the Onandaga Formation. Aggregate Resource and Inventory Paper 117 for the area shows on the regional bedrock map (Map 3) that the Bois Blanc Formation is the uppermost bedrock unit in the area of the existing quarry and there is a transition to the Onondaga Formation on the southeastern portion of proposed extension. Based on the work programs conducted at the site, the Port Colborne Quarry Site area is underlain by a well-defined stratigraphic sequence of limestone, dolostone, and shale bedrock including the Bois Blanc Formation and the Bertie Formation which are being excavated by the existing quarry, and the Salina Formation which underlies the quarry. The uppermost bedrock in the site area consists of the Bois Blanc Formation.

The Salina Formation consists of Upper Silurian aged rocks which are composed of alternating carbonates, evaporates, and shales. The uppermost layers of the Salina Formation can also contain anhydrite or gypsum nodules which can dissolve leaving voids and collapse structures.

The Bertie Formation overlies the Salina Formation conformably and consists of alternating carbonate and carbonate-shale units. The Bertie Formation is generally subdivided into five members known as (in ascending order):

- The Oatka Member– dolomitic shales;
- The Falkirk Member– dark brown dolostones;
- The Scajaquada Member– dark grey to black shales and argillaceous dolostones;
- Williamsville Member– grey micritic dolostones and dolomitic shales; and,
- The Akron Member– grey, wavy bedded, mottled dolostones.

Immediately above the Bertie Formation lies the Bois Blanc Formation where the contact between the two units represents the Silurian-Devonian disconformity. This disconformity represents the period of time where the Silurian-age bedrock units of the Niagara Peninsula were subjected to an extended period of subaerial weathering. The Bois Blanc consists of cherty fossiliferous bioclastic or argillaceous limestones.

The Onondaga Formation overlies the Bois Blanc formation in the area surrounding the Port Colborne Quarry and consists of variably cherty, fossiliferous limestone with some minor shale partings.

2.4 Aquifer Vulnerability Index

The aquifer vulnerability index (AVI) for the regional surficial geology in the vicinity of the Port Colborne Quarry is considered “high” for the Niagara Peninsula source zone protection area due to the potential for coarse-textured glaciolacustrine deposits or for relatively thin overburden areas to be present within the Haldimand Clay Plain[1]. The AVI rating assesses the potential for vertical infiltration of contaminants through the shallow overburden into the underlying the bedrock formations. The overburden deposits in the area of the proposed Pit #3 extension are thin within the southern area of the Site corresponding to a moderate to high AVI, since there are not thick low permeability overburden deposits that would retard the downward migration of contaminants from surface. The overburden deposits thicken northwards and in the area of the wetlands/woodlands there are relatively thick (approximately 6 m) clayey deposits. It is interpreted that this area has a moderate to low AVI.

It should be noted that the AVI is relevant to sources of surface contamination. The AVI is not directly applicable to the proposed extension since potential sources of surface contamination will not be placed on the ground surface and as such the protection of the aquifer is not reliant on the character of overburden deposits reflected in the AVI. The AVI is not directly applicable in a below water table quarry setting since this involves excavation through the surface cover. Therefore, there is no reliance on the presence of the overburden at surface soil to protect the aquifer.

In addition, the Site is mapped within a potentially significant groundwater recharge area. However, the Site is overlain by clay, from a depth of approximately 10 mbgs on the north end of the Site to approximately 1 mbgs on the south end of the Site. Therefore, the overlying clay material will limit groundwater recharge to the underlying bedrock groundwater formations.

There is inward groundwater flow which prevents the outward flow of groundwater under existing conditions, and this is planned to be continued in the long term to maintain the quarry in a dry state by pumping. Further, the quarry is underlain by shale deposits that prevent the seepage downward seepage of contaminants through the base of the quarry. The AVI rating in the vicinity of the proposed extension at the Port Colborne Quarry is not considered to be a significant concern for potential infiltration of contaminants to affect water supply wells in nearby bedrock formations since the groundwater will continue to flow inward during active quarry dewatering.

2.5 Potential for Karst

There is potential for chemical weathering to create small-scale karstic features within dolostone units along the sidewalls of the Port Colborne Quarry. Potential karst features may include solution-widened bedding planes or conjugate fracture systems that are related to the dissolution effects of water flowing through the fractured dolostone of stratigraphic units of the Bertie formation.

During the summer months the quarry is maintained in a dry state with minimal to low pumping and if significant transmissive karst features were present they would be apparent on the quarry walls. No significant larger scale karstic features have been observed on the sidewalls of the Port Colborne Quarry and the observed relatively low rates of groundwater flow into the Port Colborne Quarry are not consistent with significant karstic features on the quarry sidewalls.

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[1] Groundwater Vulnerability Analysis Niagara Peninsula Source Protection Area”, Niagara Peninsula Conservation Authority (NPCA), 2011. Prepared for Niagara Peninsula Source Protection Authority, November 30, 2009, numerical amendments made in June 2011.

As noted previously, by maintaining the dewatering sump at a groundwater elevation for the foreseeable future, the local groundwater flow directions adjacent to the quarry are expected to be radially inward over the long term. This zone of depression in the water table would be expected to capture any groundwater that is flowing through potential karstic features along the quarry sidewalls. As a result of the radially inward groundwater flow, the potential for water quality impacts to occur in nearby supply wells as a result of karstic features on the sidewalls of the Port Colborne Quarry is considered to be very low.

3.0 FIELD INVESTIGATION METHODOLOGY

The hydrogeological characterization of the Site involved groundwater investigations initiated in early 2017 followed by groundwater monitoring through July 2017. The hydrogeological work program included:

- Borehole drilling and monitoring well installations;
- Hydraulic conductivity testing;
- Groundwater level monitoring;
- Groundwater quality sampling;
- Estimation of groundwater inflow;
- Water well impact assessment;
- Private water well survey;
- Development of a groundwater monitoring program and a well response complaint program for private wells; and,
- Report preparation.

Groundwater monitoring was completed monthly throughout 2018 and 2019 and is being continued on a quarterly frequency during 2020. The investigations have built upon the information available from previous site investigations and ongoing monitoring of the existing PCQ operations and adjoining lands. As part of the Site investigation, boreholes were drilled at ten on-site locations. The following sections provide an overview of the investigation while more detailed discussion of each aspect of the investigation along with the results including borehole logs and monitoring data are provided in the appendices attached to this report.

3.1 Borehole Drilling and Well Installation

The hydrogeological investigation involved the drilling and installation of monitoring wells at ten locations at the Site. A shallow and deep well were installed at each location for a total of 20 monitoring wells. These monitoring wells which were completed in February through March 2017 and are labelled as MW17-1S and MW17-1D through to MW17-10S and MW17-10D, where “S” represents the shallow well and “D” represents the deep monitoring well at each location. The location of the completed wells at the Site is shown on Figure 4. A shallow and deep 100 mm diameter borehole was cored using HQ coring equipment with water flush and completed to depths varying from 6.0 to 21.4 metres below ground surface (mbgs) in order to target pre-determined stratigraphic horizons. The bedrock core was logged to determine the rock conditions and stratigraphy of the formations encountered. Upon completion of drilling, hydraulic conductivity packer testing was carried out in the deep boreholes at each location.

Following the completion of the hydraulic conductivity testing, monitoring wells were installed in the shallow and deep boreholes using 32 mm diameter flush threaded PVC pipe and slotted well screen. At monitoring well locations MW17-1S, MW17-2S, MW17-3S, and MW17-10S where the targeted stratigraphic horizons were not encountered, shallow overburden monitoring wells were installed at depths varying from 5.18 to 6.05 mbgs. Shallow overburden wells were installed via hollow stem augers using 51 mm flush threaded PVC pipe and slotted well screen. The bedrock monitoring wells were completed using 32 mm flush threaded PVC pipe and slotted well screen. Both shallow and deep bedrock and overburden monitoring wells were set in silica sand to the target depths and sealed with bentonite to surface.

Following installation of all of the monitoring wells, Golder returned to the site to complete GPS and elevation surveying of each of the locations. Details of the monitoring well locations and elevations are provided in Table 1 and can be found on the borehole records in Appendix A.

3.2 Hydraulic Conductivity Testing

A total of 30 packer tests were completed in order to assess the horizontal hydraulic conductivity of the bedrock at the Site. The packer tests were conducted in the open boreholes (MW17-1D through MW17-10D) prior to the installation of the monitoring wells. Prior to the start of packer testing, the open boreholes were developed by flushing with water and over-pumping until clear water was produced. Drill rod seal tests were also performed prior to the initiation of all the packer tests to determine the competency of the drill rods.

The majority of the packer tests (20 of the 30 tests) were conducted over 3.2 m vertical intervals. Testing was conducted using a double packer assembly between the bottom of the hole and the water table or the casing, whichever was lower. The overlap between test intervals was generally 0.3 m, in some cases larger overlaps were used in order to test all available bedrock. The remainder of the packer tests were completed on the bottom of each hole using a single packer assembly with vertical intervals ranging from 2.9 to 3.8 m.

All packer tests were performed using the falling head test method, where the column of water representing the static water level within the packer interval is raised by adding water from an external source. Subsequently, the water column falls while the water level and elapsed time are recorded. The packers were inflated with nitrogen gas to pressures around 200 pounds per square inch (psi) to ensure an adequate seal between the packer glands and the wall of the borehole. Following the inflation of the packers, the water column in the test interval was monitored within the drill rods until static or near static conditions were observed over periods of 5 to 30 minutes. The drill rods were then filled with water and the falling head test was initiated. The water level and elapsed time was then measured using Solinst level loggers until the water level reached static or at least 60% of the initial static level. In some cases, 60% of initial static was not achievable due to very slow hydraulic conductivity. Manual recordings of time and water column depth were also recorded during each test where applicable.

The packer test data for all falling head tests were analyzed by the Bouwer and Rice method using the Aqtesolv software program. The use of the Bouwer and Rice analytical solution for the determination of hydraulic conductivity of fracture rocks is deemed appropriate in this situation based on the scale of the proposed quarry, which makes it impractical to consider the individual flow paths within the bedrock. Rather, the net effect of the fractures, in terms of their ability to conduct water under the influence of a hydraulic gradient, must be considered as a bulk hydraulic conductivity. In this study, the geometric mean is applied to measure hydraulic conductivities for this purpose. During this process, minor analytical errors in the analysis of the data are not significant.

Results of the packer test data are summarized in Table 2.

3.3 Groundwater Level Monitoring

Following the installation of each monitoring well, Golder completed monitoring well development as per Golder's Standard Operating Procedure No. 5: Monitoring Well Development. Each monitoring well was developed to remove fine particles from the filter pack and to remove any fluids introduced to the monitoring well during drilling and to ensure fresh formation water has entered the well prior to groundwater sample collection.

Starting April 10, 2017, Golder initiated a weekly groundwater monitoring program which involved the groundwater level collection in each of the newly installed monitoring wells for a period of 12 weeks which was completed on July 31, 2017. Water levels in each well were measured using an electronic water level meter. The water level meter was appropriately cleaned using a liquid Alcanox^{TM} and distilled water rinse to prevent cross contamination between monitored locations. The results of the groundwater monitoring program are presented in Table 3.

From January 2018 through December 2019, Golder collected monthly groundwater levels at all of the accessible groundwater monitoring wells that were installed as part of the 2017 drilling program. The results of this groundwater monitoring program are also included in Table 3. Golder continues to collect groundwater levels quarterly at these wells throughout 2020.

The 2017 through 2020 groundwater elevations have been included in the hydrographs provided in Appendix D.

3.4 Groundwater Quality Sampling

Prior to sampling, water levels in each well were measured using an electronic water level meter. The water level meter was appropriately cleaned using a liquid AlcanoxTM and distilled water rinse to prevent cross contamination between monitored locations. Prior to sampling, the monitoring wells were purged of either a volume of water equivalent to three standing well volumes or until dry using the dedicated inertial lift pumps installed in each well.

Groundwater sampling involved purging prior to sample collection to ensure that the samples are representative of true aquifer conditions. Field parameters (pH, electrical conductivity, and temperature) were measured after the removal of each well volume and prior to sample collection. The samples collected for metals analyses were field filtered using a disposable in-line 0.45 micron filter attached directly to the inertial lift pump assemblage. Samples were stored on ice and shipped to the laboratory within 24 hours of collection under chain of custody. Samples were compared to Ontario Drinking Water Standards (ODWS) (MECP 2006) and any applicable site specific limits or criteria.

3.5 Quarry Sump Quality Sampling

Quarry sump sampling involved the collection of one quality sample from the main quarry sump located within Pit 2 of the existing Port Colborne Quarry. Prior to sampling, field parameters (pH, electrical conductivity, temperature, and dissolved oxygen) were measured from directly within the quarry sump. The samples were then collected directly from the quarry sump into laboratory provided bottles. Samples were compared to the Provincial Water Quality Objectives (PWQO).

4.0 RESULTS OF INVESTIGATION

The results of the investigation conducted by Golder at the Site are presented below.

4.1 Borehole Investigation Results

The stratigraphic sequence of bedrock encountered during the drilling program included the Bois Blanc Formation, the Bertie Formation, and the Salina Formation. The details of each stratigraphic unit are described below.

The Salina Formation was only encountered at borehole location MW17-1D where drilling progressed deeper in order to confirm the location of the targeted stratigraphic horizons. The bottom of the Salina Formation was not encountered so the formation thickness is not reported.

The Bertie Formation was encountered at all deep borehole locations and in six of the shallow borehole locations. Unit 1 of the Bertie Formation was the target horizon for the deep borehole locations. The thickness of the Oatka Shale was 5.2 m and was only encountered in its entirety at borehole location MW17-1D. The thickness of the Bertie Formation in the southern portion of the site that will be extracted ranged from 13.9 m to 14.9 m (not including the Oatka shale). The thickness of the Bertie Formation in the northern portion of the site ranged from 5.1 to 6.2 m where it was truncated and overlain by overburden.

The Bois Blanc Formation was only encountered at borehole locations MW17-4, MW17-5, MW17-7, MW17-8, and MW17-9. The Bois Blanc was overlain by overburden at all of these locations and the thickness of the overburden ranged from 0.4 m to 5.1 m.

4.1.1 Stratigraphy

The stratigraphic units are described below:

Bois Blanc Formation

The Bois Blanc Formation consists of medium to light grey, medium bedded, medium grained cherty limestone with light to medium grey calcareous sandstone and siltstone beds and green glauconitic layers, and green glauconitic coatings on fracture surfaces, with a sharp lower contact.

Akron Member

The Akron Member consists of mottled light to medium grey, thin to medium bedded and medium grained dolostone with occasional thin argillaceous partings with green glauconitic coatings on fracture surfaces and brecciated intervals, with a sharp contact and a gradational transitional lower contact. This Member has been referred to as Unit 5 throughout this report.

Williamsville Member

This member consists of a grey, medium grained, thin to medium bedded laminar textured dolostone with numerous thin to argillaceous to shaly laminate and thin shale beds. The upper contact with the Akron Member is transitional and distinguished by the transitional from its matted to laminate textured appearance. This Member has been referred to as Unit 4 throughout this report.

Scajaquada Member

The Scajaquada Member consists of medium to dark bluish grey argillaceous to shaly dolostone with thin shale interbeds. The upper contact with the Williamsville Member is transitional identified at the transitional first appearance of dark grey shaly bedding. This Member has been referred to as Unit 3 throughout this report.

Falkirk Member

The Falkirk member is comprised of brown medium to thickly bedded to missive, medium crystalline dolostone with occasional argillaceous laminate. The upper contact is sharp and identified at the base of the argillaceous to shaly bedding, and appearance of brown to crystalline rock. This Member has been referred to as Unit 2 throughout this report.

Oatka Member

The Oatka Member is a fine grained, thinly bedded, bluish-grey argillaceous dolostone and shale. The upper contact is sharp and demarcated by the transition from crystalline brown rock to fine grain bluish grey rock. This Member has been referred to as Unit 1 throughout this report.

Salina Formation

The Salina Formation consists of dark grey to black argillaceous dolostone, and black shale with thin gypsum beds and nodules. The upper contact drawn at the transition from bluish grey rock to dark grey to black shale.

4.1.2 Hydrostratigraphy

The upper aquifer units are interpreted to consist of the limestone of the Bois Blanc Formation and the dolostones of Akron Member and Williamsville Member of the Bertie Formation. These aquifer units are underlain by the shaly dolostone of the Scajaquada Member of the Bertie Formation which is interpreted to act as weak aquitard. This unit is underlain by the lower aquifer which is comprised of the Falkirk Member of the Bertie Formation. This sequence is underlain by the shaly Oatka member which acts as an aquitard and is forms the floor of the existing quarry.

4.2 Bedrock Surface Contours

Overburden thickness contours were derived using the ground surface elevation (shown on Figure 5) and digitally subtracting a contour plan of the bedrock surface elevation. The overburden thickness contours are shown on Figure 6. The overburden is thin in the southern portion of the site and thickens northward where is reaches its maximum thickness beneath the wetland/woodland area. At Borehole 17-1D a thickness of 10.2 m of silty clay overlain by topsoil was encountered. At Borehole 17-2D topsoil underlain by silty clay with a thickness of 8.7 m was encountered while at 17-3D a thickness of 5.4 m was encountered. The silty clay overburden deposits beneath the wetland form a low permeability clayey base to the wetland.

Bedrock surface contour maps were created based on the data from the borehole locations and are presented on Figures 7, 8, and 9. The inferred bedrock surface at the Site is presented on Figure 7. The bedrock surface depth varied across the Site from 0.51 mbgs at location MW17-5D to 10.21 mbgs at location MW17-1D. On the south side of the Site the bedrock surface gradually slopes to the east away from the existing quarry. On the north side of the Site the bedrock surface slopes towards the north with a decrease in elevation of 9 m between locations MW17-4D and MW17-1D. This subsurface topographic feature may be the result of a localized depression, a buried channel or possibly the presence of the buried Onondaga Escarpment.

Figure 8 shows the inferred surface of the base of the Williamsville Member (Unit ~~5~~4) of the Bertie Formation. The base of Unit ~~5~~4 was encountered at every deep borehole location except for MW17-1D and at shallow borehole location MW17-6S. The base of Unit 4 slopes gently towards the southwest with a decrease in elevation of approximately 6.5 m between locations MW17-3D and MW17-8D.

Figure 9 shows the inferred surface of the base of the Falkirk Member (Unit 2) of the Bertie Formation. The base of Unit 2 was encountered at every deep borehole location. The base of the Falkirk Member also slopes gently towards the southwest with a decrease in elevation of approximately 8 m between locations MW17-3D and MW17-8D.

4.3 Hydraulic Conductivity Results

A total of 30 packer tests were completed within the deep borehole locations MW17-1D through MW17-10D located at the Site. The results of all the tests are presented in Table 2 and the summary of each test including a plot is compiled in Appendix B. The results of the tests are also presented on the borehole logs in Appendix A.

The individual packer test results are plotted on Figure 10 which indicates the overall range of hydraulic conductivity with depth. The test intervals are shown with respect to the formation stratigraphy and relative to the base of Unit 2 of the Bertie Formation which will act as the base of the proposed quarry. Figure 10 indicates that the hydraulic conductivity of the rock sequence varies over a wide range between 8.7 x 10^{-10} metres per second (m/s) and 1.2 x 10^{-5} m/s. The test results characterize the hydraulic conductivity of the individual formations including the wide variation both spatially and with depth.

Examination of the exposed quarry faces, core logging, and packer testing results indicate that the hydraulic conductivity of the bedrock is primarily related to open, near-horizontal bedding partings within the rock. Therefore, the hydraulic conductivity values determined during packer testing are considered to primarily reflect horizontal permeability along the open bedding partings. The vertical permeability of the intact beds of rock separating the open bedding partings is anticipated to be much lower, with the possible exception of the Falkirk Member of the Bertie Formation based on the interconnectivity of the vugs.

Due to the observed static water levels within the open boreholes during packer testing, the majority of the packer test intervals (25 tests) were completed within the lowermost portion of the Bertie Formation, Unit 1 through to Unit 3. One packer test interval was completed within the Salina Formation at MW17-1D. While four packer test intervals were completed in Unit 4. No packer tests were completed within the Bois Blanc Formation. The results of the packer test interval within the Salina Formation returned the lowest hydraulic conductivity recorded at the Site of 8.7 x 10^{-10} m/s.

The results of the 25 packer test intervals that fall within Units 1 through 3 of the Bertie Formation returned a wide range of results from 1.2 x 10^{-5} m/s to 4.6 x 10^{-9} m/s. Due to the length of the packer interval, the majority of the tests would straddle two of the stratigraphic units. As Unit 1 was the targeted stratigraphic horizon, the exposure of this Unit was between 0.2 m to 1.5 m in all of the deep boreholes except for MW17-1D where its entirety was encountered. The only packer test completed completely within Unit 1 returned the result of 7.6 x 10^{-6} m/s.

Six packer tests were completed entirely within Unit 2 of the Bertie Formation. The results from these tests ranged from 8.8 x 10^{-6} m/s to 9.5 x 10^{-8} m/s.

One packer test was completed entirely within Unit 3 of the Bertie Formation at MW17-9D and one completed almost entirely within at MW17-8D. The results from these two tests were 2.8 x 10^{-8} m/s and 4.6 x 10^{-9} m/s, respectively.

One packer test was completed entirely within Unit 4 of the Bertie Formation at MW17-8D and three packer tests were completed partially within Unit 4. The result from the packer test that was entirely within Unit 4 was 5.1 x 10^{-5} m/s. The other three test results ranged from 2.6 x 10^{-7} m/s to 4.6 x 10^{-9} m/s.

4.4 Groundwater Level Monitoring Results

The results of the 12 week groundwater level monitoring program and the monthly and quarterly groundwater level monitoring program are presented in Table 3. Using the results of the groundwater level monitoring program in May 2017, May 2018, May 2019, and May 2020 and based on the stratigraphy encountered at the Site, groundwater potentiometric surfaces were produced for overburden (Figures 11A, 11B, 11C, 11D), shallow bedrock (12A, 12B, 12C, 12D) and deep bedrock (Figures 13A, 13B, 13C, and 13D).

4.4.1 Overburden Groundwater Elevations

The overburden groundwater potentiometric surfaces are presented on Figures 11A to 11D based on the groundwater levels collected during May 2017 to May 2020. Based on Figures 11A to 11D, overburden groundwater appears to flow to the east away from the active quarry, however, there is limited data available, therefore, overburden contours have not been included on this figure.

The 2017 to 2020 groundwater elevations have been included on hydrographs presented in Appendix D. The hydrographs indicate that the groundwater elevations in the overburden monitoring wells, MW17-1S, MW17-2S, and MW17-3S, increased since the development and sampling of the wells until August 2017 when they appeared to reach static. The groundwater elevations at MW17-1S and MW17-3S fluctuated seasonally in 2018 with higher elevations observed in late spring/early summer. The groundwater elevation at MW17-2S has remained relatively stable since August 2017 and the groundwater elevation at MW17-10S has remained near the base of the well screen since well development.

The wetland areas in the north of the site were not observed to be in a flooded condition during much of the year which is interpreted to reflect the underlying low permeability clayey deposits which reduce seepage through the base of the wetland

4.4.2 Shallow Bedrock Groundwater Elevations

The shallow bedrock groundwater monitoring wells are either completely installed within the Akron and Williamsville Members of the Bertie Formation or partially within these members and partially within the Bois Blanc Formation. The shallow bedrock groundwater potentiometric surfaces are presented on Figures 12A to 12 D based on the groundwater levels collected during May 2017 to May 2020.

Groundwater levels within the shallow bedrock remained relatively stable. Subtle fluctuations in the groundwater elevations were observed across each of the monitoring well locations indicating that the shallow bedrock groundwater surface is well connected across the Site, with the exception of MW17-4S which exhibited very limited fluctuations. Higher groundwater elevations were typically observed during the spring and late fall in the shallow bedrock monitoring wells.

Based on Figures 12A to 12D, the shallow bedrock groundwater flows from south to north toward MW17-7S. From this location it flows northwest towards MW17-5S and the existing quarry. There is also southward groundwater flow from MW17-4S. This may be due to the overburden groundwater influence from the north which may act as a recharge area for the shallow bedrock groundwater as it is truncated and overlain by overburden between MW17-4 to MW17-2. Monitoring well MW17-6S has not been included in the contouring as the groundwater elevation at this location appears to be anomalously low.

4.4.3 Deep Bedrock Groundwater Elevations

The deep bedrock groundwater monitoring wells are either completely installed within the Falkirk Member of the Bertie Formations or mostly within the Falkirk Member and partially within the Oatka Member of the Bertie

Formation. The deep bedrock groundwater potentiometric surfaces are presented on Figures 13A to 13D based on the groundwater levels collected during May 2017 to May 2020.

Groundwater elevations within the deep bedrock remained relatively stable. Subtle fluctuations in the groundwater elevations were observed across each of the monitoring well locations indicating that the deep bedrock groundwater surface is well connected across the Site. The overall groundwater elevations appear to be decreasing over time with muted seasonal fluctuations observed. A noticeable decrease in groundwater elevations is observed at MW17-5D, MW17-7D, MW17-8D, and MW17-9D which are all located on the southern portion of the Site.

Based on Figures 13A to 13D, the deep bedrock groundwater flows from the south, west, and northern property boundaries towards the eastern property boundary and MW17-5D. The potentiometric surface represents a slight draw down cone with MW17-5D as the lowest point. This may indicate that MW17-5D is more strongly connected to the exposed quarry to the northwest.

4.4.4 Water Table

The approximate water table corresponds to the shallow monitoring wells installed in the bedrock and overburden. The overburden water table is shown on Figures 11A and 11B and ranges from 176.19 to 179.51 masl in May 2017. The shallow bedrock water table is shown on Figures 12A and 12B and ranges from 176.0 to 177.88 masl in May 2017. Therefore, a generalized value for the water table is approximately 178 masl. No overburden wells were installed on the southern portion of the Site as the bedrock is near surface.

4.4.5 Hydrogeological Cross-Sections

Two hydrogeological cross-sections were developed across the site area at the locations shown on Figures 11 to 13. Cross-Section A-A’ on Figure 14 is oriented west-east and extends through the wetland/woodland in the northern portion of the site (and is oriented along the direction of groundwater flow toward the quarry). Cross section B-B’ on Figure 15 is oriented north-south and extends along the western edge of the proposed extension (and is oriented across the direction of inward groundwater flow to quarry).

Cross-section A-A’ shows the relatively thick clayey overburden deposits beneath the wetland. The section shows the groundwater levels in the monitoring wells installed and are below ground surface with downward hydraulic gradients from the overburden to the bedrock wells. The wetland/woodland is noted to have standing water during the fall and spring which is considered to reflect the low permeability of the clayey materials beneath the wetland. It is interpreted that other areas of the wetland will continue to have standing water during spring and summer during the quarry expansion since this is occurring under existing conditions in areas directly adjacent to the existing quarry.

Cross-section B-B’ indicates the increase in elevation of the bedrock units from north to south, while the bedrock surface is decreasing to the north. This result in the truncation of the upper bedrock units northward. The relatively thick overburden deposits are a result of the northward decline in bedrock surface. The relatively consistent groundwater elevations along the section reflect the orientation of the section along the general trend of groundwater flow contours.

4.5 Groundwater Quality Sampling Results

On April 10, 2017 Golder collected 12 groundwater samples from MW17-1S, MW17-1D, MW17-2S, MW17-3D, MW17-4S, MW17-6S, MW17-6D, MW17-8S, MW17-8D, MW17-9S, MW17-9D, and MW17-10D. A summary of the groundwater results has been provided in Table 4. The groundwater samples were analyzed for the Rapid

Chemical Analysis Package (RCAP) Comprehensive list of parameters which includes general parameters, nutrients and organic indicators, major and minor ions, and dissolved metals. The groundwater results were compared to the ODWS as shown on Table 4. The laboratory certificates of analysis are provided in Appendix D.

~~4.5.2~~4.5.1 Overburden Groundwater Quality Results

A review of the groundwater chemistry from the two samples collected from overburden monitoring wells MW17-1S and MW17-2S is provided below:

- Concentrations of general parameters were generally similar at each of the wells with the exception of TSS and TDS which were elevated at MW17-1S and hardness which was elevated at MW17-2S. The groundwater quality typically complied with the applicable ODWS with the exception of TDS at both sampled locations.
- Concentrations of nutrients and organic indicator parameters were generally similar at MW17-1S and MW17-2S. The concentrations of orthophosphate, nitrate, and nitrite were below detection limits at MW17-2S, while they were marginally above detection limits at MW17-1S. The groundwater quality typically complied with the applicable ODWS with the exception of DOC at MW17-2S.
- Concentrations of major and minor ions were variable at MW17-1S and MW17-2S. The concentrations of alkalinity, calcium, and magnesium were marginally elevated at MW17-2S, while the concentrations of sodium and sulphate were significantly elevated at MW17-1S. There were no ODWS exceedances for the major and minor ion parameters.
- Concentrations of dissolved metal parameters were generally similar at MW17-1S and MW17-2S. The concentration of aluminum, barium, molybdenum, uranium, and vanadium were elevated at MW17-1S, while boron, silicon, and strontium were elevated at MW17-2S. The groundwater quality typically complied with the applicable ODWS with the exception Manganese at MW17-2S.

~~4.5.3~~4.5.2 Shallow Bedrock Groundwater Quality Results

A review of the groundwater chemistry from the four samples collected from the shallow bedrock monitoring wells MW17-4S, MW17-6S, MW17-8S, and MW17-9S is provided below:

- Concentrations of general parameters were generally similar at each of the bedrock wells with the exception of TDS and hardness which were elevated at MW17-9S and TSS which was elevated at MW17-4S, MW17-6S and MW17-8S. The groundwater quality typically complied with the applicable ODWS with the exception of TDS and hardness at all sampled locations.
- Concentrations of nutrients and organic indicator parameters were generally similar at all sampled shallow bedrock locations. There were no ODWS exceedances for the nutrients and organic indicator parameters in shallow bedrock.
- Concentrations of major and minor ions were variable at the sampled shallow bedrock monitoring wells. The following observations were noted:
  - Alkalinity and magnesium were elevated at MW17-4S and MW17-9S;
  - Sodium and chloride were significantly elevated at MW17-9S; and,
  - Sulphate was notably lower at MW17-8S.

There were no ODWS exceedances for the major and minor ion parameters.

- Concentrations of dissolved metal parameters were generally consistent between the four shallow bedrock monitoring wells with the exception of:
  - Barium, manganese, molybdenum, and uranium were elevated at MW17-4S; and,
  - Silicon and strontium were elevated at MW17-6S.

The groundwater quality typically complied with the applicable ODWS with the exception of manganese (aesthetic objective) and uranium (health related) at MW17-4S.

~~4.5.4~~4.5.3Deep Bedrock Groundwater Quality Results

A review of the groundwater chemistry from the six samples collected from the deep bedrock monitoring wells MW17-1D, MW17-3D, MW17-6D, MW17-8D, MW17-9D, and MW17-10D are provided below:

- Concentrations of general parameters were generally similar at each of the deep bedrock wells with the following exceptions:
  - Conductivity was notably lower at MW17-6D;
  - TSS was elevated at MW17-3D and MW17-6D; and,
  - TDS and hardness were notably lower at MW17-3D and MW17-6D.

The groundwater quality typically complied with the applicable ODWS with the exception of TDS and hardness at all sampled locations.

- Concentrations of nutrients and organic indicator parameters were generally similar at all sampled deep bedrock locations with the exception of total ammonia which was elevated at MW17-8D and MW17-9D. There were no ODWS exceedances for the nutrients and organic indicator parameters in shallow bedrock.
- Concentrations of major and minor ions were variable at the sampled deep bedrock monitoring wells. The following observations were noted:
  - Chloride was elevated at MW17-9D;
  - Sodium was elevated at MW17-8D and MW17-9D; and,
  - Calcium, magnesium, and sulphate were notably lower at MW17-3D and MW17-6D.

There were no ODWS exceedances for the major and minor ion parameters with the exception of sulphate in the deep bedrock wells MW17-1D, MW17-8D, MW17-9D and MW17-10D.

- Concentrations of dissolved metal parameters were generally consistent between the deep bedrock monitoring wells with the exception of:
  - Aluminum was elevated at MW17-9D;
  - Boron was elevated at MW17-8D and MW17-9D and,
  - Manganese was elevated at MW17-1D and MW17-8D.

There were no ODWS exceedances for the dissolved metals parameters.

~~4.5.5~~4.5.4 Groundwater Quality Summary

The groundwater quality in the overburden and bedrock at the Site was generally similar based on the groundwater quality results. Overburden groundwater quality was typically elevated in pH and TSS concentrations in comparison with the bedrock groundwater quality. The shallow bedrock was typically elevated in hardness and TDS, calcium, chloride, and magnesium in comparison with the overburden groundwater quality. The deep bedrock groundwater quality was typically more mineralized than the shallow bedrock groundwater quality as expected. In comparison to the shallow bedrock groundwater quality, TDS, hardness, calcium, potassium, sodium, sulphate, boron, and strontium were elevated.

4.6 Quarry Sump Quality Sampling Results

On April 11, 2017, Golder collected one surface water sample from the main quarry sump located within the existing Port Colborne Quarry. A summary of the quarry sump results is provided in Table 5. The quarry sump sample was analyzed for the RCAP surface water list of parameters which included general parameters, nutrients and organic indicators, major and minor ions, and total metals. The quarry sump results were compared to the PWQO. The concentrations of all analyzed parameters from the quarry sump sample were below the PWQO with the exception of total boron.

5.0 GROUNDWATER SEEPAGE ESTIMATE

A groundwater seepage estimate has been developed for the proposed quarry extension. This estimate involves calculation of the seepage along the east, north, and south faces. This seepage estimate does not include upward seepage from the floor of the quarry as this is comprised of low permeability dolomitic shales that will be the floor of the proposed extension. The seepage estimate was calculated using Darcy's Law Q=KIA, where:

Q = seepage in m^3/sec

K = hydraulic conductivity corresponding to the geomean of packer test results (m/sec)

I = hydraulic gradient, assuming a 500 m radius of influence and a drawdown of 15 m

A = cross-sectional area of quarry faces (m^2)

The results of the seepage estimate using the Darcy Calculation are provided in Table E.2 in Appendix E. The parameters and results of calculation are summarized below:

Seepage Calculation Values	
K	7×10^{-7} m/s
I	0.03 (15 m/500 m)
A	56850 m^2 (15 m x 3790 m)
Q	0.00119385 m^3/sec or 71.63 L/min

Based on this calculation using the geomean of the packer test results, the estimated seepage from the east, north, and south walls of the proposed extension is 72 L/min. If the hydraulic conductivity were increased by one order of magnitude, to produce a conservative estimate the resultant seepage would be 720 L/min.

6.0 PRIVATE WATER WELLS

An evaluation of the MECP water well database was completed to provide additional information with respect to the bedrock surface and groundwater elevations at the water wells surrounding the proposed extension. The location of water wells relative to the calculated dewatering zone of influence is shown on Figure 16. The location of water well cross sections is shown on Figure 17. The MECP water well records in the area of the sections are included in Appendix F. The sections are discussed below.

6.1 Water Well Cross Sections

Four water well cross sections were completed based on the MECP water well records.

- Section C-C' was completed in an east-west direction along Second Concession and is presented on Figure 18;
- Section D-D' was completed in an east-west direction along Killaly Road and is presented on Figure 19;
- Section E-E' was completed in a north-south direction along Miller Road and is presented on Figure 20; and,
- Section F-F' was completed in a northwest-southeast direction along Highway 3 and is presented on Figure 21.

The ground surface and bedrock surface have been included on these cross sections. The recorded depth that water was found during drilling and the static water levels following drilling have also been included on these cross sections for reference, however these water levels have a low degree of accuracy since the depth that water is found is typically estimated and the static water levels may not have fully reached static conditions. In addition, the ground surface elevation, that is used to calculate the ground surface elevation from the measured depth, at the well location is usually not surveyed but instead estimated from mapping based on the location indicated on the drillers log.

Water Well Cross Section C-C'

Cross section C-C' was completed along Second Concession which is located at the northern property boundary of the current quarry operation and the expansion property. The ground surface elevation is approximately 185 masl and increases to approximately 190 masl east of the expansion property. According to the MECP well records this topographic high consists of sand and gravel material whereas the overburden material in the vicinity of the expansion property is typically clay. The bedrock surface is approximately 180 masl in the vicinity of the expansion property and continues to decrease in elevation towards the east. Immediately to the east of the expansion property the bedrock surface decreases to approximately 175 masl as shown on Figure 18. In this area of lower bedrock elevation, the overburden deposits were noted to be sand and gravels rather than clayey materials, which were noted in the western portion of the section. The wells are typically less than 10 m in depth except for two very deep wells and one deeper well. The water was found in bedrock and various depths with no consistent producing horizon. The static water levels are generally above the bedrock surface in the overburden deposits. The water was noted to vary from fresh to sulphur taste.

Water Well Cross Section D-D'

Cross section D-D’ was completed along Killaly Road which is located south of the current quarry operation and the expansion property. The overburden deposits consist of clayey that overlie limestone bedrock. The ground surface elevation along Killaly Road is approximately 178 masl to 180 masl. There is a topographic low located south of the expansion property as shown on this cross section. The bedrock surface is approximately 177 masl south of the current quarry operations. The bedrock surface is very close to the ground surface in this location. South of the expansion property, the bedrock surface decreases in elevation to approximately 173 masl. The decrease in bedrock elevation in this area coincides with the decrease in ground surface elevation that is also observed in this area. Further east of the expansion property the bedrock surface increases to approximately 177 masl as shown on Figure 19. The wells are generally completed less than 20 m into bedrock. The water was found a variable depth with no apparent consistent elevation. The water was noted to vary from fresh or sulphur in taste.

Water Well Cross Section E-E'

Cross section E-E’ was completed along Miller Road which is located to the east of the expansion property. The ground surface elevation decreases from north to south along Miller Road. The ground surface at the northern end of Miller Road is approximately 185 masl and decreases to approximately 178 masl at the southern end of Miller Road. In general, the overburden deposits are clayey materials overlying bedrock. The bedrock surface elevation typically is similar to the ground surface topography as the bedrock surface also decreases from north to south along Miller Road. At the north end of Miller Road, the bedrock surface is located at approximately 183 masl and decreases to approximately 170 masl at the south end of Miller Road. A bedrock surface elevation increase is noted at some locations along Miller Road based on MECP well records which indicate that the bedrock surface is close to the ground surface as shown on Figure 20. The wells are generally completed less than 20 m into bedrock. The water was found at variable depths with no apparent consistent producing horizon, with the static water levels in the overburden or near bedrock surface. The water was noted to vary from fresh to sulphur in taste.

Water Well Cross Section F-F'.

Cross section F-F’ was completed along Highway 3 which is located at the southern property boundary of the current quarry operation and the extension property. The ground surface elevation in the vicinity of the current site and the expansion property is approximately 180 masl and is relatively flat. The clayey overburden deposits overlie bedrock along the section. The bedrock is located at ground surface in the vicinity of the current operation, to the west of the expansion property. South of the expansion property the bedrock surface begins to decrease to approximately 177 masl. To the east of the expansion property, the bedrock surface continues to decrease to approximately 173 masl. Further to the east the bedrock surface begins to increase as shown on Figure 21.

The cross sections indicate that the bedrock surface in the vicinity of the current quarry operation and the proposed extension property is variable. This is likely attributed to the close proximity of the Onondaga Escarpment which appears to be located at the northern end of the expansion property. The bedrock surface appears to slope from the north to the south towards Lake Erie as shown on cross section D-D’ on Figure 19. The bedrock surface appears to decrease in elevation moving from west to east along the northern and southern property boundary of the current operations and expansion property as shown on Figures 18 and 21.

6.2 Zone of Influence for the Proposed Extension

The dewatering Zone of Influence (ZOI) represents the lateral extent of groundwater drawdown in response to dewatering which could potentially affect the supply of surrounding water wells (see Appendix E). The dewatering ZOI is governed by the transmissivity of the fractured bedrock and the depth of dewatering required. In the vicinity of the dewatering area a transmissivity ranging from 0.6 m^2/day to 1.0 m^2/day has been assumed, based on the observed geomean hydraulic conductivity from the packer testing in the Bertie Formation (7 x 10^{-7} m/s) and a saturated aquifer thickness ranging from 10.4 m to 16.8 m. The Theis equation was used to estimate the ZOI. The Theis equation is considered to provide a conservative estimate of the groundwater level drawdown since it does not incorporate groundwater recharge which would limit the expansion of the drawdown curve. Applying the Theis analytical solution, the lateral extend of groundwater level drawdown can be estimated as follows:

$$s(r,t) = \frac{Q}{4\pi T} W\left(\frac{r^2 S}{4Tt}\right)$$

where:

s(r,t) = drawdown at distance (r) and time (t) after the start of pumping

Q = pumping rate required to achieve maximum drawdown (m^3/day)

T = aquifer transmissivity (0.6 m^2/day to 1.0 m^2/day)

S = aquifer storativity (10^{-4} – assumed for specific yield of fractured bedrock)

W = Theis well function

Based on the Theis analytical approach discussed above and assuming 14 days for the dewatering system to reach steady-state, the dewatering ZOI for the proposed extension is interpreted to range from 700 m to 1,000 m at which distance the groundwater level drawdown will be less than 10 cm and considered minimal. The results of the Theis drawdown analysis are provided in Table E.1 in Appendix E. The distance-drawdown relationship is expressed on a curve on Figure E.1 in Appendix E. The maximum drawdown case corresponds to a distance of 1,000 m. The intermediate drawdown case corresponds to a distance of approximately 900 m, while the minimum drawdown case corresponds to a distance of approximately 700 m.

This results of this calculation are comparable with the 1 kilometre (km) area that is currently used for the PTTW monitoring for the existing quarry. The estimated ZOI is shown on Figure 16.

The upper range of the ZOI calculation of 1 km is used as the area of groundwater level drawdown and area for potential impact on surrounding water wells. A water well survey was conducted within a 1 km radius of the site (see Figure 16). The MECP water well numbers within the 1 km offset from the extraction boundary of the proposed extension is provided in Table 7.

6.3 Well Impact Assessment

The potential for impacts on the groundwater supply of surrounding wells was determined based on the calculated ZOI which was assumed to be 10 cm. It is assumed that wells within this zone could potentially be affected would occur within the ZOI. The wells with the closest proximity would have a higher likelihood of experiencing a decline in groundwater levels that may affect their supply, although this would be dependant upon the specifics of each well, actual drawdown in groundwater levels. Based on the operating history of the quarry there are wells within a comparable distance from the quarry that have historically not complained to the quarry about their water supply, based on the monitoring reports by WSP.

A water well survey was conducted to establish an initial baseline on wells situated within the potential ZOI (see Section 6.4).

The closest water wells to the proposed extension are at five houses situated south of Highway No. 3 ranging from approximately 75 m to 110 m from the proposed extension (Figure 16). These five properties are identified as *1252 Highway 3 East, 1305 Highway 3 East, 1331 Highway 3 East, 1266 Weaver Road and 1751 Highway 3 East. Of these five properties, the residents at 1305 Highway 3 East, 1331 Highway 3 East and 1266 Weaver Road responded to the 2018 water well survey completed by WSP.* The predicted drawdown for the distances of 100 m and 150 m from the quarry are approximately 2.6 m and 2.8 m respectively. The potential for drawdown will be assessed based on the groundwater monitoring program, including monthly groundwater level monitoring of monitoring wells MW17-8 and MW17-9. Any complaints will be addressed by the complaint response program. In 2018, the resident at 1305 Highway 3 East indicated that they are using a cistern, the resident at 1331 Highway 3 East updated their pump, piping and treatment in 2016 and the resident at 1266 Weaver Road indicated that their water system was upgraded 4 months ago and they have had any issues with the quality of water. The water wells along Miller Road are situated from approximately 365 m to 385 m from the proposed extension (Figure 16). A groundwater monitoring program and complaint response program have also been developed for the operating lifespan of the quarry (see Section 7.0). The predicted drawdowns from the Theis analysis at 350 m, 375 m, and 400 m are 1.52 m, 1.38 m, and 1.27 m respectively.

The potential drawdown of these will be evaluated based on the new monitoring wells to be installed along the eastern perimeter at the proposed extension. There are also wells situated to the east of Miller Road along the 2nd Concession Road within the ZOI. To the southeast there are wells within the ZOI along Killaly Street, Miller Road, and Highway No. 3 (Figure 16). The wells more distant from the quarry monitoring well network will be included in the complaint response program. In addition, these wells could be fitted with pressure transducers to measure groundwater levels if this is agreed to between Rankin and the property owner.

6.4 Water Well Survey

Golder conducted a water well survey for all properties located within 1 km of the expansion property at the addresses indicated in Table 6. A total of 74 private wells were identified within a 1,000 m distance from the perimeter of the Site (Figure 16 and Table 7). Properties that were included in the water well survey completed by WSP were not included in this survey. Golder completed this well survey on September 5, 19, 20, and 26, 2017. A notification letter was delivered to all of the residents on August 23, 2017 indicating that Golder staff would be attempting two visits at each location between August 23 and September 29, 2017. These visits were completed on September 5 and 19, 2017. An additional visit was completed at the remaining residents on September 20, 2017.

Additional properties were included in the well survey based on the revised expansion property boundary provided by PCQ. These additional properties were included in the September 19 and 20, 2017 site visits. On

September 25, 2017 the resident of 1580 Miller Road requested that the well survey be completed which required an additional visit on September 26, 2017. On September 22, 2017 Golder delivered a revised letter and the well survey form to the remaining properties where no response was previously received. Golder requested that the residents fill out the survey form and send it back to the St. Catharines office. No completed survey forms were received by the deadline, September 29, 2017 as indicated on the cover letter provided with the survey form.

A summary of the completed survey forms is provided on Table 6, and a copy of all the completed survey forms is provided in Appendix F. All available information from the residents is included in the survey form. Golder attempted to contact a total of 49 residences as part of the water well survey. A total of 30 residences were successfully surveyed. A total of six residences were not interested in participating in this survey. At the remaining 13 residences, no resident was home during the visits and no response to the letters was received. A summary of these responses is provided in Table 6.

7.0 GROUNDWATER MONITORING AND RESPONSE PROGRAM

This section provides a recommended monitoring program that will be implemented at the onset of extraction in the proposed extension.

Currently, manual monitoring of groundwater levels is being carried out on a quarterly basis at all of the on-site monitoring wells within the proposed extension. The monitoring well network will be augmented by three additional monitoring wells along the eastern perimeter. The groundwater monitoring locations are shown on Figure 22 and summarized in Table 8. This on-site water level monitoring program will be conducted during quarry operations on a monthly basis. Groundwater quality sampling and analysis will be continued every five years during extraction of the proposed extension. It should be noted that the monitoring wells within the extraction area will progressively be mined out as the quarry expands and three new wells will be added along the eastern property boundary. The monitoring program will be discontinued once the quarrying is completed and the quarry will be allowed to flood through natural surface water and groundwater inflows, and the groundwater levels will recover to static conditions.

A monitoring and response program is in place for the existing quarry to detect groundwater level drawdown at the monitoring well locations. A response program would be initiated, if required, to evaluate potential impacts and implement operational measures, or contingency measures, to prevent an interruption of the water supply or to restore the supply. This monitoring and response program will include all residences within 1,000 m of the proposed extension. If required, a temporary water supply would be provided by PCQ to the homeowners that had their water supply interrupted due to quarrying activities. This will be outlined in the PTTW. PCQ will install continuous data loggers in the quarry monitoring wells closest to the five closest water wells (MW17-8S, MW17-8D, MW17-9S and MW17-9D). PCQ would also record manual water levels as part of the PTTW monitoring program from the five closest water wells assuming they are accessible, and permission has been granted by the Owner.

In order to implement appropriate response actions in a timely manner, PCQ will retain qualified personnel in the areas of hydrogeology and will have water well contractors and a plumbing contractor on retainer in the event that the need for these services arises. The Complaint Response Program (CRP) is described below.

7.1 Private Well Complaint Response Program

The following description provides the decision process to be followed when a well interference complaint is received.

- The well will be inspected by a Hydrogeologist and/or a Licenced Well Contractor to initially evaluate the complaint. An analysis and impact assessment will then be conducted by a Hydrogeologist to evaluate potential impacts for groundwater level drawdown to affect the water supply of the well. An assessment of the well system performance will then be carried out by the Hydrogeologist and Contractor.
- If it is determined by a Hydrogeologist that there is a significant potential for interruption of the water supply of the well or the water supply of the well has been interrupted, then the water supply restoration program will be initiated. If the initial measures are not successful, then mitigation measures will be implemented in the interim until a successful response is achieved. This could involve the implementation of additional contingency measures until a successful result is achieved.
- If there is no significant potential for the interruption of water supply, then no restoration action will be undertaken, and the temporary water supply will be discontinued. The actions and responses undertaken, as determined by a Hydrogeologist, will be documented for the annual report, and reported to the agencies as required.

7.2 Potential Mitigation Options

There are several mitigation strategies that could be implemented to affect the supply of surrounding water wells, to counteract the effect of quarry-related groundwater level drawdown, if required, based on the results of the monitoring and complaint response program.

- Well Deepening

This would be effective, for example, for shallow bedrock wells that no longer have a sufficient water column due to quarry-related groundwater level drawdown. The results of the hydrogeological program indicate that well deepening for shallow wells is feasible, since water supply is obtained from the lower bedrock above the Salina shales.

- Well Replacement

This measure could be introduced for wells where well deepening was not sufficient and could also be positioned further from the quarry, or where the facilities are not directly connected to the quarry wall.

- Additional Wells

Additional wells could be installed and connected by plumbing into the residence by piping as such that there is a common feed of water from multiple wells.

- Trickle Wells

This would involve the pumping low yield wells into a storage system such as a subsurface cistern.

- Grouting

The bedrock along the quarry wall could be grouted to seal the fractures and remove the hydraulic connection to adjacent wells.

- Low Permeability Side Slopes

The quarry walls could be sloped with low permeability clayey materials to line the fractures on the quarry wall.

- Recharge Wells

Recharge wells could be installed to maintain groundwater levels in areas affected by groundwater level drawdown.

The requirement for any of these mitigation measures would be determined based on the results of the groundwater monitoring program.

The results of the monitoring and response program will be incorporated into a report that will be submitted to the MECP on an annual basis as part of the future requirements for a Site-wide PTTW.

8.0 CONCLUSIONS AND RECOMMENDATIONS

The following conclusions and recommendations are provided for the proposed quarry extension.

8.1 Conclusions

1) The topography in the area of the proposed extension is generally flat lying ranging from approximately 180 masl to 185 masl.

2) The regional surficial geology in the site area consists of deposits of the Haldimand Clay Plain.

3) The overburden thickness at the drill hole locations ranged from approximately 0.5 to 10.5 m. The decrease in bedrock surface results in an increase in overburden thickness from south to north across the site with the thickest overburden deposits occurring in the area of the wetland/woodland which are underlain by low permeability silty clay deposits.

4) The bedrock surface elevation in the area of the proposed extension decreases from south to north across the area. The highest bedrock surface elevations occur in the southwestern area of the site, near Main Street East, with the lowest elevations occurring in the northern area of the site, in the wooded area near 2nd Concession Road.

5) The bedrock geology is comprised of the uppermost Bois Blanc Formation which is underlain by the Bertie Formation, and the Salina Formation. The proposed quarry will extract the same formations (the Bois Blanc and Bertie Formations) as the existing quarry. The bedrock units slope westward to southwestward toward the quarry. The base of The Falkirk Member of the Bertie Formation will be the floor of the proposed quarry at the top of the Oatka shale, which ranges in elevation from 169 masl in the northern area of the site to 162 masl in the southern area of the site.

6) The results of the packer testing in the Bertie Formation range from 1.8×10^{-9} m/sec to 1.2×10^{-5} m/sec. The hydraulic conductivity test result for the Salina Formation was 8.7×10^{-10} m/sec.

7) Contouring of groundwater levels in the bedrock indicates a westward direction of groundwater flow reflecting inward groundwater flow to the existing quarry excavation. The direction of groundwater flow will be inward toward the proposed extension from the areas to the west, north and site of excavation.

8) The wetland/woodland has surface water during the fall and spring which is considered to reflect the low permeability of the clayey materials beneath the wetland. The wetland will continue to have standing water during spring and summer during the quarry expansion since this is occurring under existing conditions in areas directly adjacent to the existing quarry.

9) The results of the groundwater quality sampling have indicated that the shallow bedrock was typically elevated in hardness, TDS, calcium chloride, and manganese in comparison to overburden quality. The overburden groundwater quality was typically elevated in pH concentrations in comparison to the shallow bedrock quality. The deep bedrock groundwater quality was more mineralized than the overburden or shallow bedrock, with elevated TDS, hardness, calcium potassium, sodium, sulphate, boron, and strontium. The results reflect natural groundwater quality and generally meets applicable ODWS with the exception of TDS in overburden samples at two locations, and uranium and manganese in the shallow bedrock at one location.

10) The results of the analysis of the surface water sample obtained from the quarry sump indicates that all of the analyzed parameters were below the PWQO, with the exception of boron.

11) The estimated additional seepage from the north, south, and west walls of the proposed extension is 72 L/min.

12) An estimate of the radius of groundwater level drawdown associated with the dewatering of the proposed extension was developed to be utilized for the hydrogeological impact assessment on surrounding water wells. The ZOI of the dewatering is 700 m to 1,000 m from the proposed extension.

13) A baseline water well survey has been carried out within 1 km of the boundary of the proposed extension in advance of quarrying activities. A total of 74 private wells were identified within a 1,000 m distance from the perimeter of the Site. Detailed cross-sections have been developed for the area along the road surrounding the proposal extension.

14) A groundwater monitoring program has been developed for the proposed extension involving both groundwater quality sampling and analysis and groundwater level monitoring at existing monitoring wells in the area of the proposed extension. The results of the groundwater quality monitoring will be used to evaluate potential changes in water quality as the proposed quarry extension expands. The groundwater level monitoring results will be used to assess the groundwater level drawdown associated with quarry dewatering as the quarry expands. The monitoring program will be used to evaluate potential impacts on surrounding water wells. The results will also be utilized as part of the hydrogeological and ecological disciplines to confirm that there are no unanticipated effects on the natural environment.

15) A monitoring and response program will be in place to detect groundwater level drawdown at the proposed quarry extension quarry monitoring wells as part of the PTTW.

16) A Complain Response Program (CRP) will be in place to respond to well interference complaints from surrounding residents.

17) There will be no impacts on the surrounding water wells with the operation of the monitoring and CRP since the quarry operator will ensure that there are no impacts on the quantity or quality of the supply of surrounding water wells.

8.2 Recommendations

Golder recommends the following actions be taken:

1) The quarry should adopt the groundwater monitoring and response program during the excavation of the proposed extension.

2) The quarry should utilize the proposed CRP for complaints associated with supply of residents within 1 km of the quarry for the Pit #3 extension.

3) The quarry should incorporate the monitoring program for the proposed extension into a PTTW for the site operations.

9.0 LIMITATIONS

This report has been prepared by Golder Associates Ltd. (Golder) for use by Rankin Construction and Port Colborne Quarries and its authorized agents. The factual information, descriptions, interpretations, comments, results, conclusions, and electronic files contained herein are specific to the project described in this report. Information used in this report should be restricted to that specified in the scope of work unless otherwise mutually agreed upon by Golder and Rankin and Port Colborne Quarries. This report should be read in its entirety as some sections could be falsely interpreted when taken individually or out-of-context. Golder is not responsible for any use of this report and its content by a third party, and/or for its use for purposes other than those intended.

Golder is not responsible for any damages that may result from unpredictable or unknown underground conditions, from erroneous information provided by and/or obtained from sources other than Golder, and from ulterior changes in the site conditions unless Golder has been notified of any occurrence, activity, information, or discovery, past or future, susceptible of modifying the underground conditions described herein, and have had the opportunity of revising its interpretations.

The professional groundwater services described in this report are conducted in a manner consistent with that level of care and skill normally exercised by other members of the engineering and science professions currently practicing under similar conditions. The results of previous or simultaneous work provided by sources other than Golder and quoted and/or used herein are considered as having been obtained according to recognized and accepted professional rules and practices, and therefore deemed valid.

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TABLES

Table 1 - Monitoring Well Construction Details
Port Colborne Quarry Expansion Property

Location	Top of Pipe (masl)	Ground Surface (masl)	Depth to Bedrock (mbgs)	Depth to Bedrock (masl)	Bottom Depth (mbtop)	Bottom of Screen (mbtop)	Bottom of Screen (masl)	Top of Screen (mbgs)	Top of Screen (masl)	Top of Sand (mbgs)	Screened In	Stick Up (m) field measured	Stick Up (from survey data)	Easting (UTM Zone 17)	Northing (UTM Zone 17)	Notes
MW17-1D	182.92	181.99	10.21	171.77	14.39	14.39	168.53	11.89	170.10	10.98	lower dolostone	0.95	0.94	646595.40	4752362.64	hole back filled to 13.41
MW17-2D	182.64	181.70	8.69	173.01	15.15	15.15	167.49	10.98	170.72	9.45	lower dolostone	0.99	0.94	646602.90	4752109.43	hole back filled to 14.02
MW17-3D	183.00	181.99	5.36	176.63	13.45	13.45	169.49	9.45	172.54	7.62	lower dolostone	0.94	1.01	646823.07	4751983.70	hole back filled to 12.50
MW17-4D	183.40	182.51	2.44	180.07	19.40	19.40	164.00	15.29	167.22	13.72	lower dolostone/lower shale	0.91	0.89	646626.89	4751621.30	
MW17-5D	183.64	182.56	0.51	182.05	20.80	20.80	162.84	16.64	165.92	15.24	lower dolostone/lower shale	1.00	1.08	646415.54	4751485.26	
MW17-6D	182.84	181.83	3.35	178.47	19.11	19.11	163.73	14.94	166.89	13.41	lower dolostone/lower shale	1.04	1.01	646833.18	4751418.07	
MW17-7D	182.43	181.39	1.55	179.84	19.93	19.93	162.50	15.70	165.69	14.02	lower dolostone/lower shale	1.04	1.04	646634.77	4751237.03	
MW17-8D	182.49	181.39	0.84	180.56	20.76	20.76	161.65	16.69	164.70	15.24	lower dolostone	1.00	1.09	646422.35	4751094.88	hole backfilled to 19.74
MW17-9D	181.73	180.75	2.13	178.61	19.08	19.08	162.65	14.94	165.81	13.41	lower dolostone	0.96	0.98	646834.09	4750972.13	hole backfilled to 17.99
MW17-10D	183.04	181.96	6.30	175.66	13.18	13.18	169.77	9.15	172.82	7.62	lower dolostone	1.05	1.07	646721.25	4752127.19	hole backfilled to 12.20
MW17-4S	183.47	182.53	2.44	180.09	8.50	8.50	174.88	4.60	177.93	3.35	upper dolostone	0.92	0.94	646627.13	4751619.19	
MW17-5S	183.63	182.58	0.64	181.94	10.05	10.05	173.56	5.97	176.61	5.49	upper dolostone	0.98	1.06	646415.35	4751486.30	
MW17-6S	182.77	181.79	3.35	178.43	10.17	10.17	172.60	6.12	175.66	4.88	upper dolostone/middle shale	0.92	0.98	646833.02	4751420.19	well screen goes 0.3 m into middle shale layer
MW17-7S	182.36	181.37	1.50	179.87	8.60	8.60	173.75	4.57	176.80	2.74	upper dolostone/upper limestone	0.98	0.99	646634.86	4751234.36	
MW17-8S	182.59	181.46	0.66	180.80	8.56	8.56	173.94	4.47	176.99	3.05	*upper limestone/upper dolostone	1.11	1.13	646422.56	4751097.20	*well screen within only 1.52 m of upper dolostone, rest of screen within upper limestone
MW17-9S	181.71	180.71	2.13	178.58	6.92	6.92	174.69	2.97	177.74	2.74	upper dolostone*	0.94	0.99	646834.03	4750974.29	*well screen crosses a unique 0.3 m shale layer and sand goes 0.3 m into upper limestone
MW17-1S	182.86	182.07	NA	NA	7.13	7.13	175.73	3.00	179.07	2.24	overburden	0.95	0.79	646597.97	4752362.66	
MW17-2S	182.85	181.70	NA	NA	7.17	7.17	175.65	3.00	178.70	2.44	overburden	0.98	1.15	646604.84	4752108.56	
MW17-3S	183.05	182.06	NA	NA	6.22	6.22	176.83	2.13	179.93	1.83	overburden	1.00	0.99	646822.97	4751985.67	
MW17-10S	182.86	181.94	NA	NA	6.92	6.92	175.94	2.87	179.07	2.13	overburden	0.96	0.92	646718.75	4752127.45	

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

Table 2 - Hydraulic Conductivity Results
Port Colborne Quarry Expansion Property

Well	Test Interval (mbgs)	Interval Length (m)	Formation Screened	Test Completed	Hydraulic Conductivity (m/s)
MW17-1D	17.68 - 21.42	3.74	Salina Formation	Single Packer Falling Head Test	8.5E-10
	15.09 - 18.29	3.20	Bertie Formation	Double Packer Falling Head Test	7.5E-06
	12.50 - 15.70	3.20	Bertie Formation	Double Packer Falling Head Test	3.3E-05
	10.98 - 14.18	3.20	Bertie Formation	Double Packer Falling Head Test	3.1E-05
MW17-2D	11.59 - 15.27	3.68	Bertie Formation	Single Packer Falling Head Test	7.4E-07
	9.45 - 12.65	3.20	Bertie Formation	Double Packer Falling Head Test	4.2E-08
MW17-3D	10.67 - 13.72	3.05	Bertie Formation	Single Packer Falling Head Test	1.1E-06
	7.78 - 10.98	3.20	Bertie Formation	Double Packer Falling Head Test	1.9E-07
MW17-4D	14.63 - 18.34	3.71	Bertie Formation	Single Packer Falling Head Test	1.1E-06
	11.74 - 14.94	3.20	Bertie Formation	Double Packer Falling Head Test	3.1E-06
MW17-5D	15.85 - 19.69	3.84	Bertie Formation	Single Packer Falling Head Test	3.8E-08
	12.96 - 16.16	3.20	Bertie Formation	Double Packer Falling Head Test	9.1E-08
	10.06 - 13.26	3.20	Bertie Formation	Double Packer Falling Head Test	2.5E-07
MW17-6D	14.33 - 17.99	3.66	Bertie Formation	Single Packer Falling Head Test	2.4E-06
	11.43 - 14.63	3.20	Bertie Formation	Double Packer Falling Head Test	2.4E-07
	9.88 - 13.08	3.20	Bertie Formation	Double Packer Falling Head Test	1.8E-06
MW17-7D	15.85 - 18.75	2.90	Bertie Formation	Single Packer Falling Head Test	3.8E-06
	12.96 - 16.17	3.20	Bertie Formation	Double Packer Falling Head Test	6.5E-07
	10.06 - 13.26	3.20	Bertie Formation	Double Packer Falling Head Test	3.2E-05
MW17-8D	17.68 - 21.29	3.61	Bertie Formation	Single Packer Falling Head Test	1.1E-06
	14.79 - 17.99	3.20	Bertie Formation	Double Packer Falling Head Test	9.3E-08
	11.89 - 15.09	3.20	Bertie Formation	Double Packer Falling Head Test	1.2E-08
	8.99 - 12.19	3.20	Bertie Formation	Double Packer Falling Head Test	4.5E-09
	6.10 - 9.30	3.20	Bertie Formation	Double Packer Falling Head Test	5.0E-05
MW17-9D	14.63 - 18.29	3.66	Bertie Formation	Single Packer Falling Head Test	1.9E-08
	13.11 - 16.31	3.20	Bertie Formation	Double Packer Falling Head Test	1.2E-05
	10.21 - 13.41	3.20	Bertie Formation	Double Packer Falling Head Test	2.7E-08
	7.16 - 10.36	3.20	Bertie Formation	Double Packer Falling Head Test	1.7E-09
MW17-10D	10.06 - 13.72	3.66	Bertie Formation	Single Packer Falling Head Test	1.8E-05
	7.01 - 10.21	3.20	Bertie Formation	Double Packer Falling Head Test	8.6E-06

Well ID	Top of Pipe Elevation	Ground Surface Elevation	Well Stick Up (m)	10-Apr-17			17-Apr-17			24-Apr-17			01-May-17		
				Depth to Water (mbtop)	Depth to Water (mbgs)	Groundwater Elevation (masl)	Depth to Water (mbtop)	Depth to Water (mbgs)	Groundwater Elevation (masl)	Depth to Water (mbtop)	Depth to Water (mbgs)	Groundwater Elevation (masl)	Depth to Water (mbtop)	Depth to Water (mbgs)	Groundwater Elevation (masl)
MW17-1S	182.86	182.07	0.95	5.95	5.00	176.91	6.11	5.16	176.75	5.57	4.62	177.29	5.10	4.15	177.76
MW17-1D	182.92	181.99	0.95	5.97	5.02	176.95	6.25	5.30	176.67	6.17	5.22	176.75	6.26	5.31	176.66
MW17-2S	182.85	181.70	0.98	2.93	1.95	179.92	5.75	4.77	177.10	5.02	4.04	177.83	4.46	3.48	178.39
MW17-2D	182.64	181.70	0.99	7.16	6.17	175.48	7.12	6.13	175.52	7.03	6.04	175.61	7.09	6.10	175.55
MW17-3S	183.05	182.06	1.00	5.83	4.83	177.22	5.95	4.95	177.10	5.95	4.95	177.10	5.93	4.93	177.12
MW17-3D	183.00	181.99	0.94	7.28	6.34	175.72	7.36	6.42	175.64	7.17	6.23	175.83	7.12	6.18	175.88
MW17-4S	183.47	182.53	0.92	6.10	5.18	177.37	6.12	5.20	177.35	6.12	5.20	177.35	6.11	5.19	177.36
MW17-4D	183.40	182.51	0.91	7.45	6.54	175.95	7.67	6.76	175.73	7.62	6.71	175.78	7.66	6.75	175.74
MW17-5S	183.63	182.58	0.98	7.58	6.60	176.05	7.71	6.73	175.92	7.59	6.61	176.04	7.63	6.65	176.00
MW17-5D	183.64	182.56	1.00	11.40	10.40	172.24	11.60	10.60	172.04	11.59	10.59	172.05	11.59	10.59	172.05
MW17-6S	182.77	181.79	0.92	8.63	7.71	174.14	8.72	7.80	174.05	8.67	7.75	174.10	8.69	7.77	174.08
MW17-6D	182.84	181.83	1.04	6.46	5.42	176.38	6.67	5.63	176.17	6.62	5.58	176.22	6.67	5.63	176.17
MW17-7S	182.36	181.37	0.98	5.99	5.01	176.37	6.20	5.22	176.16	6.14	5.16	176.22	6.18	5.20	176.18
MW17-7D	182.43	181.39	1.04	8.38	7.34	174.05	8.51	7.47	173.92	8.47	7.43	173.96	8.49	7.45	173.94
MW17-8S	182.59	181.46	1.11	4.81	3.70	177.78	5.11	4.00	177.48	4.92	3.81	177.67	4.98	3.87	177.61
MW17-8D	182.49	181.39	1.00	8.25	7.25	174.24	8.45	7.45	174.04	8.40	7.40	174.09	8.41	7.41	174.08
MW17-9S	181.71	180.71	0.94	3.52	2.58	178.19	3.80	2.86	177.91	3.62	2.68	178.09	3.71	2.77	178.00
MW17-9D	181.73	180.75	0.96	6.61	5.65	175.12	6.78	5.82	174.95	6.69	5.73	175.04	6.73	5.77	175.00
MW17-10S	182.86	181.94	0.96	4.15	3.19	178.71	6.48	5.52	176.38	6.53	5.57	176.33	6.58	5.62	176.28
MW17-10D	183.04	181.96	1.05	5.96	4.91	177.08	6.30	5.25	176.74	6.21	5.16	176.83	6.27	5.22	176.77

Well ID	Top of Pipe Elevation	Ground Surface Elevation	Well Stick Up (m)	08-May-17			15-May-17			23-May-17			29-May-17		
				Depth to Water (mbtop)	Depth to Water (mbgs)	Groundwater Elevation (masl)	Depth to Water (mbtop)	Depth to Water (mbgs)	Groundwater Elevation (masl)	Depth to Water (mbtop)	Depth to Water (mbgs)	Groundwater Elevation (masl)	Depth to Water (mbtop)	Depth to Water (mbgs)	Groundwater Elevation (masl)
MW17-1S	182.86	182.07	0.95	4.71	3.76	178.15	4.40	3.45	178.46	4.12	3.17	178.74	3.87	2.92	178.99
MW17-1D	182.92	181.99	0.95	5.83	4.88	177.09	6.15	5.20	176.77	6.34	5.39	176.58	6.20	5.25	176.72
MW17-2S	182.85	181.70	0.98	3.87	2.89	178.98	3.34	2.36	179.51	3.14	2.16	179.71	3.05	2.07	179.80
MW17-2D	182.64	181.70	0.99	6.73	5.74	175.91	7.03	6.04	175.61	7.22	6.23	175.42	7.10	6.11	175.54
MW17-3S	183.05	182.06	1.00	5.89	4.89	177.16	5.85	4.85	177.20	5.80	4.80	177.25	5.73	4.73	177.32
MW17-3D	183.00	181.99	0.94	6.99	6.05	176.01	7.17	6.23	175.83	7.26	6.32	175.74	7.20	6.26	175.80
MW17-4S	183.47	182.53	0.92	6.11	5.19	177.36	6.12	5.20	177.35	6.11	5.19	177.36	6.10	5.18	177.37
MW17-4D	183.40	182.51	0.91	7.36	6.45	176.04	7.57	6.66	175.83	7.70	6.79	175.70	7.62	6.71	175.78
MW17-5S	183.63	182.58	0.98	7.51	6.53	176.12	7.63	6.65	176.00	7.74	6.76	175.89	7.70	6.72	175.93
MW17-5D	183.64	182.56	1.00	11.40	10.40	172.24	11.52	10.52	172.12	11.63	10.63	172.01	11.57	10.57	172.07
MW17-6S	182.77	181.79	0.92	8.65	7.73	174.12	8.69	7.77	174.08	8.72	7.80	174.05	8.69	7.77	174.08
MW17-6D	182.84	181.83	1.04	6.39	5.35	176.45	6.62	5.58	176.22	6.73	5.69	176.11	6.64	5.60	176.20
MW17-7S	182.36	181.37	0.98	6.06	5.08	176.30	6.19	5.21	176.17	6.32	5.34	176.04	6.26	5.28	176.10
MW17-7D	182.43	181.39	1.04	8.42	7.38	174.01	8.49	7.45	173.94	8.57	7.53	173.86	8.51	7.47	173.92
MW17-8S	182.59	181.46	1.11	4.85	3.74	177.74	5.12	4.01	177.47	5.28	4.17	177.31	5.04	3.93	177.55
MW17-8D	182.49	181.39	1.00	8.27	7.27	174.22	8.42	7.42	174.07	8.47	7.47	174.02	8.40	7.40	174.09
MW17-9S	181.71	180.71	0.94	3.57	2.63	178.14	3.83	2.89	177.88	4.03	3.09	177.68	3.77	2.83	177.94
MW17-9D	181.73	180.75	0.96	6.59	5.63	175.14	6.75	5.79	174.98	6.87	5.91	174.86	6.73	5.77	175.00
MW17-10S	182.86	181.94	0.96	6.83	5.87	176.03	6.67	5.71	176.19	6.71	5.75	176.15	6.74	5.78	176.12
MW17-10D	183.04	181.96	1.05	5.86	4.81	177.18	6.18	5.13	176.86	6.36	5.31	176.68	6.22	5.17	176.82

GOLDER

Well ID	Top of Pipe Elevation	Ground Surface Elevation	Well Stick Up (m)	05-Jun-17			12-Jun-17			20-Jun-17			26-Jun-17		
				Depth to Water (mbtop)	Depth to Water (mbgs)	Groundwater Elevation (masl)	Depth to Water (mbtop)	Depth to Water (mbgs)	Groundwater Elevation (masl)	Depth to Water (mbtop)	Depth to Water (mbgs)	Groundwater Elevation (masl)	Depth to Water (mbtop)	Depth to Water (mbgs)	Groundwater Elevation (masl)
MW17-1S	182.86	182.07	0.95	3.68	2.73	179.18	3.62	2.67	179.24	3.58	2.63	179.28	3.57	2.62	179.29
MW17-1D	182.92	181.99	0.95	6.45	5.50	176.47	6.62	5.67	176.30	6.68	5.73	176.24	6.74	5.79	176.18
MW17-2S	182.85	181.70	0.98	2.98	2.00	179.87	2.95	1.97	179.90	2.94	1.96	179.91	2.92	1.94	179.93
MW17-2D	182.64	181.70	0.99	7.34	6.35	175.30	7.48	6.49	175.16	7.54	6.55	175.10	7.60	6.61	175.04
MW17-3S	183.05	182.06	1.00	5.67	4.67	177.38	5.60	4.60	177.45	5.51	4.51	177.54	5.45	4.45	177.60
MW17-3D	183.00	181.99	0.94	7.33	6.39	175.67	7.42	6.48	175.58	7.42	6.48	175.58	7.46	6.52	175.54
MW17-4S	183.47	182.53	0.92	6.11	5.19	177.36	6.12	5.20	177.35	6.12	5.20	177.35	6.13	5.21	177.34
MW17-4D	183.40	182.51	0.91	7.94	7.03	175.46	8.16	7.25	175.24	8.22	7.31	175.18	8.30	7.39	175.10
MW17-5S	183.63	182.58	0.98	7.79	6.81	175.84	7.86	6.88	175.77	7.93	6.95	175.70	7.99	7.01	175.64
MW17-5D	183.64	182.56	1.00	11.91	10.91	171.73	12.13	11.13	171.51	12.19	11.19	171.45	12.25	11.25	171.39
MW17-6S	182.77	181.79	0.92	8.83	7.91	173.94	9.04	8.12	173.73	9.13	8.21	173.64	9.19	8.27	173.58
MW17-6D	182.84	181.83	1.04	6.90	5.86	175.94	7.11	6.07	175.73	7.14	6.10	175.70	7.24	6.20	175.60
MW17-7S	182.36	181.37	0.98	6.34	5.36	176.02	6.43	5.45	175.93	6.50	5.52	175.86	6.55	5.57	175.81
MW17-7D	182.43	181.39	1.04	8.71	7.67	173.72	8.93	7.89	173.50	9.02	7.98	173.41	9.09	8.05	173.34
MW17-8S	182.59	181.46	1.11	5.21	4.10	177.38	5.42	4.31	177.17	5.62	4.51	176.97	5.70	4.59	176.89
MW17-8D	182.49	181.39	1.00	8.65	7.65	173.84	8.86	7.86	173.63	8.92	7.92	173.57	9.01	8.01	173.48
MW17-9S	181.71	180.71	0.94	3.97	3.03	177.74	4.15	3.21	177.56	4.36	3.42	177.35	4.47	3.53	177.24
MW17-9D	181.73	180.75	0.96	6.94	5.98	174.79	7.18	6.22	174.55	7.30	6.34	174.43	7.38	6.42	174.35
MW17-10S	182.86	181.94	0.96	6.77	5.81	176.09	6.77	5.81	176.09	6.78	5.82	176.08	6.78	5.82	176.08
MW17-10D	183.04	181.96	1.05	6.47	5.42	176.57	6.64	5.59	176.40	6.70	5.65	176.34	6.76	5.71	176.28

Well ID	Top of Pipe Elevation	Ground Surface Elevation	Well Stick Up (m)	31-Jul-17		
				Depth to Water (mbtop)	Depth to Water (mbgs)	Groundwater Elevation (masl)
MW17-1S	182.86	182.07	0.95	3.53	2.58	179.33
MW17-1D	182.92	181.99	0.95	6.93	5.98	175.99
MW17-2S	182.85	181.70	0.98	2.80	1.82	180.05
MW17-2D	182.64	181.70	0.99	7.76	6.77	174.88
MW17-3S	183.05	182.06	1.00	5.16	4.16	177.89
MW17-3D	183.00	181.99	0.94	7.59	6.65	175.41
MW17-4S	183.47	182.53	0.92	6.12	5.20	177.35
MW17-4D	183.40	182.51	0.91	8.42	7.51	174.98
MW17-5S	183.63	182.58	0.98	8.14	7.16	175.49
MW17-5D	183.64	182.56	1.00	12.43	11.43	171.21
MW17-6S	182.77	181.79	0.92	9.29	8.37	173.48
MW17-6D	182.84	181.83	1.04	7.33	6.29	175.51
MW17-7S	182.36	181.37	0.98	6.61	5.63	175.75
MW17-7D	182.43	181.39	1.04	9.20	8.16	173.23
MW17-8S	182.59	181.46	1.11	5.73	4.62	176.86
MW17-8D	182.49	181.39	1.00	9.12	8.12	173.37
MW17-9S	181.71	180.71	0.94	4.45	3.51	177.26
MW17-9D	181.73	180.75	0.96	7.50	6.54	174.23
MW17-10S	182.86	181.94	0.96	6.80	5.84	176.06
MW17-10D	183.04	181.96	1.05	6.93	5.88	176.11
1	181.8	NA	NA	2.69	NA	179.11
2	179.24	NA	NA	4.02	NA	175.22
3	181.53	NA	NA	12.02	NA	169.51
1-94	183.06	NA	NA	2.73	NA	180.33
2-94	182.24	NA	NA	1.67	NA	180.57
3-94	183.33	NA	NA	9.81	NA	173.52
4-94	184.01	NA	NA	3.76	NA	180.25

Well ID	Top of Pipe Elevation	Ground Surface Elevation	Well Stick Up (m)	10-Jan-18			05-Feb-18			08-Mar-18			11-Apr-18		
				Depth to Water (mbtop)	Depth to Water (mbgs)	Groundwater Elevation (masl)	Depth to Water (mbtop)	Depth to Water (mbgs)	Groundwater Elevation (masl)	Depth to Water (mbtop)	Depth to Water (mbgs)	Groundwater Elevation (masl)	Depth to Water (mbtop)	Depth to Water (mbgs)	Groundwater Elevation (masl)
MW17-1S	182.86	182.07	0.95	4.70	3.75	177.37	3.91	2.96	178.16	3.16	2.21	178.91	2.77	1.82	179.30
MW17-1D	182.92	181.99	0.95	6.55	5.60	175.44	6.28	5.33	175.71	6.00	5.05	175.99	6.20	5.25	175.79
MW17-2S	182.85	181.70	0.98	2.79	1.81	178.91	2.81	1.83	178.89	2.80	1.82	178.90	2.77	1.79	178.93
MW17-2D	182.64	181.70	0.99	7.43	6.44	174.27	7.26	6.27	174.44	7.03	6.04	174.67	7.24	6.25	174.46
MW17-3S	183.05	182.06	1.00	7.23	6.23	174.83	5.51	4.51	176.55	5.32	4.32	176.74	4.89	3.89	177.17
MW17-3D	183.00	181.99	0.94	5.48	4.54	176.51	7.13	6.19	174.86	6.99	6.05	175.00	7.09	6.15	174.90
MW17-4S	183.47	182.53	0.92	6.12	5.20	176.41	6.12	5.20	176.41	6.11	5.19	176.42	6.10	5.18	176.43
MW17-4D	183.40	182.51	0.91	8.31	7.40	174.20	8.18	7.27	174.33	7.90	6.99	174.61	8.14	7.23	174.37
MW17-5S	183.63	182.58	0.98	8.06	7.08	174.52	8.00	7.02	174.58	7.91	6.93	174.67	7.96	6.98	174.62
MW17-5D	183.64	182.56	1.00	12.59	11.59	169.97	12.77	11.77	169.79	12.66	11.66	169.90	12.89	11.89	169.67
MW17-6S	182.77	181.79	0.92	9.23	8.31	172.56	9.35	8.43	172.44	9.19	8.27	172.60	9.38	8.46	172.41
MW17-6D	182.84	181.83	1.04	7.21	6.17	174.62	7.08	6.04	174.75	6.82	5.78	175.01	7.03	5.99	174.80
MW17-7S	182.36	181.37	0.98	6.46	5.48	174.91	6.35	5.37	175.02	6.22	5.24	175.15	6.27	5.29	175.10
MW17-7D	182.43	181.39	1.04	9.15	8.11	172.24	9.23	8.19	172.16	9.06	8.02	172.33	9.25	8.21	172.14
MW17-8S	182.59	181.46	1.11	5.44	4.33	176.02	5.26	4.15	176.20	5.09	3.98	176.37	5.08	3.97	176.38
MW17-8D	182.49	181.39	1.00	9.06	8.06	172.33	9.12	8.12	172.27	8.97	7.97	172.42	9.14	8.14	172.25
MW17-9S	181.71	180.71	0.94	4.10	3.16	176.61	3.84	2.90	176.87	3.60	2.66	177.11	3.58	2.64	177.13
MW17-9D	181.73	180.75	0.96	7.36	6.40	173.39	7.34	6.38	173.41	7.23	6.27	173.52	7.33	6.37	173.42
MW17-10S	182.86	181.94	0.96	6.81	5.85	175.13	6.81	5.85	175.13	6.82	5.86	175.12	6.82	5.86	175.12
MW17-10D	183.04	181.96	1.05	6.58	5.53	175.38	6.31	5.26	175.65	6.04	4.99	175.92	6.25	5.20	175.71

Well ID	Top of Pipe Elevation	Ground Surface Elevation	Well Stick Up (m)	15-May-18			14-Jun-18			18-Jul-18			01-Aug-18		
				Depth to Water (mbtop)	Depth to Water (mbgs)	Groundwater Elevation (masl)	Depth to Water (mbtop)	Depth to Water (mbgs)	Groundwater Elevation (masl)	Depth to Water (mbtop)	Depth to Water (mbgs)	Groundwater Elevation (masl)	Depth to Water (mbtop)	Depth to Water (mbgs)	Groundwater Elevation (masl)
MW17-1S	182.86	182.07	0.95	2.20	1.25	179.87	2.47	1.52	179.60	2.68	1.73	179.39	2.74	1.79	179.33
MW17-1D	182.92	181.99	0.95	6.45	5.50	175.54	6.72	5.77	175.27	6.88	5.93	175.11	6.97	6.02	175.02
MW17-2S	182.85	181.70	0.98	2.68	1.70	179.02	2.60	1.62	179.10	2.57	1.59	179.13	2.58	1.60	179.12
MW17-2D	182.64	181.70	0.99	7.35	6.36	174.35	7.79	6.80	173.91	7.83	6.84	173.87	7.91	6.92	173.79
MW17-3S	183.05	182.06	1.00	4.58	3.58	177.48	4.47	3.47	177.59	4.43	3.43	177.63	4.42	3.42	177.64
MW17-3D	183.00	181.99	0.94	7.15	6.21	174.84	7.47	6.53	174.52	7.44	6.50	174.55	7.61	6.67	174.38
MW17-4S	183.47	182.53	0.92	6.10	5.18	176.43	6.11	5.19	176.42	6.14	5.22	176.39	6.13	5.21	176.40
MW17-4D	183.40	182.51	0.91	8.25	7.34	174.26	8.85	7.94	173.66	8.98	8.07	173.53	9.07	8.16	173.44
MW17-5S	183.63	182.58	0.98	8.13	7.15	174.45	8.31	7.33	174.27	8.47	7.49	174.11	8.51	7.53	174.07
MW17-5D	183.64	182.56	1.00	13.03	12.03	169.53	13.49	12.49	169.07	13.68	12.68	168.88	13.76	12.76	168.80
MW17-6S	182.77	181.79	0.92	9.47	8.55	172.32	9.75	8.83	172.04	9.95	9.03	171.84	9.99	9.07	171.80
MW17-6D	182.84	181.83	1.04	7.12	6.08	174.71	7.73	6.69	174.10	7.83	6.79	174.00	7.93	6.89	173.90
MW17-7S	182.36	181.37	0.98	6.50	5.52	174.87	6.73	5.75	174.64	6.87	5.89	174.50	6.94	5.96	174.43
MW17-7D	182.43	181.39	1.04	9.36	8.32	172.03	9.71	8.67	171.68	9.92	8.88	171.47	10.01	8.97	171.38
MW17-8S	182.59	181.46	1.11	5.42	4.31	176.04	5.77	4.66	175.69	6.05	4.94	175.41	6.11	5.00	175.35
MW17-8D	182.49	181.39	1.00	9.49	8.49	171.90	9.67	8.67	171.72	9.88	8.88	171.51	9.96	8.96	171.43
MW17-9S	181.71	180.71	0.94	3.99	3.05	176.72	4.43	3.49	176.28	4.76	3.82	175.95	4.90	3.96	175.81
MW17-9D	181.73	180.75	0.96	7.50	6.54	173.25	7.91	6.95	172.84	8.10	7.14	172.65	8.22	7.26	172.53
MW17-10S	182.86	181.94	0.96	6.81	5.85	175.13	6.80	5.84	175.14	6.77	5.81	175.17	6.81	5.85	175.13
MW17-10D	183.04	181.96	1.05	6.38	5.33	175.58	6.77	5.72	175.19	6.91	5.86	175.05	7.00	5.95	174.96

GOLDER

Well ID	Top of Pipe Elevation	Ground Surface Elevation	Well Stick Up (m)	05-Sep-18			18-Oct-18			15-Nov-18			05-Dec-18		
				Depth to Water (mbtop)	Depth to Water (mbgs)	Groundwater Elevation (masl)	Depth to Water (mbtop)	Depth to Water (mbgs)	Groundwater Elevation (masl)	Depth to Water (mbtop)	Depth to Water (mbgs)	Groundwater Elevation (masl)	Depth to Water (mbtop)	Depth to Water (mbgs)	Groundwater Elevation (masl)
MW17-1S	182.86	182.07	0.95	2.92	1.97	179.15	3.16	2.21	178.91	3.25	2.30	178.82	3.32	2.37	178.75
MW17-1D	182.92	181.99	0.95	6.90	5.95	175.09	6.75	5.80	175.24	6.32	5.37	175.67	6.10	5.15	175.89
MW17-2S	182.85	181.70	0.98	2.48	1.50	179.22	2.35	1.37	179.35	2.30	1.32	179.40	2.31	1.33	179.39
MW17-2D	182.64	181.70	0.99	7.85	6.86	173.85	7.75	6.76	173.95	7.40	6.41	174.30	7.23	6.24	174.47
MW17-3S	183.05	182.06	1.00	4.38	3.38	177.68	4.74	3.74	177.32	5.06	4.06	177.00	5.21	4.21	176.85
MW17-3D	183.00	181.99	0.94	7.60	6.66	174.39	7.54	6.60	174.45	7.29	6.35	174.70	7.18	6.24	174.81
MW17-4S	183.47	182.53	0.92	6.15	5.23	176.38	6.14	5.22	176.39	6.18	5.26	176.35	6.18	5.26	176.35
MW17-4D	183.40	182.51	0.91	9.12	8.21	173.39	9.15	8.24	173.36	8.80	7.89	173.71	8.74	7.83	173.77
MW17-5S	183.63	182.58	0.98	8.55	7.57	174.03	8.45	7.47	174.13	8.25	7.27	174.33	8.20	7.22	174.38
MW17-5D	183.64	182.56	1.00	13.94	12.94	168.62	14.07	13.07	168.49	14.07	13.07	168.49	14.07	13.07	168.49
MW17-6S	182.77	181.79	0.92	9.99	9.07	171.80	9.93	9.01	171.86	9.80	8.88	171.99	9.92	9.00	171.87
MW17-6D	182.84	181.83	1.04	7.93	6.89	173.90	7.93	6.89	173.90	7.59	6.55	174.24	7.50	6.46	174.33
MW17-7S	182.36	181.37	0.98	6.88	5.90	174.49	6.72	5.74	174.65	6.49	5.51	174.88	6.47	5.49	174.90
MW17-7D	182.43	181.39	1.04	10.12	9.08	171.27	10.11	9.07	171.28	10.05	9.01	171.34	10.01	8.97	171.38
MW17-8S	182.59	181.46	1.11	5.97	4.86	175.49	5.70	4.59	175.76	5.31	4.20	176.15	5.25	4.14	176.21
MW17-8D	182.49	181.39	1.00	10.02	9.02	171.37	9.99	8.99	171.40	9.86	8.86	171.53	9.82	8.82	171.57
MW17-9S	181.71	180.71	0.94	4.68	3.74	176.03	4.32	3.38	176.39	3.90	2.96	176.81	3.78	2.84	176.93
MW17-9D	181.73	180.75	0.96	8.23	7.27	172.52	8.13	7.17	172.62	7.96	7.00	172.79	7.88	6.92	172.87
MW17-10S	182.86	181.94	0.96	6.80	5.84	175.14	6.80	5.84	175.14	6.80	5.84	175.14	6.80	5.84	175.14
MW17-10D	183.04	181.96	1.05	6.93	5.88	175.03	6.80	5.75	175.16	6.36	5.31	175.60	6.17	5.12	175.79
Race Track		NA	0.67	-	-	-	-	-	-	-	-	-	4.47	3.80	NA

Well ID	Top of Pipe Elevation	Ground Surface Elevation	Well Stick Up (m)	14-Jan-19			08-Mar-19			27-Mar-19			04-Apr-19		
				Depth to Water (mbtop)	Depth to Water (mbgs)	Groundwater Elevation (masl)	Depth to Water (mbtop)	Depth to Water (mbgs)	Groundwater Elevation (masl)	Depth to Water (mbtop)	Depth to Water (mbgs)	Groundwater Elevation (masl)	Depth to Water (mbtop)	Depth to Water (mbgs)	Groundwater Elevation (masl)
MW17-1S	182.86	182.07	0.95	2.84	1.89	180.02	2.65	1.70	180.21	1.91	0.96	180.95	1.86	0.91	181.00
MW17-1D	182.92	181.99	0.95	6.64	5.69	176.28	6.04	5.09	176.88	6.09	5.14	176.83	5.98	5.03	176.94
MW17-2S	182.85	181.70	0.98	2.39	1.41	180.46	2.41	1.43	180.44	2.44	1.46	180.41	2.42	1.44	180.43
MW17-2D	182.64	181.70	0.99	7.18	6.19	175.46	7.18	6.19	175.46	7.21	6.22	175.43	7.15	6.16	175.49
MW17-3S	183.05	182.06	1.00	5.60	4.60	177.45	5.75	4.75	177.30	5.66	4.66	177.39	5.63	4.63	177.42
MW17-3D	183.00	181.99	0.94	7.15	6.21	175.85	7.18	6.24	175.82	7.16	6.22	175.84	7.12	6.18	175.88
MW17-4S	183.47	182.53	0.92	6.12	5.20	177.35	6.13	5.21	177.34	6.11	5.19	177.36	6.10	5.18	177.37
MW17-4D	183.40	182.51	0.91	8.56	7.65	174.84	8.52	7.61	174.88	8.63	7.72	174.77	8.61	7.70	174.79
MW17-5S	183.63	182.58	0.98	8.19	7.21	175.44	8.25	7.27	175.38	8.17	7.19	175.46	8.10	7.12	175.53
MW17-5D	183.64	182.56	1.00	13.94	12.94	169.70	13.95	12.95	169.69	14.05	13.05	169.59	14.10	13.10	169.54
MW17-6S	182.77	181.79	0.92	9.93	9.01	172.84	9.95	9.03	172.82	9.96	9.04	172.81	9.98	9.06	172.79
MW17-6D	182.84	181.83	1.04	7.29	6.25	175.55	6.19	5.15	176.65	7.30	6.26	175.54	7.27	6.23	175.57
MW17-7S	182.36	181.37	0.98	6.48	5.50	175.88	6.54	5.56	175.82	6.44	5.46	175.92	6.39	5.41	175.97
MW17-7D	182.43	181.39	1.04	9.90	8.86	172.53	9.88	8.84	172.55	9.91	8.87	172.52	9.92	8.88	172.51
MW17-8S	182.59	181.46	1.11	5.30	4.19	177.29	5.40	4.29	177.19	5.22	4.11	177.37	5.16	4.05	177.43
MW17-8D	182.49	181.39	1.00	9.72	8.72	172.77	9.73	8.73	172.76	9.73	8.73	172.76	9.73	8.73	172.76
MW17-9S	181.71	180.71	0.94	3.78	2.84	177.93	3.80	2.86	177.91	3.60	2.66	178.11	3.51	2.57	178.20
MW17-9D	181.73	180.75	0.96	7.78	6.82	173.95	7.80	6.84	173.93	7.77	6.81	173.96	7.74	6.78	173.99
MW17-10S	182.86	181.94	0.96	6.80	5.84	176.06	6.84	5.88	176.02	6.79	5.83	176.07	6.79	5.83	176.07
MW17-10D	183.04	181.96	1.05	6.10	5.05	176.94	6.09	5.04	176.95	6.14	5.09	176.90	6.05	5.00	176.99
Race Track	NA	NA	0.67	5.13	4.46	-	4.28	3.61	-	4.21	3.54	-	3.85	3.18	NA

Well ID	Top of Pipe Elevation	Ground Surface Elevation	Well Stick Up (m)	27-May-19			05-Jun-19			10-Jul-19			13-Aug-19		
				Depth to Water (mbtop)	Depth to Water (mbgs)	Groundwater Elevation (masl)	Depth to Water (mbtop)	Depth to Water (mbgs)	Groundwater Elevation (masl)	Depth to Water (mbtop)	Depth to Water (mbgs)	Groundwater Elevation (masl)	Depth to Water (mbtop)	Depth to Water (mbgs)	Groundwater Elevation (masl)
MW17-1S	182.86	182.07	0.95	1.68	0.73	181.18	1.65	0.70	181.21	1.77	0.82	181.09	2.00	1.05	180.86
MW17-1D	182.92	181.99	0.95	6.13	5.18	176.79	6.20	5.25	176.72	6.28	5.33	176.64	6.61	5.66	176.31
MW17-2S	182.85	181.70	0.98	2.27	1.29	180.58	2.24	1.26	180.61	2.14	1.16	180.71	2.14	1.16	180.71
MW17-2D	182.64	181.70	0.99	7.27	6.28	175.37	7.31	6.32	175.33	7.38	6.39	175.26	7.65	6.66	174.99
MW17-3S	183.05	182.06	1.00	4.88	3.88	178.17	4.80	3.80	178.25	4.65	3.65	178.40	4.59	3.59	178.46
MW17-3D	183.00	181.99	0.94	7.13	6.19	175.87	7.15	6.21	175.85	7.16	6.22	175.84	7.34	6.40	175.66
MW17-4S	183.47	182.53	0.92	6.10	5.18	177.37	6.11	5.19	177.36	6.11	5.19	177.36	6.13	5.21	177.34
MW17-4D	183.40	182.51	0.91	8.82	7.91	174.58	8.89	7.98	174.51	8.98	8.07	174.42	9.23	8.32	174.17
MW17-5S	183.63	182.58	0.98	8.50	7.52	175.13	8.63	7.65	175.00	8.71	7.73	174.92	8.89	7.91	174.74
MW17-5D	183.64	182.56	1.00	14.52	13.52	169.12	14.60	13.60	169.04	14.82	13.82	168.82	15.01	14.01	168.63
MW17-6S	182.77	181.79	0.92	9.96	9.04	172.81	9.99	9.07	172.78	10.00	9.08	172.77	9.99	9.07	172.78
MW17-6D	182.84	181.83	1.04	7.40	6.36	175.44	7.47	6.43	175.37	7.51	6.47	175.33	7.77	6.73	175.07
MW17-7S	182.36	181.37	0.98	6.67	5.69	175.69	6.80	5.82	175.56	6.90	5.92	175.46	7.31	6.33	175.05
MW17-7D	182.43	181.39	1.04	10.03	8.99	172.40	10.12	9.08	172.31	10.24	9.20	172.19	10.52	9.48	171.91
MW17-8S	182.59	181.46	1.11	5.42	4.31	177.17	5.50	4.39	177.09	5.68	4.57	176.91	6.15	5.04	176.44
MW17-8D	182.49	181.39	1.00	9.91	8.91	172.58	10.02	9.02	172.47	10.16	9.16	172.33	10.50	9.50	171.99
MW17-9S	181.71	180.71	0.94	3.93	2.99	177.78	3.99	3.05	177.72	4.18	3.24	177.53	4.75	3.81	176.96
MW17-9D	181.73	180.75	0.96	7.94	6.98	173.79	8.04	7.08	173.69	8.18	7.22	173.55	8.55	7.59	173.18
MW17-10S	182.86	181.94	0.96	6.24	5.28	176.62	5.97	5.01	176.89	5.50	4.54	177.36	5.46	4.50	177.40
MW17-10D	183.04	181.96	1.05	6.19	5.14	176.85	6.25	5.20	176.79	6.32	5.27	176.72	6.64	5.59	176.40
Race Track	NA	NA	0.67	3.90	3.23	-	4.07	3.40	-	4.01	3.34	-	4.62	3.95	-

Well ID	Top of Pipe Elevation	Ground Surface Elevation	Well Stick Up (m)	10-Sep-19			11-Oct-19			06-Nov-19			23-Dec-19		
				Depth to Water (mbtop)	Depth to Water (mbgs)	Groundwater Elevation (masl)	Depth to Water (mbtop)	Depth to Water (mbgs)	Groundwater Elevation (masl)	Depth to Water (mbtop)	Depth to Water (mbgs)	Groundwater Elevation (masl)	Depth to Water (mbtop)	Depth to Water (mbgs)	Groundwater Elevation (masl)
MW17-1S	182.86	182.07	0.95	2.14	1.19	180.72	2.26	1.31	180.60	2.35	1.40	180.51	2.21	1.26	180.65
MW17-1D	182.92	181.99	0.95	6.58	5.63	176.34	6.54	5.59	176.38	6.18	5.23	176.74	5.78	4.83	177.14
MW17-2S	182.85	181.70	0.98	2.11	1.13	180.74	2.05	1.07	180.80	2.04	1.06	180.81	2.05	1.07	180.80
MW17-2D	182.64	181.70	0.99	7.62	6.63	175.02	7.58	6.59	175.06	7.33	6.34	175.31	7.02	6.03	175.62
MW17-3S	183.05	182.06	1.00	4.64	3.64	178.41	4.83	3.83	178.22	5.07	4.07	177.98	5.47	4.47	177.58
MW17-3D	183.00	181.99	0.94	7.31	6.37	175.69	7.35	6.41	175.65	7.18	6.24	175.82	6.99	6.05	176.01
MW17-4S	183.47	182.53	0.92	6.14	5.22	177.33	6.14	5.22	177.33	6.17	5.25	177.30	6.13	5.21	177.34
MW17-4D	183.40	182.51	0.91	9.20	8.29	174.20	9.43	8.52	173.97	9.17	8.26	174.23	8.84	7.93	174.56
MW17-5S	183.63	182.58	0.98	8.85	7.87	174.78	8.79	7.81	174.84	8.33	7.35	175.30	8.52	7.54	175.11
MW17-5D	183.64	182.56	1.00	14.95	13.95	168.69	15.17	14.17	168.47	15.22	14.22	168.42	15.35	14.35	168.29
MW17-6S	182.77	181.79	0.92	9.97	9.05	172.80	10.00	9.08	172.77	9.99	9.07	172.78	9.97	9.05	172.80
MW17-6D	182.84	181.83	1.04	7.72	6.68	175.12	7.84	6.80	175.00	7.61	6.57	175.23	7.26	6.22	175.58
MW17-7S	182.36	181.37	0.98	7.19	6.21	175.17	6.93	5.95	175.43	6.49	5.51	175.87	6.60	5.62	175.76
MW17-7D	182.43	181.39	1.04	10.46	9.42	171.97	10.47	9.43	171.96	10.37	9.33	172.06	10.35	9.31	172.08
MW17-8S	182.59	181.46	1.11	5.95	4.84	176.64	5.72	4.61	176.87	5.37	4.26	177.22	5.31	4.20	177.28
MW17-8D	182.49	181.39	1.00	10.40	9.40	172.09	10.37	9.37	172.12	10.23	9.23	172.26	10.26	9.26	172.23
MW17-9S	181.71	180.71	0.94	4.45	3.51	177.26	4.20	3.26	177.51	3.83	2.89	177.88	3.77	2.83	177.94
MW17-9D	181.73	180.75	0.96	8.38	7.42	173.35	8.30	7.34	173.43	8.10	7.14	173.63	8.06	7.10	173.67
MW17-10S	182.86	181.94	0.96	5.47	4.51	177.39	5.51	4.55	177.35	5.53	4.57	177.33	5.59	4.63	177.27
MW17-10D	183.04	181.96	1.05	6.60	5.55	176.44	6.58	5.53	176.46	6.24	5.19	176.80	5.83	4.78	177.21
Race Track	NA	NA	0.67	4.87	4.20	-	4.84	4.17	-	4.63	3.96	-	4.13	3.46	-

Well ID	Top of Pipe Elevation	Ground Surface Elevation	Well Stick Up (m)	13-Jan-20			13-Feb-20			29-May-20		
				Depth to Water (mbtop)	Depth to Water (mbgs)	Groundwater Elevation (masl)	Depth to Water (mbtop)	Depth to Water (mbgs)	Groundwater Elevation (masl)	Depth to Water (mbtop)	Depth to Water (mbgs)	Groundwater Elevation (masl)
MW17-1S	182.86	182.07	0.95	1.97	1.02	180.89	1.65	0.70	181.21	1.48	0.53	181.38
MW17-1D	182.92	181.99	0.95	5.56	4.61	177.36	5.50	4.55	177.42	5.97	5.02	176.95
MW17-2S	182.85	181.70	0.98	2.06	1.08	180.79	2.11	1.13	180.74	2.06	1.08	180.79
MW17-2D	182.64	181.70	0.99	6.85	5.86	175.79	6.79	5.80	175.85	7.24	6.25	175.40
MW17-3S	183.05	182.06	1.00	5.53	4.53	177.52	5.29	4.29	177.76	4.15	3.15	178.90
MW17-3D	183.00	181.99	0.94	6.90	5.96	176.10	6.89	5.95	176.11	7.34	6.40	175.66
MW17-4S	183.47	182.53	0.92	6.13	5.21	177.34	6.11	5.19	177.36	6.11	5.19	177.36
MW17-4D	183.40	182.51	0.91	8.65	7.74	174.75	8.57	7.66	174.83	9.21	8.30	174.19
MW17-5S	183.63	182.58	0.98	8.35	7.37	175.28	8.33	7.35	175.30	8.83	7.85	174.80
MW17-5D	183.64	182.56	1.00	15.19	14.19	168.45	15.18	14.18	168.46	16.40	15.40	167.24
MW17-6S	182.77	181.79	0.92	9.97	9.05	172.80	9.91	8.99	172.86	9.98	9.06	172.79
MW17-6D	182.84	181.83	1.04	7.04	6.00	175.80	6.91	5.87	175.93	7.50	6.46	175.34
MW17-7S	182.36	181.37	0.98	6.48	5.50	175.88	6.45	5.47	175.91	7.01	6.03	175.35
MW17-7D	182.43	181.39	1.04	10.25	9.21	172.18	10.18	9.14	172.25	10.84	9.80	171.59
MW17-8S	182.59	181.46	1.11	5.17	4.06	177.42	5.05	3.94	177.54	5.60	4.49	176.99
MW17-8D	182.49	181.39	1.00	10.15	9.15	172.34	10.08	9.08	172.41	10.66	9.66	171.83
MW17-9S	181.71	180.71	0.94	3.47	2.53	178.24	3.32	2.38	178.39	3.95	3.01	177.76
MW17-9D	181.73	180.75	0.96	7.90	6.94	173.83	7.83	6.87	173.90	8.54	7.58	173.19
MW17-10S	182.86	181.94	0.96	5.54	4.58	177.32	5.12	4.16	177.74	5.51	4.55	177.35
MW17-10D	183.04	181.96	1.05	6.61	5.56	176.43	5.54	4.49	177.50	5.79	4.74	177.25
Race Track	NA	NA	0.67	3.75	3.08	-	3.51	2.84	-	3.88	3.21	-

Parameters	Ontario Drinking Water Standards			Location	Overburden Monitoring Wells		Shallow Bedrock Monitoring Wells				Deep Bedrock Monitoring Wells					
					MW17-1S	MW17-2S	MW17-4S	MW17-6S	MW17-8S	MW17-9S	MW17-1D	MW17-3D	MW17-6D	MW17-8D	MW17-9D	MW17-10D
	Health	AO	OG	Units	10-Apr-17	11-Apr-17	10-Apr-17	10-Apr-17	10-Apr-17	10-Apr-17	10-Apr-17	10-Apr-17	10-Apr-17	10-Apr-17	10-Apr-17	10-Apr-17
General Parameters																
pH			6.5 to 8.5	pH	8.15	8.04	7.8	7.82	7.81	7.85	7.58	7.77	7.79	7.65	7.78	7.51
Conductivity				umho/cm	1200	960	1200	1200	1000	1800	2100	1200	980	2800	2900	2000
Total Suspended Solids				mg/L	9000	1900	1300	1900	1900	270	630	970	2100	170	38	240
Total Dissolved Solids		500		mg/L	**670**	**590**	**740**	**740**	**590**	**980**	**1500**	**680**	**600**	**2300**	**2200**	**1600**
Hardness (CaCO3)			100	mg/L	*220*	*410*	*650*	*540*	*470*	*730*	*1200*	*560*	*450*	*1500*	*1200*	*1200*
Nutrients/Organic Indicators																
Total Ammonia				mg/L	0.43	0.25	0.093	0.5	0.44	0.14	1.3	0.5	0.96	2.5	3.7	0.58
Nitrite	1			mg/L	<0.050	<0.010	0.39	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Nitrate	10			mg/L	0.58	<0.10	1.46	<0.10	<0.10	1.34	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Nitrate + Nitrite	10			mg/L	0.58	<0.10	1.85	<0.10	<0.10	1.34	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Dissolved Organic Carbon		5		mg/L	4.7	**5.9**	1.8	1.9	2.9	2.1	0.46	1.7	0.57	1.8	1	1
Orthophosphate				mg/L	0.017	<0.010	<0.010	<0.010	0.015	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Major and Minor Ions																
Alkalinity (Total as CaCO3)			500	mg/L	200	320	410	310	340	410	290	380	270	320	310	310
Calcium				mg/L	49	79	110	120	91	110	320	120	120	440	350	360
Chloride		250		mg/L	19	18	18	62	40	200	20	36	28	36	98	21
Magnesium				mg/L	25	51	90	57	59	110	84	61	39	100	88	81
Potassium				mg/L	4	3.4	3	5.3	2.9	3.1	11	5	7.8	17	22	5.8
Sodium		200		mg/L	160	46	18	31	28	79	36	19	13	83	170	19
Sulphate		500		mg/L	280	190	240	270	160	220	**880**	190	220	**1400**	**1200**	**910**
Anion Sum				me/L	10.4	10.8	13.9	13.5	11.3	18.5	24.7	12.5	10.8	36.8	34.2	25.6
Cation Sum				me/L	11.7	10.3	13.8	12.4	10.7	18	25	12.2	9.81	34.7	33.3	25.6
Dissolved Metals																
Aluminum			0.1	mg/L	0.018	0.0065	0.0094	0.0069	0.0077	0.0059	0.0059	0.0057	0.0078	0.0078	0.016	<0.0050
Antimony	0.006			mg/L	0.0017	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Arsenic	0.025			mg/L	0.0028	<0.0010	<0.0010	<0.0010	0.001	<0.0010	<0.0010	<0.0010	<0.0010	0.001	<0.0010	<0.0010
Barium	1			mg/L	0.076	0.065	0.071	0.019	0.023	0.023	0.016	0.01	0.0051	0.015	0.0094	0.0073
Beryllium				mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Boron	5			mg/L	0.19	0.28	0.11	0.38	0.22	0.096	1.6	0.2	0.5	2.4	3.9	0.39
Cadmium	0.005			mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Chromium	0.05			mg/L	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Cobalt				mg/L	<0.00050	<0.00050	0.00075	<0.00050	<0.00050	0.0012	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Copper	1			mg/L	0.003	0.0021	0.0011	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Iron	0.3			mg/L	<0.10	<0.10	<0.10	<0.10	0.13	<0.10	0.13	<0.10	<0.10	<0.10	<0.10	<0.10
Lead	0.01			mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Manganese		0.05		mg/L	0.017	**0.094**	**0.061**	0.012	0.021	0.031	0.011	0.0038	0.003	0.019	0.0084	0.0055
Molybdenum				mg/L	0.082	0.03	0.016	<0.00050	0.0019	0.0007	<0.00050	0.0014	<0.00050	<0.00050	<0.00050	<0.00050
Nickel				mg/L	0.0016	0.004	0.0067	<0.0010	0.0014	0.0022	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Phosphorus				mg/L	<0.10	<0.10	<0.10	<0.10	0.1	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Selenium	0.01		Oct-17	mg/L	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	0.002	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
Silicon				mg/L	2.8	3.3	3.9	5.6	3.9	4.4	7	10	7.5	3.9	4.1	8.1
Silver				mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Strontium				mg/L	1.8	5.1	2.2	7	3.2	3.5	12	15	14	10	8.1	11
Thallium				mg/L	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Titanium				mg/L	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Uranium	0.02			mg/L	0.011	0.0058	0.026	0.0006	0.0007	0.0036	<0.00010	0.00019	<0.00010	0.00054	0.00033	0.00011
Vanadium				mg/L	0.0021	0.00086	0.0012	<0.00050	0.00066	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Zinc		5		mg/L	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050

Notes:
ODWS-AO - Ontario Drinking Water Objectives - Aesthetic Objectives
ODWS-OG - Ontario Drinking Water Standards - Operational Guidelines
ODWS-Health - Ontario Drinking Water Standards - Health
Bold denotes an exceedance of the applicable ODWS - AO
Italicized denotes an exceedance of the applicable ODWS - OG
Underlined indicates an exceedance of the applicable ODWS - Health

GOLDER

Table 5 - Quarry Sump Quality Sample Results
Port Colborne Quarries

Parameters	Provincial Water Quality Objectives	Location	Quarry Sump
		Units	11-Apr-17
General Parameters			
pH		pH	7.93
Conductivity		umho/cm	1300
Turbidity		NTU	1.5
Total Dissolved Solids		mg/L	870
Total Suspended Solids		mg/L	<3
Hardness (CaCO3)		mg/L	670
Nutrients/Organic Indicators			
Total Ammonia-N		mg/L	<0.050
Nitrite (N)		mg/L	<0.010
Nitrate (N)		mg/L	0.73
Nitrate + Nitrite (N)		mg/L	0.73
Total Organic Carbon (TOC)		mg/L	2.1
Orthophosphate (P)		mg/L	<0.010
Total Phosphorus	0.01	mg/L	0.005
Major and Minor Ions			
Alkalinity (Total as CaCO3)		mg/L	140
Calcium		mg/L	170
Chloride (Cl)		mg/L	45
Magnesium		mg/L	52
Potassium		mg/L	5.4
Sodium		mg/L	32
Sulphate (SO4)		mg/L	460
Total Metals			
Aluminum	0.075	mg/L	0.047
Antimony	0.02	mg/L	<0.00050
Arsenic	0.1	mg/L	<0.0010
Barium		mg/L	0.038
Beryllium	0.011	mg/L	<0.00050
Boron	0.2	mg/L	**0.24**
Cadmium	0.0002	mg/L	<0.00010
Chromium	0.0089	mg/L	<0.0050
Cobalt	0.0009	mg/L	<0.00050
Copper	0.005	mg/L	0.0014
Iron	0.3	mg/L	<0.10
Lead	0.005	mg/L	<0.00050
Manganese		mg/L	0.0046
Molybdenum	0.04	mg/L	0.0085
Nickel	0.025	mg/L	0.0049
Selenium	0.1	mg/L	<0.0020
Silicon		mg/L	1.5
Silver	0.0001	mg/L	<0.00010
Strontium		mg/L	4.8
Thallium	0.0003	mg/L	<0.000050
Titanium		mg/L	<0.0050
Vanadium	0.006	mg/L	<0.00050
Zinc	0.02	mg/L	<0.0050

GOLDER

Address		Water Supply			Well Details		Other Groundwater Related Issues/Complaints/Notes
		Number of Wells	Number of Cisterns	Municipal Water	Depth of Well	Water Description	
1645	2nd Concession	-	-	Yes	-	-	
2146	2nd Concession	2	-	Yes	-	Sulphurous	On city water, but use well water for chickens, have well tested semi-annual by Pinty`s
2261	2nd Concession	1	-	Yes	45'	Hard	On city water, but use well water for outdoor use and back-up, indicated previous E.coli contamination from neighbouring sheep farm property which no longer exists
2276	2nd Concession	-	-	Yes	-	-	
1326	Hwy 3	2	1	No	20'	Iron Staining	Does not drink water due to quality, has second well in barn which produces black water
2229	Hwy 3	-	1	No	-	-	
1379	Killaly Street	1	1	No	-	-	Well on property not connected
1384	Killaly Street	1	-	No	-	Sulphurous	Does not drink well water due to quality
1408	Killaly Street	1	-	No	-	Sulphurous & Hard	Water used for drinking, no problems, Culligan treatment, tested when salt is replaced
1430	Killaly Street	-	1	No	-	-	
1446	Killaly Street	-	1	No	-	-	
1739	Killaly Street	1	-	No	25'	Hard & Sulphurous	Previous issues with well due to mud in bottom of well
1740	Killaly Street	1	-	No	-	Sulphurous, Iron Staining & Salty	Owners recently purchased property 1 year ago, do not use water for drinking due to quality
1750	Killaly Street	1	-	No	21'	Iron Staining & Hard	Newly installed well, approximately 3 years ago
2015	Killaly Street	1	-	No	-	Hard & Sulphurous	Don`t use water from drinking due to taste, peroxide treatment in house for water, on occasion will dry out well due to high use
1359	Miller Road	1	-	No	55'	Iron Staining & Sulphurous	Do not use well water for drinking due to smell and floating black particles
1580	Miller Road	1	-	No	-	Hard & Iron Staining	Old well on site was decommissioned previously
1630	Miller Road	1	-	No	-	Sulphurous & Iron Staining	Do not use well water for drinking due to quality, but use it for livestock
1778	Miller Road	1	-	No	-	Sulphurous, Iron Staining & Hard	Do not use well water for drinking due to quality, drilled well most likely buried in backyard somewhere
1826	Miller Road	-	1	No	-	-	Possible well on property, owner unsure, use cistern
1903	Miller Road	1	-	No	40'	Sulphurous, Iron Staining & Hard	Water used for drinking, no problems, water is tested 3 to 4 times per year, reverse osmosis, softener and filters
2225	Miller Road	-	1	No	-	-	
2282	Miller Road	1	-	No	40'	Sulphurous & Hard	Owners recently purchased home 2 years ago, homeowner indicated issue with significant water loss in surface water pond at back of property
2391	Miller Road	1	-	No	65'	Hard	Newly constructed home, < 1 year
2439	Miller Road	2	1	No	-	-	Recently constructed home, owner aware of two wells on property that are not in use, may connect to them for future outdoor use
2478	Miller Road	1	-	No	-	Iron Staining	Owners recently purchased property 1 year ago
974	Weaver Road	1	-	No	-	Iron Staining & Hard	Do not use well water for drinking due to quality
1080	Weaver Road	1	1	No	15'	Sulphurous & Hard	Dug well used for outdoor use
1094	Weaver Road	-	1	No	-	-	
1162	Weaver Road	1	-	No	-	Fresh	No treatment
1030	Weaver Road						Not Participating
2506	Miller Road						Not Participating
1458	Killaly Street						Not Participating
1470	Killaly Street						Not Participating
1394	Killaly Street						Not Participating
1374	Killaly Street						Not Participating
1740	2nd Concession						No Response
2317	Miller Road						No Response
2322	Miller Road						No Response
2363	Miller Road						No Response
2394	Miller Road						No Response
2168	Miller Road						No Response
2187	Miller Road						No Response
1110	Weaver Road						No Response
1732	Miller Road						No Response
1498	Miller Road						No Response
1591	Miller Road						No Response
1728	Killaly Street						No Response
1716	Hwy 3						No Response

Totals

49	Surveys
49	Delivered
29	Responses
6	Not Participating
13	No Response
59%	Response Rate

Table 7 - MECP Wells within 1 km of Extraction Area
Port Colborne Quarries

Borehole ID	Well ID	Date Completed	Depth (m)	Depth to Bedrock (m)	Static Water Level (m)
1004120689	7185637	2012-07-20	0.00	0.00	0.00
1004120686	7185636	2012-07-15	18.90	0.00	3.00
11767154	7044668	2007-05-18	0.00	0.00	0.00
10460615	6600881	1960-09-23	4.90	1.80	1.50
10460604	6600870	1967-06-27	15.20	3.00	0.00
10460605	6600871	1967-11-30	17.40	7.30	0.30
10463804	6604207	1995-06-28	7.60	2.40	3.40
10462849	6603234	1977-10-05	7.60	2.40	0.60
1007456541	7333353	2019-04-28	9.10	0.00	2.10
10460712	6600978	1957-07-01	6.40	2.40	2.10
10462804	6603188	1976-12-14	6.10	2.10	0.90
10460719	6600985	1953-07-18	11.90	3.40	8.20
10460717	6600983	1952-05-13	4.60	2.40	0.60
10460713	6600979	1959-01-12	6.40	2.10	1.80
10462510	6602787	1973-10-10	7.30	0.60	1.50
1005035417	7225195	2014-07-11	6.40	0.00	2.10
10460705	6600971	1948-07-29	8.80	2.70	0.60
10460701	6600967	1966-11-09	9.10	4.60	1.80
10460704	6600970	1963-10-23	16.80	13.70	10.70
10460714	6600980	1961-06-19	6.10	0.60	0.90
10460718	6600984	1952-07-26	6.40	3.00	1.20
10536270	6604662	2002-06-09	10.10	3.00	0.60
10463391	6603793	1988-01-25	10.70	5.80	0.90
10460711	6600977	1951-11-20	19.20	1.80	5.20
10460700	6600966	1965-05-20	8.50	3.70	0.60
10460699	6600965	1956-06-06	6.70	2.40	1.50
10460708	6600974	1958-05-27	12.20	7.90	2.40
1006223490	7269706	2016-08-05	18.90	0.00	5.20
10460710	6600976	1951-07-12	9.10	0.90	2.40
10460709	6600975	1949-09-25	9.10	0.90	3.70
10463253	6603653	1985-07-09	6.10	4.00	2.70
10462509	6602786	1973-10-13	10.10	4.30	1.20
10460706	6600972	1952-03-21	9.10	5.80	2.40
10462508	6602785	1973-09-18	18.30	4.00	3.00
10462432	6602706	1972-09-19	7.00	2.10	2.40
10463936	6604339	1999-03-01	6.70	2.40	0.90
10463921	6604324	1998-08-22	14.60	1.20	6.10
10463656	6604059	1992-01-04	13.40	11.30	4.90
10463676	6604079	1992-08-24	90.80	10.10	0.00
10463675	6604078	1992-08-21	90.80	14.00	12.80
10463103	6603494	1981-07-23	30.80	7.30	7.00
10463104	6603495	1982-01-22	24.40	11.90	10.70
10463101	6603492		24.40	11.90	10.70
10462512	6602789	1973-10-20	11.60	3.40	4.90
10462612	6602990	1974-09-05	12.20	8.20	4.90
10462394	6602667	1972-05-27	13.70	6.40	2.10
10462286	6602558	1970-10-28	13.70	5.80	2.40
10460707	6600973	1954-08-14	7.30	6.40	3.00
10462513	6602790	1973-10-17	16.10	8.50	4.00
10460703	6600969	1954-05-21	9.40	7.60	2.40
1004060730	7184673	2012-07-04	0.00	0.00	7.60
10460702	6600968	1949-08-28	13.70	9.10	7.60
10460828	6601094	1947-08-06	8.50	4.30	8.50
10464119	6604522	2000-09-07	12.80	0.90	0.00
10460826	6601092	1965-11-13	12.80	8.80	6.10
10460834	6601100	1959-03-11	10.10	5.80	3.70
10460827	6601093	1966-10-06	12.50	8.20	6.70
10464118	6604521	2000-09-09	14.30	0.90	0.00
1006991669	7306395	2018-01-26	0.00	0.00	0.00
10462705	6603087	1975-06-16	22.60	10.70	6.70
10463270	6603670	1985-10-17	19.50	0.00	8.20
10460833	6601099	1959-03-06	9.40	5.20	3.00
10462992	6603379	1979-09-26	16.80	0.00	8.50
10460836	6601102	1961-07-08	8.80	4.90	2.40
10463603	6604006	1991-07-10	6.40	1.20	0.00
10462916	6603301	1978-05-11	17.40	9.80	6.70
10460825	6601091	1958-05-29	7.90	3.70	2.40
10463604	6604007	1991-07-09	7.90	1.80	0.00
10463605	6604008	1991-07-08	7.00	0.00	0.00
10462805	6603189	1976-12-15	7.60	3.40	1.20
10460837	6601103	1962-04-04	8.20	3.70	1.20
1006081749	7265731	2016-06-14	18.90	0.00	3.40
10460838	6601104	1965-09-04	9.40	2.40	3.70
10462708	6603090	1975-08-07	9.10	2.40	1.80

Notes
All depths recorded in metres

Table 8 - Proposed Extension Monitoring Locations
Port Colborne Quarries

<table>
<tr><th>Monitoring Well ID</th><th>Groundwater Level Monitoring</th><th>Groundwater Sampling</th><th>Analytical Parameters</th></tr>
<tr><td>MW17-1S</td><td>X</td><td>X</td><td rowspan="23">General Chemistry
pH, EC, TSS, TDS, Hardness

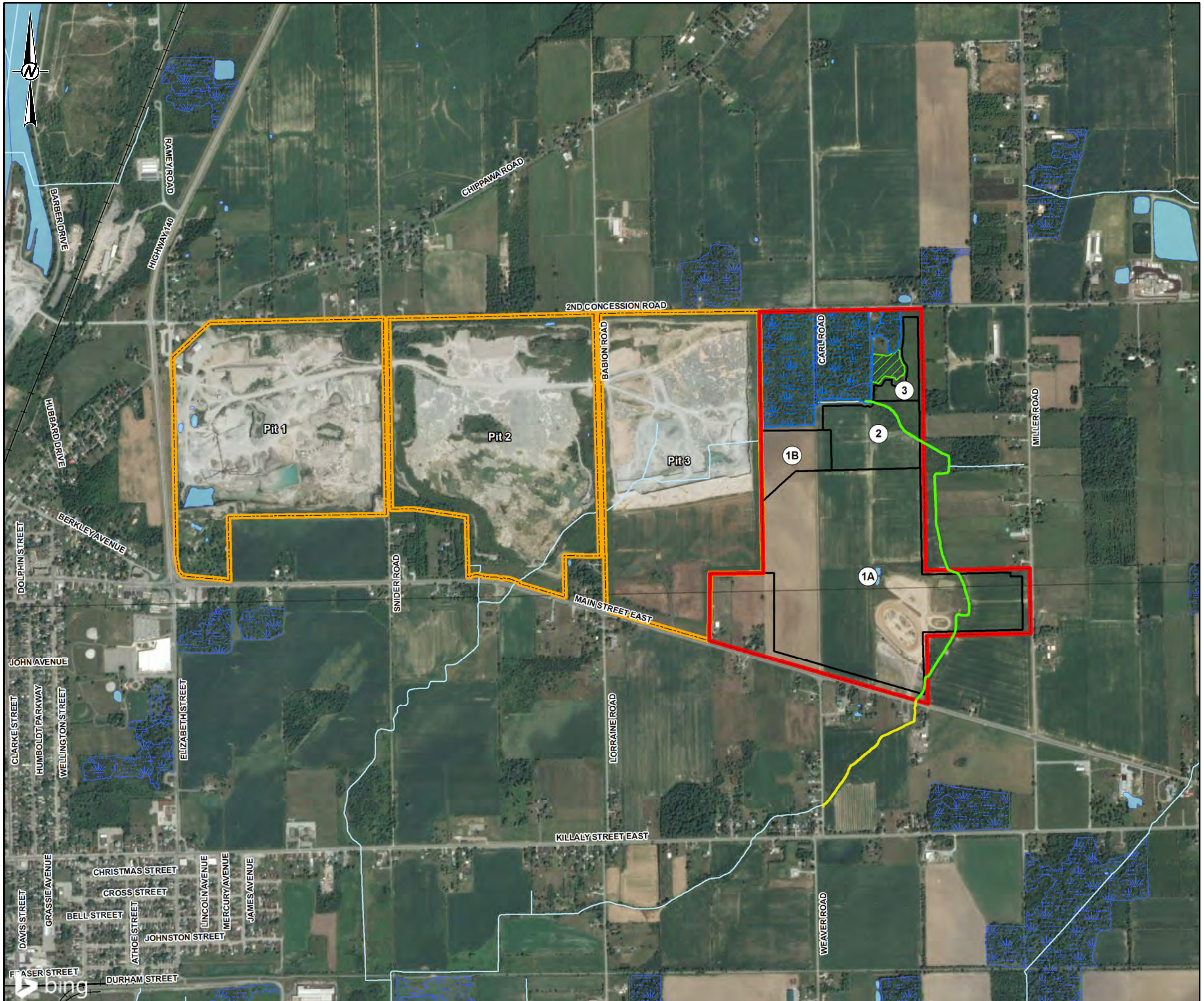
Nutrients/Organic Indicators
Total ammonia, Nitrate, Nitrite, DOC, Orthophosphate

Major and Minor Ions
Akalinity, calcium, chloride, magnesium, potassium, sodium, sulphate, hydrogen sulphide, anion sum, cation sum

Dissolved Metals
aluminum, antimony, arsenic, barium, beryllium, boron, cadmium, chromium, cobalt, copper, iron, lead, manganese, molybdenum, nickel, phosphorous, selenium, silicon, silver, strontium, thallium, titanium, uranium, vanadium, zinc</td></tr>
<tr><td>MW17-1D</td><td>X</td><td>X</td></tr>
<tr><td>MW17-2S</td><td>X</td><td>X</td></tr>
<tr><td>MW17-2D</td><td>X</td><td>X</td></tr>
<tr><td>MW17-3S</td><td>X</td><td>X</td></tr>
<tr><td>MW17-3D</td><td>X</td><td>X</td></tr>
<tr><td>MW17-4S</td><td>X</td><td>X</td></tr>
<tr><td>MW17-4D</td><td>X</td><td>X</td></tr>
<tr><td>MW17-5S</td><td>X</td><td>X</td></tr>
<tr><td>MW17-5D</td><td>X</td><td>X</td></tr>
<tr><td>MW17-6S</td><td>X</td><td>X</td></tr>
<tr><td>MW17-6D</td><td>X</td><td>X</td></tr>
<tr><td>MW17-7S</td><td>X</td><td>X</td></tr>
<tr><td>MW17-7D</td><td>X</td><td>X</td></tr>
<tr><td>MW17-8S</td><td>X</td><td>X</td></tr>
<tr><td>MW17-8D</td><td>X</td><td>X</td></tr>
<tr><td>MW17-9S</td><td>X</td><td>X</td></tr>
<tr><td>MW17-9D</td><td>X</td><td>X</td></tr>
<tr><td>MW17-10S</td><td>X</td><td>X</td></tr>
<tr><td>MW17-10D</td><td>X</td><td>X</td></tr>
<tr><td>New Monitoring Well A</td><td>X</td><td>X</td></tr>
<tr><td>New Monitoring Well B</td><td>X</td><td>X</td></tr>
<tr><td>New Monitoring Well C</td><td>X</td><td>X</td></tr>
</table>

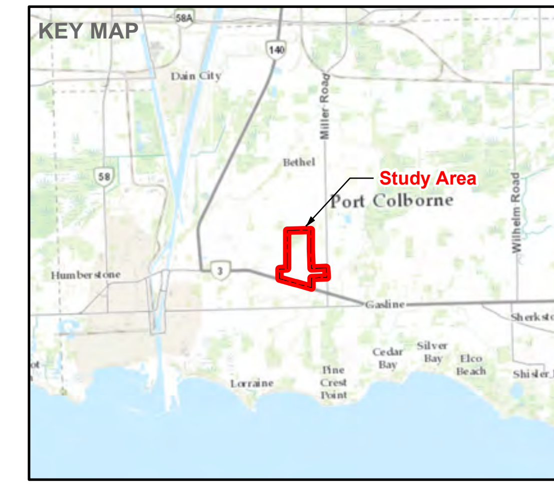
Notes:
Groundwater levels measured on a monthly basis
Groundwater quality monitoring conducted every five years
Three new monitoring wells will be installed along eastern property boundary

FIGURES



LEGEND

- ① Excavation Phase
- Roads
- Railway
- Wignell Drain (formerly Mitchner Drain)
- Mitchner Drain
- Watercourse
- Waterbody
- Wetland
- Woodland
- Property Boundary
- Proposed Quarry Extension
- Approximate Excavation Phasing Boundary



0 500 1,000

1:15,000 Meters

NOTE(S)

REFERENCE(S)
1. BASE DATA: MNRF LIO 2016
2. IMAGERY: SOURCES: ESRI, HERE, GARMIN, INTERMAP, INCREMENT P CORP., GEBCO, USGS, FAO, NPS, NRCAN, GEOBASE, IGN, KADASTER NL, ORDNANCE SURVEY, ESRI JAPAN, METI, ESRI CHINA (HONG KONG), (C) OPENSTREETMAP CONTRIBUTORS, AND THE GIS USER COMMUNITY
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3. PROJECTION: TRANSVERSE MERCATOR NAD 1983 UTM ZONE 17N

CLIENT
RANKIN CONSTRUCTION

PROJECT
PROPOSED PORT COLBORNE QUARRY EXTENSION

TITLE
SITE LOCATION PLAN

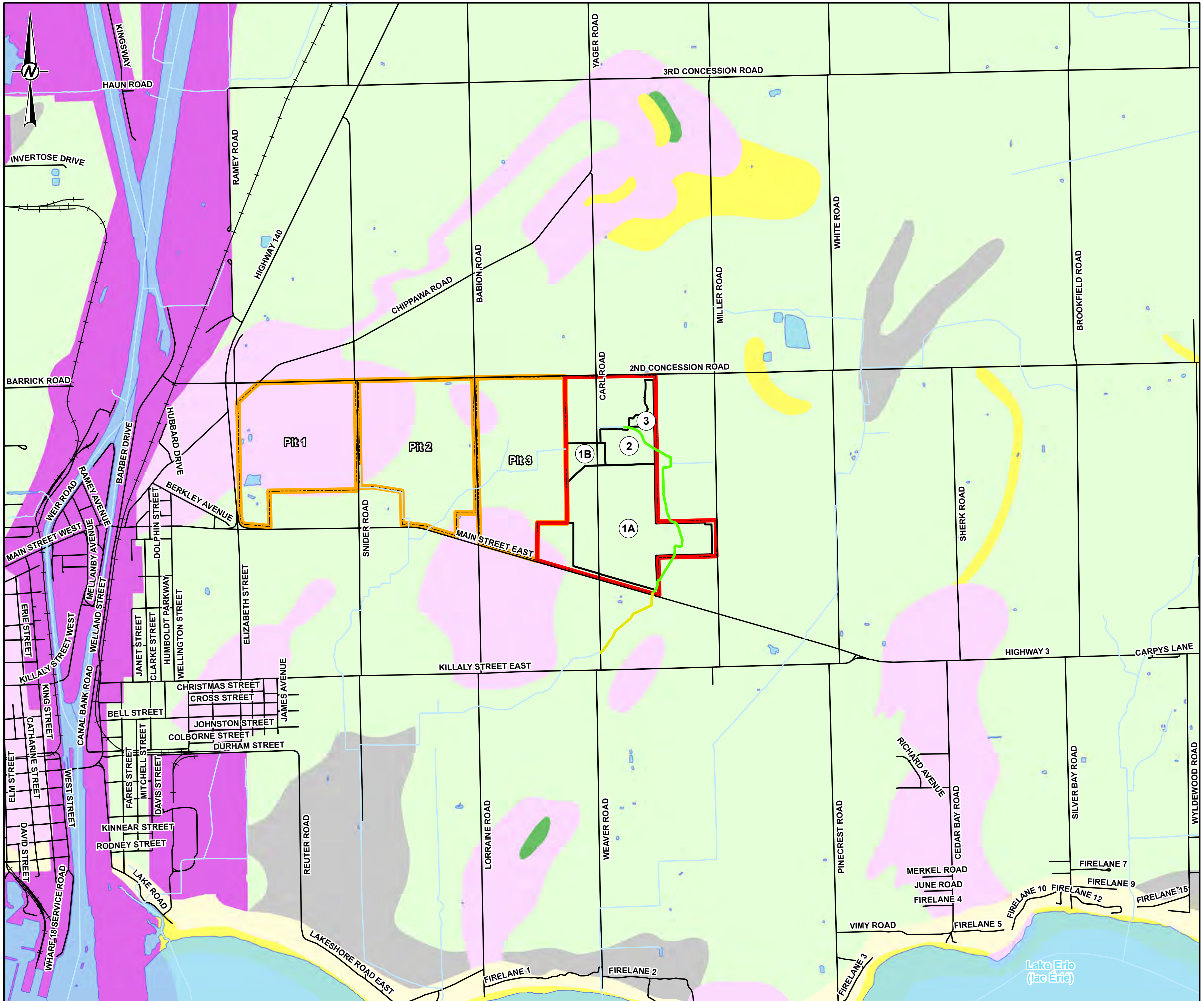
CONSULTANT

GOLDER

YYYY-MM-DD	2020-09-03
DESIGNED	PR
PREPARED	PR
REVIEWED	BZ
APPROVED	SM

PROJECT NO.	CONTROL	REV.	FIGURE
1771656	0018		1

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM:



LEGEND

1 Excavation Phase

Roads

Railway

Wignell Drain (formerly Mitchner Drain)

Mitchner Drain

Watercourse

Waterbody

Property Boundary

Proposed Quarry Extension

Approximate Excavation Phasing Boundary

Surficial Geology

3: Paleozoic bedrock

5d: Glaciolacustrine-derived silty to clayey till

8a: Glaciolacustrine Massive-well laminated Clay and Silt

9: Coarse-textured glaciolacustrine deposits

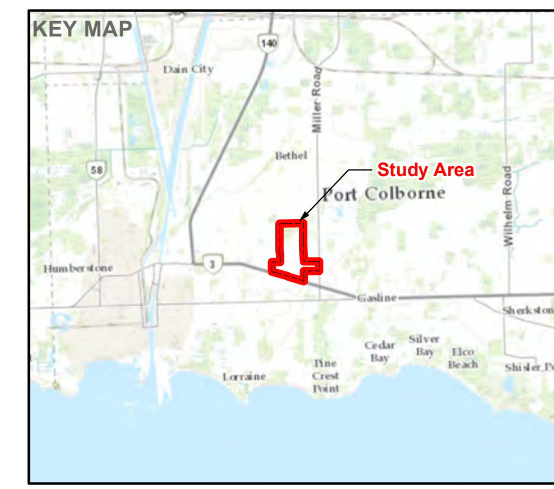
9b: Littoral-foreshore deposits

14b: Littoral-foreshore deposits

17: Eolian deposits

20: Organic deposits

21: Man-made deposits



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1:26,900 Kilometers

NOTE(S)

REFERENCE(S)

1. BASE DATA: MNRF LIO 2016
2. IMAGERY: SOURCES: ESRI, HERE, DELORME, INTERMAP, INCREMENT P CORP., GEBCO, USGS, FAO, NPS, NRCAN, GEOBASE, IGN, KADASTER NL, ORDNANCE SURVEY, ESRI JAPAN, METI, ESRI CHINA (HONG KONG), SWISSTOPO, MAPMYINDIA, © OPENSTREETMAP CONTRIBUTORS, AND THE GIS USER COMMUNITY
2. PROJECTION: TRANSVERSE MERCATOR NAD 1983 UTM ZONE 17N

CLIENT
RANKIN CONSTRUCTION

PROJECT
PROPOSED PORT COLBORNE QUARRY EXTENSION

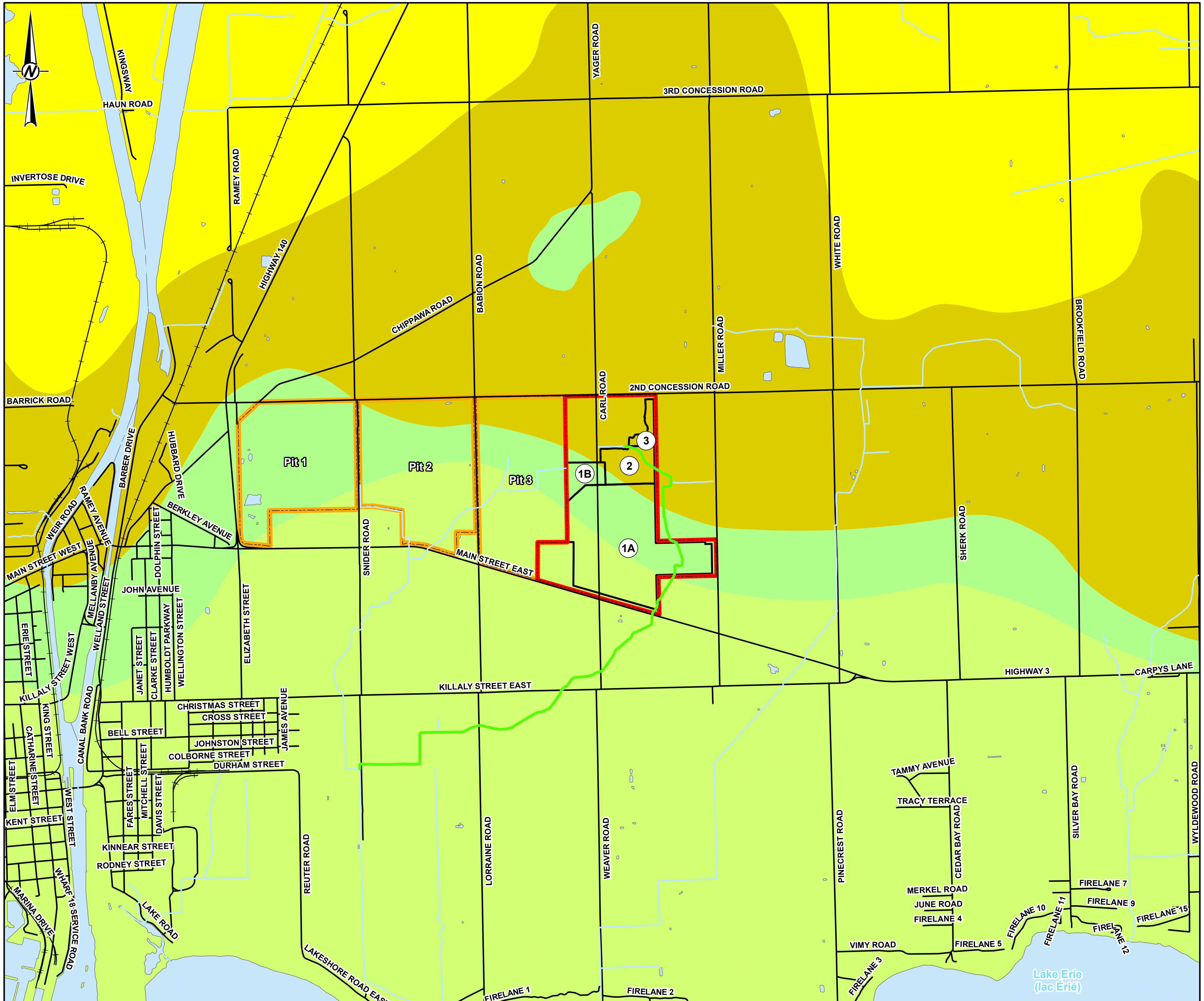
TITLE
REGIONAL SURFICIAL GEOLOGY

CONSULTANT

GOLDER

YYYY-MM-DD	2020-09-03
DESIGNED	PR
PREPARED	PR
REVIEWED	BZ
APPROVED	SM

PROJECT NO.	CONTROL	REV.	FIGURE
1771656	0018		2

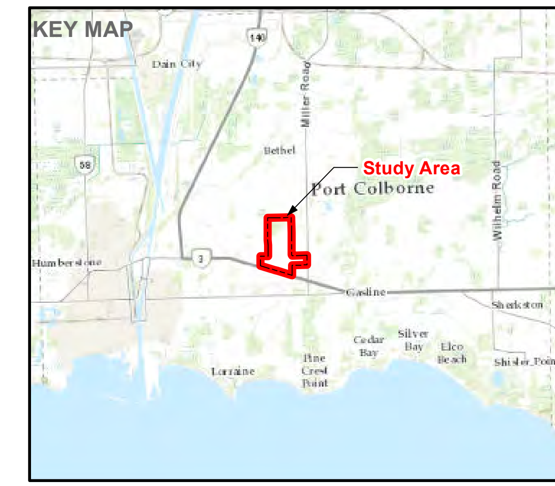


LEGEND

- 1 Excavation Phase
- Roads
- Railway
- Wignell Drain (formerly Mitchner Drain)
- Mitchner Drain
- Watercourse
- Waterbody
- Property Boundary
- Proposed Quarry Extension
- Approximate Excavation Phasing Boundary

Bedrock Geology

- 22: Bertie
- 25: Bois Blanc
- 26c: Clarence
- 26b: Edgecliffe
- 26d: Moorehouse
- 21: Salina



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NOTE(S)

REFERENCE(S)
1. BASE DATA: MNRF LIO 2016
2. IMAGERY: SOURCES: ESRI, HERE, DELORME, INTERMAP, INCREMENT P CORP., GEBCO, USGS, FAO, NPS, NRCAN, GEOBASE, IGN, KADASTER NL, ORDNANCE SURVEY, ESRI JAPAN, METI, ESRI CHINA (HONG KONG), SWISSTOPO, MAPMYINDIA, © OPENSTREETMAP CONTRIBUTORS, AND THE GIS USER COMMUNITY
3. GEOLOGY DATA: ARMSTRONG, D.K. 2017. PALEOZOIC GEOLOGY OF THE WELLAND–FORT ERIE AREA, SOUTHERN ONTARIO; ONTARIO GEOLOGICAL SURVEY, PRELIMINARY MAP P .3811, SCALE 1:50 000
4. PROJECTION: TRANSVERSE MERCATOR NAD 1983 UTM ZONE 17N

CLIENT
RANKIN CONSTRUCTION

PROJECT
PROPOSED PORT COLBORNE QUARRY EXTENSION

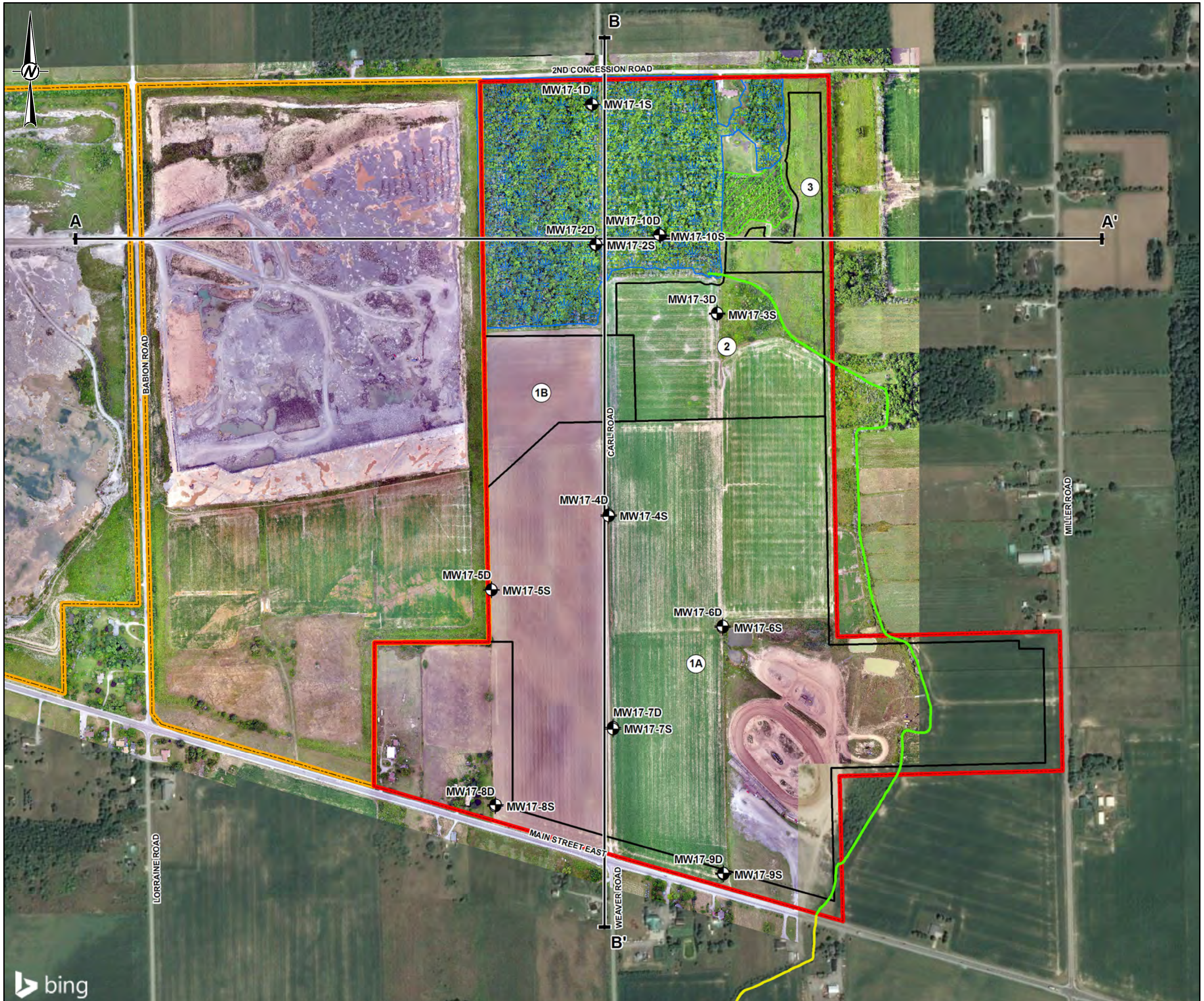
TITLE
REGIONAL BEDROCK GEOLOGY

CONSULTANT

GOLDER

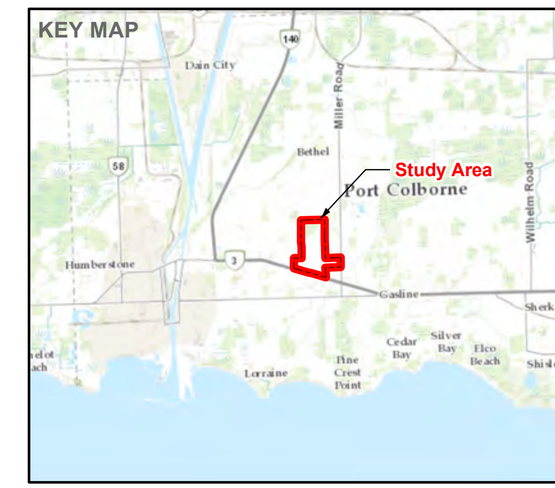
YYYY-MM-DD	2021-09-29
DESIGNED	PR
PREPARED	PR
REVIEWED	BZ
APPROVED	SM

PROJECT NO.	CONTROL	REV.	FIGURE
1771656	0018		3



LEGEND

- 1 Excavation Phase
- Monitoring Well
- Cross Sections
- Wignell Drain (formerly Mitchner Drain)
- Mitchner Drain
- Wetland
- Woodland
- Property Boundary
- Proposed Quarry Extension
- Approximate Excavation Phasing Boundary



0 200 400

1:7,000 Meters

NOTE(S)

REFERENCE(S)

1. BASE DATA: MNRF LIO 2016
2. IMAGERY: ORTHOIMAGE PROVIDED BY IBI GROUP. SITE FLOWN JULY 29TH, 2018
3. ADDITIONAL IMAGERY FROM SOURCES: ESRI, HERE, GARMIN, INTERMAP, INCREMENT P CORP., GEBCO, USGS, FAO, NPS, NRCAN, GEOBASE, IGN, KADASTER NL, ORDNANCE SURVEY, ESRI JAPAN, METI, ESRI CHINA (HONG KONG), (C) OPENSTREETMAP CONTRIBUTORS, AND THE GIS USER COMMUNITY

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4. PROJECTION: TRANSVERSE MERCATOR NAD 1983 UTM ZONE 17N

CLIENT
RANKIN CONSTRUCTION

PROJECT
PORT COLBORNE QUARRY EXTENSION

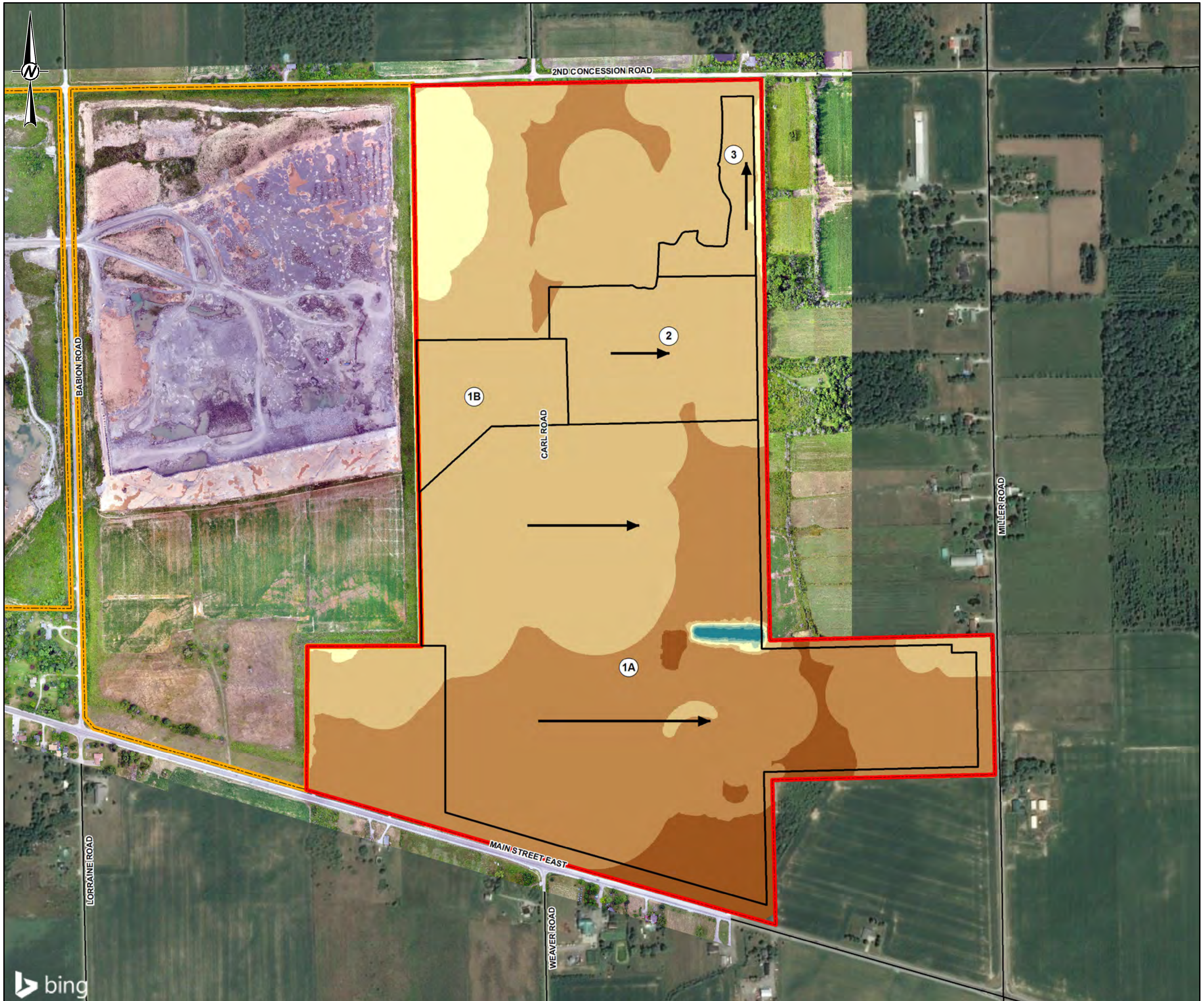
TITLE
BOREHOLE LOCATION PLAN

CONSULTANT
GOLDER

YYYY-MM-DD	2020-09-03
DESIGNED	PR
PREPARED	PR
REVIEWED	BZ
APPROVED	SM

PROJECT NO.	CONTROL	REV.	FIGURE
1771656	0018		4

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM:



LEGEND

- 1 Excavation Phase
- Property Boundary
- Proposed Quarry Extension
- Approximate Excavation Phasing Boundary
- Excavation Direction Arrow

Ground Surface Elevation (m)

- 180 - 181
- 181 - 182
- 182 - 183
- 183 - 184
- 184 - 185
- 185 - 186
- 186 - 187

0 0.2 0.4

1:7,000 Kilometers

NOTE(S)

REFERENCE(S)

1. IMAGERY: ORTHOIMAGE PROVIDED BY IBI GROUP. SITE FLOWN JULY 29TH, 2018
2. ADDITIONAL IMAGERY FROM ESRI, HERE, DELORME, INTERMAP, INCREMENT P CORP., GEBCO, USGS, FAO, NPS, NRCAN, GEOBASE, IGN, KADASTER NL, ORDNANCE SURVEY, ESRI JAPAN, METI, ESRI CHINA (HONG KONG), SWISSTOPO, MAPMYINDIA, © OPENSTREETMAP CONTRIBUTORS, AND THE GIS USER COMMUNITY
3. PROJECTION: TRANSVERSE MERCATOR NAD 1983 UTM ZONE 17N

CLIENT
RANKIN CONSTRUCTION

PROJECT
PORT COLBORNE QUARRY EXTENSION

TITLE
GROUND SURFACE ELEVATION

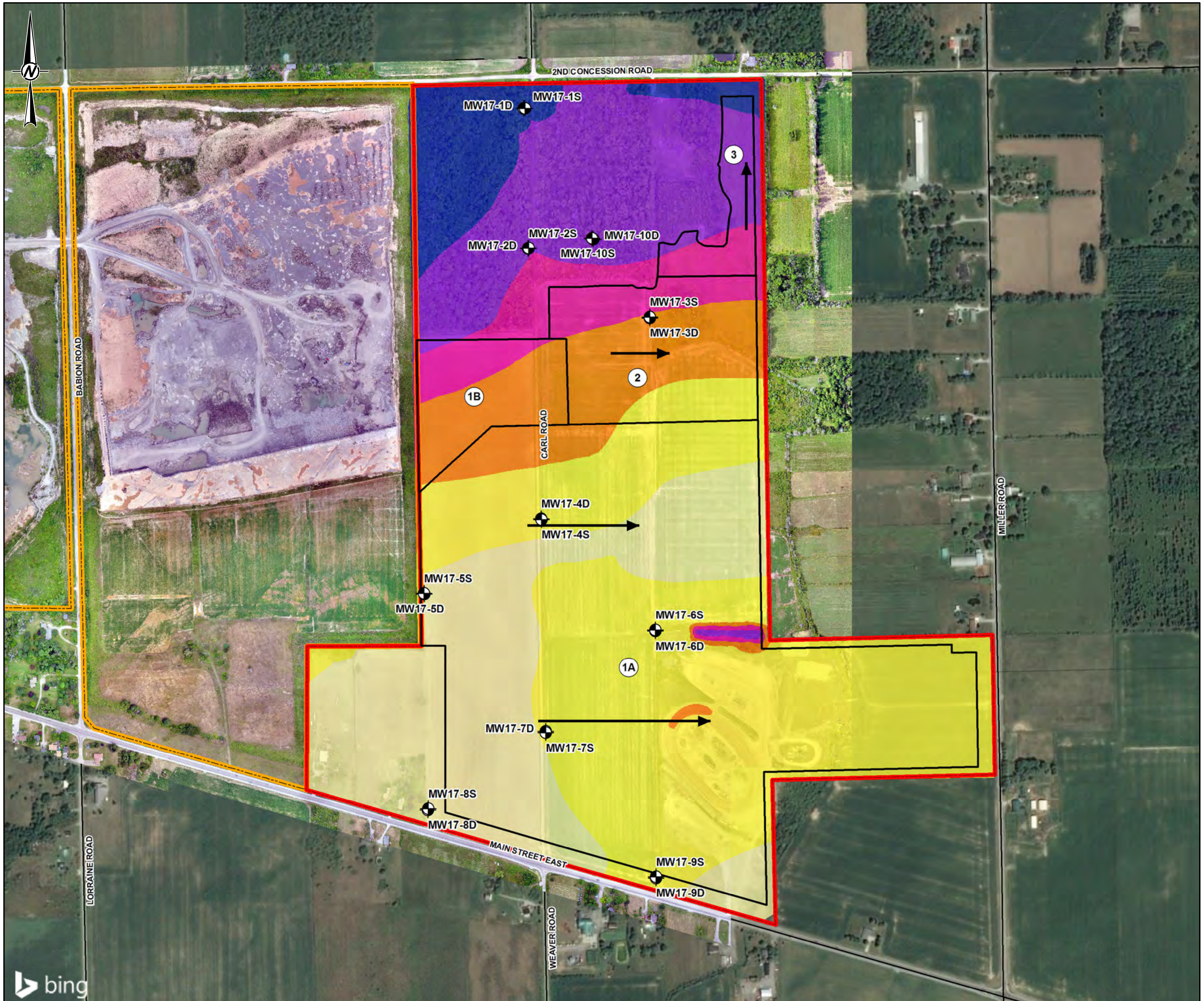
CONSULTANT

GOLDER

YYYY-MM-DD	2020-09-03
DESIGNED	PR
PREPARED	PR
REVIEWED	BZ
APPROVED	SM

PROJECT NO.	CONTROL	REV.	FIGURE
1771656	0018		5

25mm IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM:



LEGEND

- Excavation Phase
- Monitoring Well
- Property Boundary
- Proposed Quarry Extension
- Approximate Excavation Phasing Boundary
- Excavation Direction Arrow

Overburden Thickness (m)

- 0.5 - 2
- 2 - 4
- 4 - 6
- 6 - 8
- 8 - 10
- 10 - 12

0 0.2 0.4

1:7,000 Kilometers

NOTE(S)

1. CONTOURS WERE GENERATED BY EXTRAPOLATION FROM DATA POINTS ACROSS THE SITE AREA.

REFERENCE(S)

1. IMAGERY: ORTHOIMAGE PROVIDED BY IBI GROUP. SITE FLOWN JULY 29TH, 2018
2. ADDITIONAL IMAGERY FROM © 2020 MICROSOFT CORPORATION © 2020 MAXAR ©CNES (2020) DISTRIBUTION AIRBUS DS
3. PROJECTION: TRANSVERSE MERCATOR NAD 1983 UTM ZONE 17N

CLIENT
RANKIN CONSTRUCTION

PROJECT
PORT COLBORNE QUARRY EXTENSION

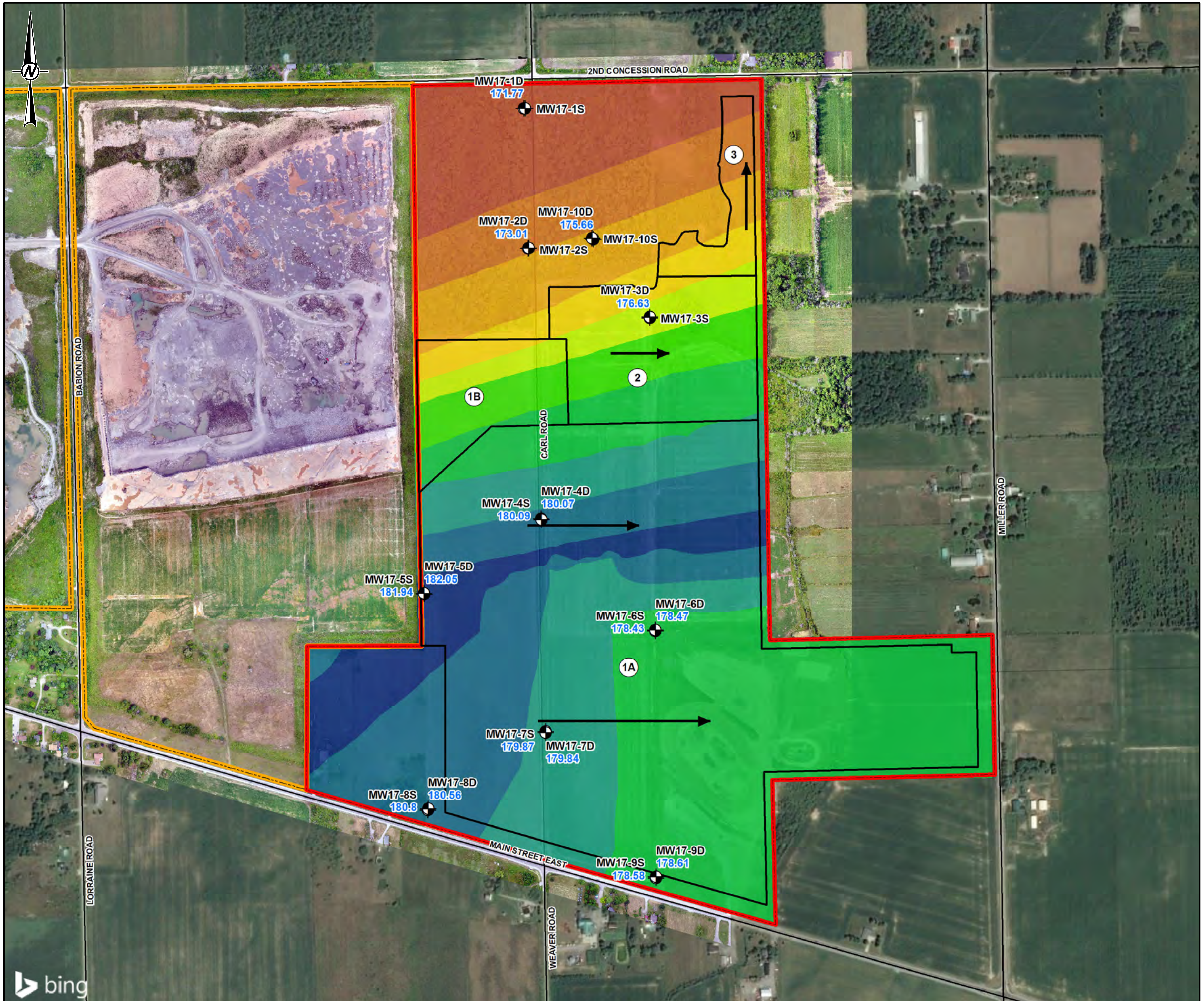
TITLE
OVERBURDEN THICKNESS

CONSULTANT

GOLDER

YYYY-MM-DD	2020-09-03
DESIGNED	PR
PREPARED	PR
REVIEWED	BZ
APPROVED	SM

PROJECT NO.	CONTROL	REV.	FIGURE
1771656	0018		6



LEGEND

1 Excavation Phase

Monitoring Well and Bedrock Elevation (m)

Property Boundary

Proposed Quarry Extension

Approximate Excavation Phasing Boundary

Excavation Direction Arrow

Bedrock Elevation (m)

172 - 173

173 - 174

174 - 175

175 - 176

176 - 177

177 - 178

178 - 179

179 - 180

180 - 181

181 - 182

0 0.2 0.4

1:7,000 Kilometers

NOTE(S)

1. CONTOURS WERE GENERATED BY EXTRAPOLATION FROM DATA POINTS ACROSS THE SITE AREA.

REFERENCE(S)

1.BASE DATA: MNRF LIO 2016
2. IMAGERY: ORTHOIMAGE PROVIDED BY IBI GROUP. SITE FLOWN JULY 29TH, 2018
3. ADDITIONAL IMAGERY FROM © 2020 MICROSOFT CORPORATION © 2020 MAXAR ©CNES (2020) DISTRIBUTION AIRBUS DS
4. PROJECTION: TRANSVERSE MERCATOR NAD 1983 UTM ZONE 17N

CLIENT
RANKIN CONSTRUCTION

PROJECT
PORT COLBORNE QUARRY EXTENSION

TITLE
BEDROCK SURFACE TOPOGRAPHY

CONSULTANT

GOLDER

YYYY-MM-DD	2020-09-03
DESIGNED	PR
PREPARED	PR
REVIEWED	BZ
APPROVED	SM

PROJECT NO.	CONTROL	REV.	FIGURE
1771656	0018		7

LEGEND

- Monitoring Well
- Contours
- Roads
- Wignell Drain (formerly Mitchner Drain)
- Mitchner Drain
- Watercourse
- Waterbody
- Wetland
- Woodland
- Property Boundary
- Proposed Quarry Extension
- Approximate Excavation Phasing Boundary

0 0.2 0.4

1:8,000 Kilometers

NOTE(S)

REFERENCE(S)
1. BASE DATA: MNRF LIO 2016
2. IMAGERY: ORTHOIMAGE PROVIDED BY IBI GROUP. SITE FLOWN JULY 29TH, 2018
3. ADDITIONAL IMAGERY FROM © 2020 MICROSOFT CORPORATION © 2020 MAXAR ©CNES (2020) DISTRIBUTION AIRBUS DS
4. PROJECTION: TRANSVERSE MERCATOR NAD 1983 UTM ZONE 17N

CLIENT
RANKIN CONSTRUCTION

PROJECT
PORT COLBORNE QUARRY EXTENSION

TITLE
BASE OF WILLIAMSVILLE UNIT

CONSULTANT

GOLDER

YYYY-MM-DD	2020-09-03
DESIGNED	PR
PREPARED	PR
REVIEWED	BZ
APPROVED	SM

PROJECT NO.	CONTROL	REV.	FIGURE
1771656	0011		8

LEGEND

- (1) Excavation Phase
- Monitoring Well
- Contours
- Roads
- Wignell Drain (formerly Mitchner Drain)
- Mitchner Drain
- Watercourse
- Waterbody
- Wetland
- Woodland
- Property Boundary
- Proposed Quarry Extension
- Approximate Excavation Phasing Boundary

0 0.2 0.4
1:8,000 Kilometers

NOTE(S)

REFERENCE(S)
1. BASE DATA: MNRF LIO 2016
2. IMAGERY: ORTHOIMAGE PROVIDED BY IBI GROUP. SITE FLOWN JULY 29TH, 2018
3. ADDITIONAL IMAGERY FROM © 2020 MICROSOFT CORPORATION © 2020 MAXAR ©CNES (2020) DISTRIBUTION AIRBUS DS
4. PROJECTION: TRANSVERSE MERCATOR NAD 1983 UTM ZONE 17N

CLIENT
RANKIN CONSTRUCTION

PROJECT
PORT COLBORNE QUARRY EXTENSION

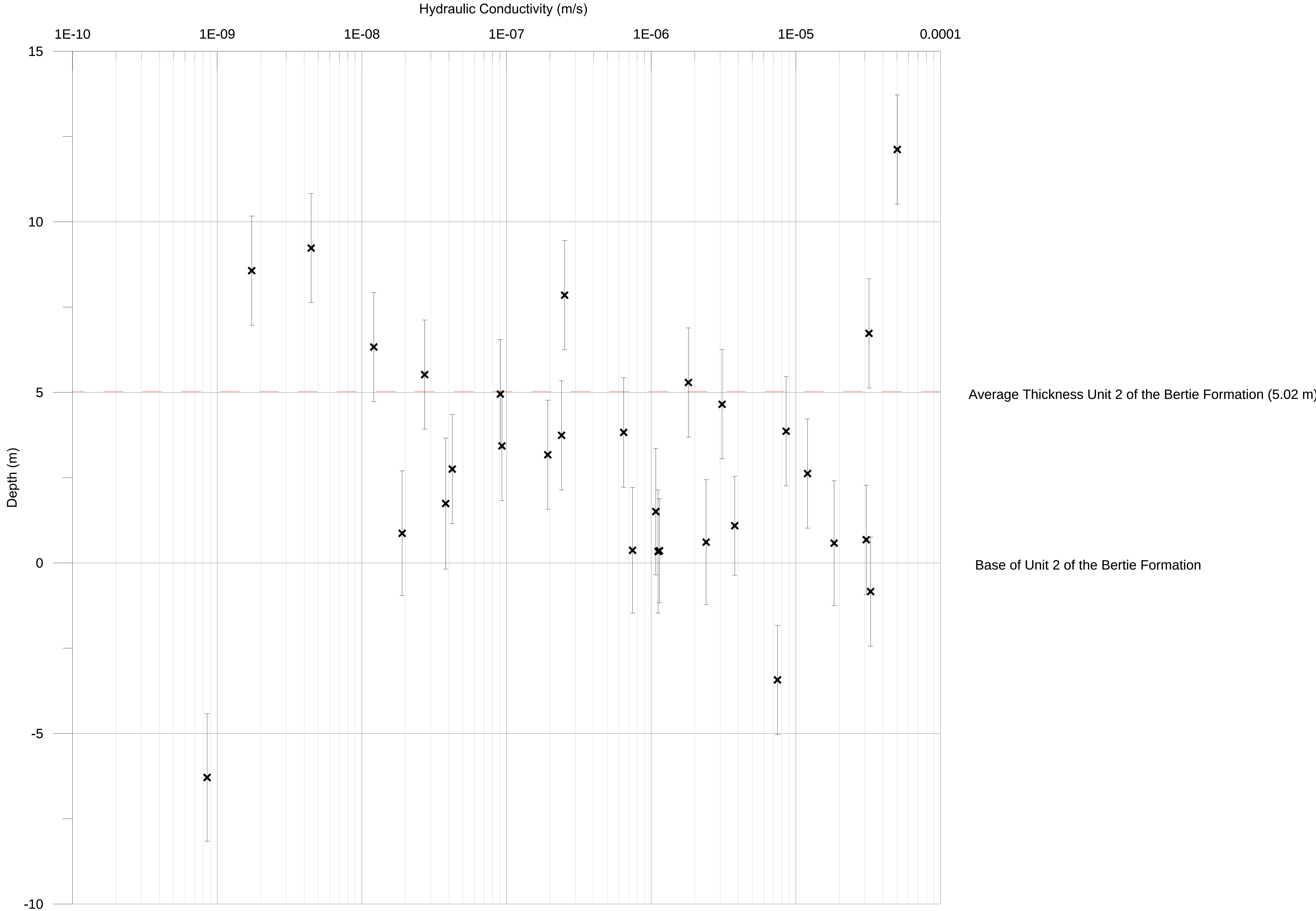
TITLE
BASE OF FALKIRK UNIT

CONSULTANT
GOLDER

YYYY-MM-DD	2020-09-03
DESIGNED	PR
PREPARED	PR
REVIEWED	BZ
APPROVED	SM

PROJECT NO.	CONTROL	REV.	FIGURE
1771656	0018		9

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: 25mm



GOLDER

Hydraulic Conductivity Results
Port Colborne Quarries

FIGURE 10	
PROJECT NO: 1771656	
DATE: October 20, 2017	
DRAWN: TP	APPROVED: SM

LEGEND

- 1 Excavation Phase
- Monitoring Well
- Wignell Drain (formerly Mitchner Drain)
- Mitchner Drain
- Roads
- Watercourse
- Waterbody
- Wetland
- Woodland
- Property Boundary
- Proposed Quarry Extension
- Approximate Excavation Phasing Boundary
- 178.46 Metres Above Sea Level
- 3.45 Metres Below Ground Surface

0 0.2 0.4
1:8,000 Kilometers

NOTE(S)
1. GROUNDWATER ELEVATIONS MEASURED ON MAY 15, 2017
2. OVERBURDEN GROUND WATER LEVELS ARE CONTINUING TO RECOVER FOLLOWING THE MONITORING WELL INSTALLATIONS AND GROUNDWATER SAMPLING/DEVELOPMENT

REFERENCE(S)
1.BASE DATA: MNRF LIO 2016
2. IMAGERY: ORTHOIMAGE PROVIDED BY IBI GROUP. SITE FLOWN JULY 29TH, 2018
3. ADDITIONAL IMAGERY FROM © 2020 MICROSOFT CORPORATION © 2020 MAXAR ©CNES (2020) DISTRIBUTION AIRBUS DS
4. PROJECTION: TRANSVERSE MERCATOR NAD 1983 UTM ZONE 17N

CLIENT
RANKIN CONSTRUCTION

PROJECT
PORT COLBORNE QUARRY EXTENSION

TITLE
GROUNDWATER ELEVATIONS – OVERBURDEN – MAY 2017

CONSULTANT
GOLDER

YYYY-MM-DD	2020-09-03
DESIGNED	PR
PREPARED	PR
REVIEWED	BZ
APPROVED	SM

PROJECT NO.	CONTROL	REV.	FIGURE
1771656	0018		11A

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM:

LEGEND

- 1 Excavation Phase
- Monitoring Well
- Wignell Drain (formerly Mitchner Drain)
- Mitchner Drain
- Roads
- Railway
- Watercourse
- Waterbody
- Wetland
- Woodland
- Property Boundary
- Proposed Quarry Extension
- Approximate Excavation Phasing Boundary
- 178.46 Metres Above Sea Level
- 3.45 Metres Below Ground Surface

0 0.2 0.4
1:8,000 Kilometers

NOTE(S)
1. GROUNDWATER ELEVATIONS MEASURED ON MAY 15, 2018
2. OVERBURDEN GROUND WATER LEVELS ARE CONTINUING TO RECOVER FOLLOWING THE MONITORING WELL INSTALLATIONS AND GROUNDWATER SAMPLING/DEVELOPMENT

REFERENCE(S)
1.BASE DATA: MNRF LIO 2016
2. IMAGERY: ORTHOIMAGE PROVIDED BY IBI GROUP. SITE FLOWN JULY 29TH, 2018
3. ADDITIONAL IMAGERY FROM © 2020 MICROSOFT CORPORATION © 2020 MAXAR ©CNES (2020) DISTRIBUTION AIRBUS DS
4. PROJECTION: TRANSVERSE MERCATOR NAD 1983 UTM ZONE 17N

CLIENT
RANKIN CONSTRUCTION

PROJECT
PORT COLBORNE QUARRY EXTENSION

TITLE
GROUNDWATER ELEVATIONS – OVERBURDEN – MAY 2018

CONSULTANT

GOLDER

YYYY-MM-DD	2020-09-03
DESIGNED	PR
PREPARED	PR
REVIEWED	BZ
APPROVED	SM

PROJECT NO.	CONTROL	REV.	FIGURE
1771656	0011		11B

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: 25mm

LEGEND

- 1 Excavation Phase
- Monitoring Well
- Wignell Drain (formerly Mitchner Drain)
- Mitchner Drain
- Roads
- Watercourse
- Waterbody
- Wetland
- Woodland
- Property Boundary
- Proposed Quarry Extension
- Approximate Excavation Phasing Boundary
- 181.18 Metres Above Sea Level
- 0.89 Metres Below Ground Surface

0 0.2 0.4

1:8,000 Kilometers

NOTE(S)

1. GROUNDWATER ELEVATIONS MEASURED ON MAY 15, 2017
2. OVERBURDEN GROUND WATER LEVELS ARE CONTINUING TO RECOVER FOLLOWING THE MONITORING WELL INSTALLATIONS AND GROUNDWATER SAMPLING/DEVELOPMENT

REFERENCE(S)

1.BASE DATA: MNRF LIO 2016
2. IMAGERY: ORTHOIMAGE PROVIDED BY IBI GROUP. SITE FLOWN JULY 29TH, 2018
3. ADDITIONAL IMAGERY FROM © 2020 MICROSOFT CORPORATION © 2020 MAXAR ©CNES (2020) DISTRIBUTION AIRBUS DS
4. PROJECTION: TRANSVERSE MERCATOR NAD 1983 UTM ZONE 17N

CLIENT
RANKIN CONSTRUCTION

PROJECT
PORT COLBORNE QUARRY EXTENSION

TITLE
GROUNDWATER ELEVATIONS – OVERBURDEN – MAY 2019

CONSULTANT
GOLDER

YYYY-MM-DD	2020-09-03
DESIGNED	PR
PREPARED	PR
REVIEWED	BZ
APPROVED	SM

PROJECT NO.	CONTROL	REV.	FIGURE
1771656	0018		**11C**

LEGEND

- 1 Excavation Phase
- Monitoring Well
- Mitchell Drain
- Roads
- Railway
- Watercourse
- Waterbody
- Property Boundary
- Proposed Quarry Extension
- Approximate Excavation Phasing Boundary
- 181.18 Metres Above Sea Level
- 0.89 Metres Below Ground Surface

0 0.2 0.4

1:8,000 Kilometers

NOTE(S)

1. GROUNDWATER ELEVATIONS MEASURED ON MAY 29, 2019
2. OVERBURDEN GROUND WATER LEVELS ARE CONTINUING TO RECOVER FOLLOWING THE MONITORING WELL INSTALLATIONS AND GROUNDWATER SAMPLING/DEVELOPMENT

REFERENCE(S)

1. BASE DATA: MNRF LIO 2016
2. IMAGERY: ORTHOIMAGE PROVIDED BY IBI GROUP. SITE FLOWN JULY 29TH, 2018
3. ADDITIONAL IMAGERY FROM © 2020 MICROSOFT CORPORATION © 2020 MAXAR ©CNES (2020) DISTRIBUTION AIRBUS DS
4. PROJECTION: TRANSVERSE MERCATOR NAD 1983 UTM ZONE 17N

CLIENT
RANKIN CONSTRUCTION

PROJECT
PORT COLBORNE QUARRY EXTENSION

TITLE
GROUNDWATER ELEVATIONS – OVERBURDEN – MAY 2020

CONSULTANT

GOLDER

YYYY-MM-DD	2020-09-03
DESIGNED	PR
PREPARED	PR
REVIEWED	BZ
APPROVED	SM

PROJECT NO.	CONTROL	REV.	FIGURE
1771656	0018	0	11D

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM:

25mm

LEGEND

- ① Excavation Phase
- Monitoring Well
- Monitoring Well not Included in Contouring
- Wignell Drain (formerly Mitchner Drain)
- Mitchner Drain
- Groundwater Elevation Contours
- Flow Lines
- Wetland
- Woodland
- Property Boundary
- Proposed Quarry Extension
- Approximate Excavation Phasing Boundary
- 177.35 Metres Above Sea Level
- 5.20 Metres Below Ground Surface

0 0.2 0.4
1:8,000 Kilometers

NOTE(S)
1. * GROUNDWATER ELEVATION AT MW17-6S NOT INCLUDED IN CONTOURING. DATA IS ANOMALOUS.
2. GROUNDWATER ELEVATIONS MEASURED ON MAY 15, 2017

REFERENCE(S)
1.BASE DATA: MNRF LIO 2016
2. IMAGERY: ORTHOIMAGE PROVIDED BY IBI GROUP. SITE FLOWN JULY 29TH, 2018
3. ADDITIONAL IMAGERY FROM © 2020 MICROSOFT CORPORATION © 2020 MAXAR ©CNES (2020) DISTRIBUTION AIRBUS DS
4. PROJECTION: TRANSVERSE MERCATOR NAD 1983 UTM ZONE 17N

CLIENT
RANKIN CONSTRUCTION

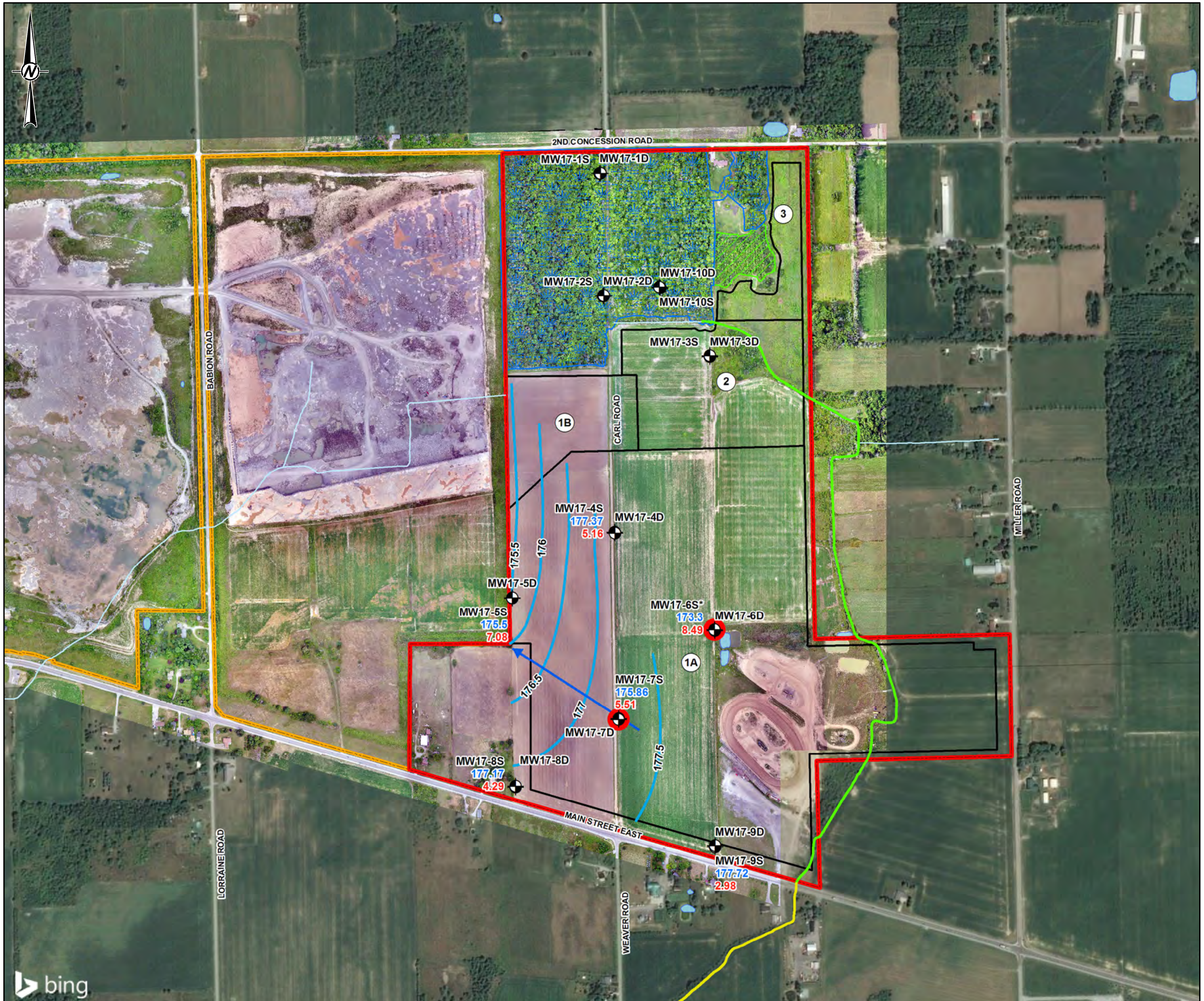
PROJECT
PORT COLBORNE QUARRY EXTENSION

TITLE
GROUNDWATER FLOW MAP – SHALLOW BEDROCK – MAY 2017

CONSULTANT
GOLDER

YYYY-MM-DD	2020-09-03
DESIGNED	MM
PREPARED	PR
REVIEWED	BZ
APPROVED	SM

PROJECT NO.	CONTROL	REV.	FIGURE
1771656	0018		12A



LEGEND

- 1 Excavation Phase
- Monitoring Well
- Monitoring Well not Included in Contouring
- Wignell Drain (formerly Mitchner Drain)
- Mitchner Drain
- Groundwater Elevation Contours
- Flow Lines
- Watercourse
- Waterbody
- Wetland
- Woodland
- Property Boundary
- Proposed Quarry Extension
- Approximate Excavation Phasing Boundary
- 177.35 Metres Above Sea Level
- 5.20 Metres Below Ground Surface

0 0.2 0.4
1:8,000 Kilometers

NOTE(S)
1. * GROUNDWATER ELEVATION AT MW17-6S NOT INCLUDED IN CONTOURING. DATA IS ANOMALOUS.
2. GROUNDWATER ELEVATIONS MEASURED ON MAY 15, 2018

REFERENCE(S)
1.BASE DATA: MNRF LIO 2016
2. IMAGERY: ORTHOIMAGE PROVIDED BY IBI GROUP. SITE FLOWN JULY 29TH, 2018
3. ADDITIONAL IMAGERY FROM © 2020 MICROSOFT CORPORATION © 2020 MAXAR ©CNES (2020) DISTRIBUTION AIRBUS DS
4. PROJECTION: TRANSVERSE MERCATOR NAD 1983 UTM ZONE 17N

CLIENT
RANKIN CONSTRUCTION

PROJECT
PORT COLBORNE QUARRY EXTENSION

TITLE
GROUNDWATER FLOW MAP – SHALLOW BEDROCK – MAY 2018

CONSULTANT
GOLDER

YYYY-MM-DD	2020-09-03
DESIGNED	PR
PREPARED	PR
REVIEWED	BZ
APPROVED	SM

PROJECT NO.	CONTROL	REV.	FIGURE
1771656	0018		12B

LEGEND

1	Excavation Phase
	Monitoring Well
	Monitoring Well not Included in Contouring
	Wignell Drain (formerly Mitchner Drain)
	Mitchner Drain
	Groundwater Elevation Contours
	Flow Lines
	Roads
	Watercourse
	Waterbody
	Wetland
	Woodland
	Property Boundary
	Proposed Quarry Extension
	Approximate Excavation Phasing Boundary
181.18	Metres Above Sea Level
0.89	Metres Below Ground Surface

0 0.2 0.4
1:8,000 Kilometers

NOTE(S)
1. GROUNDWATER ELEVATIONS MEASURED ON MAY 27, 2019
2. GROUNDWATER ELEVATION AT MW17-6S NOT INCLUDED IN CONTOURING. DATA IS ANOMALOUS

REFERENCE(S)
1.BASE DATA: MNRF LIO 2016
2. IMAGERY: ORTHOIMAGE PROVIDED BY IBI GROUP. SITE FLOWN JULY 29TH, 2018
3. ADDITIONAL IMAGERY FROM © 2020 MICROSOFT CORPORATION © 2020 MAXAR ©CNES (2020) DISTRIBUTION AIRBUS DS
4. PROJECTION: TRANSVERSE MERCATOR NAD 1983 UTM ZONE 17N

CLIENT
RANKIN CONSTRUCTION

PROJECT
PORT COLBORNE QUARRY EXTENSION

TITLE
GROUNDWATER FLOW MAP – SHALLOW BEDROCK – MAY 2019

CONSULTANT

GOLDER

YYYY-MM-DD	2020-09-03
DESIGNED	PR
PREPARED	PR
REVIEWED	BZ
APPROVED	SM

PROJECT NO.	CONTROL	REV.	FIGURE
1771656	0018		12C

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM:

25mm

LEGEND

- (1) Excavation Phase
- Monitoring Well
- Monitoring Well not Included in Contouring
- Wignell Drain (formerly Mitchner Drain)
- Mitchner Drain
- Flow Lines
- Groundwater Elevation Contours
- Roads
- Watercourse
- Waterbody
- Wetland
- Woodland
- Property Boundary
- Proposed Quarry Extension
- Approximate Excavation Phasing Boundary
- 181.18 Metres Above Sea Level
- 0.89 Metres Below Ground Surface

0 0.2 0.4
1:8,000 Kilometers

NOTE(S)
1. * GROUNDWATER ELEVATION AT MW17-6S NOT INCLUDED IN CONTOURING. DATA IS ANOMALOUS.
2. GROUNDWATER ELEVATIONS MEASURED ON MAY 29, 2020

REFERENCE(S)
1.BASE DATA: MNRF LIO 2016
2. IMAGERY: ORTHOIMAGE PROVIDED BY IBI GROUP. SITE FLOWN JULY 29TH, 2018
3. ADDITIONAL IMAGERY FROM © 2020 MICROSOFT CORPORATION © 2020 MAXAR ©CNES (2020) DISTRIBUTION AIRBUS DS
4. PROJECTION: TRANSVERSE MERCATOR NAD 1983 UTM ZONE 17N

CLIENT
RANKIN CONSTRUCTION

PROJECT
PORT COLBORNE QUARRY EXTENSION

TITLE
GROUNDWATER FLOW MAP – SHALLOW BEDROCK – MAY 2020

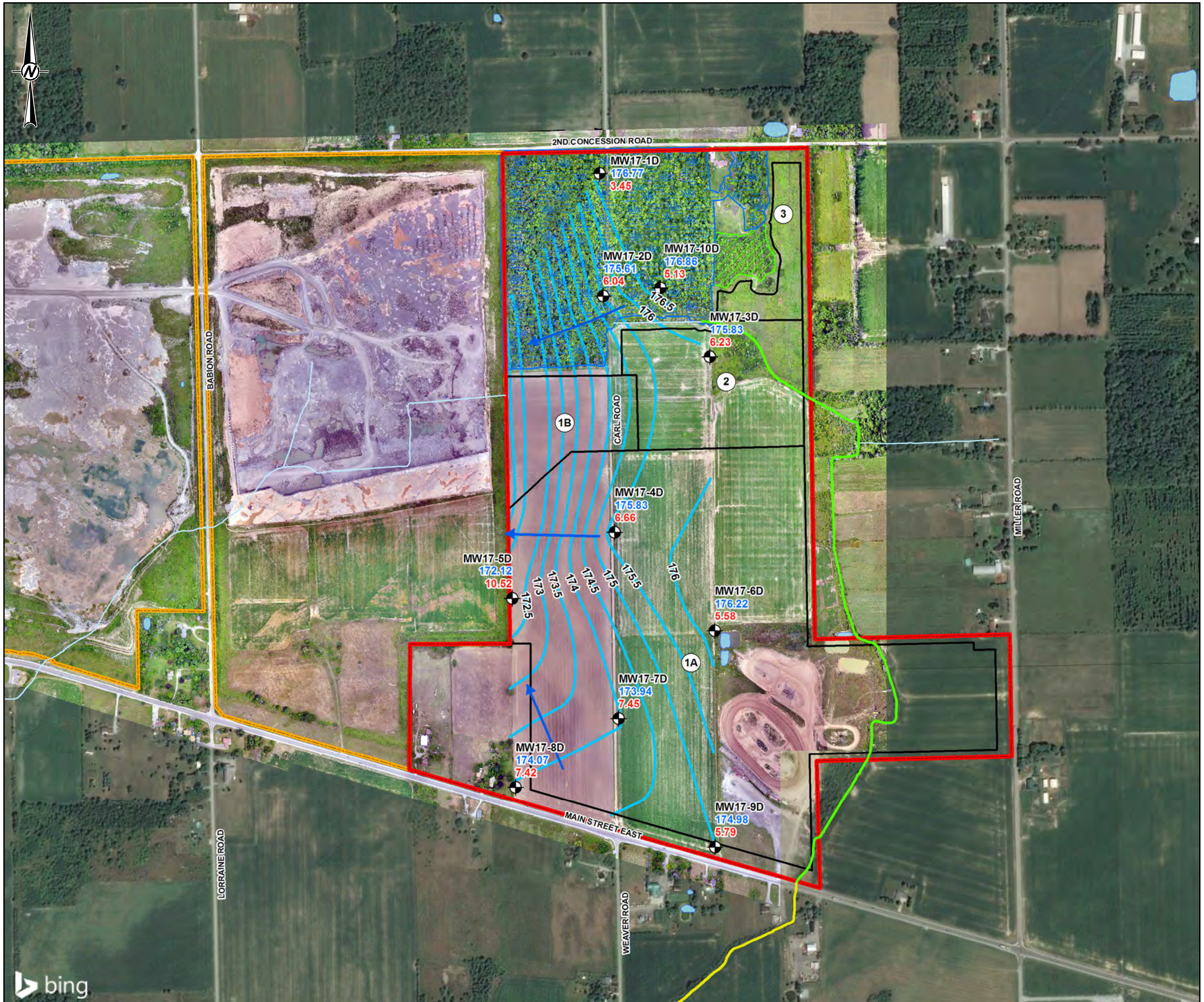
CONSULTANT

GOLDER

YYYY-MM-DD	2020-09-03
DESIGNED	PR
PREPARED	PR
REVIEWED	BZ
APPROVED	SM

PROJECT NO.	CONTROL	REV.	FIGURE
1771656	0018		12D

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM:



LEGEND

- ① Excavation Phase
- Monitoring Well
- Groundwater Elevation Contours
- Flow Lines
- Wignell Drain (formerly Mitchner Drain)
- Mitchner Drain
- Watercourse
- Waterbody
- Wetland
- Woodland
- Property Boundary
- Proposed Quarry Extension
- Approximate Excavation Phasing Boundary
- 176.77 Metres Above Sea Level
- 3.45 Metres Below Ground Surface

0 0.2 0.4

1:8,000 Kilometers

NOTE(S)

1. GROUNDWATER ELEVATIONS MEASURED ON MAY 15, 2017

REFERENCE(S)

1.BASE DATA: MNRF LIO 2016
2. IMAGERY: ORTHOIMAGE PROVIDED BY IBI GROUP. SITE FLOWN JULY 29TH, 2018
3. ADDITIONAL IMAGERY FROM © 2020 MICROSOFT CORPORATION © 2020 MAXAR ©CNES (2020) DISTRIBUTION AIRBUS DS
4. PROJECTION: TRANSVERSE MERCATOR NAD 1983 UTM ZONE 17N

CLIENT
RANKIN CONSTRUCTION

PROJECT
PORT COLBORNE QUARRY EXTENSION

TITLE
GROUNDWATER FLOW MAP - DEEP BEDROCK – MAY 2017

CONSULTANT

GOLDER

YYYY-MM-DD	2020-09-03
DESIGNED	PR
PREPARED	PR
REVIEWED	BZ
APPROVED	SM

PROJECT NO.	CONTROL	REV.	FIGURE
1771656	0018		13A

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: 25mm

LEGEND

- ① Excavation Phase
- Monitoring Well
- Wignell Drain (formerly Mitchner Drain)
- Mitchner Drain
- Groundwater Elevation Contours
- Flow Lines
- Watercourse
- Waterbody
- Wetland
- Woodland
- Property Boundary
- Proposed Quarry Extension
- Approximate Excavation Phasing Boundary
- 176.77 Metres Above Sea Level
- 3.45 Metres Below Ground Surface

0 0.2 0.4

1:8,000 Kilometers

NOTE(S)

1. GROUNDWATER ELEVATIONS MEASURED ON MAY 15, 2018

REFERENCE(S)

1. BASE DATA: MNRF LIO 2016
2. IMAGERY: ORTHOIMAGE PROVIDED BY IBI GROUP. SITE FLOWN JULY 29TH, 2018
3. ADDITIONAL IMAGERY FROM © 2020 MICROSOFT CORPORATION © 2020 MAXAR ©CNES (2020) DISTRIBUTION AIRBUS DS
4. PROJECTION: TRANSVERSE MERCATOR NAD 1983 UTM ZONE 17N

CLIENT
RANKIN CONSTRUCTION

PROJECT
PORT COLBORNE QUARRY EXTENSION

TITLE
GROUNDWATER FLOW MAP - DEEP BEDROCK – MAY 2018

CONSULTANT
GOLDER

YYYY-MM-DD	2020-09-03
DESIGNED	PR
PREPARED	PR
REVIEWED	BZ
APPROVED	SM

PROJECT NO.	CONTROL	REV.	FIGURE
1771656	0018		13B

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: 25mm

LEGEND

- ① Excavation Phase
- Monitoring Well
- Wignell Drain (formerly Mitchner Drain)
- Mitchner Drain
- Groundwater Elevation Contours
- Flow Lines
- Roads
- Watercourse
- Waterbody
- Wetland
- Woodland
- Property Boundary
- Proposed Quarry Extension
- Approximate Excavation Phasing Boundary
- 181.18 Metres Above Sea Level
- 0.89 Metres Below Ground Surface

0 0.2 0.4
1:8,000 Kilometers

NOTE(S)
1. GROUNDWATER ELEVATIONS MEASURED ON MAY 27, 2019

REFERENCE(S)
1.BASE DATA: MNRF LIO 2016
2. IMAGERY: ORTHOIMAGE PROVIDED BY IBI GROUP. SITE FLOWN JULY 29TH, 2018
3. ADDITIONAL IMAGERY FROM ESRI, HERE, DELORME, INTERMAP, INCREMENT P CORP., GEBCO, USGS, FAO, NPS, NRCAN, GEOBASE, IGN, KADASTER NL, ORDNANCE SURVEY, ESRI JAPAN, METI, ESRI CHINA (HONG KONG), SWISSTOPO, MAPMYINDIA, © OPENSTREETMAP CONTRIBUTORS, AND THE GIS USER COMMUNITY
4. PROJECTION: TRANSVERSE MERCATOR NAD 1983 UTM ZONE 17N

CLIENT
RANKIN CONSTRUCTION

PROJECT
PORT COLBORNE QUARRY EXTENSION

TITLE
GROUNDWATER FLOW MAP – DEEP BEDROCK – MAY 2019

CONSULTANT

GOLDER

YYYY-MM-DD	2020-09-03
DESIGNED	PR
PREPARED	PR
REVIEWED	BZ
APPROVED	SM

PROJECT NO.	CONTROL	REV.	FIGURE
1771656	0018		13C

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM:
25mm

LEGEND

- ① Excavation Phase
- Monitoring Well
- Wignell Drain (formerly Mitchner Drain)
- Mitchner Drain
- Groundwater Elevation Contours
- Flow Lines
- Roads
- Watercourse
- Waterbody
- Wetland
- Woodland
- Property Boundary
- Proposed Quarry Extension
- Approximate Excavation Phasing Boundary
- 181.18 Metres Above Sea Level
- 0.89 Metres Below Ground Surface

0 0.2 0.4
1:8,000 Kilometers

NOTE(S)
1. GROUNDWATER ELEVATIONS MEASURED ON MAY 29, 2020

REFERENCE(S)
1.BASE DATA: MNRF LIO 2016
2. IMAGERY: ORTHOIMAGE PROVIDED BY IBI GROUP. SITE FLOWN JULY 29TH, 2018
3. ADDITIONAL IMAGERY FROM © 2020 MICROSOFT CORPORATION © 2020 MAXAR ©CNES (2020) DISTRIBUTION AIRBUS DS
4. PROJECTION: TRANSVERSE MERCATOR NAD 1983 UTM ZONE 17N

CLIENT
RANKIN CONSTRUCTION

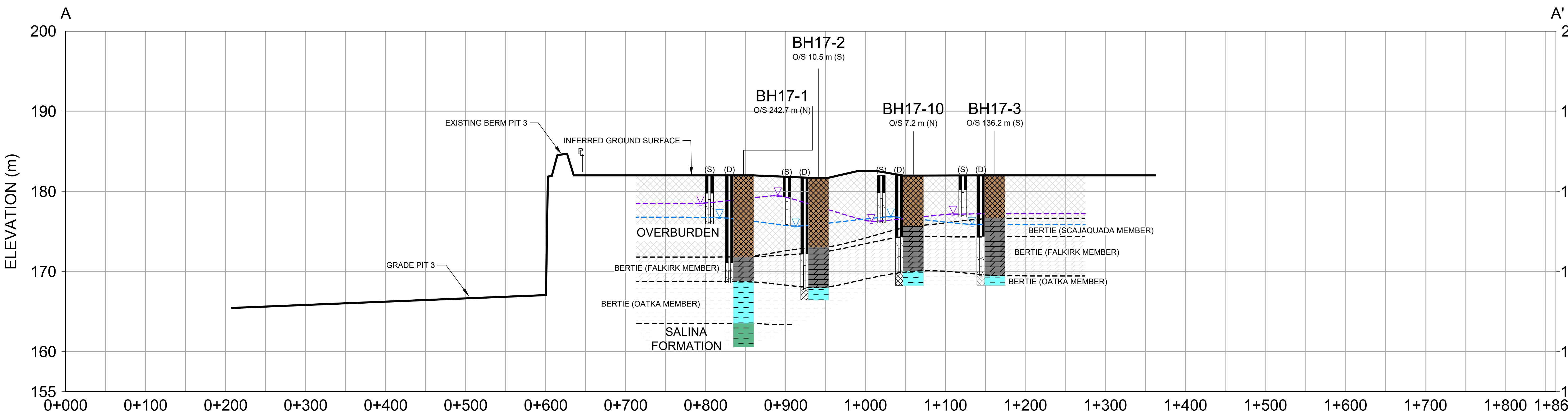
PROJECT
PORT COLBORNE QUARRY EXTENSION

TITLE
GROUNDWATER FLOW MAP – DEEP BEDROCK – MAY 2020

CONSULTANT
GOLDER

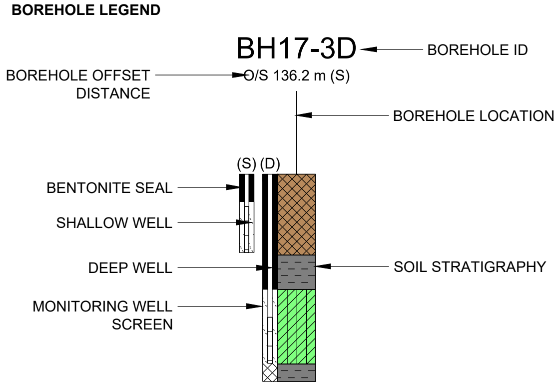
YYYY-MM-DD	2020-09-03
DESIGNED	PR
PREPARED	PR
REVIEWED	BZ
APPROVED	SM

PROJECT NO.	CONTROL	REV.	FIGURE
1771656	0018		**13D**



HORIZ. SCALE 1:5000 VERT. SCALE 1:500 A-A' 1 CROSS-SECTION A-A'

BOREHOLE LEGEND



NOTE(S)

1. THIS REPORT SHOULD BE READ IN CONJUNCTION WITHIN WHICH REPORT BOUND.

LEGEND

OVERBURDEN
DOLOSTONE
SHALE
LIMESTONE
OVERBURDEN GROUNDWATER ELEVATIONS
SHALLOW BEDROCK GROUNDWATER ELEVATIONS
DEEP BEDROCK GROUNDWATER ELEVATIONS

0 100 200
1:5,000 VERTICAL METRES
0 100 200
1:5,000 HORIZONTAL METRES

CLIENT
RANKIN CONSTRUCTION

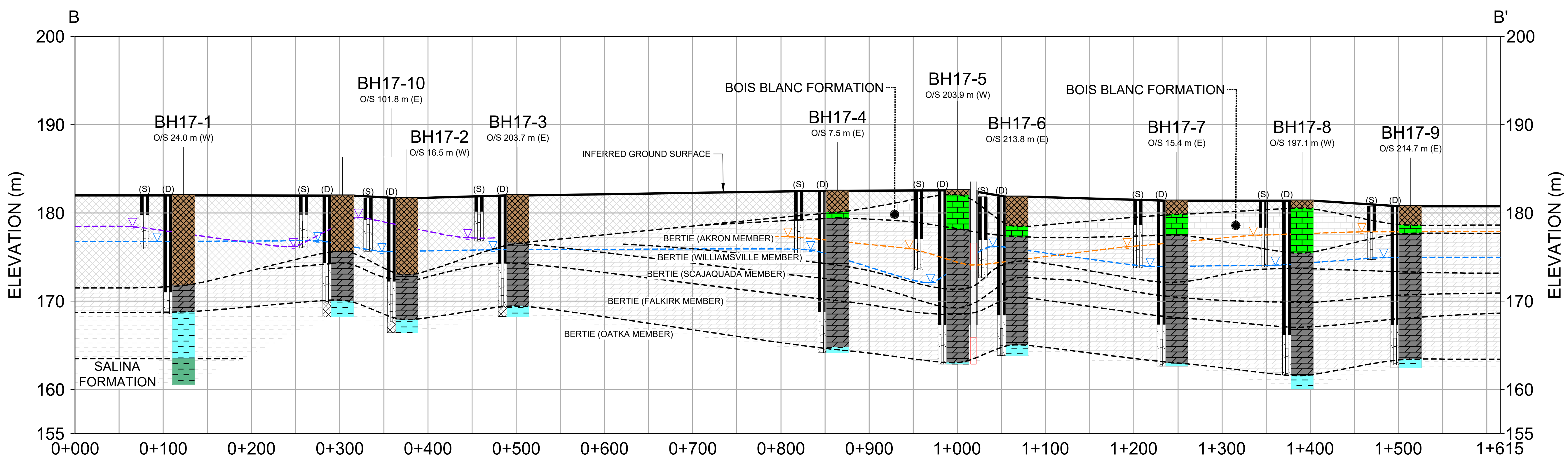
PROJECT
PORT COLBORNE QUARRY EXTENSION

CONSULTANT
GOLDER

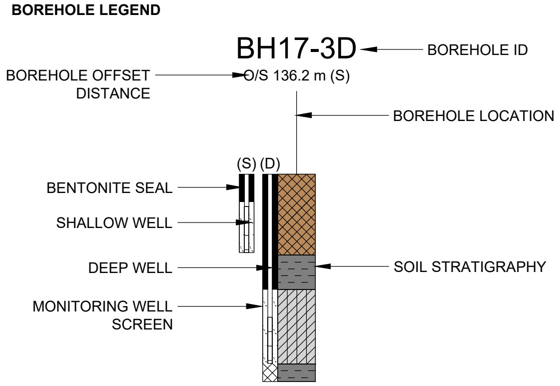
YYYY-MM-DD	2020-07-16
DESIGNED	
PREPARED	JPR
REVIEWED	BSZ
APPROVED	SM

TITLE
HYDROGEOLOGICAL CROSS-SECTION A - A'

PROJECT NO.	CONTROL	REV.	FIGURE
1771656	0018	----	14



HORIZ. SCALE 1:5000 B-B' CROSS-SECTION B-B'
VERT. SCALE 1:500 1



NOTE(S)

1. THIS REPORT SHOULD BE READ IN CONJUNCTION WITHIN WHICH REPORT BOUND.

LEGEND

- OVERBURDEN
- DOLOSTONE
- SHALE
- LIMESTONE
- OVERBURDEN GROUNDWATER ELEVATIONS
- SHALLOW BEDROCK GROUNDWATER ELEVATIONS
- DEEP BEDROCK GROUNDWATER ELEVATIONS

0 100 200
1:5,000 VERTICAL METRES
0 100 200
1:5,000 HORIZONTAL METRES

CLIENT
RANKIN CONSTRUCTION

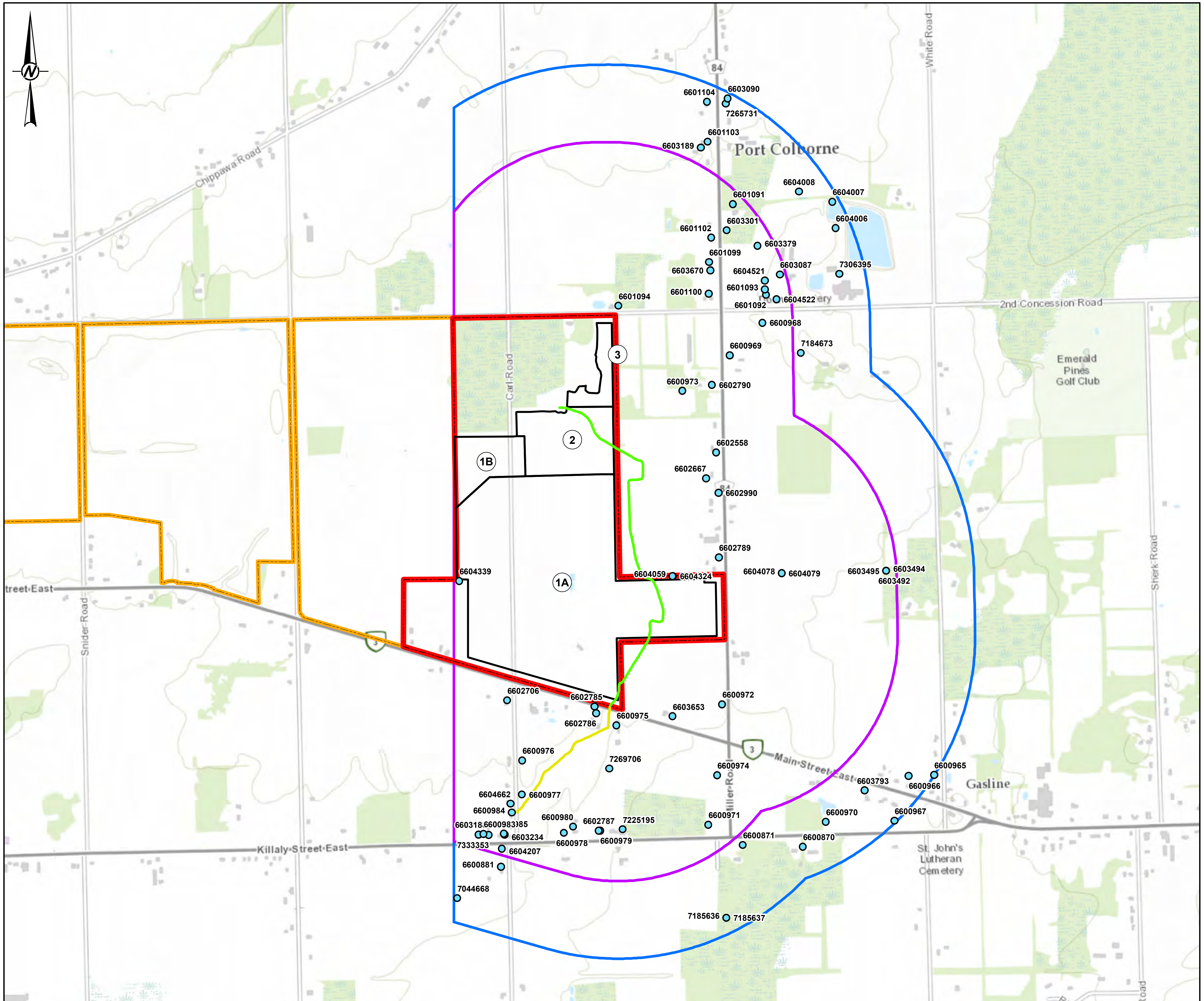
PROJECT
PORT COLBORNE QUARRY EXTENSION

CONSULTANT
GOLDER

YYYY-MM-DD	2020-07-16
DESIGNED	
PREPARED	JPR
REVIEWED	BSZ
APPROVED	SM

TITLE
HYDROGEOLOGICAL CROSS-SECTION B - B'

PROJECT NO.	CONTROL	REV.	FIGURE
1771656	0018	----	15



LEGEND

- ① Excavation Phase
- MECP Water Well
- Wignell Drain (formerly Mitchner Drain)
- Mitchner Drain
- Property Boundary
- Proposed Quarry Extension
- Approximate Excavation Phasing Boundary
- Potential Zone of Influence – 700 m Radius
- Water Well Survey Area and Potential Zone of Influence – 1000 m Radius

0 0.5 1

1:15,000 Kilometers

NOTE(S)

REFERENCE(S)

1. IMAGERY: SOURCES: ESRI, HERE, DELORME, INTERMAP, INCREMENT P CORP., GEBCO, USGS, FAO, NPS, NRCAN, GEOBASE, IGN, KADASTER NL, ORDNANCE SURVEY, ESRI JAPAN, METI, ESRI CHINA (HONG KONG), SWISSTOPO, MAPMYINDIA, © OPENSTREETMAP CONTRIBUTORS, AND THE GIS USER COMMUNITY
2. WATER WELL LOCATIONS OBTAINED FROM MECP (MINISTRY OF THE ENVIRONMENT, CONSERVATION AND PARKS) FORMERLY MOECC (MINISTRY OF THE ENVIRONMENT AND CLIMATE CHANGE). WATER WELL INFORMATION SYSTEM (WWIS). DATA PUBLISHED ON MARCH 21, 2019.
3. PROJECTION: TRANSVERSE MERCATOR NAD 1983 UTM ZONE 17N

CLIENT
RANKIN CONSTRUCTION

PROJECT
PORT COLBORNE QUARRY EXTENSION

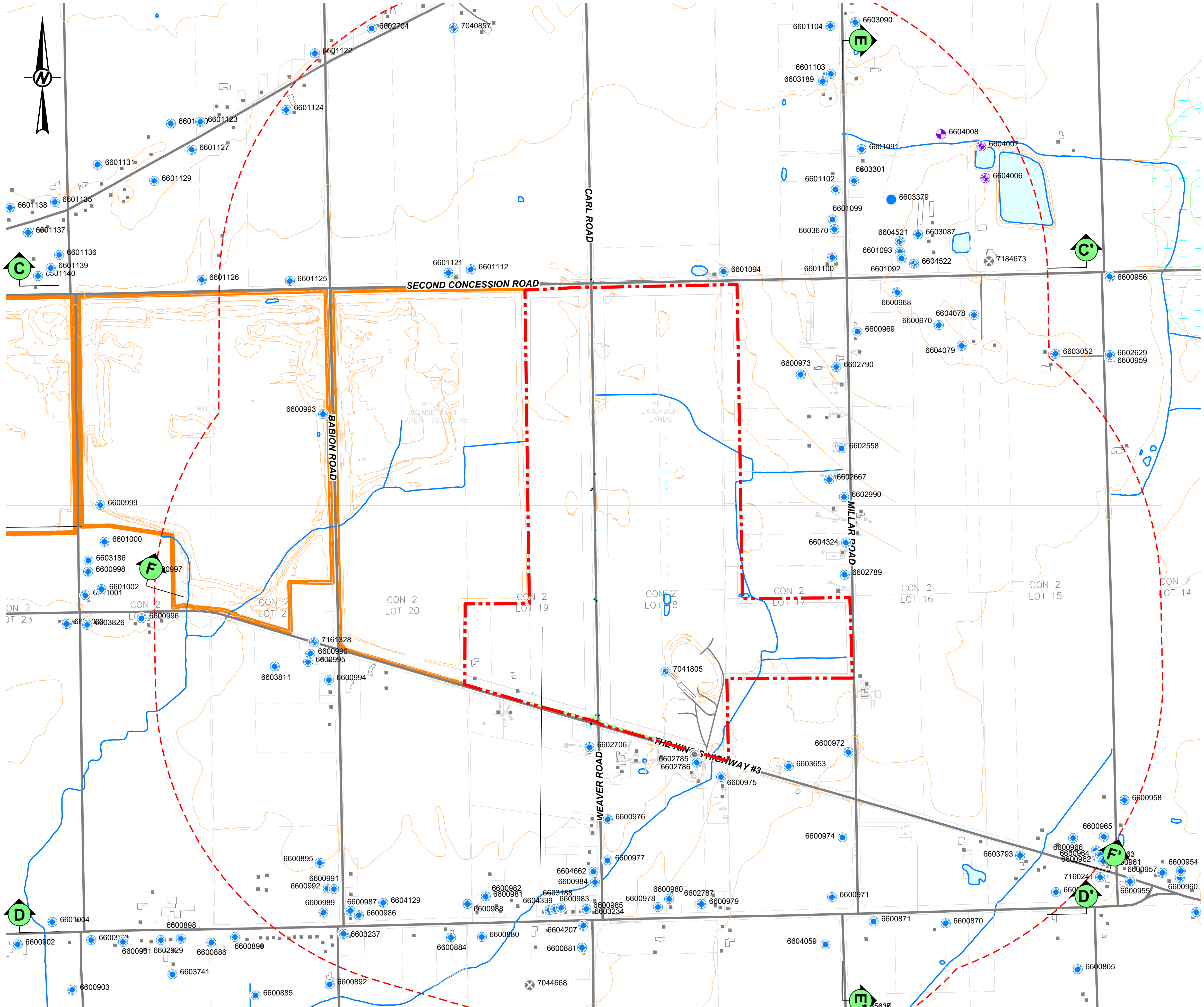
TITLE
WATER WELLS LOCATIONS AND ZONE OF INFLUENCE

CONSULTANT

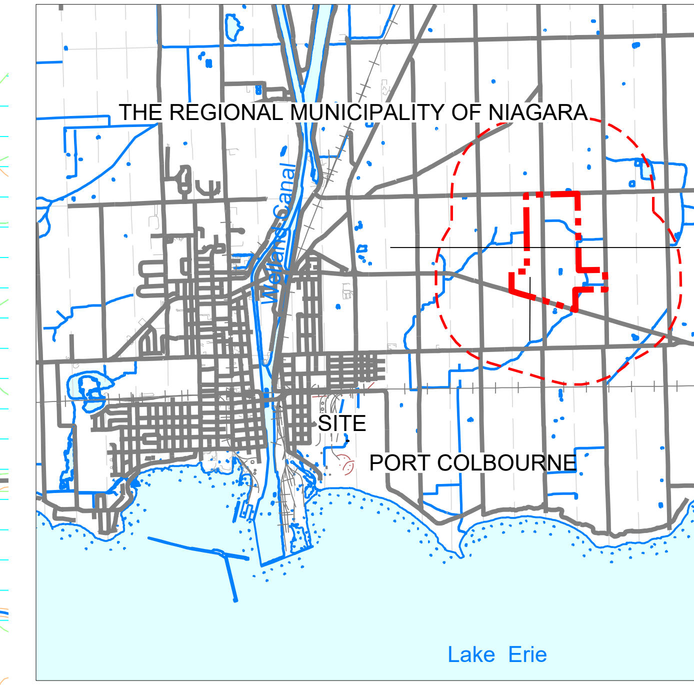
GOLDER

YYYY-MM-DD	2020-09-03
DESIGNED	PR
PREPARED	PR
REVIEWED	BZ
APPROVED	SM

PROJECT NO.	CONTROL	REV.	FIGURE
1771656	0015		16



MAP KEY



PLAN LEGEND

- Property Boundary (Expansion)
- 1000 m Offset from Expansion Boundary
- Existing Operations
- Record of Abandonment
- Drilled Overburden Well
- Test or Observation Well
- Drilled Bedrock Well
- Site Monitoring Well
- Line of Section

REFERENCES

Orthoimage from Niagara Navigator, 2010

0 250 500 750 m

1:12500

Plotted 11x17" Tabloid

Projection is UTM NAD 83 Zone 17

CLIENT
RANKIN CONSTRUCTION

PROJECT
PORT COLBORNE QUARRY EXTENSION

TITLE
MECP RECORDED WELLS & SECTION KEY

CONSULTANT

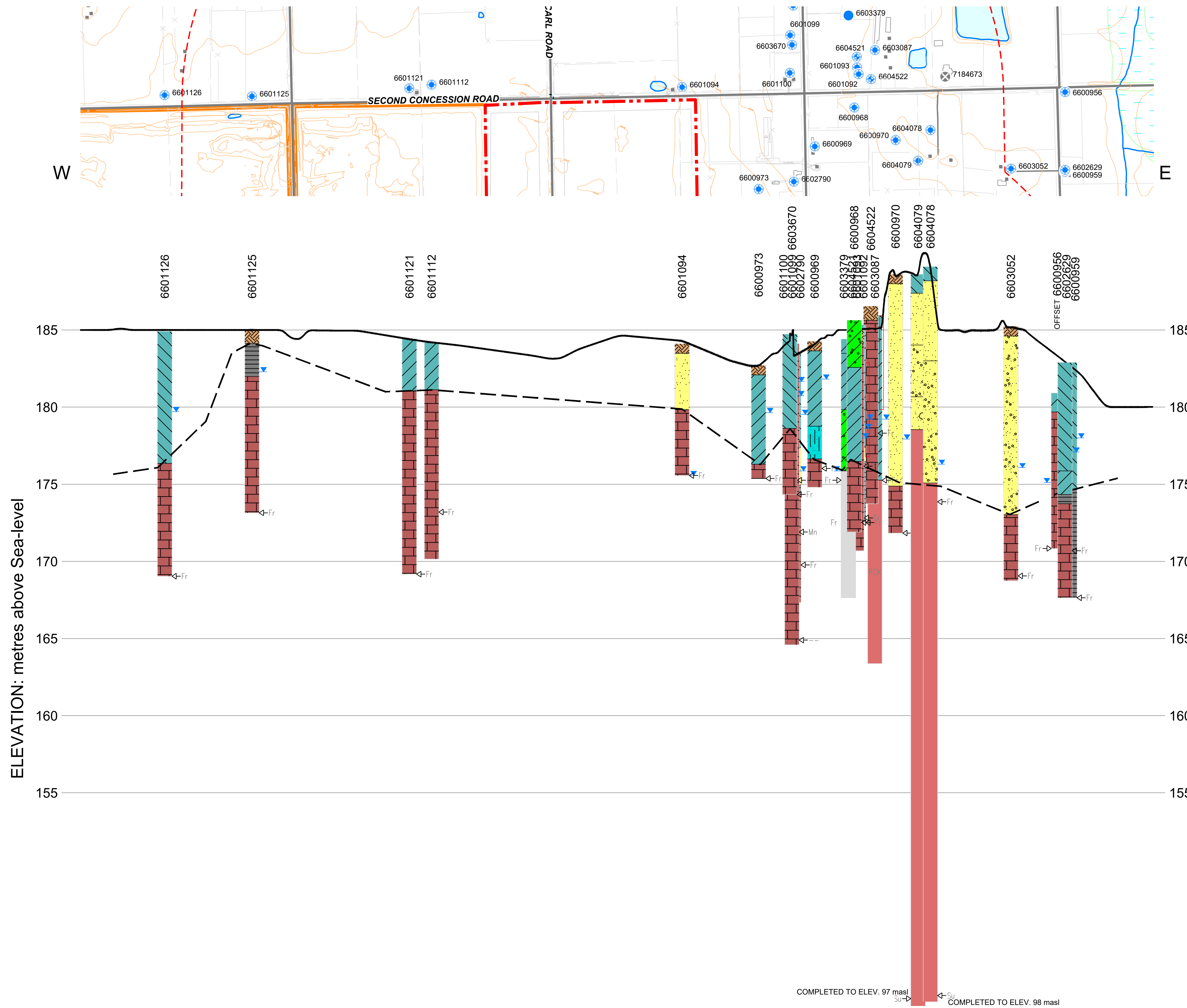
GOLDER

YYYY-MM-DD	2020-07-16
DESIGNED	
PREPARED	JPR
REVIEWED	BSZ
APPROVED	SM

PROJECT NO.	CONTROL	REV.	FIGURE
1771656	0018	----	17

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI B

25 mm



PLAN LEGEND

- Shallow Dug or Bored <10 m
- Deep Bored Well >10 m
- Drilled Overburden Well
- Test or Observation Well
- Drilled Bedrock Well
- Municipal / Public Supply
- Site Monitoring Well

SOIL PATTERN LEGEND AND GENERIC SHADING

Unoxidized Clay Blue, Grey White, or Undefined	Unknown
Oxidized Clay Brown, Red, Yellow	Peat/loam
Silt	Sands & Gravels
Sand	Granular Till
Gravel	Silt
Stones, Pebbles	Silt Clayey
Boulder	Clay
Till	Till
Shale	Limestones
Limestone	Shales
Crystalline Rock	Undifferentiated

SECTION WELL SYMBOLS

- 23453 MOE Recorded Private Well
- Recorded Static Water Level
- Flowing Well
- Water Producing Zone
- Equipotential
- Screen

NOTES:

Ministry of Environment Water Well Records, Queen's Printer. Location and elevations of field verified wells are subject to revision.

Boundaries between soil strata have been determined only at well and test well locations. Between the wells and test wells, boundaries are not proven but are assumed from geological eveidence.

0 500 1000 1500 m

1:25000

Plotted 11x17" Tabloid

Projection is UTM NAD 83 Zone 17

CLIENT
RANKIN CONSTRUCTION

PROJECT
PORT COLBORNE QUARRY EXTENSION

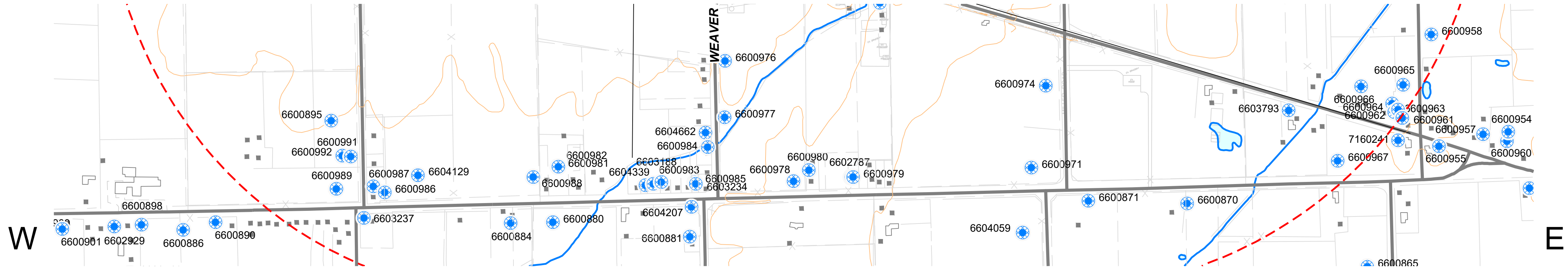
TITLE
WATER WELLS CROSS-SECTION C - C'

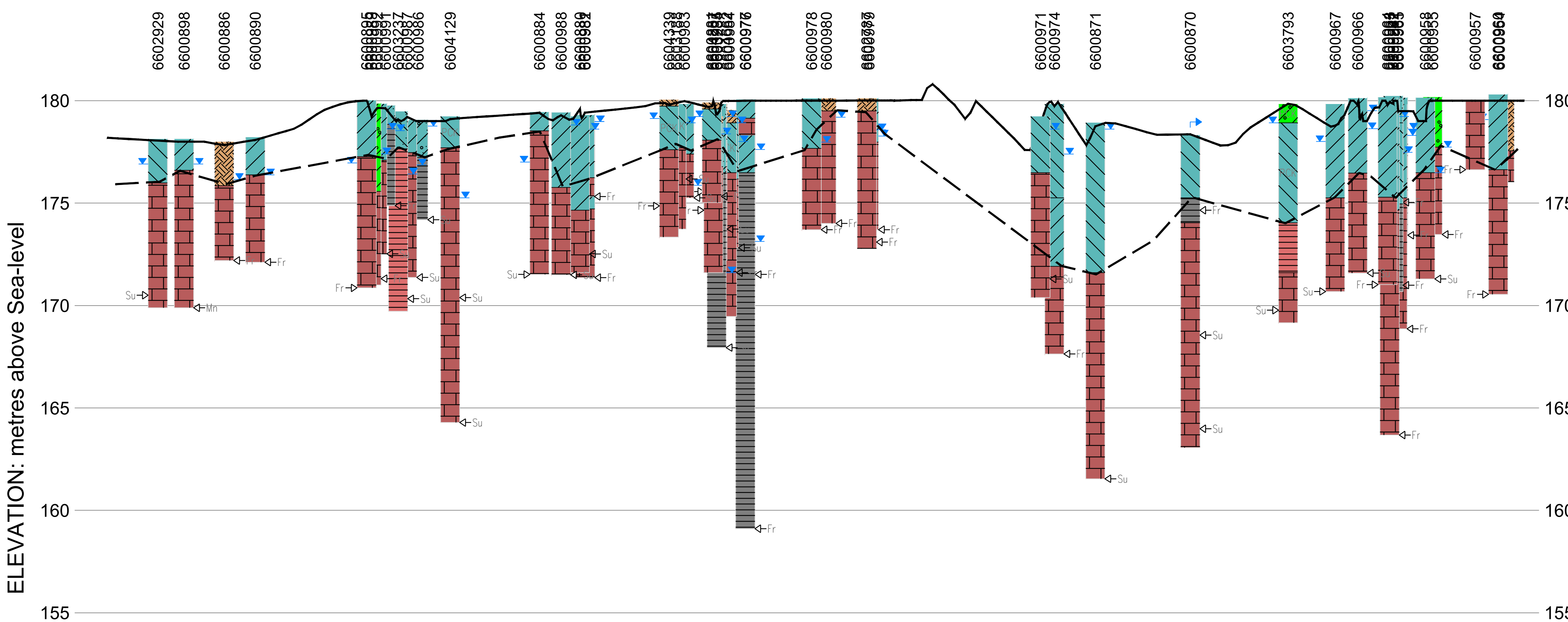
CONSULTANT

GOLDER

YYYY-MM-DD	2020-07-16
DESIGNED	
PREPARED	JPR
REVIEWED	BSZ
APPROVED	SM

PROJECT NO.	CONTROL	REV.	FIGURE
1771656	0018	----	18





PLAN LEGEND

- Shallow Dug or Bored <10 m
- Deep Bored Well >10 m
- Drilled Overburden Well
- Test or Observation Well
- Drilled Bedrock Well
- Municipal / Public Supply
- Site Monitoring Well

SOIL PATTERN LEGEND AND GENERIC SHADING

- Unoxidized Clay Blue, Grey White, or Undefined
- Oxidized Clay Brown, Red, Yellow
- Silt
- Sand
- Gravel
- Stones, Pebbles
- Boulder
- Till
- Shale
- Limestone
- Crystalline Rock
- Unknown
- Peat/loam
- Sands & Gravels
- Granular Till
- Silt
- Silt Clayey
- Clay
- Till
- Limestones
- Shales
- Undifferentiated

SECTION WELL SYMBOLS

- 23453 MOE Recorded Private Well
- Recorded Static Water Level
- Water Producing Zone
- Screen
- Flowing Well
- Equipotential

NOTES:

Ministry of Environment Water Well Records, Queen's Printer. Location and elevations of field verified wells are subject to revision.

Boundaries between soil strata have been determined only at well and test well locations. Between the wells and test wells, boundaries are not proven but are assumed from geological eveidence.

0 500 1000 1500 m

1:25000

Plotted 11x17" Tabloid

Projection is UTM NAD 83 Zone 17

CLIENT
RANKIN CONSTRUCTION

PROJECT
PORT COLBORNE QUARRY EXTENSION

TITLE
WATER WELLS CROSS-SECTION D - D'

CONSULTANT

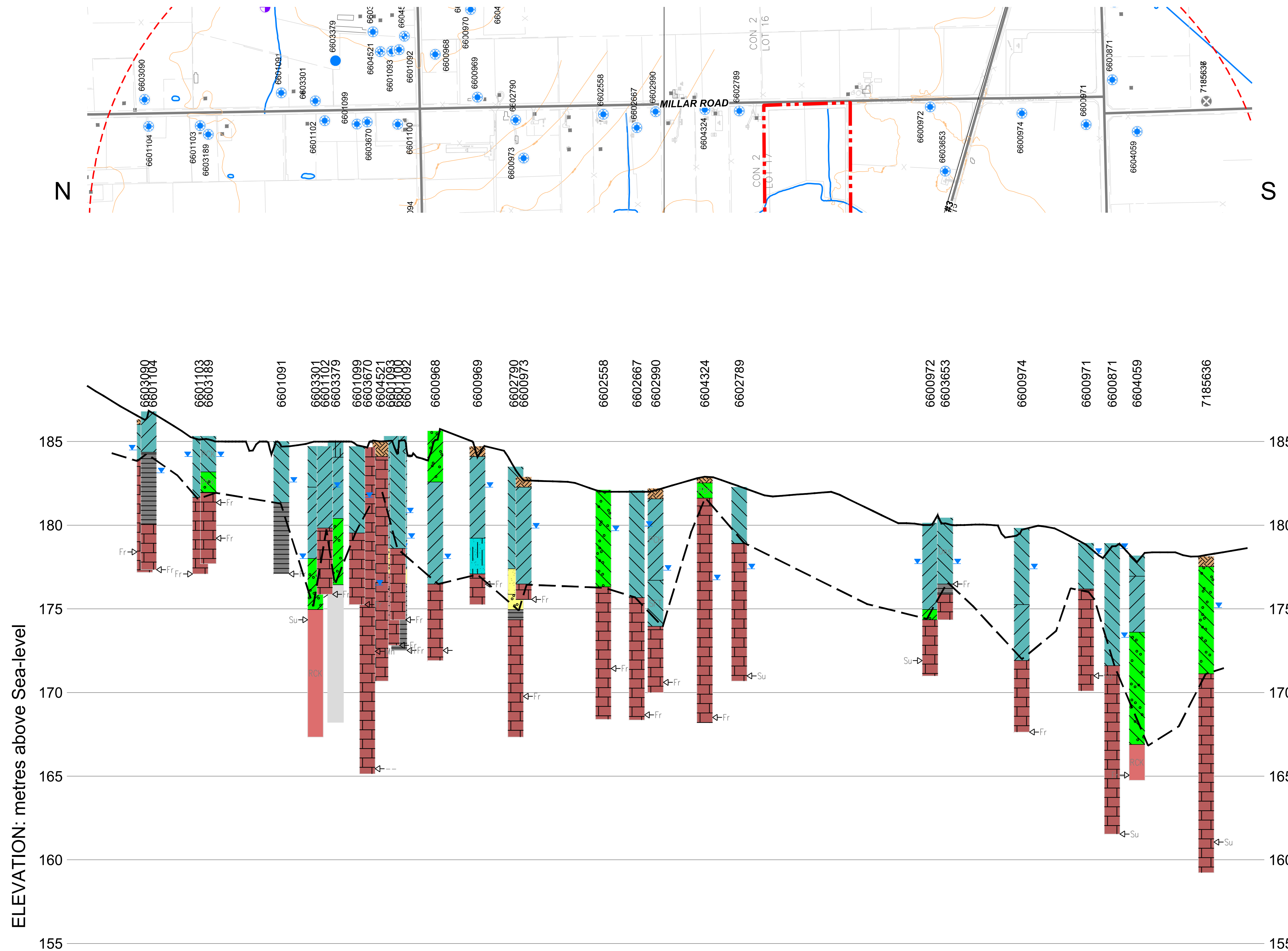
GOLDER

YYYY-MM-DD	2020-07-16
DESIGNED	
PREPARED	JPR
REVIEWED	BSZ
APPROVED	SM

PROJECT NO.	CONTROL	REV.	FIGURE
1771656	0018	----	19

25 mm

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI B



PLAN LEGEND

- Shallow Dug or Bored <10 m
- Deep Bored Well >10 m
- Drilled Overburden Well
- Test or Observation Well
- Drilled Bedrock Well
- Municipal / Public Supply
- Site Monitoring Well

SOIL PATTERN LEGEND AND GENERIC SHADING

Pattern	Shading
Unoxidized Clay Blue, Grey White, or Undefined	Unknown
Oxidized Clay Brown, Red, Yellow	Peat/loam
Silt	Sands & Gravels
Sand	Granular Till
Gravel	Silt
Stones, Pebbles	Silt Clayey
Boulder	Clay
Till	Till
Shale	Limestones
Limestone	Shales
Crystalline Rock	Undifferentiated

SECTION WELL SYMBOLS

- 23453 MOE Recorded Private Well
- Recorded Static Water Level
- Flowing Well
- Water Producing Zone
- Equipotential
- Screen

NOTES:

Ministry of Environment Water Well Records, Queen's Printer. Location and elevations of field verified wells are subject to revision.

Boundaries between soil strata have been determined only at well and test well locations. Between the wells and test wells, boundaries are not proven but are assumed from geological eveidence.

0 500 1000 1500 m

1:25000

Plotted 11x17" Tabloid

Projection is UTM NAD 83 Zone 17

CLIENT
RANKIN CONSTRUCTION

PROJECT
PORT COLBORNE QUARRY EXTENSION

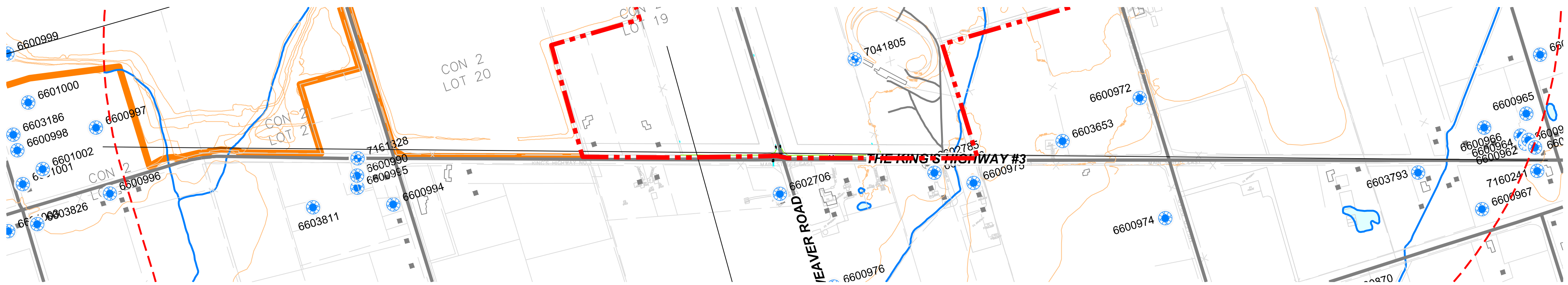
TITLE
WATER WELLS CROSS-SECTION E - E'

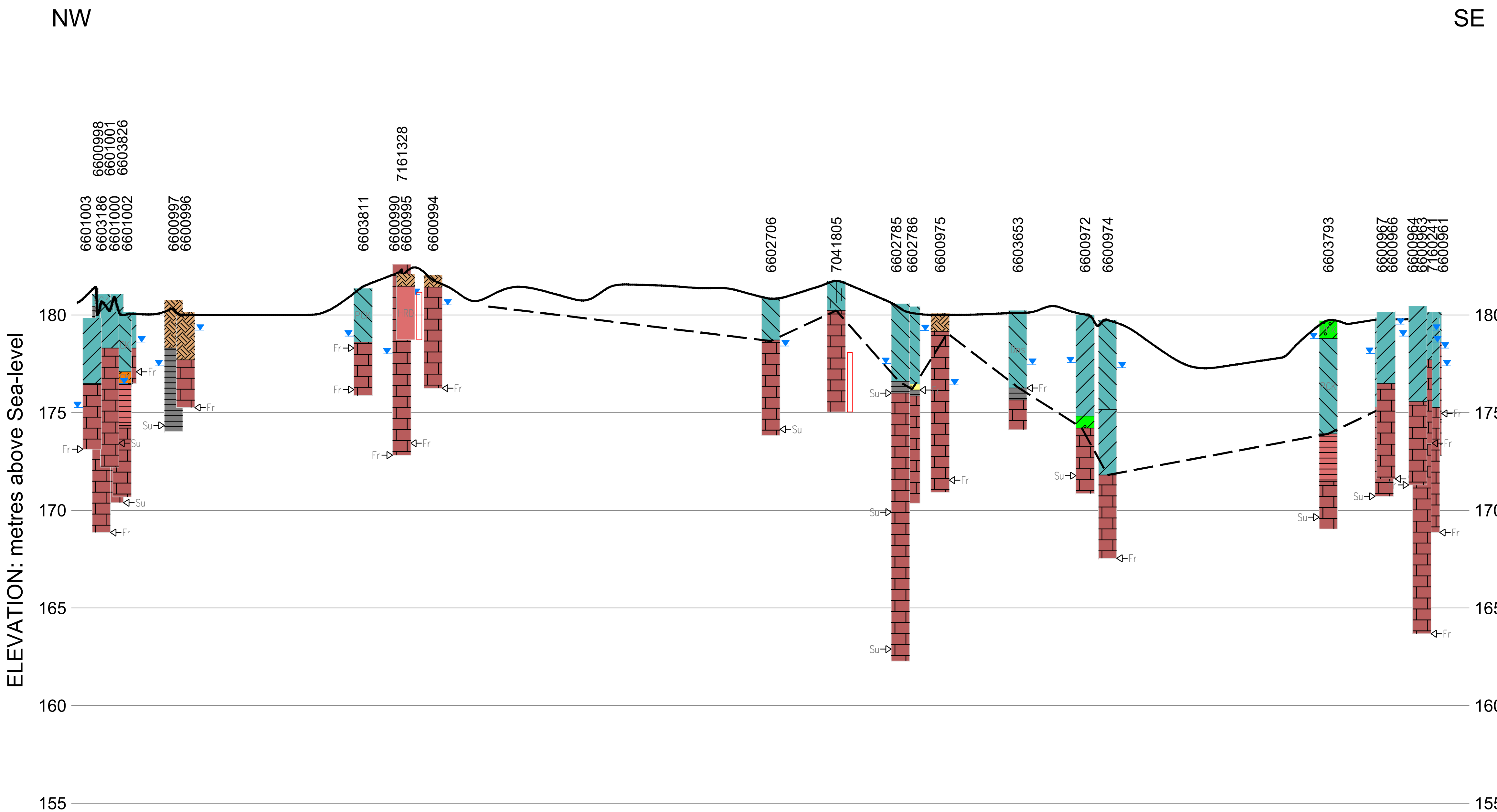
CONSULTANT

GOLDER

YYYY-MM-DD	2020-07-16
DESIGNED	
PREPARED	JPR
REVIEWED	BSZ
APPROVED	SM

PROJECT NO.	CONTROL	REV.	FIGURE
1771656	0018	----	20





PLAN LEGEND

- Shallow Dug or Bored <10 m
- Deep Bored Well >10 m
- Drilled Overburden Well
- Test or Observation Well
- Drilled Bedrock Well
- Municipal / Public Supply
- Site Monitoring Well

SOIL PATTERN LEGEND AND GENERIC SHADING

Unoxidized Clay Blue, Grey White, or Undefined	Unknown
Oxidized Clay Brown, Red, Yellow	Peat/loam
Silt	Sands & Gravels
Sand	Granular Till
Gravel	Silt
Stones, Pebbles	Silt Clayey
Boulder	Clay
Till	Till
Shale	Limestones
Limestone	Shales
Crystalline Rock	Undifferentiated

SECTION WELL SYMBOLS

- 23453 MOE Recorded Private Well
- Recorded Static Water Level
- Flowing Well
- Water Producing Zone
- Equipotential
- Screen

NOTES:

Ministry of Environment Water Well Records, Queen's Printer. Location and elevations of field verified wells are subject to revision.

Boundaries between soil strata have been determined only at well and test well locations. Between the wells and test wells, boundaries are not proven but are assumed from geological eveidence.

0 500 1000 1500 m

1:25000

Plotted 11x17" Tabloid

Projection is UTM NAD 83 Zone 17

CLIENT
RANKIN CONSTRUCTION

PROJECT
PORT COLBORNE QUARRY EXTENSION

TITLE
WATER WELLS CROSS-SECTION F - F'

CONSULTANT

GOLDER

YYYY-MM-DD	2020-07-16
DESIGNED	
PREPARED	JPR
REVIEWED	BSZ
APPROVED	SM

PROJECT NO.	CONTROL	REV.	FIGURE
1771656	0018	----	21

25 mm

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI B

LEGEND

- (1) Excavation Phase
- Monitoring Locations for Proposed Extension
- Future Monitoring Wells (to be installed prior to quarrying)
- Wignell Drain (formerly Mitchner Drain)
- Mitchner Drain
- Roads
- Watercourse
- Waterbody
- Wetland
- Woodland
- Property Boundary
- Proposed Quarry Extension
- Approximate Excavation Phasing Boundary

0 0.2 0.4

1:8,000 Kilometers

NOTE(S)

1. GROUNDWATER ELEVATIONS MEASURED ON MAY 15, 2017
2. OVERBURDEN GROUND WATER LEVELS ARE CONTINUING TO RECOVER FOLLOWING THE MONITORING WELL INSTALLATIONS AND GROUNDWATER SAMPLING/DEVELOPMENT

REFERENCE(S)

1. BASE DATA: MNRF LIO 2016
2. IMAGERY: ORTHOIMAGE PROVIDED BY IBI GROUP. SITE FLOWN JULY 29TH, 2018
3. ADDITIONAL IMAGERY FROM © 2020 MICROSOFT CORPORATION © 2020 MAXAR ©CNES (2020) DISTRIBUTION AIRBUS DS
4. PROJECTION: TRANSVERSE MERCATOR NAD 1983 UTM ZONE 17N

CLIENT
RANKIN CONSTRUCTION

PROJECT
PORT COLBORNE QUARRY EXTENSION

TITLE
MONITORING LOCATIONS FOR PROPOSED EXTENSION

CONSULTANT

GOLDER

YYYY-MM-DD	2020-09-03
DESIGNED	PR
PREPARED	PR
REVIEWED	BZ
APPROVED	SM

PROJECT NO.	CONTROL	REV.	FIGURE
1771656	0018		22

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM:

APPENDIX A

Borehole Logs

PROJECT: 1771656

LOCATION: N 4752127.19; E 646721.25

RECORD OF BOREHOLE: BH17-10D

BORING DATE: April 3, 2017

SHEET 1 OF 2

DATUM: Geodetic

SPT/DCPT HAMMER: MASS, 64kg; DROP, 760mm

HAMMER TYPE: AUTOMATIC

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80); SHEAR STRENGTH Cu, kPa nat V. + Q - ● rem V. ⊕ U - ○ (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-9} 10^{-8} 10^{-7} 10^{-6}); WATER CONTENT PERCENT Wp ⊢—○W—⊣ Wl (10 20 30 40)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		181.96							
0	Acker SoilMax; Hollow Stem Augers	OVERBURDEN - TOPSOIL , over SILTY CLAY ; reddish brown		0.00							
1											
2											
3											
4											
5											
		CONTINUED NEXT PAGE									

PROJECT: 1771656

LOCATION: N 4752127.19; E 646721.25

RECORD OF BOREHOLE: BH17-10D

BORING DATE: April 3, 2017

DATUM: Geodetic

SPT/DCPT HAMMER: MASS, 64kg; DROP, 760mm

HAMMER TYPE: AUTOMATIC

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80); SHEAR STRENGTH Cu, kPa nat V. + Q - ● rem V. ⊕ U - ○ (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-9} 10^{-8} 10^{-7} 10^{-6}); WATER CONTENT PERCENT Wp —○W— Wl (10 20 30 40)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		--- CONTINUED FROM PREVIOUS PAGE ---									
5		OVERBURDEN - TOPSOIL , over SILTY CLAY ; reddish brown									
6				175.66 6.30							
		END OF BOREHOLE - AUGER REFUSAL - For Bedrock coring details, refer to Record of Drillhole BH17-10D									
7											
8											
9											
10											

GTA-BHS 001 S:\CLIENTS\RANKIN_CONSTRUCTION\PORT_COLBORNE_QUARRY\02_DATA\GINT\1771656.GPJ GAL-MIS.GDT 7/27/20

DEPTH SCALE

1 : 25

GOLDER

LOGGED: TP

CHECKED: SM

RECORD OF BOREHOLE: BH17-10S

PROJECT: 1771656
LOCATION: N 4752127.45; E 646718.75
BORING DATE: April 5, 2017
SHEET 1 OF 2
DATUM: Geodetic

SPT/DCPT HAMMER: MASS, 64kg; DROP, 760mm
HAMMER TYPE: AUTOMATIC

DEPTH SCALE METRES	BORING METHOD	DESCRIPTION	ELEV. / DEPTH (m)	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE	181.94	
0	Acker SoilMax, Hollow Stem Augers	TOPSOIL	0.00	Bentonite Seal
		SILTY CLAY; light brown;	180.42 / 1.52	Sand; Screen and Sand
5				

Column headings: SAMPLES (NUMBER, TYPE, BLOWS/0.3m); DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20, 40, 60, 80); SHEAR STRENGTH Cu, kPa (nat V. + Q - ●, rem V. ⊕ U - ○) (20, 40, 60, 80); HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-9}, 10^{-8}, 10^{-7}, 10^{-6}); WATER CONTENT PERCENT (Wp, W, Wl) (10, 20, 30, 40); ADDITIONAL LAB. TESTING

CONTINUED NEXT PAGE

DEPTH SCALE
1 : 25

GOLDER

LOGGED: TP
CHECKED: SM

RECORD OF BOREHOLE: BH17-10S

BORING DATE: April 5, 2017

DATUM: Geodetic

SPT/DCPT HAMMER: MASS, 64kg; DROP, 760mm

HAMMER TYPE: AUTOMATIC

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80); SHEAR STRENGTH Cu, kPa nat V. + Q - ● rem V. ⊕ U - ○ (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-9} 10^{-8} 10^{-7} 10^{-6}); WATER CONTENT PERCENT Wp ⊢—○W—⊣ Wl (10 20 30 40)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		--- CONTINUED FROM PREVIOUS PAGE ---									
5	Acker SoilMax / Hollow Stem Augers	SILTY CLAY; light brown;		176.02 5.92							Screen and Sand
6		END OF BOREHOLE									
7											
8											
9											
10											

DEPTH SCALE
1 : 25

GOLDER

LOGGED: TP
CHECKED: SM

RECORD OF BOREHOLE: BH17-1D

PROJECT: 1771656
LOCATION: N 4752362.64; E 646595.40
BORING DATE: February 6, 2017
SHEET 1 OF 3
DATUM: Geodetic

SPT/DCPT HAMMER: MASS, 64kg; DROP, 760mm
HAMMER TYPE: AUTOMATIC

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	SAMPLES NUMBER	TYPE	BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80); SHEAR STRENGTH Cu, kPa nat V. + Q - ● rem V. ⊕ U - ○ (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-9} 10^{-8} 10^{-7} 10^{-6}); WATER CONTENT PERCENT Wp ⊢ ○W ⊣ Wl (10 20 30 40)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		181.99							
0		OVERBURDEN - TOPSOIL over SILTY CLAY ; reddish brown		0.00							
1											
2											
3											
4											
5											

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GTA-BHS 001 S:\CLIENTS\RANKIN_CONSTRUCTION\PORT_COLBORNE_QUARRY\02_DATA\GINT\1771656.GPJ GAL-MIS.GDT 7/27/20

DEPTH SCALE
1 : 25

GOLDER

LOGGED: TP
CHECKED: SM

PROJECT: 1771656

LOCATION: N 4752362.64; E 646595.40

RECORD OF BOREHOLE: BH17-1D

BORING DATE: February 6, 2017

DATUM: Geodetic

SPT/DCPT HAMMER: MASS, 64kg; DROP, 760mm

HAMMER TYPE: AUTOMATIC

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80); SHEAR STRENGTH Cu, kPa nat V. + Q - ● rem V. ⊕ U - ○ (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-9} 10^{-8} 10^{-7} 10^{-6}); WATER CONTENT PERCENT Wp —○W— Wl (10 20 30 40)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		--- *CONTINUED FROM PREVIOUS PAGE* ---									
5		OVERBURDEN - TOPSOIL over SILTY CLAY ; reddish brown									
6											
7											
8											
9											
10											

CONTINUED NEXT PAGE

DEPTH SCALE

1 : 25

LOGGED: TP

CHECKED: SM

RECORD OF BOREHOLE: BH17-1D

PROJECT: 1771656
LOCATION: N 4752362.64; E 646595.40
BORING DATE: February 6, 2017

DATUM: Geodetic

SPT/DCPT HAMMER: MASS, 64kg; DROP, 760mm
HAMMER TYPE: AUTOMATIC

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80); SHEAR STRENGTH Cu, kPa nat V. + Q - ● rem V. ⊕ U - ○ (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-9} 10^{-8} 10^{-7} 10^{-6}); WATER CONTENT PERCENT Wp — W — Wl (10 20 30 40)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		--- CONTINUED FROM PREVIOUS PAGE ---									
10		OVERBURDEN - TOPSOIL over SILTY CLAY ; reddish brown		171.78							
		END OF BOREHOLE - AUGER REFUSAL - For Bedrock coring details, refer to Record of Drillhole BH17-1D		10.21							
11											
12											
13											
14											
15											

DEPTH SCALE
1 : 25

GOLDER

LOGGED: TP
CHECKED: SM

PROJECT: 1771656

LOCATION: N 4752362.66; E 646597.97

RECORD OF BOREHOLE: BH17-1S

BORING DATE: March 29, 2017

DATUM: Geodetic

SPT/DCPT HAMMER: MASS, 64kg; DROP, 760mm

HAMMER TYPE: AUTOMATIC

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20, 40, 60, 80); SHEAR STRENGTH Cu, kPa nat V. + Q - ● rem V. ⊕ U - ○ (20, 40, 60, 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-9}, 10^{-8}, 10^{-7}, 10^{-6}); WATER CONTENT PERCENT Wp ⊢—○W—⊣ Wl (10, 20, 30, 40)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		182.07							
0	Acker SoilMax / Hollow Stem Augers	TOPSOIL		0.00							
1											Bentonite Seal
		SILTY CLAY; reddish brown;		180.55 / 1.52							
2											
											Sand
3											
4											Screen and Sand
5											

CONTINUED NEXT PAGE

DEPTH SCALE

1 : 25

GOLDER

LOGGED: TP

CHECKED: SM

RECORD OF BOREHOLE: BH17-1S

PROJECT: 1771656
LOCATION: N 4752362.66; E 646597.97
BORING DATE: March 29, 2017
SHEET 2 OF 2
DATUM: Geodetic

SPT/DCPT HAMMER: MASS, 64kg; DROP, 760mm
HAMMER TYPE: AUTOMATIC

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80); SHEAR STRENGTH Cu, kPa nat V. + Q - ● rem V. ⊕ U - ○ (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-9} 10^{-8} 10^{-7} 10^{-6}); WATER CONTENT PERCENT Wp —○W— Wl (10 20 30 40)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		--- *CONTINUED FROM PREVIOUS PAGE* ---									
5	Acker SoilMax / Hollow Stem Augers	SILTY CLAY; reddish brown;									Screen and Sand
6				176.02 / 6.05							
		END OF BOREHOLE									
7											
8											
9											
10											

DEPTH SCALE
1 : 25

GOLDER

LOGGED: TP
CHECKED: SM

PROJECT: 1771656

RECORD OF BOREHOLE: BH17-2D

LOCATION: N 4752109.43; E 646602.90

BORING DATE: March 29, 2017

DATUM: Geodetic

SPT/DCPT HAMMER: MASS, 64kg; DROP, 760mm

HAMMER TYPE: AUTOMATIC

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80); SHEAR STRENGTH Cu, kPa nat V. + Q - ● rem V. ⊕ U - ○ (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-9} 10^{-8} 10^{-7} 10^{-6}); WATER CONTENT PERCENT Wp ⊢—○W—⊣ Wl (10 20 30 40)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		181.70							
0		OVERBURDEN - TOPSOIL, over SILTY CLAY ; reddish brown		0.00							
1											
2											
3											
4											
5											

CONTINUED NEXT PAGE

DEPTH SCALE
1 : 25

GOLDER

LOGGED: TP
CHECKED: SM

PROJECT: 1771656

RECORD OF BOREHOLE: BH17-2D

LOCATION: N 4752109.43; E 646602.90

BORING DATE: March 29, 2017

DATUM: Geodetic

SPT/DCPT HAMMER: MASS, 64kg; DROP, 760mm

HAMMER TYPE: AUTOMATIC

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80); SHEAR STRENGTH Cu, kPa nat V. + Q - ● rem V. ⊕ U - ○ (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-9} 10^{-8} 10^{-7} 10^{-6}); WATER CONTENT PERCENT Wp —o W— Wl (10 20 30 40)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		--- *CONTINUED FROM PREVIOUS PAGE* ---									
5		OVERBURDEN - TOPSOIL, over SILTY CLAY ; reddish brown									
6											
7											
8				173.01							
		END OF BOREHOLE - AUGER REFUSAL - For Bedrock coring details, refer to Record of Drillhole BH17-2D		8.69							
9											
10											

DEPTH SCALE

1 : 25

GOLDER

LOGGED: TP

CHECKED: SM

RECORD OF BOREHOLE: BH17-2S

PROJECT: 1771656
LOCATION: N 4752108.56; E 646604.84
BORING DATE: March 30, 2017
SHEET 1 OF 2
DATUM: Geodetic

SPT/DCPT HAMMER: MASS, 64kg; DROP, 760mm
HAMMER TYPE: AUTOMATIC

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80); SHEAR STRENGTH Cu, kPa nat V. + Q - ● rem V. ⊕ U - ○ (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-9} 10^{-8} 10^{-7} 10^{-6}); WATER CONTENT PERCENT Wp ⊢—○W—⊣ Wl (10 20 30 40)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		181.70							
0	Acker SoilMax; Hollow Stem Augers	TOPSOIL		0.00							
1											Bentonite Seal
		SILTY CLAY; reddish brown;		180.18 1.52							
2											
											Sand
3											
4											Screen and Sand
5											

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DEPTH SCALE
1 : 25

GOLDER

LOGGED: TP
CHECKED: SM

RECORD OF BOREHOLE: BH17-2S

PROJECT: 1771656
LOCATION: N 4752108.56; E 646604.84
BORING DATE: March 30, 2017
SHEET 2 OF 2
DATUM: Geodetic

SPT/DCPT HAMMER: MASS, 64kg; DROP, 760mm
HAMMER TYPE: AUTOMATIC

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80); SHEAR STRENGTH Cu, kPa nat V. + Q - ● rem V. ⊕ U - ○ (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-9} 10^{-8} 10^{-7} 10^{-6}); WATER CONTENT PERCENT Wp ⊢ ○W ⊣ Wl (10 20 30 40)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		--- CONTINUED FROM PREVIOUS PAGE ---									
5	Acker SoilMax / Hollow Stem Augers	SILTY CLAY; reddish brown;									Screen and Sand
6				175.65							
		END OF BOREHOLE		6.05							
7											
8											
9											
10											

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DEPTH SCALE
1 : 25

GOLDER

LOGGED: TP
CHECKED: SM

PROJECT: 1771656

LOCATION: N 4751983.70; E 646823.07

RECORD OF BOREHOLE: BH17-3D

BORING DATE: March 23, 2017

DATUM: Geodetic

SPT/DCPT HAMMER: MASS, 64kg; DROP, 760mm

HAMMER TYPE: AUTOMATIC

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80); SHEAR STRENGTH Cu, kPa nat V. + Q - ● rem V. ⊕ U - ○ (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-9} 10^{-8} 10^{-7} 10^{-6}); WATER CONTENT PERCENT Wp —○W— Wl (10 20 30 40)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		181.99							
0		OVERBURDEN - TOPSOIL , over SILTY CLAY ; reddish brown		0.00							
1											
2											
3											
4											
5											

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DEPTH SCALE

1 : 25

GOLDER

LOGGED: TP

CHECKED: SM

RECORD OF BOREHOLE: BH17-3D

PROJECT: 1771656
LOCATION: N 4751983.70; E 646823.07
BORING DATE: March 23, 2017
DATUM: Geodetic

SPT/DCPT HAMMER: MASS, 64kg; DROP, 760mm
HAMMER TYPE: AUTOMATIC

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	SAMPLES NUMBER	TYPE	BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80); SHEAR STRENGTH Cu, kPa nat V. + Q - ● rem V. ⊕ U - ○ (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-9} 10^{-8} 10^{-7} 10^{-6}); WATER CONTENT PERCENT Wp ⊢—○W—⊣ Wl (10 20 30 40)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		--- CONTINUED FROM PREVIOUS PAGE ---									
5		OVERBURDEN - TOPSOIL , over SILTY CLAY ; reddish brown									
		END OF BOREHOLE - AUGER REFUSAL - For Bedrock coring details, refer to Record of Drillhole BH17-3D		176.63 5.36							
6											
7											
8											
9											
10											

DEPTH SCALE
1 : 25

GOLDER

LOGGED: TP
CHECKED: SM

PROJECT: 1771656

RECORD OF BOREHOLE: BH17-3S

LOCATION: N 4751985.67; E 646822.97

BORING DATE: March 27, 2017

DATUM: Geodetic

SPT/DCPT HAMMER: MASS, 64kg; DROP, 760mm

HAMMER TYPE: AUTOMATIC

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	SAMPLES NUMBER	TYPE	BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m 20 40 60 80 / SHEAR STRENGTH Cu, kPa nat V. + Q - ● rem V. ⊕ U - ○ 20 40 60 80	HYDRAULIC CONDUCTIVITY, k, cm/s 10^{-9} 10^{-8} 10^{-7} 10^{-6} / WATER CONTENT PERCENT Wp W Wl 10 20 30 40	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		182.06							
0	Acker SoilMax, Hollow Stem Augers	TOPSOIL		0.00							
1											Bentonite Seal
		SILTY CLAY; reddish brown;		180.54 1.52							
2											Sand
3											Screen and Sand
4											
5											

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DEPTH SCALE
1 : 25

GOLDER

LOGGED: TP
CHECKED: SM

PROJECT: 1771656

RECORD OF BOREHOLE: BH17-3S

LOCATION: N 4751985.67; E 646822.97

BORING DATE: March 27, 2017

DATUM: Geodetic

SPT/DCPT HAMMER: MASS, 64kg; DROP, 760mm

HAMMER TYPE: AUTOMATIC

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	SAMPLES NUMBER	SAMPLES TYPE	BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80); SHEAR STRENGTH Cu, kPa nat V. + Q - ● rem V. ⊕ U - ○ (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-9} 10^{-8} 10^{-7} 10^{-6}); WATER CONTENT PERCENT Wp —O W— Wl (10 20 30 40)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		--- *CONTINUED FROM PREVIOUS PAGE* ---									
5		SILTY CLAY; reddish brown;		176.88							Screen and Sand
		END OF BOREHOLE		5.18							
6											
7											
8											
9											
10											

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DEPTH SCALE

1 : 25

GOLDER

LOGGED: TP

CHECKED: SM

RECORD OF BOREHOLE: BH17-4D

PROJECT: 1771656
LOCATION: N 4751621.30; E 646626.89
BORING DATE: February 27, 2017
SHEET 1 OF 1
DATUM: Geodetic

SPT/DCPT HAMMER: MASS, 64kg; DROP, 760mm
HAMMER TYPE: AUTOMATIC

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80); SHEAR STRENGTH Cu, kPa nat V. + Q - ● rem V. ⊕ U - ○ (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-9} 10^{-8} 10^{-7} 10^{-6}); WATER CONTENT PERCENT Wp —○W— Wl (10 20 30 40)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		182.51							
0		OVERBURDEN - TOPSOIL , over SILTY CLAY ; reddish brown		0.00							
1											
2				180.07							
		END OF BOREHOLE - AUGER REFUSAL - For Bedrock coring details, refer to Record of Drillhole BH17-4D		2.44							
3											
4											
5											

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DEPTH SCALE
1 : 25

GOLDER

LOGGED: TP
CHECKED: SM

RECORD OF BOREHOLE: BH17-4S

PROJECT: 1771656
LOCATION: N 4751619.19; E 646627.13
BORING DATE: February 28, 2017
SHEET 1 OF 1
DATUM: Geodetic

SPT/DCPT HAMMER: MASS, 64kg; DROP, 760mm
HAMMER TYPE: AUTOMATIC

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80); SHEAR STRENGTH Cu, kPa nat V. + Q - ● rem V. ⊕ U - ○ (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-9} 10^{-8} 10^{-7} 10^{-6}); WATER CONTENT PERCENT Wp ⊢—○W—⊣ Wl (10 20 30 40)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		182.53							
0		OVERBURDEN - TOPSOIL , over SILTY CLAY ; reddish brown		0.00							
1											
											Bentonite Seal
2											
				180.12							
		END OF BOREHOLE - AUGER REFUSAL - For Bedrock coring details, refer to Record of Drillhole BH17-4S		2.41							
3											
4											
5											

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DEPTH SCALE
1 : 25

GOLDER

LOGGED: TP
CHECKED: SM

RECORD OF BOREHOLE: BH17-5D

PROJECT: 1771656
LOCATION: N 4751485.26; E 646415.54
BORING DATE: March 20, 2017
SHEET 1 OF 1
DATUM: Geodetic

SPT/DCPT HAMMER: MASS, 64kg; DROP, 760mm
HAMMER TYPE: AUTOMATIC

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80); SHEAR STRENGTH Cu, kPa (nat V. + Q - ●; rem V. ⊕ U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-9} 10^{-8} 10^{-7} 10^{-6}); WATER CONTENT PERCENT Wp —O^W— Wl (10 20 30 40)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		182.56							
0		OVERBURDEN - TOPSOIL		0.00							
		END OF BOREHOLE - AUGER REFUSAL - For Bedrock coring details, refer to Record of Drillhole BH17-5D		182.05 0.51							
1											
2											
3											
4											
5											

DEPTH SCALE
1 : 25

GOLDER

LOGGED: TP
CHECKED: SM

RECORD OF BOREHOLE: BH17-5S

PROJECT: 1771656

LOCATION: N 4751486.30; E 646415.35

BORING DATE: March 23, 2017

SHEET 1 OF 1

DATUM: Geodetic

SPT/DCPT HAMMER: MASS, 64kg; DROP, 760mm

HAMMER TYPE: AUTOMATIC

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE - DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES - NUMBER	TYPE	BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80); SHEAR STRENGTH Cu, kPa nat V. + Q - ● rem V. ⊕ U - ○ (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-9} 10^{-8} 10^{-7} 10^{-6}); WATER CONTENT PERCENT Wp —○W— Wl (10 20 30 40)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		182.58							
0	Acker SoilMax Hollow Stem Augers	OVERBURDEN - TOPSOIL		0.00							
		END OF BOREHOLE - AUGER REFUSAL - For Bedrock coring details, refer to Record of Drillhole BH17-5S		181.82 0.76							Bentonite Seal
1											
2											
3											
4											
5											

DEPTH SCALE

1 : 25

GOLDER

LOGGED: TP

CHECKED: SM

PROJECT: 1771656

LOCATION: N 4751418.07; E 646833.18

RECORD OF BOREHOLE: BH17-6D

BORING DATE: February 22, 2017

SHEET 1 OF 1

DATUM: Geodetic

SPT/DCPT HAMMER: MASS, 64kg; DROP, 760mm

HAMMER TYPE: AUTOMATIC

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80); SHEAR STRENGTH Cu, kPa nat V. + Q - ● rem V. ⊕ U - ○ (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-9} 10^{-8} 10^{-7} 10^{-6}); WATER CONTENT PERCENT Wp ⊢—○W—⊣ Wl (10 20 30 40)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		181.83							
0		OVERBURDEN - TOPSOIL , over SILTY CLAY ; reddish brown		0.00							
1											
2											
3				178.48 3.35							
		END OF BOREHOLE - AUGER REFUSAL - For Bedrock coring details, refer to Record of Drillhole BH17-6D									
4											
5											

DEPTH SCALE

1 : 25

GOLDER

LOGGED: TP

CHECKED: SM

RECORD OF BOREHOLE: BH17-6S

PROJECT: 1771656
LOCATION: N 4751420.19; E 646833.02
BORING DATE: February 23, 2017
SHEET 1 OF 1
DATUM: Geodetic

SPT/DCPT HAMMER: MASS, 64kg; DROP, 760mm
HAMMER TYPE: AUTOMATIC

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE – DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	SAMPLES NUMBER	TYPE	BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80); SHEAR STRENGTH Cu, kPa nat V. + Q - ● rem V. ⊕ U - ○ (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-9} 10^{-8} 10^{-7} 10^{-6}); WATER CONTENT PERCENT Wp W Wl (10 20 30 40)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		181.79							
0	Acker SoilMax Hollow Stem Augers	OVERBURDEN - TOPSOIL , over SILTY CLAY ; reddish brown		0.00							Bentonite Seal
1											
2											
3				178.44 3.35							
		END OF BOREHOLE - AUGER REFUSAL - For Bedrock coring details, refer to Record of Drillhole BH17-6S									
4											
5											

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DEPTH SCALE
1 : 25

GOLDER

LOGGED: TP
CHECKED: SM

RECORD OF BOREHOLE: BH17-7D

PROJECT: 1771656
LOCATION: N 4751237.03; E 646634.77
BORING DATE: March 1, 2017
SHEET 1 OF 1
DATUM: Geodetic

SPT/DCPT HAMMER: MASS, 64kg; DROP, 760mm
HAMMER TYPE: AUTOMATIC

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80); SHEAR STRENGTH Cu, kPa nat V. + Q - ● rem V. ⊕ U - ○ (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-9} 10^{-8} 10^{-7} 10^{-6}); WATER CONTENT PERCENT Wp —○W— Wl (10 20 30 40)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		181.39							
0		OVERBURDEN - TOPSOIL , over SILTY CLAY ; reddish brown		0.00							
1											
		END OF BOREHOLE - AUGER REFUSAL - For Bedrock coring details, refer to Record of Drillhole BH17-7D		179.84 1.55							
2											
3											
4											
5											

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DEPTH SCALE
1 : 25

GOLDER

LOGGED: TP
CHECKED: SM

RECORD OF BOREHOLE: BH17-7S

PROJECT: 1771656

LOCATION: N 4751234.36; E 646634.86

BORING DATE: March 7, 2017

DATUM: Geodetic

SPT/DCPT HAMMER: MASS, 64kg; DROP, 760mm

HAMMER TYPE: AUTOMATIC

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80); SHEAR STRENGTH Cu, kPa nat V. + Q - ● rem V. ⊕ U - ○ (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-9} 10^{-8} 10^{-7} 10^{-6}); WATER CONTENT PERCENT Wp ⊢—○W—⊣ Wl (10 20 30 40)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		181.37							
0	Acker SoilMax Hollow Stem Augers	OVERBURDEN - TOPSOIL , over SILTY CLAY ; reddish brown		0.00							
1											Bentonite Seal
		END OF BOREHOLE - AUGER REFUSAL - For Bedrock coring details, refer to Record of Drillhole BH17-7S		179.87 1.50							
2											
3											
4											
5											

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DEPTH SCALE

1 : 25

GOLDER

LOGGED: TP

CHECKED: SM

RECORD OF BOREHOLE: BH17-8D

PROJECT: 1771656
LOCATION: N 4751094.88; E 646422.35
BORING DATE: March 8, 2017
SHEET 1 OF 1
DATUM: Geodetic

SPT/DCPT HAMMER: MASS, 64kg; DROP, 760mm
HAMMER TYPE: AUTOMATIC

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	SAMPLES NUMBER	TYPE	BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80); SHEAR STRENGTH Cu, kPa nat V. + Q - ● rem V. ⊕ U - ○ (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-9} 10^{-8} 10^{-7} 10^{-6}); WATER CONTENT PERCENT Wp —○W— Wl (10 20 30 40)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		181.39							
0		OVERBURDEN - TOPSOIL		0.00							
				180.55							
		END OF BOREHOLE - AUGER REFUSAL - For Bedrock coring details, refer to Record of Drillhole BH17-8D		0.84							
1											
2											
3											
4											
5											

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DEPTH SCALE
1 : 25

GOLDER

LOGGED: TP
CHECKED: SM

PROJECT: 1771656

LOCATION: N 4751097.20; E 646422.56

RECORD OF BOREHOLE: BH17-8S

BORING DATE: March 17, 2017

SHEET 1 OF 1

DATUM: Geodetic

SPT/DCPT HAMMER: MASS, 64kg; DROP, 760mm

HAMMER TYPE: AUTOMATIC

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80); SHEAR STRENGTH Cu, kPa nat V. + Q - ● rem V. ⊕ U - ○ (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-9} 10^{-8} 10^{-7} 10^{-6}); WATER CONTENT PERCENT Wp ⊢—○W—⊣ Wl (10 20 30 40)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		181.46							
0	Acker SoilMax Hollow Stem Augers	OVERBURDEN - TOPSOIL		0.00							
				180.80 / 0.66							
		END OF BOREHOLE - AUGER REFUSAL - For Bedrock coring details, refer to Record of Drillhole BH17-8S									Bentonite Seal
1											
2											
3											
4											
5											

DEPTH SCALE

1 : 25

GOLDER

LOGGED: TP

CHECKED: SM

RECORD OF BOREHOLE: BH17-9D

PROJECT: 1771656
LOCATION: N 4750972.13; E 646834.09
BORING DATE: February 14, 2017
SHEET 1 OF 1
DATUM: Geodetic

SPT/DCPT HAMMER: MASS, 64kg; DROP, 760mm
HAMMER TYPE: AUTOMATIC

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80); SHEAR STRENGTH Cu, kPa nat V. + Q - ● rem V. ⊕ U - ○ (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-9} 10^{-8} 10^{-7} 10^{-6}); WATER CONTENT PERCENT Wp — W — Wl (10 20 30 40)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		180.75							
0		OVERBURDEN - TOPSOIL , over SILTY CLAY ; reddish brown		0.00							
1											
2				178.62 2.13							
		END OF BOREHOLE - AUGER REFUSAL - For Bedrock coring details, refer to Record of Drillhole BH17-9D									
3											
4											
5											

DEPTH SCALE
1 : 25

GOLDER

LOGGED: TP
CHECKED: SM

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RECORD OF BOREHOLE: BH17-9S

PROJECT: 1771656

LOCATION: N 4750974.29; E 646834.03

BORING DATE: February 21, 2017

SHEET 1 OF 1

DATUM: Geodetic

SPT/DCPT HAMMER: MASS, 64kg; DROP, 760mm

HAMMER TYPE: AUTOMATIC

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80); SHEAR STRENGTH Cu, kPa nat V. + Q - ● rem V. ⊕ U - ○ (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-9} 10^{-8} 10^{-7} 10^{-6}); WATER CONTENT PERCENT Wp ⊢ ○W ⊣ Wl (10 20 30 40)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		180.71							
0	Acker SoilMax Hollow Stem Augers	OVERBURDEN - TOPSOIL , over SILTY CLAY ; reddish brown		0.00							
1											
											Bentonite Seal
2				178.63							
		END OF BOREHOLE - AUGER REFUSAL - For Bedrock coring details, refer to Record of Drillhole BH17-9S		2.08							
3											
4											
5											

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DEPTH SCALE

1 : 25

GOLDER

LOGGED: TP

CHECKED: SM

RECORD OF DRILLHOLE: BH17-10D

PROJECT: 1771656

SHEET 1 OF 2

LOCATION: N 4752127.2 ;E 646721.3

INCLINATION: -90° AZIMUTH: ---

DRILLING DATE: April 3, 2017

DRILL RIG: Acker SoilMax

DRILLING CONTRACTOR: Lantech

DATUM: Geodetic

JN - Joint, FLT - Fault, SHR- Shear, VN - Vein, CJ - Conjugate; BD- Bedding, FO- Foliation, CO- Contact, OR- Orthogonal, CL - Cleavage; PL - Planar, CU- Curved, UN- Undulating, ST - Stepped, IR - Irregular; PO- Polished, K - Slickensided, SM- Smooth, Ro - Rough, MB- Mechanical Break; BR - Broken Rock, VRo - Very Rough. **NOTE:** For additional abbreviations refer to list of abbreviations & symbols.

DEPTH SCALE METRES	DESCRIPTION	ELEV. / DEPTH (m)	RUN No.	DISCONTINUITY DATA – TYPE AND SURFACE DESCRIPTION	NOTES WATER LEVELS INSTRUMENTATION
	Continued from Record of Borehole BH17-10D	175.66			
	Fresh, medium to dark grey, fine to medium grained, ARGILLACEOUS DOLOSTONE and SHALY DOLOSTONE (Bertie Formation, Scajaquada Member)	6.30	1	Broken Core; Broken Core; BD/JN,PL to UN,SM to RO (×12)	
7	Fresh, brownish-grey to brown, medium grained, pitted to vuggy DOLOSTONE (Bertie Formation, Falkirk Member)	175.00 / 6.96		BD/JN,PL to UN,SM to RO (×6)	
8			2	BD/JN,PL to UN,SM to RO (×4); BD/JN,PL to UN,SM to RO; BD/JN,PL to UN,SM to RO; BD/JN,PL to UN,SM to RO	Sand
9			3	BD/JN,PL to UN,SM to RO; BD/JN,PL to UN,RO to SM; BD/JN,PL to UN,RO to SM; BD/JN,PL to UN,RO to SM; BD/JN,PL to UN,RO to SM	
10				BD/JN,PL to UN,RO to SM; BD/JN,PL to UN,RO to SM	Screen and Sand
11			4	BD/JN,IR to UN,RO; BD/JN,IR to UN,RO; BD/JN,IR to UN,RO; BD/JN,IR to UN,RO	

Column headings also printed: DRILLING RECORD; SYMBOLIC LOG; PENETRATION RATE min/(m); COLOUR % RETURN; FLUSH; RECOVERY (TOTAL CORE %, SOLID CORE %) 80 60 40 20; R.Q.D. % 80 60 40 20; FRACT. INDEX PER 0.3 m 5 10 15 20; Broken Core; DIP w.r.t. CORE AXIS 0 30 60 90; HYDRAULIC CONDUCTIVITY K, m/sec 10^{-9} 10^{-8} 10^{-7} 10^{-6}; ROCK STRENGTH INDEX R4 R3 R2 R1; WEATHERING INDEX W1 W2 W3 W4.

CONTINUED NEXT PAGE

DEPTH SCALE 1 : 25

GOLDER

LOGGED: TP

CHECKED: SM

RECORD OF DRILLHOLE: BH17-10D

PROJECT: 1771656
SHEET 2 OF 2

LOCATION: N 4752127.2 ;E 646721.3
DRILLING DATE: April 3, 2017
DATUM: Geodetic
DRILL RIG: Acker SoilMax
INCLINATION: -90° AZIMUTH: ---
DRILLING CONTRACTOR: Lantech

JN - Joint, FLT - Fault, SHR- Shear, VN - Vein, CJ - Conjugate; BD- Bedding, FO- Foliation, CO- Contact, OR- Orthogonal, CL - Cleavage; PL - Planar, CU- Curved, UN- Undulating, ST - Stepped, IR - Irregular; PO- Polished, K - Slickensided, SM- Smooth, Ro - Rough, MB- Mechanical Break; BR - Broken Rock, VRo - Very Rough

NOTE: For additional abbreviations refer to list of abbreviations & symbols.

DEPTH SCALE METRES	DRILLING RECORD	DESCRIPTION	SYMBOLIC LOG	ELEV. DEPTH (m)	RUN No.	DISCONTINUITY DATA – TYPE AND SURFACE DESCRIPTION	NOTES WATER LEVELS INSTRUMENTATION
		--- *CONTINUED FROM PREVIOUS PAGE* ---					
		Fresh, brownish-grey to brown, medium grained, pitted to vuggy DOLOSTONE (Bertie Formation, Falkirk Member)			4	BD/JN,IR to UN,RO BD/JN,IR to UN,RO BD/JN,IR to UN,RO BD/JN,IR to UN,RO BD/JN,PL,SM	Screen and Sand
12							
		Fresh, dark bluish grey to black argillaceous DOLOSTONE and SHALE (Bertie Formation, Oatka Member)		169.49 12.47	5	BD/JN,PL,SM BD/JN,PL,SM BD/JN,PL,SM BD/JN,PL,SM BD/JN,PL,SM BD/JN,PL,SM BD/JN,PL,SM	Backfill
13							
		END OF DRILLHOLE		168.24 13.72			
14							
15							
16							

Columns also shown: PENETRATION RATE min/(m); FLUSH; COLOUR % RETURN; RECOVERY (TOTAL CORE %, SOLID CORE %); R.Q.D. %; FRACT. INDEX PER 0.3 m; Broken Core; DIP w.r.t. CORE AXIS; HYDRAULIC CONDUCTIVITY K, m/sec (10^{-9}, 10^{-8}, 10^{-7}, 10^{-6}); ROCK STRENGTH INDEX (R4 R3 R2 R1); WEATHERING INDEX (W1 W2 W3 W4).

DEPTH SCALE 1 : 25

GOLDER

LOGGED: TP
CHECKED: SM

PROJECT: 1771656

RECORD OF DRILLHOLE: BH17-1D

SHEET 1 OF 3

LOCATION: N 4752362.6 ;E 646595.4

INCLINATION: -90° AZIMUTH: ---

DRILLING DATE: February 6, 2017

DRILL RIG: Acker SoilMax

DRILLING CONTRACTOR: Lantech

DATUM: Geodetic

JN - Joint, FLT - Fault, SHR- Shear, VN - Vein, CJ - Conjugate; BD- Bedding, FO- Foliation, CO- Contact, OR- Orthogonal, CL - Cleavage; PL - Planar, CU- Curved, UN- Undulating, ST - Stepped, IR - Irregular; PO- Polished, K - Slickensided, SM- Smooth, Ro - Rough, MB- Mechanical Break; BR - Broken Rock, VRo - Very Rough

NOTE: For additional abbreviations refer to list of abbreviations & symbols.

Depth (m)	Description	Elev. / Depth (m)	Run No.	Discontinuity Data (Type and Surface Description)	Notes / Water Levels / Instrumentation
	Continued from Record of Borehole BH17-1D	171.78			
10.21	Fresh, brownish-grey to brown, medium grained, pitted to vuggy DOLOSTONE (Bertie Formation, Falkirk Member)	10.21	1		
11				BD,PL,SM	
				BD,PL,SM	Sand
				BD,PL,SM	
				BD,PL,SM	
12				BD,PL,SM	
			2	BD,PL,SM	Screen and Sand
				BD,PL,SM	
13				BD,PL,SM	
13.26	Fresh, dark bluish grey to black argillaceous DOLOSTONE and SHALE (Bertie Formation, Oatka Member)	168.73 / 13.26		FR/BC,PL,SM	
				FR/BC,PL,SM	
14			3	BD,PL,SM	
				BD,PL,SM	
15					

CONTINUED NEXT PAGE

DEPTH SCALE 1 : 25

GOLDER

LOGGED: TP

CHECKED: SM

PROJECT: 1771656

RECORD OF DRILLHOLE: BH17-1D

LOCATION: N 4752362.6 ;E 646595.4

INCLINATION: -90° AZIMUTH: ---

DRILLING DATE: February 6, 2017

DRILL RIG: Acker SoilMax

DRILLING CONTRACTOR: Lantech

DATUM: Geodetic

JN - Joint, FLT - Fault, SHR- Shear, VN - Vein, CJ - Conjugate; BD- Bedding, FO- Foliation, CO- Contact, OR- Orthogonal, CL - Cleavage; PL - Planar, CU- Curved, UN- Undulating, ST - Stepped, IR - Irregular; PO- Polished, K - Slickensided, SM- Smooth, Ro - Rough, MB- Mechanical Break; BR - Broken Rock, VRo - Very Rough. **NOTE:** For additional abbreviations refer to list of abbreviations & symbols.

Columns: DEPTH SCALE METRES | DRILLING RECORD | DESCRIPTION | SYMBOLIC LOG | ELEV. DEPTH (m) | RUN No. | PENETRATION RATE min/(m) | COLOUR % RETURN | FLUSH | RECOVERY (TOTAL CORE %, SOLID CORE %) | R.Q.D. % | FRACT. INDEX PER 0.3 m | Broken Core | DISCONTINUITY DATA (DIP w.r.t. CORE AXIS; TYPE AND SURFACE DESCRIPTION) | HYDRAULIC CONDUCTIVITY K, m/sec (10^{-9}, 10^{-8}, 10^{-7}, 10^{-6}) | ROCK STRENGTH INDEX (R4 R3 R2 R1) | WEATHERING INDEX (W1 W2 W3 W4) | NOTES WATER LEVELS INSTRUMENTATION

--- *CONTINUED FROM PREVIOUS PAGE* ---

Depth (m)	Description	Elev. / Depth (m)	Run No.	Discontinuity type and surface description
	Fresh, dark bluish grey to black argillaceous DOLOSTONE and SHALE (Bertie Formation, Oatka Member)		3	BD,PL,SM
				FR,PL,PO
16			4	BD,PL,SM
				BD,PL,SM
17			5	
18				BD,PL,SM
				BD,PL,SM
	fresh, fine to medium grained, thin to medium bedded, medium to dark grey, SHALE, with increasing gypsum horizons (Salina Formation)	163.49 / 18.50	6	BD,PL,SM
				BD,PL,SM
				BD,PL,SM
19				BD,PL,SM
				BD,PL,SM
				FR,PL,SM
				BD,PL,SM
20				

<<

CONTINUED NEXT PAGE

LOCATION: N 4752362.6 ;E 646595.4

INCLINATION: -90° AZIMUTH: ---

DRILLING DATE: February 6, 2017

DRILL RIG: Acker SoilMax

DRILLING CONTRACTOR: Lantech

DATUM: Geodetic

JN - Joint, FLT - Fault, SHR - Shear, VN - Vein, CJ - Conjugate, BD - Bedding, FO - Foliation, CO - Contact, OR - Orthogonal, CL - Cleavage, PL - Planar, CU - Curved, UN - Undulating, ST - Stepped, IR - Irregular, PO - Polished, K - Slickensided, SM - Smooth, Ro - Rough, MB - Mechanical Break, BR - Broken Rock, VRo - Very Rough

NOTE: For additional abbreviations refer to list of abbreviations & symbols.

DEPTH SCALE METRES	DESCRIPTION	ELEV. DEPTH (m)	DISCONTINUITY DATA TYPE AND SURFACE DESCRIPTION	NOTES WATER LEVELS INSTRUMENTATION
	--- CONTINUED FROM PREVIOUS PAGE ---			
	fresh, fine to medium grained, thin to medium bedded, medium to dark grey, SHALE, with increasing gypsum horizons (Salina Formation)		BD,PL,SM	
			BD,PL,SM	
			BD,PL,SM	
21			BD,PL,SM	
		160.57	FR,PL,SM	
	END OF DRILLHOLE	21.42		
22				
23				
24				
25				

DEPTH SCALE

1 : 25

GOLDER

LOGGED: TP

CHECKED: SM

PROJECT: 1771656

RECORD OF DRILLHOLE: BH17-2D

SHEET 1 OF 2

LOCATION: N 4752109.4 ;E 646602.9

INCLINATION: -90° AZIMUTH: ---

DRILLING DATE: March 29, 2017

DRILL RIG: Acker SoilMax

DRILLING CONTRACTOR: Lantech

DATUM: Geodetic

JN - Joint, FLT - Fault, SHR- Shear, VN - Vein, CJ - Conjugate; BD- Bedding, FO- Foliation, CO- Contact, OR- Orthogonal, CL - Cleavage; PL - Planar, CU- Curved, UN- Undulating, ST - Stepped, IR - Irregular; PO- Polished, K - Slickensided, SM- Smooth, Ro - Rough, MB- Mechanical Break; BR - Broken Rock, VRo - Very Rough. NOTE: For additional abbreviations refer to list of abbreviations & symbols.

Columns: DEPTH SCALE METRES | DRILLING RECORD | DESCRIPTION | SYMBOLIC LOG | ELEV. DEPTH (m) | RUN No. | PENETRATION RATE min/(m) | COLOUR % RETURN | FLUSH | RECOVERY (TOTAL CORE %, SOLID CORE %) | R.Q.D. % | FRACT. INDEX PER 0.3 m | Broken Core | DISCONTINUITY DATA (DIP w.r.t. CORE AXIS; TYPE AND SURFACE DESCRIPTION) | HYDRAULIC CONDUCTIVITY K, m/sec (10^{-9}, 10^{-8}, 10^{-7}, 10^{-6}) | ROCK STRENGTH INDEX (R4 R3 R2 R1) | WEATHERING INDEX (W1 W2 W3 W4) | NOTES WATER LEVELS INSTRUMENTATION

Continued from Record of Borehole BH17-2D — Elev. 173.01

Depth scale (m)	Description	Elev. / Depth (m)	Run No.	Discontinuity data (type and surface description)	Notes
	Fresh, medium to dark grey, fine to medium grained, ARGILLACEOUS DOLOSTONE and SHALY DOLOSTONE (Bertie Formation, Scajaquada Member)	8.69		BD/JN,PL,SM; BD/JN,PL,SM	
9			1	BD/JN,PL,SM; BD/JN,PL,SM; BD/JN,PL,SM; BD/JN,PL,SM	
	Fresh, brownish-grey to brown, medium grained, pitted to vuggy DOLOSTONE (Bertie Formation, Falkirk Member)	172.40 / 9.30		BC,IR,RO; FR/JN,PL to UN,SM; FR/JN,PL to UN,SM; FR/JN,PL to UN,SM; FR/JN,PL to UN,SM; FR/JN,PL to UN,SM	
10			2	FR/JN,PL to UN,SM; FR/JN,PL to UN,SM; FR/JN,PL to UN,SM	Sand
11				JN/BD,PL to IR,RO to SM	
			3	JN/BD,PL to IR,RO to SM; JN/BD,PL to IR,RO to SM; JN/BD,PL to IR,RO to SM	
12				JN/BD,PL to IR,RO to SM; JN/BD,PL to IR,RO to SM; JN/BD,PL to IR,RO to SM; JN/BD,PL to IR,RO to SM	Screen and Sand
13			4	JN/BD,PL to IR,RO to SM; JN/BD,PL to IR,RO to SM	
	Concentration and frequency of vugs reduce @13.1 m			JN/BD,PL to IR,RO to SM; JN/BD,PL to IR,RO to SM	

Broken Core (at approx. 8.7 m and 9.3 m)

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DEPTH SCALE
1 : 25

GOLDER

LOGGED: TP
CHECKED: SM

GTA-RCK 025 S:\CLIENTS\RANKIN_CONSTRUCTION\PORT_COLBORNE_QUARRY\02_DATA\GINT\1771656.GPJ GAL-MISS.GDT 7/27/20

PROJECT: 1771656

RECORD OF DRILLHOLE: BH17-2D

SHEET 2 OF 2

LOCATION: N 4752109.4 ;E 646602.9

DRILLING DATE: March 29, 2017

DATUM: Geodetic

DRILL RIG: Acker SoilMax

INCLINATION: -90° AZIMUTH: ---

DRILLING CONTRACTOR: Lantech

JN - Joint, FLT - Fault, SHR- Shear, VN - Vein, CJ - Conjugate
BD- Bedding, FO- Foliation, CO- Contact, OR- Orthogonal, CL - Cleavage
PL - Planar, CU- Curved, UN- Undulating, ST - Stepped, IR - Irregular
PO- Polished, K - Slickensided, SM- Smooth, Ro - Rough, MB- Mechanical Break
BR - Broken Rock, VRo - Very Rough
NOTE: For additional abbreviations refer to list of abbreviations & symbols.

DEPTH SCALE METRES	DESCRIPTION	ELEV. / DEPTH (m)	RUN No.	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	NOTES WATER LEVELS INSTRUMENTATION
	--- CONTINUED FROM PREVIOUS PAGE ---		4		
	Fresh, dark bluish grey to black argillaceous DOLOSTONE and SHALE (Bertie Formation, Oatka Member)	167.90 / 13.80			Screen and Sand
14				BD/JN,PL,SM	
	Clay Seam from 14.1 m to 14.2 m			BD/JN,PL,SM	
				BD/JN,PL,SM	
				BD/JN,PL,SM	
				BD/JN,PL,SM	
				BD/JN,PL,SM	
			5	BD/JN,PL,SM	
				BD/JN,PL,SM	Bentonite
				BD/JN,PL,SM	
				BD/JN,PL,SM	
15				BD/JN,PL,SM	
		166.43 / 15.27			
	END OF DRILLHOLE				
16					
17					
18					

Column headings: DEPTH SCALE METRES; DRILLING RECORD; DESCRIPTION; SYMBOLIC LOG; ELEV. DEPTH (m); RUN No.; PENETRATION RATE min/(m); FLUSH COLOUR % RETURN; RECOVERY (TOTAL CORE %, SOLID CORE %) 80 60 40 20; R.Q.D. % 80 60 40 20; FRACT. INDEX PER 0.3 m 5 10 15 20; Broken Core; DISCONTINUITY DATA (DIP w.r.t. CORE AXIS 0 30 60 90; TYPE AND SURFACE DESCRIPTION); HYDRAULIC CONDUCTIVITY K, m/sec 10^{-9} 10^{-8} 10^{-7} 10^{-6}; ROCK STRENGTH INDEX R4 R3 R2 R1; WEATHERING INDEX W1 W2 W3 W4; NOTES WATER LEVELS INSTRUMENTATION

DEPTH SCALE
1 : 25

GOLDER

LOGGED: TP
CHECKED: SM

PROJECT: 1771656

RECORD OF DRILLHOLE: BH17-3D

LOCATION: N 4751983.7 ;E 646823.1

DRILLING DATE: March 23, 2017

DATUM: Geodetic

INCLINATION: -90° AZIMUTH: ---

DRILL RIG: Acker SoilMax

DRILLING CONTRACTOR: Lantech

JN - Joint, FLT - Fault, SHR - Shear, VN - Vein, CJ - Conjugate, BD - Bedding, FO - Foliation, CO - Contact, OR - Orthogonal, CL - Cleavage, PL - Planar, CU - Curved, UN - Undulating, ST - Stepped, IR - Irregular, PO - Polished, K - Slickensided, SM - Smooth, Ro - Rough, MB - Mechanical Break, BR - Broken Rock, VRo - Very Rough. NOTE: For additional abbreviations refer to list of abbreviations & symbols.

DEPTH SCALE METRES	DESCRIPTION	ELEV. / DEPTH (m)	RUN No.	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	NOTES / WATER LEVELS / INSTRUMENTATION
	Continued from Record of Borehole BH17-3D	176.63			
	Fresh, medium to dark grey, fine to medium grained, ARGILLACEOUS DOLOSTONE and SHALY DOLOSTONE (Bertie Formation, Scajaquada Member)	5.36	1	Broken Core; FR/BD,PL,SM; ,PL,SM; ,PL,SM; ,PL,SM; Broken Core	
6				FR/BD,PL,SM	
			2	FR/BD,PL,SM; FR/BD,PL,SM; FR/BD,PL,SM; FR/BD,PL,SM; FR/BD,PL,SM; FR/BD,PL,SM	
7				FR/BD,PL,SM; FR/BD,PL,SM	
	Fresh, brownish-grey to brown, medium grained, pitted to vuggy DOLOSTONE (Bertie Formation, Falkirk Member)	174.37 7.62	3	FR/JN,IR to UN,RO; FR/JN,IR to UN,RO; FR/JN,IR to UN,RO	
8				FR/JN,IR to UN,RO; FR/JN,IR to UN,RO; FR/JN,IR to UN,RO; FR/JN,IR to UN,RO	Sand
9				FR/JN,IR to UN,RO	
			4	FR/JN,IR to UN,RO	Screen and Sand
10				FR/JN,IR to UN,RO; FR/JN,IR to UN,RO	
	CONTINUED NEXT PAGE				

Column headings also include: DRILLING RECORD, SYMBOLIC LOG, PENETRATION RATE min/(m), COLOUR % RETURN, FLUSH, RECOVERY (TOTAL CORE %, SOLID CORE %), R.Q.D. %, FRACT. INDEX PER 0.3 m, Broken Core, DIP w.r.t. CORE AXIS, HYDRAULIC CONDUCTIVITY K, m/sec (10^{-9} 10^{-8} 10^{-7} 10^{-6}), ROCK STRENGTH INDEX (R4 R3 R2 R1), WEATHERING INDEX (W1 W2 W3 W4).

DEPTH SCALE 1 : 25

GOLDER

LOGGED: TP

CHECKED: SM

RECORD OF DRILLHOLE: BH17-3D

PROJECT: 1771656
LOCATION: N 4751983.7 ;E 646823.1
INCLINATION: -90° AZIMUTH: ---
DRILLING DATE: March 23, 2017
DRILL RIG: Acker SoilMax
DRILLING CONTRACTOR: Lantech
DATUM: Geodetic

JN - Joint, FLT - Fault, SHR - Shear, VN - Vein, CJ - Conjugate; BD - Bedding, FO - Foliation, CO - Contact, OR - Orthogonal, CL - Cleavage; PL - Planar, CU - Curved, UN - Undulating, ST - Stepped, IR - Irregular; PO - Polished, K - Slickensided, SM - Smooth, Ro - Rough, MB - Mechanical Break; BR - Broken Rock, VRo - Very Rough. **NOTE:** For additional abbreviations refer to list of abbreviations & symbols.

DEPTH SCALE METRES	DESCRIPTION	ELEV. / DEPTH (m)	RUN No.	DISCONTINUITY DATA – TYPE AND SURFACE DESCRIPTION	NOTES / WATER LEVELS / INSTRUMENTATION
	--- *CONTINUED FROM PREVIOUS PAGE* ---				
	Fresh, brownish-grey to brown, medium grained, pitted to vuggy DOLOSTONE (Bertie Formation, Falkirk Member)		4	FR/JN,IR to UN,RO; FR/JN,IR to UN,RO	
11				FR/JN,IR to UN,RO; FR/JN,IR to UN,RO; FR/JN,IR to UN,RO	
			5	FR/JN,IR to UN,RO	Screen and Sand
12				FR/JN,IR to UN,RO; FR/JN,IR to UN,RO; FR/JN,IR to UN,RO	
	Fresh, dark bluish grey to black argillaceous DOLOSTONE and SHALE (Bertie Formation, Oatka Member)	169.44 / 12.55		BD,PL,SM; BD,PL,SM; BD,PL,SM; BD,PL,SM; BD,PL,SM	
13			6	BD,PL,SM	Backfill
				BD,PL,SM	
	END OF DRILLHOLE	168.27 / 13.72			
14					
15					

Column headings also include: DRILLING RECORD, SYMBOLIC LOG, PENETRATION RATE min/(m), FLUSH, COLOUR % RETURN, RECOVERY (TOTAL CORE %, SOLID CORE %), R.Q.D. %, FRACT. INDEX PER 0.3 m, Broken Core, DIP w.r.t. CORE AXIS, HYDRAULIC CONDUCTIVITY K, m/sec (10^{-9} 10^{-8} 10^{-7} 10^{-6}), ROCK STRENGTH INDEX (R4 R3 R2 R1), WEATHERING INDEX (W1 W2 W3 W4).

DEPTH SCALE
1 : 25

GOLDER

LOGGED: TP
CHECKED: SM

LOCATION: N 4751621.3 ;E 646626.9

INCLINATION: -90° AZIMUTH: ---

DRILLING DATE: February 27, 2017

DRILL RIG: Acker SoilMax

DRILLING CONTRACTOR: Lantech

DATUM: Geodetic

JN - Joint, FLT - Fault, SHR- Shear, VN - Vein, CJ - Conjugate, BD- Bedding, FO- Foliation, CO- Contact, OR- Orthogonal, CL - Cleavage, PL - Planar, CU- Curved, UN- Undulating, ST - Stepped, IR - Irregular, PO- Polished, K - Slickensided, SM- Smooth, Ro - Rough, MB- Mechanical Break, BR - Broken Rock, VRo - Very Rough

NOTE: For additional abbreviations refer to list of abbreviations & symbols.

Columns: DEPTH SCALE METRES | DRILLING RECORD | DESCRIPTION | SYMBOLIC LOG | ELEV. DEPTH (m) | RUN No. | PENETRATION RATE min/(m) | FLUSH COLOUR % RETURN | RECOVERY (TOTAL CORE %, SOLID CORE %) | R.Q.D. % | FRACT. INDEX PER 0.3 m | Broken Core | DISCONTINUITY DATA (DIP w.r.t. CORE AXIS; TYPE AND SURFACE DESCRIPTION) | HYDRAULIC CONDUCTIVITY K, m/sec | ROCK STRENGTH INDEX | WEATHERING INDEX | NOTES WATER LEVELS INSTRUMENTATION

Depth (m)	Description	Elev. / Depth (m)	Run No.	Discontinuity type and surface description
	Continued from Record of Borehole BH17-4D	180.07		
	Fresh to highly weathered, medium grey, medium bedded, medium grained LIMESTONE with siltstone and sandstone horizons and greenish grey siltstone and cherty limestone beds (Bois Blanc Formation)	2.44	1	FR/JN,IR to UN,SM to RO; FR/JN,IR to UN,SM to RO; FR/JN,IR to UN,SM to RO; FR/JN,IR to UN,SM to RO
3		179.38		
	Fresh, light to medium grey, medium bedded, medium grained, mottled DOLOSTONE with green beds, green fracture coatings and brecciated intervals (Bertie Formation, Akron Member)	3.13	2	FR/JN,IR to UN,SM to RO; FR/JN,IR to UN,SM to RO; FR/JN,IR to UN,SM to RO; BD,IR to UN,SM to RO
4				FR/JN,IR to UN,SM to RO; FR/JN,IR to UN,SM to RO; FR/JN,IR to UN,SM to RO
			3	FR/JN,IR to UN,RO to SM; FR/JN,IR to UN,RO to SM; FR/JN,IR to UN,RO to SM
5	Large fracture from 5.0 m to 5.1 m with sub-rounded pieces of green mineralized core.			FR/JN,PL to IR,SM to PO (Broken Core); FR/JN,PL to IR,SM to PO; FR,IR to UN,RO
	Brecciated horizons end @ 5.5 m and light grey mottled appearance begins			FR,IR to UN,RO
6			4	
7				BD or JN,IR to UN,RO to SM; BD or JN,IR to UN,RO to SM; BD or JN,IR to UN,RO to SM; BD or JN,IR to UN,RO to SM; BD or JN,IR to UN,RO to SM; BD or JN,IR to UN,RO to SM; BD or JN,IR to UN,RO to SM; BD or JN,IR to UN,RO to SM; BD or JN,IR to UN,RO to SM; BD or JN,IR to UN,RO to SM; BD or JN,IR to

CONTINUED NEXT PAGE

LOCATION: N 4751621.3 ;E 646626.9

INCLINATION: -90° AZIMUTH: ---

DRILLING DATE: February 27, 2017

DRILL RIG: Acker SoilMax

DRILLING CONTRACTOR: Lantech

DATUM: Geodetic

Legend:

JN - Joint, FLT - Fault, SHR - Shear, VN - Vein, CJ - Conjugate

BD - Bedding, FO - Foliation, CO - Contact, OR - Orthogonal, CL - Cleavage

PL - Planar, CU - Curved, UN - Undulating, ST - Stepped, IR - Irregular

PO - Polished, K - Slickensided, SM - Smooth, Ro - Rough, MB - Mechanical Break

BR - Broken Rock, VRo - Very Rough

NOTE: For additional abbreviations refer to list of abbreviations & symbols.

Columns: DEPTH SCALE METRES | DRILLING RECORD | DESCRIPTION | SYMBOLIC LOG | ELEV. DEPTH (m) | RUN No. | PENETRATION RATE min/(m) | FLUSH | COLOUR % RETURN | RECOVERY (TOTAL CORE % / SOLID CORE %) | R.Q.D. % | FRACT. INDEX PER 0.3 m | Broken Core | DISCONTINUITY DATA (DIP w.r.t. CORE AXIS / TYPE AND SURFACE DESCRIPTION) | HYDRAULIC CONDUCTIVITY K, m/sec (10^{-9}, 10^{-8}, 10^{-7}, 10^{-6}) | ROCK STRENGTH INDEX (R4 R3 R2 R1) | WEATHERING INDEX (W1 W2 W3 W4) | NOTES WATER LEVELS INSTRUMENTATION

--- CONTINUED FROM PREVIOUS PAGE ---

Elev. / Depth (m)	Description
	Fresh, light to medium grey, medium bedded, medium grained, mottled DOLOSTONE with green beds, green fracture coatings and brecciated intervals (Bertie Formation, Akron Member)
174.03 / 8.48	Fresh, grey to bluish-grey, medium grained, thin to medium bedded, fine to medium grained laminate textured DOLOSTONE with thin argillaceous laminae (Bertie Formation, Williamsville Member)
172.47 / 10.04	Fresh, medium to dark grey, fine to medium grained, ARGILLACEOUS DOLOSTONE and SHALY DOLOSTONE (Bertie Formation, Scajaquada Member)
170.11	

Depth scale: 8, 9, 10, 11, 12

Run No.: 4, 5, 6, 7, 8

Broken Core (approx. 9.0 m); Lost Core (approx. 10.3 m)

Discontinuity data (type and surface description):

- UN,RO to SM
- BD or JN,IR to UN,RO to SM
- BD or JN,IR to UN,RO to SM
- BD or JN,IR to UN,RO to SM
- FR/JN,IR to UN,RO to SM
- FR/JN,IR to UN,RO to SM
- FR/JN,IR to UN,RO to SM
- FR or JN,IR to UN,RO to SM
- FR or JN,IR to UN,RO to SM
- FR or JN,IR to UN,RO to SM
- FR or JN,IR to UN,RO to SM
- FR or JN,IR to UN,RO to SM
- FR or JN,IR to UN,RO to SM
- FR or JN,IR to UN,RO to SM
- FR or JN,IR to UN,RO to SM
- FR,IR to UN,RO to SM
- FR,IR to UN,RO to SM
- FR/JN or BD,IR to UN,RO to SM
- FR/JN or BD,IR to UN,RO to SM
- FR/JN or BD,IR to UN,RO to SM
- FR/JN or BD,IR to UN,RO to SM
- FR/JN or BD,IR to UN,RO to SM
- FR/JN or BD,IR to UN,RO to SM
- FR/JN or BD,IR to UN,RO to SM
- BD,PL,SM
- BD,PL,SM
- BD,PL,SM
- BD,PL,SM
- BD,PL,SM
- BD,PL,SM
- BD,PL,SM
- BD,PL,SM
- BD,PL,SM
- BD,PL,SM

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RECORD OF DRILLHOLE: BH17-4D

PROJECT: 1771656
LOCATION: N 4751621.3 ;E 646626.9
INCLINATION: -90° AZIMUTH: ---
DRILLING DATE: February 27, 2017
DRILL RIG: Acker SoilMax
DRILLING CONTRACTOR: Lantech
DATUM: Geodetic

JN - Joint, FLT - Fault, SHR - Shear, VN - Vein, CJ - Conjugate; BD - Bedding, FO - Foliation, CO - Contact, OR - Orthogonal, CL - Cleavage; PL - Planar, CU - Curved, UN - Undulating, ST - Stepped, IR - Irregular; PO - Polished, K - Slickensided, SM - Smooth, Ro - Rough, MB - Mechanical Break; BR - Broken Rock, VRo - Very Rough. **NOTE:** For additional abbreviations refer to list of abbreviations & symbols.

DEPTH SCALE METRES	DESCRIPTION	ELEV. DEPTH (m)	RUN No.	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	NOTES WATER LEVELS INSTRUMENTATION
	--- CONTINUED FROM PREVIOUS PAGE ---				
	Fresh, brownish-grey to brown, medium grained, pitted to vuggy DOLOSTONE (Bertie Formation, Falkirk Member)	12.40		BD,UN,SM BD,UN,SM	
13			8	FR/JN,UN to IR,RO to SM FR or BD,UN to IR,RO to SM FR or BD,UN to IR,RO to SM FR or BD,UN to IR,RO to SM	
14			9	FR/JN,IR to UN,RO to SM FR/JN,IR to UN,RO to SM FR/JN,IR to UN,RO to SM	Sand
15				Broken Core	
16			10	FR/JN,IR to ST,RO	Screen and Sand
17			11	BD,PL to CU,SM to RO	
	CONTINUED NEXT PAGE				

Column headings also include: DRILLING RECORD, SYMBOLIC LOG, PENETRATION RATE min/(m), COLOUR % RETURN, FLUSH, RECOVERY (TOTAL CORE %, SOLID CORE %), R.Q.D. %, FRACT. INDEX PER 0.3 m, Broken Core, DIP w.r.t. CORE AXIS, HYDRAULIC CONDUCTIVITY K, m/sec (10^{-9}, 10^{-8}, 10^{-7}, 10^{-6}), ROCK STRENGTH INDEX (R4 R3 R2 R1), WEATHERING INDEX (W1 W2 W3 W4).

DEPTH SCALE 1 : 25

GOLDER

LOGGED: TP
CHECKED: SM

LOCATION: N 4751621.3 ;E 646626.9
DRILLING DATE: February 27, 2017
DATUM: Geodetic
INCLINATION: -90° AZIMUTH: ---
DRILL RIG: Acker SoilMax
DRILLING CONTRACTOR: Lantech

JN - Joint, FLT - Fault, SHR- Shear, VN - Vein, CJ - Conjugate, BD- Bedding, FO- Foliation, CO- Contact, OR- Orthogonal, CL - Cleavage, PL - Planar, CU- Curved, UN- Undulating, ST - Stepped, IR - Irregular, PO- Polished, K - Slickensided, SM- Smooth, Ro - Rough, MB- Mechanical Break, BR - Broken Rock, VRo - Very Rough

NOTE: For additional abbreviations refer to list of abbreviations & symbols.

DEPTH SCALE METRES	DRILLING RECORD	DESCRIPTION	SYMBOLIC LOG	ELEV. DEPTH (m)	RUN No.	PENETRATION RATE min/(m)	COLOUR % RETURN / FLUSH	RECOVERY TOTAL CORE % / SOLID CORE %	R.Q.D. %	FRACT. INDEX PER 0.3 m	Broken Core	DISCONTINUITY DATA DIP w.r.t. CORE AXIS	TYPE AND SURFACE DESCRIPTION	HYDRAULIC CONDUCTIVITY K, m/sec	ROCK STRENGTH INDEX	WEATHERING INDEX	NOTES WATER LEVELS INSTRUMENTATION
		--- CONTINUED FROM PREVIOUS PAGE ---															
		Fresh, brownish-grey to brown, medium grained, pitted to vuggy DOLOSTONE (Bertie Formation, Falkirk Member)		164.78 / 17.73									BD,PL to CU,SM to RO; BD,PL to CU,SM to RO; BD,PL to CU,SM to RO				
18		Fresh, dark bluish grey to black argillaceous DOLOSTONE and SHALE (Bertie Formation, Oatka Member)		164.17 / 18.34	11								BD,PL,SM				Screen and Sand
		END OF DRILLHOLE															
19																	
20																	
21																	
22																	

PROJECT: 1771656

RECORD OF DRILLHOLE: BH17-4S

SHEET 1 OF 2

LOCATION: N 4751619.2 ;E 646627.1

INCLINATION: -90° AZIMUTH: ---

DRILLING DATE: February 28, 2017

DRILL RIG: Acker SoilMax

DRILLING CONTRACTOR: Lantech

DATUM: Geodetic

JN - Joint; FLT - Fault; SHR- Shear; VN - Vein; CJ - Conjugate

BD- Bedding; FO- Foliation; CO- Contact; OR- Orthogonal; CL - Cleavage

PL - Planar; CU- Curved; UN- Undulating; ST - Stepped; IR - Irregular

PO- Polished; K - Slickensided; SM- Smooth; Ro - Rough; MB- Mechanical Break

BR - Broken Rock; VRo - Very Rough; **NOTE:** For additional abbreviations refer to list of abbreviations & symbols.

Column headings: DEPTH SCALE METRES | DRILLING RECORD | DESCRIPTION | SYMBOLIC LOG | ELEV. DEPTH (m) | RUN No. | PENETRATION RATE min/(m) | COLOUR % RETURN | FLUSH | RECOVERY (TOTAL CORE % 80 60 40 20; SOLID CORE % 80 60 40 20) | R.Q.D. % 80 60 40 20 | FRACT. INDEX PER 0.3 m 5 10 15 20 | Broken Core | DISCONTINUITY DATA (DIP w.r.t. CORE AXIS 0 30 60 90; TYPE AND SURFACE DESCRIPTION) | HYDRAULIC CONDUCTIVITY K, m/sec 10^{-9} 10^{-8} 10^{-7} 10^{-6} | ROCK STRENGTH INDEX R4 R3 R2 R1 | WEATHERING INDEX W1 W2 W3 W4 | NOTES WATER LEVELS INSTRUMENTATION

Continued from Record of Borehole BH17-4S

Depth scale (m)	Description	Elev. / Depth (m)	Run No.	Broken Core	Discontinuity type and surface description	Notes / Water levels / Instrumentation
		180.12				
	Fresh to highly weathered, medium grey, medium bedded, medium grained LIMESTONE with siltstone and sandstone horizons and greenish grey siltstone and cherty limestone beds (Bois Blanc Formation)	2.41	1	Broken Core	BC,IR,RO	
		179.68			FR/JN,IR,RO	Bentonite Seal
3	Fresh, light to medium grey, medium bedded, medium grained, mottled DOLOSTONE with green beds, green fracture coatings and brecciated intervals (Bertie Formation, Akron Member)	2.85			FR/JN,IR,RO	
					FR/JN,IR,RO	
			2	Broken Core	BC,IR,RO	
					FR/JW,IR,RO	
					FR/JW,IR,RO	
4					FR/JW,IR,RO	Sand
					FR/JW,IR,RO	
					FR/JW,IR,RO	
					FR/JW,IR,RO	
5	Large fracture from 4.9 m to 5.1 m, wih sub-rounded pieces of green mineralized core		3	Broken Core	BC,IR to PL,RO to SM	
					JN/FR,IR,RO	
					JN/FR,IR,RO	
					JN/FR,IR,RO	
	Brecciated horizons end @5.8 m					
6					JN/FR,IR,RO	Screen and Sand
	Light grey mottled appearance begins @ beginning of run (6.1)		4			
					FR/JN,IR,RO	
					FR/JN,IR,RO	
7					FR/JN,IR,RO	
					FR/JN,IR,RO	
					FR/JN,IR,RO	

CONTINUED NEXT PAGE

PROJECT: 1771656

RECORD OF DRILLHOLE: BH17-4S

LOCATION: N 4751619.2 ;E 646627.1

INCLINATION: -90° AZIMUTH: ---

DRILLING DATE: February 28, 2017

DRILL RIG: Acker SoilMax

DRILLING CONTRACTOR: Lantech

DATUM: Geodetic

JN - Joint, FLT - Fault, SHR- Shear, VN - Vein, CJ - Conjugate
BD- Bedding, FO- Foliation, CO- Contact, OR- Orthogonal, CL - Cleavage
PL - Planar, CU- Curved, UN- Undulating, ST - Stepped, IR - Irregular
PO- Polished, K - Slickensided, SM- Smooth, Ro - Rough, MB- Mechanical Break
BR - Broken Rock, VRo - Very Rough
NOTE: For additional abbreviations refer to list of abbreviations & symbols.

DEPTH SCALE METRES	DRILLING RECORD	DESCRIPTION	SYMBOLIC LOG	ELEV. DEPTH (m)	RUN No.	PENETRATION RATE min/(m)	FLUSH COLOUR % RETURN	RECOVERY TOTAL CORE %	RECOVERY SOLID CORE %	R.Q.D. %	FRACT. INDEX PER 0.3 m	Broken Core	DISCONTINUITY DATA DIP w.r.t. CORE AXIS	DISCONTINUITY DATA TYPE AND SURFACE DESCRIPTION	HYDRAULIC CONDUCTIVITY K, m/sec	ROCK STRENGTH INDEX	WEATHERING INDEX	NOTES WATER LEVELS INSTRUMENTATION
		--- CONTINUED FROM PREVIOUS PAGE ---																
				174.88	4													Screen and Sand
		END OF DRILLHOLE		7.65														
8																		
9																		
10																		
11																		
12																		

RECORD OF DRILLHOLE: BH17-5D

PROJECT: 1771656
LOCATION: N 4751485.3 ;E 646415.5
INCLINATION: -90° AZIMUTH: ---

DRILLING DATE: March 20, 2017
DRILL RIG: Acker SoilMax
DRILLING CONTRACTOR: Lantech

DATUM: Geodetic

JN - Joint, FLT - Fault, SHR- Shear, VN - Vein, CJ - Conjugate
BD- Bedding, FO- Foliation, CO- Contact, OR- Orthogonal, CL - Cleavage
PL - Planar, CU- Curved, UN- Undulating, ST - Stepped, IR - Irregular
PO- Polished, K - Slickensided, SM- Smooth, Ro - Rough, MB- Mechanical Break
BR - Broken Rock, VRo - Very Rough
NOTE: For additional abbreviations refer to list of abbreviations & symbols.

DEPTH SCALE METRES	DRILLING RECORD	DESCRIPTION	SYMBOLIC LOG	ELEV. DEPTH (m)	RUN No.	PENETRATION RATE min/(m)	FLUSH COLOUR % RETURN	RECOVERY TOTAL CORE % (80 60 40 20)	RECOVERY SOLID CORE % (80 60 40 20)	R.Q.D. % (80 60 40 20)	FRACT. INDEX PER 0.3 m (5 10 15 20)	Broken Core	DISCONTINUITY DATA DIP w.r.t. CORE AXIS (0 30 60 90)	DISCONTINUITY DATA TYPE AND SURFACE DESCRIPTION	HYDRAULIC CONDUCTIVITY K, m/sec (10^{-9} 10^{-8} 10^{-7} 10^{-6})	ROCK STRENGTH INDEX (R4 R3 R2 R1)	WEATHERING INDEX (W1 W2 W3 W4)	NOTES WATER LEVELS INSTRUMENTATION
		Continued from Record of Borehole BH17-5D		182.05														
1		Fresh to highly weathered, medium grey, medium bedded, medium grained LIMESTONE with siltstone and sandstone horizons and greenish grey siltstone and cherty limestone beds (Bois Blanc Formation)		0.51	1							Broken Core Broken Core		BD,IR to UN,RO BD,IR to UN,RO BD,IR to UN,RO BD,IR to UN,RO BD,IR to UN,RO BD,IR to UN,RO BD,IR to UN,RO BD,IR to UN,RO				
2					2									BD/JN,IR to UN,RO to SM BD/JN,IR to UN,RO to SM BD/JN,IR to UN,RO to SM BD/JN,IR to UN,RO to SM BD/JN,IR to UN,RO to SM BD/JN,IR to UN,RO to SM BD/JN,IR to UN,RO to SM BD/JN,IR to UN,RO to SM BD/JN,IR to UN,RO to SM BD/JN,IR to UN,RO to SM BD/JN,IR to UN,RO to SM BD/JN,IR to UN,RO to SM BD/JN,IR to UN,RO to SM				
3 4					3							Broken Core		BD/JN,IR to UN,RO BD/JN,IR to UN,RO BD/JN,IR to UN,RO BD/JN,IR to UN,RO BD/JN,IR to UN,RO BD/JN,IR to UN,RO BD/JN,IR to UN,RO BD/JN,IR to UN,RO BD/JN,IR to UN,RO BD/JN,IR to UN,RO BC,IR,RO BC,IR,RO BD/JN,IR to UN,RO BD/JN,IR to UN,RO BD/JN,IR to UN,RO				
5		Fresh, light to medium grey, medium bedded, medium grained, mottled DOLOSTONE with green beds, green fracture coatings and brecciated intervals (Bertie Formation, Akron Member)		178.15 4.41	4									BD/JN,IR to UN,RO BD/JN,IR to UN,RO BD/JN,IR to UN,RO BD/JN,IR to UN,RO BD/JN,IR to UN,RO BD/JN,IR to UN,RO BD/JN,IR to UN,RO				

CONTINUED NEXT PAGE

DEPTH SCALE
1 : 25

GOLDER

LOGGED: TP
CHECKED: SM

LOCATION: N 4751485.3 ;E 646415.5
INCLINATION: -90° AZIMUTH: ---
DRILLING DATE: March 20, 2017
DRILL RIG: Acker SoilMax
DRILLING CONTRACTOR: Lantech
DATUM: Geodetic

JN - Joint, FLT - Fault, SHR - Shear, VN - Vein, CJ - Conjugate; BD - Bedding, FO - Foliation, CO - Contact, OR - Orthogonal, CL - Cleavage; PL - Planar, CU - Curved, UN - Undulating, ST - Stepped, IR - Irregular; PO - Polished, K - Slickensided, SM - Smooth, Ro - Rough, MB - Mechanical Break; BR - Broken Rock, VRo - Very Rough. **NOTE:** For additional abbreviations refer to list of abbreviations & symbols.

Columns: DEPTH SCALE METRES | DRILLING RECORD | DESCRIPTION | SYMBOLIC LOG | ELEV. DEPTH (m) | RUN No. | PENETRATION RATE min/(m) | FLUSH | COLOUR % RETURN | RECOVERY (TOTAL CORE %, SOLID CORE %) | R.Q.D. % | FRACT. INDEX PER 0.3 m | Broken Core | DISCONTINUITY DATA (DIP w.r.t. CORE AXIS, TYPE AND SURFACE DESCRIPTION) | HYDRAULIC CONDUCTIVITY K, m/sec | ROCK STRENGTH INDEX | WEATHERING INDEX | NOTES WATER LEVELS INSTRUMENTATION

--- CONTINUED FROM PREVIOUS PAGE ---

Depth (m)	Description	Run No.	Discontinuity data
	Fresh, light to medium grey, medium bedded, medium grained, mottled DOLOSTONE with green beds, green fracture coatings and brecciated intervals (Bertie Formation, Akron Member)	4	JN/FR,IR to ST,RO to SM; JN/FR,IR to ST,RO to SM; JN/FR,IR to ST,RO to SM; JN/FR,IR to ST,RO to SM
6			JN/FR,IR to ST,RO to SM; BC,IR,RO (Broken Core); BC,IR,RO
		5	JN/FR,IR or ST,RO; JN/FR,IR or ST,RO; JN/FR,IR or ST,RO; JN/FR,IR or ST,RO
7			JN/FR,IR or ST,RO; JN/FR,IR or ST,RO; JN/FR,IR or ST,RO
	Zone of green mineralization from 7.6 m to 8.2 m	6	JN/FR,IR to UN,RO; JN/FR,IR to UN,RO; FR/FLT,IR to PL,SM to PO
8			FR/FLT,IR to PL,SM to PO; JN/FR,IR to UN,RO to SM; JN/FR,IR to UN,RO to SM; JN/FR,IR to UN,RO to SM; JN/FR,IR to UN,RO to SM
	Light grey mottled appearance begins @ 8.4 m		JN/FR,IR to UN,RO to SM; JN/FR,IR to UN,RO to SM; JN/FR,IR to UN,RO to SM
9		7	JN/FR,IR or ST,RO; JN/FR,IR or ST,RO
10			JN/FR,IR or ST,RO (×9)

CONTINUED NEXT PAGE

DEPTH SCALE 1 : 25
GOLDER
LOGGED: TP
CHECKED: SM

GTA-RCK 025 S:\CLIENTS\RANKIN_CONSTRUCTION\PORT_COLBORNE_QUARRY\02_DATA\GINT\1771656.GPJ GAL-MISS.GDT 7/27/20

RECORD OF DRILLHOLE: BH17-5D

PROJECT: 1771656
LOCATION: N 4751485.3 ;E 646415.5
INCLINATION: -90° AZIMUTH: ---
DRILLING DATE: March 20, 2017
DRILL RIG: Acker SoilMax
DRILLING CONTRACTOR: Lantech
DATUM: Geodetic

JN - Joint, FLT - Fault, SHR- Shear, VN - Vein, CJ - Conjugate; BD- Bedding, FO- Foliation, CO- Contact, OR- Orthogonal, CL - Cleavage; PL - Planar, CU- Curved, UN- Undulating, ST - Stepped, IR - Irregular; PO- Polished, K - Slickensided, SM- Smooth, Ro - Rough, MB- Mechanical Break; BR - Broken Rock, VRo - Very Rough

NOTE: For additional abbreviations refer to list of abbreviations & symbols.

Columns: DEPTH SCALE METRES | DRILLING RECORD | DESCRIPTION | SYMBOLIC LOG | ELEV. DEPTH (m) | RUN No. | PENETRATION RATE min/(m) | COLOUR % RETURN | FLUSH | RECOVERY (TOTAL CORE %, SOLID CORE %) | R.Q.D. % | FRACT. INDEX PER 0.3 m | Broken Core | DISCONTINUITY DATA (DIP w.r.t. CORE AXIS, TYPE AND SURFACE DESCRIPTION) | HYDRAULIC CONDUCTIVITY K, m/sec | ROCK STRENGTH INDEX | WEATHERING INDEX | NOTES WATER LEVELS INSTRUMENTATION

--- CONTINUED FROM PREVIOUS PAGE ---

Depth (m)	Description	Elev. / Depth (m)	Run No.	Discontinuity type and surface description
	Fresh, light to medium grey, medium bedded, medium grained, mottled DOLOSTONE with green beds, green fracture coatings and brecciated intervals (Bertie Formation, Akron Member)		7	JN/FR,IR or ST,RO; JN/FR,IR or ST,RO; JN/FR,IR to UN,RO to SM
11				JN/FR,IR to UN,RO to SM; JN/FR,IR to UN,RO to SM; JN/FR,IR to UN,RO to SM; JN/FR,IR to UN,RO to SM
	Fresh, grey to bluish-grey, medium grained, thin to medium bedded, fine to medium grained laminate textured DOLOSTONE with thin argillaceous laminae (Bertie Formation, Williamsville Member)	171.25 / 11.31	8	JN/FR,IR to UN,RO to SM; JN/FR,IR to UN,RO to SM; JN/FR,IR to UN,RO to SM; JN/FR,IR to UN,RO to SM; JN/FR,IR to UN,RO to SM; JN/FR,IR to UN,RO to SM; BD,PL,SM
12				BD,PL,SM; BC,IR,RO; Broken Core; BD/JN,PL to IR,SM
			9	BD/JN,PL to IR,SM; BD/JN,PL to IR,SM
13				BD/JN,PL to IR,SM; BD/JN,PL to IR,SM; BD/JN,PL to IR,SM
	Fresh, medium to dark grey, fine to medium grained, ARGILLACEOUS DOLOSTONE and SHALY DOLOSTONE (Bertie Formation, Scajaquada Member)	169.12 / 13.44		BD/JN,PL to IR,SM; BD/JN,IR to PL,RO to SM; BD/JN,IR to PL,RO to SM
14				BD/JN,IR to PL,RO to SM
	Fresh, brownish-grey to brown, medium grained, pitted to vuggy DOLOSTONE (Bertie Formation, Falkirk Member)	168.42 / 14.14	10	BD/JN,IR to PL,RO to SM; BD/JN,IR to PL,RO to SM; BD/JN,IR to PL,RO to SM; BD/JN,IR to PL,RO to SM; BD/JN,IR to PL,RO to SM; FR/JN,IR,RO; FR/JN,IR,RO; FR/JN,IR,RO
15			11	

Notes: Sand

CONTINUED NEXT PAGE

DEPTH SCALE
1 : 25

GOLDER

LOGGED: TP
CHECKED: SM

LOCATION: N 4751485.3 ;E 646415.5

INCLINATION: -90° AZIMUTH: ---

DRILLING DATE: March 20, 2017

DRILL RIG: Acker SoilMax

DRILLING CONTRACTOR: Lantech

DATUM: Geodetic

JN - Joint, FLT - Fault, SHR- Shear, VN - Vein, CJ - Conjugate; BD- Bedding, FO- Foliation, CO- Contact, OR- Orthogonal, CL - Cleavage; PL - Planar, CU- Curved, UN- Undulating, ST - Stepped, IR - Irregular; PO- Polished, K - Slickensided, SM- Smooth, Ro - Rough, MB- Mechanical Break; BR - Broken Rock, VRo - Very Rough

NOTE: For additional abbreviations refer to list of abbreviations & symbols.

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DEPTH SCALE METRES	DESCRIPTION	ELEV. DEPTH (m)	RUN No.	DISCONTINUITY DATA TYPE AND SURFACE DESCRIPTION	NOTES WATER LEVELS INSTRUMENTATION
	Fresh, brownish-grey to brown, medium grained, pitted to vuggy DOLOSTONE (Bertie Formation, Falkirk Member)			FR/JN,IR,RO FR/JN,IR,RO FR/JN,IR,RO	
16	Large vug 0.2 m long at 15.9 m with Quartz and Calcite infilling		11	FR/JN,IR,RO FR/JN,IR,RO FR/JN,IR,RO FR/JN,IR,RO	Sand
17			12		
18					Screen and Sand
19			13	BD/JN,IR to UN,RO BD/JN,IR to UN,RO BD/JN,IR to UN,RO BD/JN,IR to UN,RO BD/JN,IR to UN,RO	
	Fresh, dark bluish grey to black argillaceous DOLOSTONE and SHALE (Bertie Formation, Oatka Member)	163.05 19.51		BD,PL,SM BD,PL,SM	
	END OF DRILLHOLE	162.87 19.69			
20					

DEPTH SCALE

1 : 25

GOLDER

LOGGED: TP

CHECKED: SM

RECORD OF DRILLHOLE: BH17-5S

PROJECT: 1771656

SHEET 1 OF 2

LOCATION: N 4751486.3 ;E 646415.4

DRILLING DATE: March 23, 2017

DATUM: Geodetic

INCLINATION: -90°   AZIMUTH: ---

DRILL RIG: Acker SoilMax

DRILLING CONTRACTOR: Lantech

JN - Joint, FLT - Fault, SHR- Shear, VN - Vein, CJ - Conjugate
BD- Bedding, FO- Foliation, CO- Contact, OR- Orthogonal, CL - Cleavage
PL - Planar, CU- Curved, UN- Undulating, ST - Stepped, IR - Irregular
PO- Polished, K - Slickensided, SM- Smooth, Ro - Rough, MB- Mechanical Break
BR - Broken Rock, VRo - Very Rough
NOTE: For additional abbreviations refer to list of abbreviations & symbols.

Columns: DEPTH SCALE METRES | DRILLING RECORD | DESCRIPTION | SYMBOLIC LOG | ELEV. DEPTH (m) | RUN No. | PENETRATION RATE min/(m) | COLOUR % RETURN | FLUSH | RECOVERY (TOTAL CORE % 80 60 40 20; SOLID CORE % 80 60 40 20) | R.Q.D. % 80 60 40 20 | FRACT. INDEX PER 0.3 m 5 10 15 20 | Broken Core | DISCONTINUITY DATA (DIP w.r.t. CORE AXIS 0 30 60 90; TYPE AND SURFACE DESCRIPTION) | HYDRAULIC CONDUCTIVITY K, m/sec 10^{-9} 10^{-8} 10^{-7} 10^{-6} | ROCK STRENGTH INDEX R4 R3 R2 R1 | WEATHERING INDEX W1 W2 W3 W4 | NOTES WATER LEVELS INSTRUMENTATION

Elev. / Depth (m)	Description	Run No.
	Continued from Record of Borehole BH17-5S	
181.82 / 0.76	Fresh to highly weathered, medium grey, medium bedded, medium grained LIMESTONE with siltstone and sandstone horizons and greenish grey siltstone and cherty limestone beds (Bois Blanc Formation)	1, 2
179.58 / 3.00	Fresh, light to medium grey, medium bedded, medium grained, mottled DOLOSTONE with green beds, green fracture coatings and brecciated intervals (Bertie Formation, Akron Member)	3, 4

Depth scale: 1, 2, 3, 4, 5

Broken Core (approx. 2.6–2.8 m)

Discontinuity data (type and surface description):

BD/JN,IR to UN,RO (21 entries, approx. 0.8–2.7 m)
FR/BC,IR to ST,RO
FR/BC,IR to ST,RO
BD/JN,IR to UN,RO (8 entries, approx. 2.9–3.7 m)
BD/JN,IR to UN,RO
FR/BC/FLT,PL to IR,RO to PO
FR/BC/FLT,PL to IR,RO to PO
BD/JN,IR to PL,RO to SM
BD/JN,IR to PL,RO to SM
BD/JN,IR to PL,RO to SM
SH/JN,IR to UN,RO to SM (13 entries, approx. 4.5–5.7 m)

Notes / Water levels / Instrumentation: Bentonite Seal; Sand

CONTINUED NEXT PAGE

DEPTH SCALE 1 : 25

LOGGED: TP

CHECKED: SM

GOLDER

RECORD OF DRILLHOLE: BH17-5S

PROJECT: 1771656

SHEET 2 OF 2

LOCATION: N 4751486.3 ;E 646415.4

DRILLING DATE: March 23, 2017

DATUM: Geodetic

INCLINATION: -90°   AZIMUTH: ---

DRILL RIG: Acker SoilMax

DRILLING CONTRACTOR: Lantech

JN - Joint, FLT - Fault, SHR- Shear, VN - Vein, CJ - Conjugate; BD- Bedding, FO- Foliation, CO- Contact, OR- Orthogonal, CL - Cleavage; PL - Planar, CU- Curved, UN- Undulating, ST - Stepped, IR - Irregular; PO- Polished, K - Slickensided, SM- Smooth, Ro - Rough, MB- Mechanical Break; BR - Broken Rock, VRo - Very Rough. NOTE: For additional abbreviations refer to list of abbreviations & symbols.

DEPTH SCALE METRES	DESCRIPTION	ELEV. DEPTH (m)	RUN No.	DISCONTINUITY DATA TYPE AND SURFACE DESCRIPTION	NOTES WATER LEVELS INSTRUMENTATION
	--- CONTINUED FROM PREVIOUS PAGE ---				
	Fresh, light to medium grey, medium bedded, medium grained, mottled DOLOSTONE with green beds, green fracture coatings and brecciated intervals (Bertie Formation, Akron Member)		4	JN/FR,IR to UN,RO	Sand
6				JN/FR,IR to UN,RO	
				JN/FR,IR to UN,RO; JN/FR,IR to UN,RO; JN/FR,IR to UN,RO; JN/FR,IR to UN,RO	
			5	JN/FR,IR to UN,RO; JN/FR,IR to UN,RO	
7				JN/FR,IR to UN,RO; JN/FR,IR to UN,RO	
				JN/FR,IR to UN,RO; JN/FR,IR to UN,RO	Screen and Sand
	Zone of green mineralization from 7.8 m to 8.2 m			JN/FR,IR to UN,RO; JN/FR,IR to UN,RO; JN/FR,IR to UN,RO; JN/FR,IR to UN,RO	
8				Broken Core; FLT/FR,IR to ST,RO; FLT/FR,IR to ST,RO	
	Light grey mottled appearace begins @ 8.2 m		6	JN/FR,IR to UN,RO; JN/FR,IR to UN,RO	
				JN/FR,IR to UN,RO; JN/FR,IR to UN,RO; JN/FR,IR to UN,RO; JN/FR,IR to UN,RO	
9		173.56			
	END OF DRILLHOLE	9.02			
10					

Other columns: DRILLING RECORD; SYMBOLIC LOG; PENETRATION RATE min/(m); COLOUR % RETURN; FLUSH; RECOVERY (TOTAL CORE %, SOLID CORE %) 80 60 40 20; R.Q.D. % 80 60 40 20; FRACT. INDEX PER 0.3 m 5 10 15 20; Broken Core; DIP w.r.t. CORE AXIS 0 30 60 90; HYDRAULIC CONDUCTIVITY K, m/sec 10^{-9} 10^{-8} 10^{-7} 10^{-6}; ROCK STRENGTH INDEX R4 R3 R2 R1; WEATHERING INDEX W1 W2 W3 W4.

DEPTH SCALE 1 : 25

GOLDER

LOGGED: TP

CHECKED: SM

RECORD OF DRILLHOLE: BH17-6D

PROJECT: 1771656

SHEET 1 OF 3

LOCATION: N 4751418.1 ;E 646833.2

DRILLING DATE: February 22, 2017

DATUM: Geodetic

DRILL RIG: Acker SoilMax

INCLINATION: -90° AZIMUTH: ---

DRILLING CONTRACTOR: Lantech

JN - Joint, FLT - Fault, SHR- Shear, VN - Vein, CJ - Conjugate
BD- Bedding, FO- Foliation, CO- Contact, OR- Orthogonal, CL - Cleavage
PL - Planar, CU- Curved, UN- Undulating, ST - Stepped, IR - Irregular
PO- Polished, K - Slickensided, SM- Smooth, Ro - Rough, MB- Mechanical Break
BR - Broken Rock, VRo - Very Rough
NOTE: For additional abbreviations refer to list of abbreviations & symbols.

DEPTH SCALE METRES	DESCRIPTION	ELEV. / DEPTH (m)	RUN No.	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION
	Continued from Record of Borehole BH17-6D	178.48		
	Fresh to highly weathered, medium grey, medium bedded, medium grained LIMESTONE with siltstone and sandstone horizons and greenish grey siltstone and cherty limestone beds (Bois Blanc Formation)	3.35	1	FR,IR,RO; FR,IR,RO; FR,IR,RO; BC,IR,RO; BC,IR,RO; Broken Core; BC,IR,RO; FR,IR,RO; FR,IR,RO; FR,IR,RO
4				
	Brecciated horizons end @ 4.6 m , light grey mottled appearance begins	177.22 / 4.61		
5	Fresh, light to medium grey, medium bedded, medium grained, mottled DOLOSTONE with green beds, green fracture coatings and brecciated intervals (Bertie Formation, Akron Member)		2	BD/FR,IR,RO; FR,IR,RO; FR,IR,RO; FR,IR,RO; FR,IR,RO; FR,IR,RO
6			3	FR,IR,RO; BC,IR,RO; Lost Core; Broken Core; FR,IR,RO; FR,IR to UN,RO to SM; FR,IR to UN,RO to SM; FR,IR to UN,RO to SM; FR,IR to UN,RO to SM; FR,IR to UN,RO to SM; FR,IR to UN,RO to SM; FR,IR to UN,RO to SM
7	Fresh, grey to bluish-grey, medium grained, thin to medium bedded, fine to medium grained laminate textured DOLOSTONE with thin argillaceous laminae (Bertie Formation, Williamsville Member)	174.58 / 7.25		FR,IR to UN,RO to SM; FR,IR to UN,RO to SM; FR,IR to UN,RO to SM; FR,IR to UN,RO to SM; FR,IR to UN,RO to SM
8			4	FR,IR,RO; FR,IR to UN,RO; FR,IR to UN,RO; FR,IR to UN,RO; FR,IR to UN,RO; FR,IR to UN,RO; FR,IR to UN,RO to SM; FR,IR to UN,RO

Column headings: DEPTH SCALE METRES; DRILLING RECORD; DESCRIPTION; SYMBOLIC LOG; ELEV. DEPTH (m); RUN No.; PENETRATION RATE min/(m); FLUSH; COLOUR % RETURN; RECOVERY (TOTAL CORE %, SOLID CORE %) 80 60 40 20; R.Q.D. % 80 60 40 20; FRACT. INDEX PER 0.3 m 5 10 15 20; Broken Core; DIP w.r.t. CORE AXIS 0 30 60 90; HYDRAULIC CONDUCTIVITY K, m/sec 10^{-9} 10^{-8} 10^{-7} 10^{-6}; ROCK STRENGTH INDEX R4 R3 R2 R1; WEATHERING INDEX W1 W2 W3 W4; NOTES WATER LEVELS INSTRUMENTATION

CONTINUED NEXT PAGE

DEPTH SCALE 1 : 25

GOLDER

LOGGED: TP

CHECKED: SM

LOCATION: N 4751418.1 ;E 646833.2

INCLINATION: -90° AZIMUTH: ---

DRILLING DATE: February 22, 2017

DRILL RIG: Acker SoilMax

DRILLING CONTRACTOR: Lantech

DATUM: Geodetic

JN - Joint, FLT - Fault, SHR - Shear, VN - Vein, CJ - Conjugate; BD - Bedding, FO - Foliation, CO - Contact, OR - Orthogonal, CL - Cleavage; PL - Planar, CU - Curved, UN - Undulating, ST - Stepped, IR - Irregular; PO - Polished, K - Slickensided, SM - Smooth, Ro - Rough, MB - Mechanical Break; BR - Broken Rock, VRo - Very Rough. NOTE: For additional abbreviations refer to list of abbreviations & symbols.

--- CONTINUED FROM PREVIOUS PAGE ---

DEPTH SCALE METRES	DESCRIPTION	ELEV. DEPTH (m)	RUN No.	DISCONTINUITY DATA – TYPE AND SURFACE DESCRIPTION
	Fresh, grey to bluish-grey, medium grained, thin to medium bedded, fine to medium grained laminate textured DOLOSTONE with thin argillaceous laminae (Bertie Formation, Williamsville Member)		4	to SM; FR,IR to UN,RO to SM; FR,IR to UN,RO to SM; FR,IR to UN,RO to SM; FR,IR to UN,RO to SM; FR or FLT,IR to PL,SM to PO; FR,IR,RO; FR,IR,RO (Lost Core)
9				
	Fresh, medium to dark grey, fine to medium grained, ARGILLACEOUS DOLOSTONE and SHALY DOLOSTONE (Bertie Formation, Scajaquada Member)	172.68 / 9.15	5	BD,PL,SM; BD,PL,SM; BD,PL,SM; BD,PL,SM; BD,PL,SM; BD,PL,SM; BD,PL,SM; BD,PL,SM
10				
11			6	BD,PL,SM; BD,PL,SM; BD,PL,SM
	Fresh, brownish-grey to brown, medium grained, pitted to vuggy DOLOSTONE (Bertie Formation, Falkirk Member)	170.46 / 11.37	6	FLT or FR,BC,RO; FR,IR,RO (Broken Core); BD,PL to IR,RO to SM; BD,PL to IR,RO to SM; BD,PL to IR,RO to SM
12				
13			7	

CONTINUED NEXT PAGE

PROJECT: 1771656

RECORD OF DRILLHOLE: BH17-6D

LOCATION: N 4751418.1 ;E 646833.2

INCLINATION: -90° AZIMUTH: ---

DRILLING DATE: February 22, 2017

DRILL RIG: Acker SoilMax

DRILLING CONTRACTOR: Lantech

DATUM: Geodetic

JN - Joint, FLT - Fault, SHR- Shear, VN - Vein, CJ - Conjugate, BD- Bedding, FO- Foliation, CO- Contact, OR- Orthogonal, CL - Cleavage, PL - Planar, CU- Curved, UN- Undulating, ST - Stepped, IR - Irregular, PO- Polished, K - Slickensided, SM- Smooth, Ro - Rough, MB- Mechanical Break, BR - Broken Rock, VRo - Very Rough

NOTE: For additional abbreviations refer to list of abbreviations & symbols.

DEPTH SCALE METRES	DESCRIPTION	ELEV. DEPTH (m)	RUN No.	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	NOTES WATER LEVELS INSTRUMENTATION
	--- CONTINUED FROM PREVIOUS PAGE ---				
	Fresh, brownish-grey to brown, medium grained, pitted to vuggy DOLOSTONE (Bertie Formation, Falkirk Member)		7	FR,IR,RO FR,IR,RO	
14					Sand
			8		
15				FR,IR,RO	
				BD,PL to IR,RO to SM	
16			9	BD,PL to IR,RO to SM BD,PL to IR,RO to SM BD,PL to IR,RO to SM	Screen and Sand
				BD,PL,SM BD,PL,SM BD,PL,SM BD,PL,SM BD,PL,SM	
	Fresh, dark bluish grey to black argillaceous DOLOSTONE and SHALE (Bertie Formation, Oatka Member)	165.06 16.77			
17				BD,PL,SM BD,PL,SM	
			10	BD,PL,SM	
18	END OF DRILLHOLE	163.85 17.98			

Column headings: DRILLING RECORD; SYMBOLIC LOG; PENETRATION RATE min/(m); COLOUR % RETURN; FLUSH; RECOVERY (TOTAL CORE %, SOLID CORE %) 80 60 40 20; R.Q.D. % 80 60 40 20; FRACT. INDEX PER 0.3 m 5 10 15 20; Broken Core; DIP w.r.t. CORE AXIS 0 30 60 90; HYDRAULIC CONDUCTIVITY K, m/sec 10^{-9} 10^{-8} 10^{-7} 10^{-6}; ROCK STRENGTH INDEX R4 R3 R2 R1; WEATHERING INDEX W1 W2 W3 W4

DEPTH SCALE

1 : 25

GOLDER

LOGGED: TP

CHECKED: SM

RECORD OF DRILLHOLE: BH17-6S

PROJECT: 1771656
SHEET 1 OF 2

LOCATION: N 4751420.2 ;E 646833.0
DRILLING DATE: February 23, 2017
DATUM: Geodetic

INCLINATION: -90° AZIMUTH: ---
DRILL RIG: Acker SoilMax
DRILLING CONTRACTOR: Lantech

JN - Joint, FLT - Fault, SHR - Shear, VN - Vein, CJ - Conjugate, BD - Bedding, FO - Foliation, CO - Contact, OR - Orthogonal, CL - Cleavage, PL - Planar, CU - Curved, UN - Undulating, ST - Stepped, IR - Irregular, PO - Polished, K - Slickensided, SM - Smooth, Ro - Rough, MB - Mechanical Break, BR - Broken Rock, VRo - Very Rough

NOTE: For additional abbreviations refer to list of abbreviations & symbols.

DEPTH SCALE METRES	DESCRIPTION	ELEV. / DEPTH (m)	RUN No.	DISCONTINUITY DATA – TYPE AND SURFACE DESCRIPTION	NOTES WATER LEVELS INSTRUMENTATION
	Continued from Record of Borehole BH17-6S	178.44			
	Fresh to highly weathered, medium grey, medium bedded, medium grained LIMESTONE with siltstone and sandstone horizons and greenish grey siltstone and cherty limestone beds (Bois Blanc Formation)	3.35	1	BC,IR,RO; BC,IR,RO (Broken Core); BC,IR,RO; FR,IR,RO; FR,IR,RO	
4					Bentonite Seal
	Fresh, light to medium grey, medium bedded, medium grained, mottled DOLOSTONE with green beds, green fracture coatings and brecciated intervals (Bertie Formation, Akron Member) Brecciated horizons end @ 4.6 m, light grey mottled appearrance begins	177.25 4.54	2	FR,IR,RO; FR,IR,RO; FR,IR,RO; FR,IR,RO; FR,IR,RO; FR,IR,RO; FR,IR,RO; FR,IR,RO	Sand
5					
6			3	FR,IR to UN,RO to SM (×13)	
7				FR,IR to UN,RO to SM; FR,IR to UN,RO to SM	Screen and Sand
8	Large green tinged sediment filled vertical fracture from 7.9 m to 8.6 m		4	FR,PL,SM; FR,PL,SM; FR,PL,SM; FR,PL,SM; FR,PL,SM	
	CONTINUED NEXT PAGE				

DEPTH SCALE 1 : 25

GOLDER

LOGGED: TP
CHECKED: SM

PROJECT: 1771656

RECORD OF DRILLHOLE: BH17-6S

LOCATION: N 4751420.2 ;E 646833.0

DRILLING DATE: February 23, 2017

DATUM: Geodetic

INCLINATION: -90° AZIMUTH: ---

DRILL RIG: Acker SoilMax

DRILLING CONTRACTOR: Lantech

JN - Joint, FLT - Fault, SHR- Shear, VN - Vein, CJ - Conjugate, BD- Bedding, FO- Foliation, CO- Contact, OR- Orthogonal, CL - Cleavage, PL - Planar, CU- Curved, UN- Undulating, ST - Stepped, IR - Irregular, PO- Polished, K - Slickensided, SM- Smooth, Ro - Rough, MB- Mechanical Break, BR - Broken Rock, VRo - Very Rough

NOTE: For additional abbreviations refer to list of abbreviations & symbols.

DEPTH SCALE METRES	DESCRIPTION	ELEV. DEPTH (m)	RUN No.	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	NOTES WATER LEVELS INSTRUMENTATION
	--- CONTINUED FROM PREVIOUS PAGE ---				
	Fresh, light to medium grey, medium bedded, medium grained, mottled DOLOSTONE with green beds, green fracture coatings and brecciated intervals (Bertie Formation, Akron Member)	172.95 / 8.84	4	FR,PL,SM; FR,PL,SM	Screen and Sand
9	Fresh, grey to bluish-grey, medium grained, thin to medium bedded, fine to medium grained laminate textured DOLOSTONE with thin argillaceous laminae (Bertie Formation, Williamsville Member)	172.62 / 9.17		BD,PL,SM; BD,PL,SM; BD,PL,SM	
	END OF DRILLHOLE				
10					
11					
12					
13					

DEPTH SCALE

1 : 25

GOLDER

LOGGED: TP

CHECKED: SM

PROJECT: 1771656

RECORD OF DRILLHOLE: BH17-7D

LOCATION: N 4751237.0 ;E 646634.8

INCLINATION: -90° AZIMUTH: ---

DRILLING DATE: March 1, 2017

DRILL RIG: Acker SoilMax

DRILLING CONTRACTOR: Lantech

DATUM: Geodetic

JN - Joint, FLT - Fault, SHR- Shear, VN - Vein, CJ - Conjugate; BD- Bedding, FO- Foliation, CO- Contact, OR- Orthogonal, CL - Cleavage; PL - Planar, CU- Curved, UN- Undulating, ST - Stepped, IR - Irregular; PO- Polished, K - Slickensided, SM- Smooth, Ro - Rough, MB- Mechanical Break; BR - Broken Rock, VRo - Very Rough

NOTE: For additional abbreviations refer to list of abbreviations & symbols.

DEPTH SCALE METRES	DRILLING RECORD	DESCRIPTION	SYMBOLIC LOG	ELEV. / DEPTH (m)	RUN No.	PENETRATION RATE min/(m)	FLUSH / COLOUR % RETURN	RECOVERY TOTAL CORE % (80 60 40 20) / SOLID CORE % (80 60 40 20)	R.Q.D. % (80 60 40 20)	FRACT. INDEX PER 0.3 m (5 10 15 20)	Broken Core	DISCONTINUITY DATA: DIP w.r.t. CORE AXIS (0 30 60 90) / TYPE AND SURFACE DESCRIPTION	HYDRAULIC CONDUCTIVITY K, m/sec (10^{-9} 10^{-8} 10^{-7} 10^{-6})	ROCK STRENGTH INDEX (R4 R3 R2 R1)	WEATHERING INDEX (W1 W2 W3 W4)	NOTES WATER LEVELS INSTRUMENTATION
		Continued from Record of Borehole BH17-7D		179.84												
		Fresh to highly weathered, medium grey, medium bedded, medium grained LIMESTONE with siltstone and sandstone horizons and greenish grey siltstone and cherty limestone beds (Bois Blanc Formation)		1.55	1						Broken Core; Broken Core; Broken Core; Broken Core					
2																
3					2											
		Fresh, light to medium grey, medium bedded, medium grained, mottled DOLOSTONE with green beds, green fracture coatings and brecciated intervals (Bertie Formation, Akron Member)		177.43 / 3.96												
4																
5					3											
6					4						Lost Core					
		CONTINUED NEXT PAGE														

Discontinuity data (type and surface description), in order of depth:

TYPE AND SURFACE DESCRIPTION
FR or BD,IR,RO
FR or BD,IR,RO
FR or BD,IR,RO
FR or BD,IR,RO
BD or JN,IR to PL,RO to SM
BD or JN,IR to PL,RO to SM
BD or JN,IR to PL,RO to SM
BD or JN,IR to PL,RO to SM
BD or JN,IR to PL,RO to SM
BD or JN,IR to PL,RO to SM
BD or JN,IR to PL,RO to SM
BD or JN,IR to PL,RO to SM
BD or JN,IR to PL,RO to SM
BD or JN,IR to PL,RO to SM
BD or JN,IR to PL,RO to SM
BD or JN,IR to PL,RO to SM
BD or JN,IR to PL,RO to SM
BD or JN,IR to PL,RO to SM
BD or JN,IR to PL,RO to SM
BD or JN,IR to PL,RO to SM
BD or JN,IR to PL,RO to SM
BD or JN,IR to PL,RO to SM
BD or JN,IR to PL,RO to SM
BD or JN,IR to ST to UN,RO to SM
BD or JN,IR to ST to UN,RO to SM
BD or JN,IR to ST to UN,RO to SM
BD or JN,IR to ST to UN,RO to SM
BD or JN,IR to ST to UN,RO to SM
BD or JN,IR to ST to UN,RO to SM
BD or JN,IR to ST to UN,RO to SM
BD or JN,IR to ST to UN,RO to SM
BD or JN,IR to ST to UN,RO to SM
BD or JN,IR to ST to UN,RO to SM
JN or FR,IR to UN,SM to RO
JN or FR,IR to UN,SM to RO
JN or FR,IR to UN,SM to RO
FR,UN,SM

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DEPTH SCALE

1 : 25

GOLDER

LOGGED: TP

CHECKED: SM

PROJECT: 1771656

RECORD OF DRILLHOLE: BH17-7D

LOCATION: N 4751237.0 ;E 646634.8

DRILLING DATE: March 1, 2017

DATUM: Geodetic

DRILL RIG: Acker SoilMax

INCLINATION: -90° AZIMUTH: ---

DRILLING CONTRACTOR: Lantech

JN - Joint, FLT - Fault, SHR- Shear, VN - Vein, CJ - Conjugate; BD- Bedding, FO- Foliation, CO- Contact, OR- Orthogonal, CL - Cleavage; PL - Planar, CU- Curved, UN- Undulating, ST - Stepped, IR - Irregular; PO- Polished, K - Slickensided, SM- Smooth, Ro - Rough, MB- Mechanical Break; BR - Broken Rock, VRo - Very Rough. NOTE: For additional abbreviations refer to list of abbreviations & symbols.

DEPTH SCALE METRES	DESCRIPTION	ELEV. / DEPTH (m)	RUN No.	DISCONTINUITY DATA – TYPE AND SURFACE DESCRIPTION
	--- CONTINUED FROM PREVIOUS PAGE ---			
7	Fresh, light to medium grey, medium bedded, medium grained, mottled DOLOSTONE with green beds, green fracture coatings and brecciated intervals (Bertie Formation, Akron Member) Brecciated horizons end @ 6.7 m , light grey mottled appearance begins		4	JN or FR,IR to UN to ST,SM to RO (×8); FR or JN,IR to ST,RO to SM (×2)
8–9			5	JN or BD,UN,SM (×11)
			6	JN or BD,UN,SM (×2)
10	Fresh, grey to bluish-grey, medium grained, thin to medium bedded, fine to medium grained laminate textured DOLOSTONE with thin argillaceous laminae (Bertie Formation, Williamsville Member)	171.79 / 9.60	6	BD,PL,SM (×7)
11			7	BD,PL,SM (×7)
	Fresh, medium to dark grey, fine to medium grained, ARGILLACEOUS DOLOSTONE and SHALY DOLOSTONE (Bertie Formation, Scajaquada Member)	170.30 / 11.09	7	BD,PL,SM

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DEPTH SCALE 1 : 25

GOLDER

LOGGED: TP

CHECKED: SM

GTA-RCK 025 S:\CLIENTS\RANKIN_CONSTRUCTION\PORT_COLBORNE_QUARRY\02_DATA\GINT\1771656.GPJ GAL-MISS.GDT 7/27/20

LOCATION: N 4751237.0 ;E 646634.8

INCLINATION: -90° AZIMUTH: ---

DRILLING DATE: March 1, 2017

DRILL RIG: Acker SoilMax

DRILLING CONTRACTOR: Lantech

DATUM: Geodetic

JN - Joint, FLT - Fault, SHR- Shear, VN - Vein, CJ - Conjugate
BD- Bedding, FO- Foliation, CO- Contact, OR- Orthogonal, CL - Cleavage
PL - Planar, CU- Curved, UN- Undulating, ST - Stepped, IR - Irregular
PO- Polished, K - Slickensided, SM- Smooth, Ro - Rough, MB- Mechanical Break
BR - Broken Rock, VRo - Very Rough
NOTE: For additional abbreviations refer to list of abbreviations & symbols.

DEPTH SCALE METRES	DESCRIPTION	ELEV. DEPTH (m)	RUN No.	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	NOTES WATER LEVELS INSTRUMENTATION
	--- CONTINUED FROM PREVIOUS PAGE ---				
	Fresh, medium to dark grey, fine to medium grained, ARGILLACEOUS DOLOSTONE and SHALY DOLOSTONE (Bertie Formation, Scajaquada Member)		7	BD,PL,SM	
12				BD,PL,SM	
				BD,PL,SM	
13			8	BD/JN,IR,RO	
		168.13		BD/JN,IR,RO	
	Fresh, brownish-grey to brown, medium grained, pitted to vuggy DOLOSTONE (Bertie Formation, Falkirk Member)	13.26			
				BD,PL,SM	
14			9	FR/JN,IR to ST,RO	
				FR/JN,IR to ST,RO	
15					Sand
			10	BD,PL to IR,SM to RO	
				BD,PL to IR,SM to RO	
16				BD,PL to IR,SM to RO	
				BD,PL to IR,SM to RO	Screen and Sand
				BD,PL to IR,SM to RO	
	CONTINUED NEXT PAGE				

PROJECT: 1771656

RECORD OF DRILLHOLE: BH17-7D

LOCATION: N 4751237.0 ;E 646634.8

INCLINATION: -90° AZIMUTH: ---

DRILLING DATE: March 1, 2017

DRILL RIG: Acker SoilMax

DRILLING CONTRACTOR: Lantech

DATUM: Geodetic

JN - Joint, FLT - Fault, SHR- Shear, VN - Vein, CJ - Conjugate, BD- Bedding, FO- Foliation, CO- Contact, OR- Orthogonal, CL - Cleavage, PL - Planar, CU- Curved, UN- Undulating, ST - Stepped, IR - Irregular, PO- Polished, K - Slickensided, SM- Smooth, Ro - Rough, MB- Mechanical Break, BR - Broken Rock, VRo - Very Rough

NOTE: For additional abbreviations refer to list of abbreviations & symbols.

DEPTH SCALE METRES	DESCRIPTION	ELEV. / DEPTH (m)	RUN No.	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	NOTES WATER LEVELS INSTRUMENTATION
	--- CONTINUED FROM PREVIOUS PAGE ---				
	Fresh, brownish-grey to brown, medium grained, pitted to vuggy DOLOSTONE (Bertie Formation, Falkirk Member)				
				BD,PL,SM	
17					
			11		
					Screen and Sand
				BD/JN,PL,SM	
				BD/JN,PL,SM	
				BD/JN,PL,SM	
18					
				BD,PL,SM	
				BD,PL,SM	
		163.00 / 18.39	12	BD,PL,SM	
	Fresh, dark bluish grey to black argillaceous DOLOSTONE and SHALE (Bertie Formation, Oatka Member)				
		162.64 / 18.75			
	END OF DRILLHOLE				
19					
20					
21					

DEPTH SCALE
1 : 25

GOLDER

LOGGED: TP
CHECKED: SM

RECORD OF DRILLHOLE: BH17-7S

PROJECT: 1771656

LOCATION: N 4751234.4 ;E 646634.9

INCLINATION: -90° AZIMUTH: ---

DRILLING DATE: March 7, 2017

DRILL RIG: Acker SoilMax

DRILLING CONTRACTOR: Lantech

DATUM: Geodetic

JN - Joint, FLT - Fault, SHR - Shear, VN - Vein, CJ - Conjugate; BD - Bedding, FO - Foliation, CO - Contact, OR - Orthogonal, CL - Cleavage; PL - Planar, CU - Curved, UN - Undulating, ST - Stepped, IR - Irregular; PO - Polished, K - Slickensided, SM - Smooth, Ro - Rough, MB - Mechanical Break; BR - Broken Rock, VRo - Very Rough. NOTE: For additional abbreviations refer to list of abbreviations & symbols.

DEPTH SCALE METRES	DESCRIPTION	ELEV. / DEPTH (m)	RUN No.	DISCONTINUITY DATA – TYPE AND SURFACE DESCRIPTION	NOTES / WATER LEVELS / INSTRUMENTATION
	Continued from Record of Borehole BH17-7S	179.87 / 1.50			
	Fresh to highly weathered, medium grey, medium bedded, medium grained LIMESTONE with siltstone and sandstone horizons and greenish grey siltstone and cherty limestone beds (Bois Blanc Formation)		1	FR/JN,IR to UN,RO to SM	
2				FR/JN,IR to UN,RO to SM FR/JN,IR to UN,RO to SM FR/JN,IR to UN,RO to SM FR/JN,IR to UN,RO to SM	Bentonite Seal
				FR/JN,IR to UN,RO to SM FR/JN,IR to UN,RO to SM	
3				FR/JN,IR to UN,RO to SM FR/JN,IR to UN,RO to SM	
	Fresh, light to medium grey, medium bedded, medium grained, mottled DOLOSTONE with green beds, green fracture coatings and brecciated intervals (Bertie Formation, Akron Member)	178.22 / 3.15	2	FR/JN,IR to PL,RO to SM FR/JN,IR to PL,RO to SM FR/JN,IR to PL,RO to SM FR/JN,IR to PL,RO to SM FR/JN,IR to PL,RO to SM FR/JN,IR to PL,RO to SM FR/JN,IR to PL,RO to SM	Sand
4				FR/JN,IR to PL,RO to SM FR/JN,IR to PL,RO to SM FR/JN,IR to PL,RO to SM FR/JN,IR to PL,RO to SM FR/JN,IR to PL,RO to SM FR/JN,IR to PL,RO to SM FR/JN,IR to PL,RO to SM FR/JN,IR to PL,RO to SM FR/JN,IR to PL,RO to SM FR/JN,IR to PL,RO to SM	
5			3	FR/JN,IR to UN,RO to SM FR/JN,IR to UN,RO to SM FR/JN,IR to UN,RO to SM FR/JN,IR to UN,RO to SM	
				FR/JN,IR to UN,RO to SM	Screen and Sand
6				FR/JN,IR to UN,RO to SM FR/JN,IR to UN,RO to SM FR/JN,IR to UN,RO to SM	
			4	FR/JN,IR to ST,RO to SM FR/JN,IR to	

CONTINUED NEXT PAGE

DEPTH SCALE 1 : 25

GOLDER

LOGGED: TP

CHECKED: SM

PROJECT: 1771656

RECORD OF DRILLHOLE: BH17-7S

SHEET 2 OF 2

LOCATION: N 4751234.4 ;E 646634.9

DRILLING DATE: March 7, 2017

DATUM: Geodetic

INCLINATION: -90° AZIMUTH: ---

DRILL RIG: Acker SoilMax

DRILLING CONTRACTOR: Lantech

JN - Joint, FLT - Fault, SHR - Shear, VN - Vein, CJ - Conjugate, BD - Bedding, FO - Foliation, CO - Contact, OR - Orthogonal, CL - Cleavage, PL - Planar, CU - Curved, UN - Undulating, ST - Stepped, IR - Irregular, PO - Polished, K - Slickensided, SM - Smooth, Ro - Rough, MB - Mechanical Break, BR - Broken Rock, VRo - Very Rough

NOTE: For additional abbreviations refer to list of abbreviations & symbols.

DEPTH SCALE METRES	DRILLING RECORD	DESCRIPTION	SYMBOLIC LOG	ELEV. DEPTH (m)	RUN No.	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	NOTES WATER LEVELS INSTRUMENTATION
		--- CONTINUED FROM PREVIOUS PAGE ---					
		Fresh, light to medium grey, medium bedded, medium grained, mottled DOLOSTONE with green beds, green fracture coatings and brecciated intervals (Bertie Formation, Akron Member) Breciated horizons end @ 6.7 m light grey mottled apperance begins				ST,RO to SM FR,IR to ST,RO to SM Lost Core FR,IR to ST,RO to SM FR,IR to ST,RO to SM	
7					4		Screen and Sand
		0.1 m fracture infilled with cemerited sand @ 7.2 m				FR,IR to ST,RO to SM FR,IR to ST,RO to SM	
				173.75 7.62			
		END OF DRILLHOLE					
8							
9							
10							
11							

Other columns: PENETRATION RATE min/(m); COLOUR % RETURN; FLUSH; RECOVERY (TOTAL CORE %, SOLID CORE %); R.Q.D. %; FRACT. INDEX PER 0.3 m; Broken Core; DIP w.r.t. CORE AXIS; HYDRAULIC CONDUCTIVITY K, m/sec (10^{-9}, 10^{-8}, 10^{-7}, 10^{-6}); ROCK STRENGTH INDEX (R4 R3 R2 R1); WEATHERING INDEX (W1 W2 W3 W4)

DEPTH SCALE

1 : 25

GOLDER

LOGGED: TP

CHECKED: SM

RECORD OF DRILLHOLE: BH17-8D

PROJECT: 1771656

LOCATION: N 4751094.9 ;E 646422.4

INCLINATION: -90° AZIMUTH: ---

DRILLING DATE: March 8, 2017

DRILL RIG: Acker SoilMax

DRILLING CONTRACTOR: Lantech

DATUM: Geodetic

JN - Joint; FLT - Fault; SHR- Shear; VN - Vein; CJ - Conjugate
BD- Bedding; FO- Foliation; CO- Contact; OR- Orthogonal; CL - Cleavage
PL - Planar; CU- Curved; UN- Undulating; ST - Stepped; IR - Irregular
PO- Polished; K - Slickensided; SM- Smooth; Ro - Rough; MB- Mechanical Break
BR - Broken Rock; VRo - Very Rough
NOTE: For additional abbreviations refer to list of abbreviations & symbols.

DEPTH SCALE METRES	DRILLING RECORD	DESCRIPTION	SYMBOLIC LOG	ELEV. DEPTH (m)	RUN No.	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	NOTES WATER LEVELS INSTRUMENTATION
		Continued from Record of Borehole BH17-8D		180.55			
		Fresh to highly weathered, medium grey, medium bedded, medium grained LIMESTONE with siltstone and sandstone horizons and greenish grey siltstone and cherty limestone beds (Bois Blanc Formation)		0.84			
1					1	FR/JN,IR,RO to SM; FR/JN,IR,RO to SM; FR/JN,IR,RO to SM; FR/JN,IR,RO to SM; FR/JN,IR,RO to SM; FR/JN,IR,RO to SM; FR/JN,IR,RO to SM; FR/JN,IR,RO to SM; FR/JN,IR to UN,RO to SM; FR/JN,IR to UN,RO to SM	
2					2	FR/JN,IR to UN,RO to SM; FR/JN,IR to UN,RO to SM; FR/JN,IR to UN,RO to SM; FR/JN,IR to UN,RO to SM; FR/JN,IR to UN,RO to SM; FR/JN,IR to UN,RO to SM; FR/JN,IR to UN,RO to SM; FR/JN,IR to UN,RO to SM; FR/JN,IR to UN,RO to SM; FR/JN,IR to UN,RO to SM; FR/JN,IR to UN,RO to SM; FR/JN,IR to UN,RO to SM; FR/JN,IR to UN,RO to SM	
3					3	FR/JN,IR to UN,RO to SM; FR/JN,IR to UN,RO to SM; FR/JN,IR to UN,RO to SM; FR/JN,IR to UN,RO to SM; FR/JN,IR to UN,RO to SM; FR/JN,IR to UN,RO to SM; FR/JN,IR to UN,RO to SM; FR/JN,IR to UN,RO to SM; FR/JN,IR to UN,RO to SM; FR/JN,IR to UN,RO to SM	
4						BD,PL,SM; BD,PL,SM	
5					4	FR/JN,IR to UN,RO to SM; FR/JN,IR to UN,RO to SM; FR/JN,IR to UN,RO to SM; FR/JN,IR to UN,RO to SM; FR/JN,IR to UN,RO to SM; FR,PL,SM; FR/JN,IR to	

Column headings also include: PENETRATION RATE min/(m); COLOUR % RETURN; FLUSH; RECOVERY (TOTAL CORE %, SOLID CORE %); R.Q.D. %; FRACT. INDEX PER 0.3 m; Broken Core; DIP w.r.t. CORE AXIS; HYDRAULIC CONDUCTIVITY K, m/sec (10^{-9}, 10^{-8}, 10^{-7}, 10^{-6}); ROCK STRENGTH INDEX (R4 R3 R2 R1); WEATHERING INDEX (W1 W2 W3 W4).

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DEPTH SCALE 1 : 25

GOLDER

LOGGED: TP

CHECKED: SM

GTA-RCK 025 S:\CLIENTS\RANKIN_CONSTRUCTION\PORT_COLBORNE_QUARRY\02_DATA\GINT\1771656.GPJ GAL-MISS.GDT 7/27/20

LOCATION: N 4751094.9 ;E 646422.4
INCLINATION: -90° AZIMUTH: ---
DRILLING DATE: March 8, 2017
DRILL RIG: Acker SoilMax
DRILLING CONTRACTOR: Lantech
DATUM: Geodetic

JN - Joint, FLT - Fault, SHR - Shear, VN - Vein, CJ - Conjugate; BD - Bedding, FO - Foliation, CO - Contact, OR - Orthogonal, CL - Cleavage; PL - Planar, CU - Curved, UN - Undulating, ST - Stepped, IR - Irregular; PO - Polished, K - Slickensided, SM - Smooth, Ro - Rough, MB - Mechanical Break; BR - Broken Rock, VRo - Very Rough. **NOTE:** For additional abbreviations refer to list of abbreviations & symbols.

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DEPTH SCALE METRES	DESCRIPTION	ELEV. / DEPTH (m)	RUN No.	DISCONTINUITY DATA – TYPE AND SURFACE DESCRIPTION
			4	UN,RO to SM
6	Fresh, light to medium grey, medium bedded, medium grained, mottled DOLOSTONE with green beds, green fracture coatings and brecciated intervals (Bertie Formation, Akron Member)	175.44 / 5.95		FR/JN,IR to UN,RO to SM; FR/JN,IR to UN,RO to SM
			5	FR/JN,IR or UN,RO to SM (×7)
				FR/JN,IR to UN/PL,RO to SM
7				FR/JN,IR to UN/PL,RO to SM (×7)
	Brecciated horizons end @ 7.6 m , light grey mottled appearance begins	173.81 / 7.58		
8	Fresh, grey to bluish-grey, medium grained, thin to medium bedded, fine to medium grained laminate textured DOLOSTONE with thin argillaceous laminae (Bertie Formation, Williamsville Member)		6	JN,IR,RO
				FR/JN,IR to ST,RO (×7)
9				
			7	FR/JN,IR to UN,SM to RO (×15)
10				
			8	

CONTINUED NEXT PAGE

RECORD OF DRILLHOLE: BH17-8D

PROJECT: 1771656
LOCATION: N 4751094.9 ;E 646422.4
INCLINATION: -90° AZIMUTH: ---
DRILLING DATE: March 8, 2017
DRILL RIG: Acker SoilMax
DRILLING CONTRACTOR: Lantech
DATUM: Geodetic

JN - Joint, FLT - Fault, SHR- Shear, VN - Vein, CJ - Conjugate, BD- Bedding, FO- Foliation, CO- Contact, OR- Orthogonal, CL - Cleavage, PL - Planar, CU- Curved, UN- Undulating, ST - Stepped, IR - Irregular, PO- Polished, K - Slickensided, SM- Smooth, Ro - Rough, MB- Mechanical Break, BR - Broken Rock, VRo - Very Rough. NOTE: For additional abbreviations refer to list of abbreviations & symbols.

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Depth (m)	Description	Elev. / Depth (m)	Run No.	Discontinuity (Type and Surface Description)	Notes
11	Fresh, grey to bluish-grey, medium grained, thin to medium bedded, fine to medium grained laminate textured DOLOSTONE with thin argillaceous laminae (Bertie Formation, Williamsville Member)			FR/JN,IR to UN,RO to SM; FR/JN,IR to UN,RO to SM; FR/JN,IR to UN,RO to SM; FR/JN,IR to UN,RO to SM; FR/JN,IR to UN,RO to SM	
	Fresh, medium to dark grey, fine to medium grained, ARGILLACEOUS DOLOSTONE and SHALY DOLOSTONE (Bertie Formation, Scajaquada Member)	169.80 / 11.59	8	FR/JN,IR to UN,RO to SM; FR/JN,IR to UN,RO to SM; FR/JN,IR to UN,RO to SM; BD,PL,SM; BD,PL,SM; BD,PL,SM; BD,PL,SM; Lost Core	
12				BD,PL,SM; BD,PL,SM; BD,PL,SM; BD,PL,SM; BD,PL,SM	
13			9	FR,IR,RO; FR,IR,RO; BD,PL,SM; BD,PL,SM; BD,PL,SM	
14				BD,PL,SM	
	Fresh, brownish-grey to brown, medium grained, pitted to vuggy DOLOSTONE (Bertie Formation, Falkirk Member)	166.96 / 14.43	10	BD,PL,SM; BD,PL,SM; BD,PL,SM; BD,PL,SM; FR,IR,RO	
15				FR,IR,RO	
			11	BD/FR,IR,RO to SM; BD/FR,IR,RO to SM	Sand

CONTINUED NEXT PAGE

DEPTH SCALE 1 : 25

GOLDER

LOGGED: TP
CHECKED: SM

PROJECT: 1771656

RECORD OF DRILLHOLE: BH17-8D

LOCATION: N 4751094.9 ;E 646422.4

INCLINATION: -90° AZIMUTH: ---

DRILLING DATE: March 8, 2017

DRILL RIG: Acker SoilMax

DRILLING CONTRACTOR: Lantech

DATUM: Geodetic

JN - Joint, FLT - Fault, SHR - Shear, VN - Vein, CJ - Conjugate; BD - Bedding, FO - Foliation, CO - Contact, OR - Orthogonal, CL - Cleavage; PL - Planar, CU - Curved, UN - Undulating, ST - Stepped, IR - Irregular; PO - Polished, K - Slickensided, SM - Smooth, Ro - Rough, MB - Mechanical Break; BR - Broken Rock, VRo - Very Rough. **NOTE:** For additional abbreviations refer to list of abbreviations & symbols.

Columns: DEPTH SCALE METRES | DRILLING RECORD | DESCRIPTION | SYMBOLIC LOG | ELEV. DEPTH (m) | RUN No. | PENETRATION RATE min/(m) | COLOUR % RETURN | FLUSH | RECOVERY (TOTAL CORE %, SOLID CORE %) | R.Q.D. % | FRACT. INDEX PER 0.3 m | Broken Core | DISCONTINUITY DATA (DIP w.r.t. CORE AXIS; TYPE AND SURFACE DESCRIPTION) | HYDRAULIC CONDUCTIVITY K, m/sec (10^{-9}, 10^{-8}, 10^{-7}, 10^{-6}) | ROCK STRENGTH INDEX (R4 R3 R2 R1) | WEATHERING INDEX (W1 W2 W3 W4) | NOTES WATER LEVELS INSTRUMENTATION

--- CONTINUED FROM PREVIOUS PAGE ---

Depth (m)	Description	Elev. / Depth (m)	Run No.	Discontinuity type and surface description	Notes
16	Fresh, brownish-grey to brown, medium grained, pitted to vuggy DOLOSTONE (Bertie Formation, Falkirk Member)		11	BD/FR,IR,RO	Sand
17			12	BD/FR,IR,RO BD/FR,IR,RO	
18					Screen and Sand
19			13	BD/FR,IR,RO BD/FR,IR,RO	
20	Fresh, dark bluish grey to black argillaceous DOLOSTONE and SHALE (Bertie Formation, Oatka Member)	161.57 / 19.82	14	BD,PL,SM BD,PL,SM BD,PL,SM BD,PL,SM BD,PL,SM BD,PL,SM	

CONTINUED NEXT PAGE

DEPTH SCALE 1 : 25

GOLDER

LOGGED: TP

CHECKED: SM

RECORD OF DRILLHOLE: BH17-8D

LOCATION: N 4751094.9 ;E 646422.4

INCLINATION: -90° AZIMUTH: ---

DRILLING DATE: March 8, 2017

DRILL RIG: Acker SoilMax

DRILLING CONTRACTOR: Lantech

DATUM: Geodetic

JN - Joint, FLT - Fault, SHR- Shear, VN - Vein, CJ - Conjugate
BD- Bedding, FO- Foliation, CO- Contact, OR- Orthogonal, CL - Cleavage
PL - Planar, CU- Curved, UN- Undulating, ST - Stepped, IR - Irregular
PO- Polished, K - Slickensided, SM- Smooth, Ro - Rough, MB- Mechanical Break
BR - Broken Rock, VRo - Very Rough
NOTE: For additional abbreviations refer to list of abbreviations & symbols.

DEPTH SCALE METRES	DRILLING RECORD	DESCRIPTION	SYMBOLIC LOG	ELEV. DEPTH (m)	RUN No.	PENETRATION RATE min/(m)	FLUSH COLOUR % RETURN	RECOVERY TOTAL CORE %	RECOVERY SOLID CORE %	R.Q.D. %	FRACT. INDEX PER 0.3 m	Broken Core	DISCONTINUITY DATA DIP w.r.t. CORE AXIS	DISCONTINUITY DATA TYPE AND SURFACE DESCRIPTION	HYDRAULIC CONDUCTIVITY K, m/sec	ROCK STRENGTH INDEX	WEATHERING INDEX	NOTES WATER LEVELS INSTRUMENTATION
		--- CONTINUED FROM PREVIOUS PAGE ---																
21		Fresh, dark bluish grey to black argillaceous DOLOSTONE and SHALE (Bertie Formation, Oatka Member)			14									BD,PL,SM BD,PL,SM				
		END OF DRILLHOLE		160.10 21.29														
22																		
23																		
24																		
25																		

DEPTH SCALE

1 : 25

GOLDER

LOGGED: TP

CHECKED: SM

PROJECT: 1771656

RECORD OF DRILLHOLE: BH17-8S

LOCATION: N 4751097.2 ;E 646422.6

INCLINATION: -90° AZIMUTH: ---

DRILLING DATE: March 17, 2017

DRILL RIG: Acker SoilMax

DRILLING CONTRACTOR: Lantech

DATUM: Geodetic

JN - Joint; FLT - Fault; SHR - Shear; VN - Vein; CJ - Conjugate; BD - Bedding; FO - Foliation; CO - Contact; OR - Orthogonal; CL - Cleavage; PL - Planar; CU - Curved; UN - Undulating; ST - Stepped; IR - Irregular; PO - Polished; K - Slickensided; SM - Smooth; Ro - Rough; MB - Mechanical Break; BR - Broken Rock; VRo - Very Rough

NOTE: For additional abbreviations refer to list of abbreviations & symbols.

DEPTH SCALE METRES	DESCRIPTION	ELEV. / DEPTH (m)	RUN No.	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	NOTES / WATER LEVELS / INSTRUMENTATION
	Continued from Record of Borehole BH17-8S	180.80			
	Fresh to highly weathered, medium grey, medium bedded, medium grained LIMESTONE with siltstone and sandstone horizons and greenish grey siltstone and cherty limestone beds (Bois Blanc Formation)	0.66		FR/JN,IR,RO	
1			1	FR/JN,IR,RO FR/JN,IR,RO FR/JN,IR,RO FR/JN,IR,RO	
	Some DOLOSTONE interbed ; between 1.4 m to 2.9 m.			BD/JN,IR,RO BD/JN,IR,RO BD/JN,IR,RO	Bentonite Seal
2			2	BD/JN,IR,RO BD/JN,IR,RO BD/JN,IR,RO BD/JN,IR,RO BD/JN,IR,RO BD/JN,IR,RO BD/JN,IR,RO	
3			3	BD/JN,PL to IR,RO to SM BD/JN,PL to IR,RO to SM BD/JN,PL to IR,RO to SM BD/JN,PL to IR,RO to SM BD/JN,PL to IR,RO to SM BD/JN,PL to IR,RO to SM BD/JN,PL to IR,RO to SM	Sand
4				BD/JN,PL to IR,RO to SM BD/JN,PL to IR,RO to SM BD/JN,PL to IR,RO to SM BD/JN,PL to IR,RO to SM BD/IR,PL to IR,RO to SM BD/IR,PL to IR,RO to SM BD/IR,PL to IR,RO to SM	
5	Fresh, light to medium grey, medium bedded, medium grained, mottled DOLOSTONE with green beds, green fracture coatings and brecciated intervals (Bertie Formation, Akron Member)	176.59 4.87	4	BD/IR,PL to IR,RO to SM BD/IR,PL to IR,RO to SM BD/IR,PL to IR,RO to SM BD/IR,PL to IR,RO to SM BD/IR,PL to IR,RO to SM	Screen and Sand

Broken Core (at ~0.66 m); Lost Core (at ~3.9 m)

CONTINUED NEXT PAGE

DEPTH SCALE 1 : 25

GOLDER

LOGGED: TP

CHECKED: SM

RECORD OF DRILLHOLE: BH17-8S

PROJECT: 1771656

SHEET 2 OF 2

LOCATION: N 4751097.2 ;E 646422.6

DRILLING DATE: March 17, 2017

DATUM: Geodetic

INCLINATION: -90° AZIMUTH: ---

DRILL RIG: Acker SoilMax

DRILLING CONTRACTOR: Lantech

JN - Joint, FLT - Fault, SHR- Shear, VN - Vein, CJ - Conjugate, BD- Bedding, FO- Foliation, CO- Contact, OR- Orthogonal, CL - Cleavage, PL - Planar, CU- Curved, UN- Undulating, ST - Stepped, IR - Irregular, PO- Polished, K - Slickensided, SM- Smooth, Ro - Rough, MB- Mechanical Break, BR - Broken Rock, VRo - Very Rough

NOTE: For additional abbreviations refer to list of abbreviations & symbols.

DEPTH SCALE METRES	DESCRIPTION	ELEV. / DEPTH (m)	RUN No.	DISCONTINUITY DATA - TYPE AND SURFACE DESCRIPTION	NOTES WATER LEVELS INSTRUMENTATION
	--- CONTINUED FROM PREVIOUS PAGE ---				
6	Fresh, light to medium grey, medium bedded, medium grained, mottled DOLOSTONE with green beds, green fracture coatings and brecciated intervals (Bertie Formation, Akron Member)		4	BD/IR,PL to IR,RO to SM BD/IR,PL to IR,RO to SM JN,PL,SM FR,PL,SM FR,PL,SM JN/FR,IR to W,RO to SM JN/FR,IR to W,RO to SM	
7			5	JN/FR,IR to W,RO to SM JN/FR,IR to W,RO to SM JN/FR,IR to W,RO to SM JN/FR,IR to W,RO to SM JN/FR,IR to W,RO to SM JN/FR,IR to W,RO to SM	Screen and Sand
		173.94 7.52		JN/FR,IR to W,RO to SM JN/FR,IR to W,RO to SM JN/FR,IR to W,RO to SM	
8	END OF DRILLHOLE				
9					
10					

GTA-RCK 025 S:\CLIENTS\RANKIN_CONSTRUCTION\PORT_COLBORNE_QUARRY\02_DATA\GINT\1771656.GPJ GAL-MISS.GDT 7/27/20

DEPTH SCALE

1 : 25

GOLDER

LOGGED: TP

CHECKED: SM

RECORD OF DRILLHOLE: BH17-9D

PROJECT: 1771656

LOCATION: N 4750972.1 ;E 646834.1

DRILLING DATE: February 14, 2017

DATUM: Geodetic

DRILL RIG: Acker SoilMax

INCLINATION: -90° AZIMUTH: ---

DRILLING CONTRACTOR: Lantech

JN - Joint, FLT - Fault, SHR- Shear, VN - Vein, CJ - Conjugate
BD- Bedding, FO- Foliation, CO- Contact, OR- Orthogonal, CL - Cleavage
PL - Planar, CU- Curved, UN- Undulating, ST - Stepped, IR - Irregular
PO- Polished, K - Slickensided, SM- Smooth, Ro - Rough, MB- Mechanical Break
BR - Broken Rock, VRo - Very Rough
NOTE: For additional abbreviations refer to list of abbreviations & symbols.

DEPTH SCALE METRES	DESCRIPTION	ELEV. / DEPTH (m)	RUN No.	DISCONTINUITY DATA – TYPE AND SURFACE DESCRIPTION
	Continued from Record of Borehole BH17-9D	178.62		
	Fresh to highly weathered, medium grey, medium bedded, medium grained LIMESTONE with siltstone and sandstone horizons and greenish grey siltstone and cherty limestone beds (Bois Blanc Formation)	2.13	1	Lost Core; BD,PL to CU,SM to RO; BD,PL to CU,SM to RO; BD,PL to CU,SM to RO; FR,PL to CU,SM to RO; BD,PL to CU,SM to RO; BD,PL to CU,SM to RO; BD,PL to CU,SM to RO; BD,PL to CU,SM to RO
3		177.68		
	Fresh, light to medium grey, medium bedded, medium grained, mottled DOLOSTONE with green beds, green fracture coatings and brecciated intervals (Bertie Formation, Akron Member)	3.07	2	FR,UN,SM; BD,UN,SM; FR,UN,SM; BD,UN,SM; BD,UN,SM
4				BD,UN,SM; BD,UN,SM; BD,UN,SM
5	Weathered to fresh, thinly bedded to laminated , dark grey to black , soft , SHALE interval from 4.9 m to 5.3 m		3	CON,PL,SM; BD,PL,SM; CON,PL,SM
6				
	Breciated horizons end @ 6.4 m , light grey mottled appearance begins		4	FR,UN,SM to RO; FR,UN,SM to RO
7				FR,UN,SM to RO

CONTINUED NEXT PAGE

Column headings also printed: DRILLING RECORD; SYMBOLIC LOG; PENETRATION RATE min/(m); FLUSH; COLOUR % RETURN; RECOVERY (TOTAL CORE %, SOLID CORE %) 80 60 40 20; R.Q.D. % 80 60 40 20; FRACT. INDEX PER 0.3 m 5 10 15 20; Broken Core; DIP w.r.t. CORE AXIS 0 30 60 90; HYDRAULIC CONDUCTIVITY K, m/sec 10^{-9} 10^{-8} 10^{-7} 10^{-6}; ROCK STRENGTH INDEX R4 R3 R2 R1; WEATHERING INDEX W1 W2 W3 W4; NOTES WATER LEVELS INSTRUMENTATION

DEPTH SCALE 1 : 25

GOLDER

LOGGED: TP

CHECKED: SM

LOCATION: N 4750972.1 ;E 646834.1
DRILLING DATE: February 14, 2017
DATUM: Geodetic
DRILL RIG: Acker SoilMax
INCLINATION: -90° AZIMUTH: ---
DRILLING CONTRACTOR: Lantech

JN - Joint, FLT - Fault, SHR - Shear, VN - Vein, CJ - Conjugate, BD - Bedding, FO - Foliation, CO - Contact, OR - Orthogonal, CL - Cleavage, PL - Planar, CU - Curved, UN - Undulating, ST - Stepped, IR - Irregular, PO - Polished, K - Slickensided, SM - Smooth, Ro - Rough, MB - Mechanical Break, BR - Broken Rock, VRo - Very Rough. **NOTE:** For additional abbreviations refer to list of abbreviations & symbols.

Columns: DEPTH SCALE METRES | DRILLING RECORD | DESCRIPTION | SYMBOLIC LOG | ELEV. DEPTH (m) | RUN No. | PENETRATION RATE min/(m) | COLOUR % RETURN | FLUSH | RECOVERY (TOTAL CORE %, SOLID CORE %) | R.Q.D. % | FRACT. INDEX PER 0.3 m | Broken Core | DISCONTINUITY DATA (DIP w.r.t. CORE AXIS; TYPE AND SURFACE DESCRIPTION) | HYDRAULIC CONDUCTIVITY K, m/sec (10^{-9} 10^{-8} 10^{-7} 10^{-6}) | ROCK STRENGTH INDEX (R4 R3 R2 R1) | WEATHERING INDEX (W1 W2 W3 W4) | NOTES WATER LEVELS INSTRUMENTATION

--- CONTINUED FROM PREVIOUS PAGE ---

Depth (m)	Description	Elev. / Depth (m)	Run No.	Discontinuity type and surface description
	Fresh, light to medium grey, medium bedded, medium grained, mottled DOLOSTONE with green beds, green fracture coatings and brecciated intervals (Bertie Formation, Akron Member)		4	FR,UN,SM to RO
	Fresh, grey to bluish-grey, medium grained, thin to medium bedded, fine to medium grained laminate textured DOLOSTONE with thin argillaceous laminae (Bertie Formation, Williamsville Member)	173.16 / 7.59	5	FR,UN,SM to RO; FR,UN,SM to RO; FR,UN,SM to RO; FR,UN,SM to RO; FR,UN to ST,SM to RO; FR,UN to ST,SM to RO; BD,PL,SM; FR,ST,RO
8, 9			6	FR,UN,SM; FR,UN,SM; FR,UN to ST,SM to RO; BD,UN to PL,BD to SM; BD,UN to PL,BD to SM; BD,UN to PL,BD to SM; BD,UN to PL,BD to SM; BD,PL,SM; BD,PL,SM
10	Fresh, medium to dark grey, fine to medium grained, ARGILLACEOUS DOLOSTONE and SHALY DOLOSTONE (Bertie Formation, Scajaquada Member)	170.70 / 10.05	7	BD,PL,SM; BD,PL,SM; BD,PL,SM; BD,PL,SM
11, 12			8	

CONTINUED NEXT PAGE

LOCATION: N 4750972.1 ;E 646834.1
INCLINATION: -90° AZIMUTH: ---
DRILLING DATE: February 14, 2017
DRILL RIG: Acker SoilMax
DRILLING CONTRACTOR: Lantech
DATUM: Geodetic

JN - Joint, FLT - Fault, SHR- Shear, VN - Vein, CJ - Conjugate, BD- Bedding, FO- Foliation, CO- Contact, OR- Orthogonal, CL - Cleavage, PL - Planar, CU- Curved, UN- Undulating, ST - Stepped, IR - Irregular, PO- Polished, K - Slickensided, SM- Smooth, Ro - Rough, MB- Mechanical Break, BR - Broken Rock, VRo - Very Rough

NOTE: For additional abbreviations refer to list of abbreviations & symbols.

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DEPTH SCALE METRES	DESCRIPTION	ELEV. / DEPTH (m)	RUN No.	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	NOTES / WATER LEVELS / INSTRUMENTATION
	Fresh, medium to dark grey, fine to medium grained, ARGILLACEOUS DOLOSTONE and SHALY DOLOSTONE (Bertie Formation, Scajaquada Member)				
	Fresh, brownish-grey to brown, medium grained, pitted to vuggy DOLOSTONE (Bertie Formation, Falkirk Member)	168.20 / 12.55			
			8	BD,PL,SM; BD,PL,SM; BD,PL,SM; BD,PL,SM; BD,PL,SM	
13					
				BD,PL,SM; BD,PL,SM; BD,PL,SM	
14					Sand
			9		
15				FR,PL,RO; FR,IR,RO	
				BD,PL,SM	
				BD,PL,SM; BD,IR,RO	
			10		
16					Screen and Sand
17					

CONTINUED NEXT PAGE

RECORD OF DRILLHOLE: BH17-9D

PROJECT: 1771656

LOCATION: N 4750972.1 ;E 646834.1

INCLINATION: -90° AZIMUTH: ---

DRILLING DATE: February 14, 2017

DRILL RIG: Acker SoilMax

DRILLING CONTRACTOR: Lantech

DATUM: Geodetic

JN - Joint, FLT - Fault, SHR - Shear, VN - Vein, CJ - Conjugate; BD - Bedding, FO - Foliation, CO - Contact, OR - Orthogonal, CL - Cleavage; PL - Planar, CU - Curved, UN - Undulating, ST - Stepped, IR - Irregular; PO - Polished, K - Slickensided, SM - Smooth, Ro - Rough, MB - Mechanical Break; BR - Broken Rock, VRo - Very Rough. **NOTE:** For additional abbreviations refer to list of abbreviations & symbols.

DEPTH SCALE METRES	DRILLING RECORD	DESCRIPTION	SYMBOLIC LOG	ELEV. DEPTH (m)	RUN No.	PENETRATION RATE min/(m)	FLUSH COLOUR % RETURN	RECOVERY TOTAL CORE % / SOLID CORE %	R.Q.D. %	FRACT. INDEX PER 0.3 m	Broken Core	DISCONTINUITY DATA DIP w.r.t. CORE AXIS / TYPE AND SURFACE DESCRIPTION	HYDRAULIC CONDUCTIVITY K, m/sec	ROCK STRENGTH INDEX	WEATHERING INDEX	NOTES WATER LEVELS INSTRUMENTATION
		--- CONTINUED FROM PREVIOUS PAGE ---														
		Fresh, brownish-grey to brown, medium grained, pitted to vuggy DOLOSTONE (Bertie Formation, Falkirk Member)		163.42 17.33												Screen and Sand
18		Fresh, dark bluish grey to black argillaceous DOLOSTONE and SHALE (Bertie Formation, Oatka Member)		162.46 18.29												Sand
		END OF DRILLHOLE														
19																
20																
21																
22																

DEPTH SCALE

1 : 25

GOLDER

LOGGED: TP

CHECKED: SM

PROJECT: 1771656

RECORD OF DRILLHOLE: BH17-9S

SHEET 1 OF 1

LOCATION: N 4750974.3 ;E 646834.0

INCLINATION: -90° AZIMUTH: ---

DRILLING DATE: February 21, 2017

DRILL RIG: Acker SoilMax

DRILLING CONTRACTOR: Lantech

DATUM: Geodetic

JN - Joint, FLT - Fault, SHR- Shear, VN - Vein, CJ - Conjugate; BD- Bedding, FO- Foliation, CO- Contact, OR- Orthogonal, CL - Cleavage; PL - Planar, CU- Curved, UN- Undulating, ST - Stepped, IR - Irregular; PO- Polished, K - Slickensided, SM- Smooth, Ro - Rough, MB- Mechanical Break; BR - Broken Rock, VRo - Very Rough. NOTE: For additional abbreviations refer to list of abbreviations & symbols.

DEPTH SCALE METRES	DESCRIPTION	ELEV. DEPTH (m)	RUN No.	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	NOTES WATER LEVELS INSTRUMENTATION
	Continued from Record of Borehole BH17-9S	178.63			
	Fresh to highly weathered, medium grey, medium bedded, medium grained LIMESTONE with siltstone and sandstone horizons and greenish grey siltstone and cherty limestone beds (Bois Blanc Formation)	2.08	1	FR,IR to UN,RO FR,IR to UN,RO FR,IR to UN,RO FR,IR to UN,RO FR,IR to UN,RO FR,IR to UN,RO FR,IR to UN,RO FR,IR to UN,RO FR,IR to UN,RO FR,IR to UN,RO FR,IR,RO	Bentonite Seal Sand
3	Fresh, light to medium grey, medium bedded, medium grained, mottled DOLOSTONE with green beds, green fracture coatings and brecciated intervals (Bertie Formation, Akron Member)	177.71 3.00	2	FR,IR,RO FR,IR,RO FR,IR,RO FR,IR,RO	
4				FR,IR,RO FR,IR,RO FR,IR,RO FR,IR,RO	Screen and Sand
5	Weathered to fresh, thinly bedded to laminated , dark grey to black , soft , SHALE interval from 5.1 m to 5.3 m		3	FR,IR,RO Lost Core FR,IR,RO FR,IR,RO BD,PL,SM BD,PL,SM BD,PL,SM BD,PL,SM FR,IR,RO FR,IR,RO FR,IR,RO	
6	END OF DRILLHOLE	174.69 6.02			
7					

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DEPTH SCALE 1 : 25

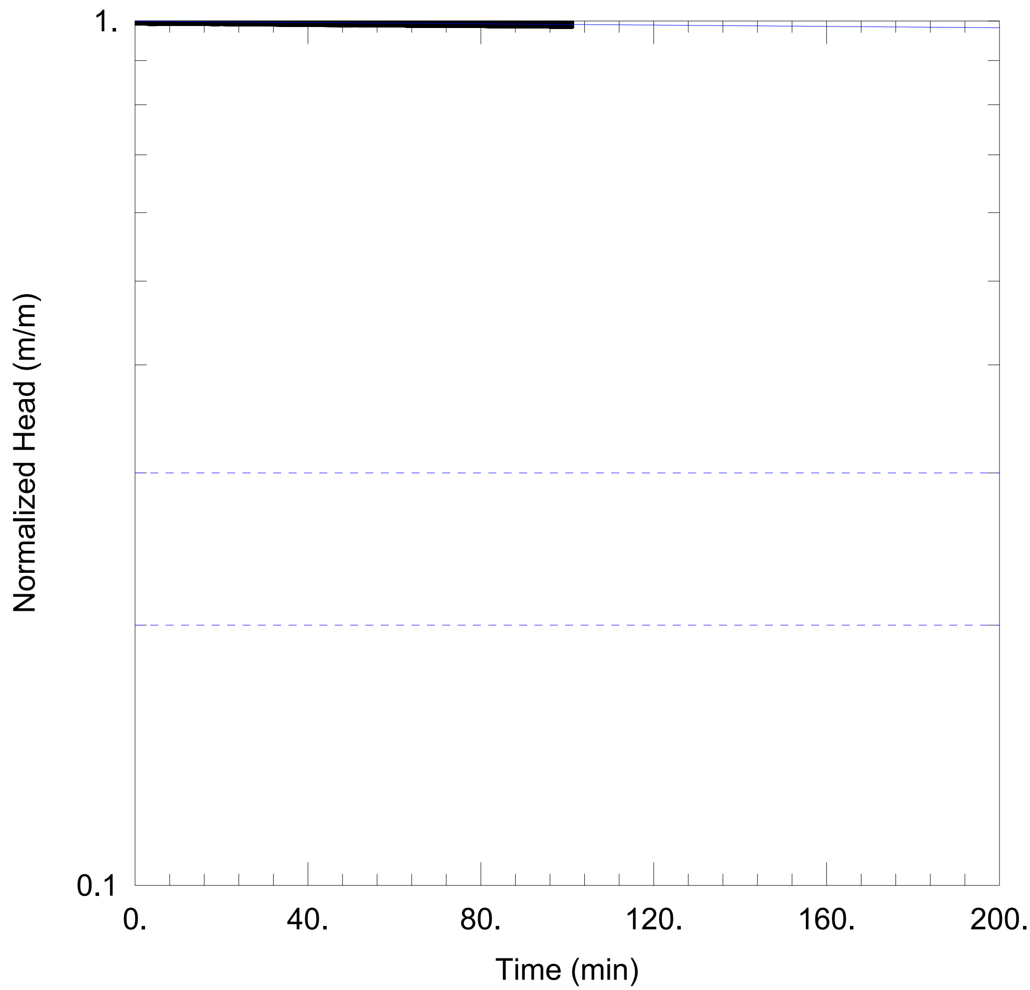
GOLDER

LOGGED: TP

CHECKED: SM

APPENDIX B

Hydraulic Conductivity Testing Results



PACKER TESTING MW17-1D (17.68 - 21.42 MBGS)

Data Set: Z:\...\MW17-1D Test 1_jlh.aqt
Date: 02/15/18 Time: 10:33:05

PROJECT INFORMATION

Company: Golder Associates
Client: Rankin
Project: 1771656
Location: Port Colborne
Test Well: MW17-1D Test 1
Test Date: March 28, 2017

AQUIFER DATA

Saturated Thickness: 16.76 m Anisotropy Ratio (Kz/Kr): 1.

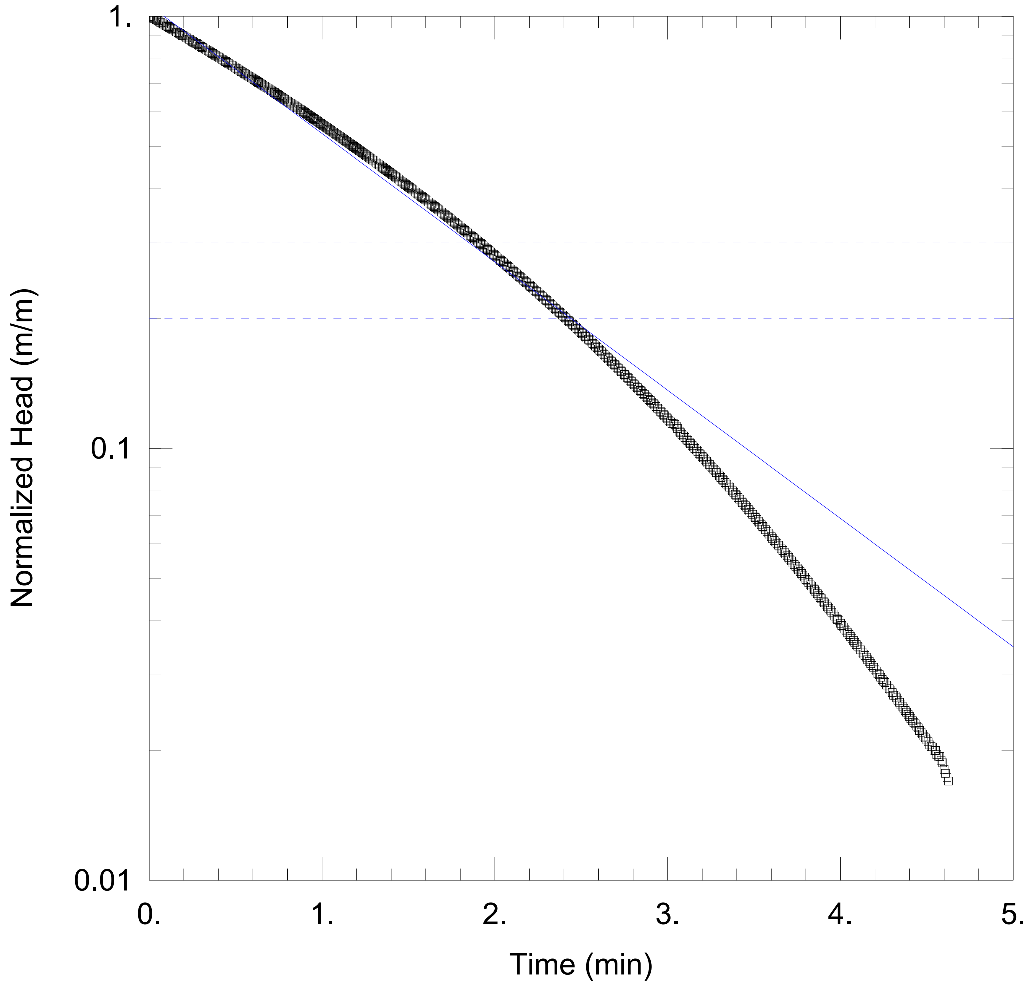
WELL DATA (MW17-1D Test 1)

Initial Displacement: 6.509 m Static Water Column Height: 16.76 m
Total Well Penetration Depth: 3.74 m Screen Length: 3.74 m
Casing Radius: 0.0389 m Well Radius: 0.048 m

SOLUTION

Aquifer Model: Confined Solution Method: Bouwer-Rice

K = 8.516E-10 m/sec y0 = 6.505 m



PACKER TESTING MW17-1D (15.09 - 18.29 MBGS)

Data Set: Z:\...\MW17-1D Test 2_jlh.aqt
Date: 02/15/18 Time: 10:39:14

PROJECT INFORMATION

Company: Golder Associates
Client: Rankin
Project: 1771656
Location: Port Colborne
Test Well: MW17-1D Test 2
Test Date: March 28, 2017

AQUIFER DATA

Saturated Thickness: 13.22 m Anisotropy Ratio (Kz/Kr): 1.

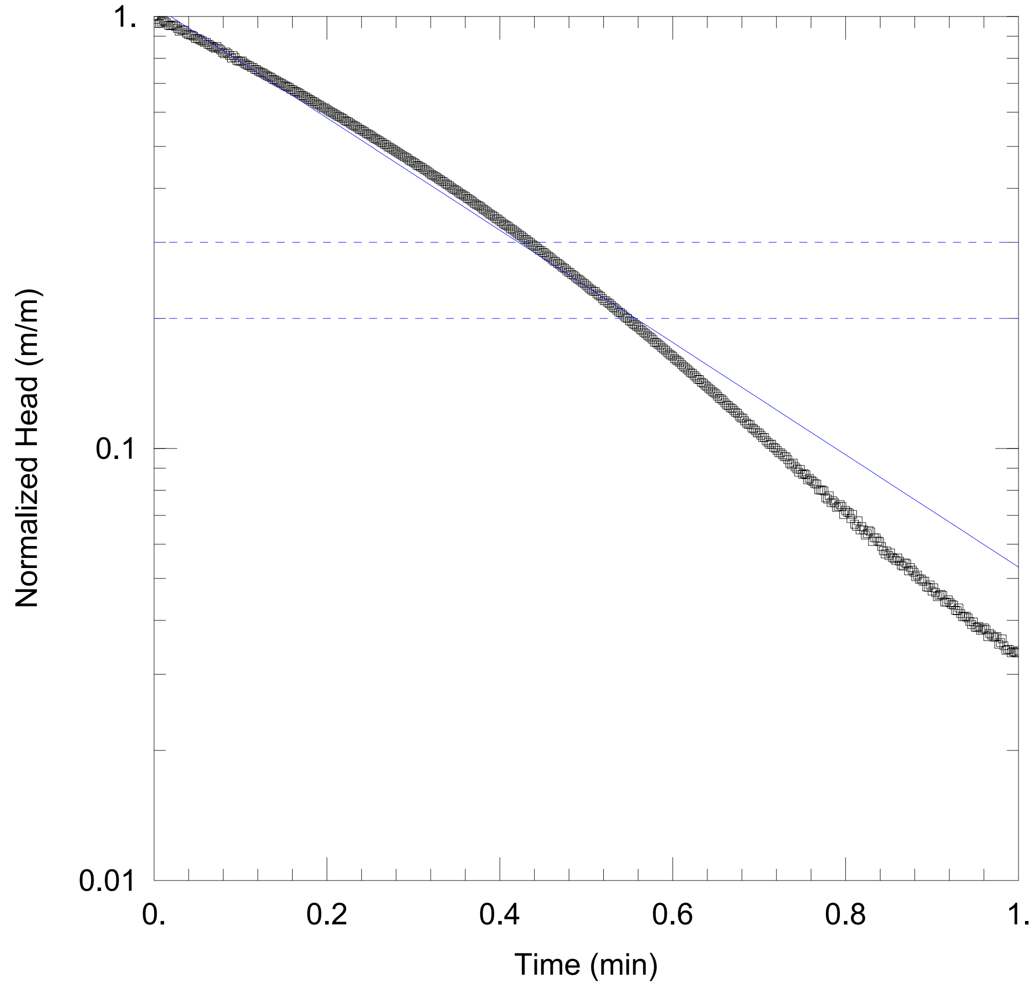
WELL DATA (MW17-1D Test 2)

Initial Displacement: 6.483 m Static Water Column Height: 13.22 m
Total Well Penetration Depth: 3.2 m Screen Length: 3.2 m
Casing Radius: 0.0389 m Well Radius: 0.048 m

SOLUTION

Aquifer Model: Confined Solution Method: Bouwer-Rice

K = 7.462E-6 m/sec y0 = 6.87 m



PACKER TESTING MW17-1D (12.50 - 15.70 MBGS)

Data Set: Z:\...\MW17-1D Test 3_jlh.aqt
Date: 02/15/18 Time: 10:40:06

PROJECT INFORMATION

Company: Golder Associates
Client: Rankin
Project: 1771656
Location: Port Colborne
Test Well: MW17-1D Test 3
Test Date: March 28, 2017

AQUIFER DATA

Saturated Thickness: 10.66 m Anisotropy Ratio (Kz/Kr): 1.

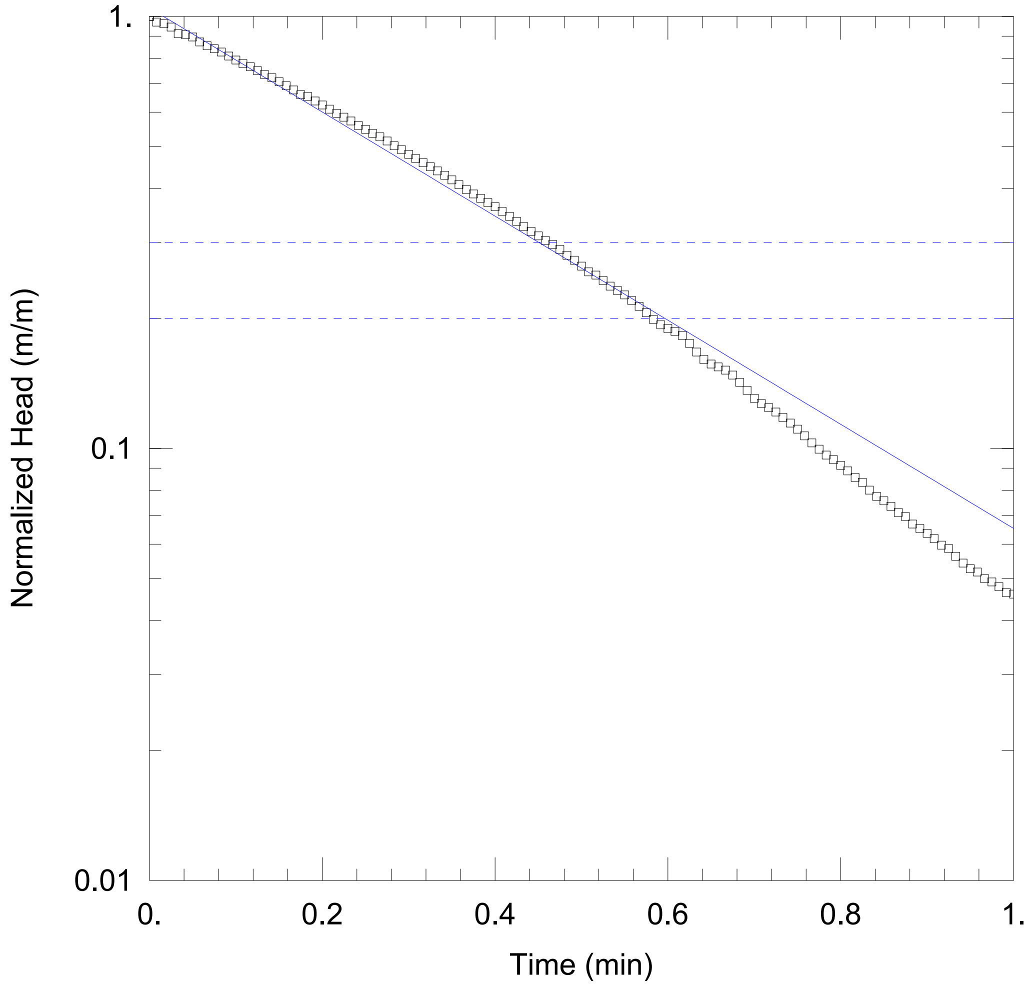
WELL DATA (MW17-1D Test 3)

Initial Displacement: 5.216 m Static Water Column Height: 10.66 m
Total Well Penetration Depth: 3.2 m Screen Length: 3.2 m
Casing Radius: 0.0389 m Well Radius: 0.048 m

SOLUTION

Aquifer Model: Confined Solution Method: Bouwer-Rice

K = 3.289E-5 m/sec y0 = 5.524 m



PACKER TESTING MW17-1D (10.98 - 14-18 MBGS)

Data Set: Z:\...\MW17-1D Test 4_jlh.aqt
Date: 02/15/18
Time: 10:40:34

PROJECT INFORMATION

Company: Golder Associates
Client: Rankin
Project: 1771656
Location: Port Colborne
Test Well: MW17-1D Test 4
Test Date: March 28, 2017

AQUIFER DATA

Saturated Thickness: 9.13 m
Anisotropy Ratio (Kz/Kr): 1.

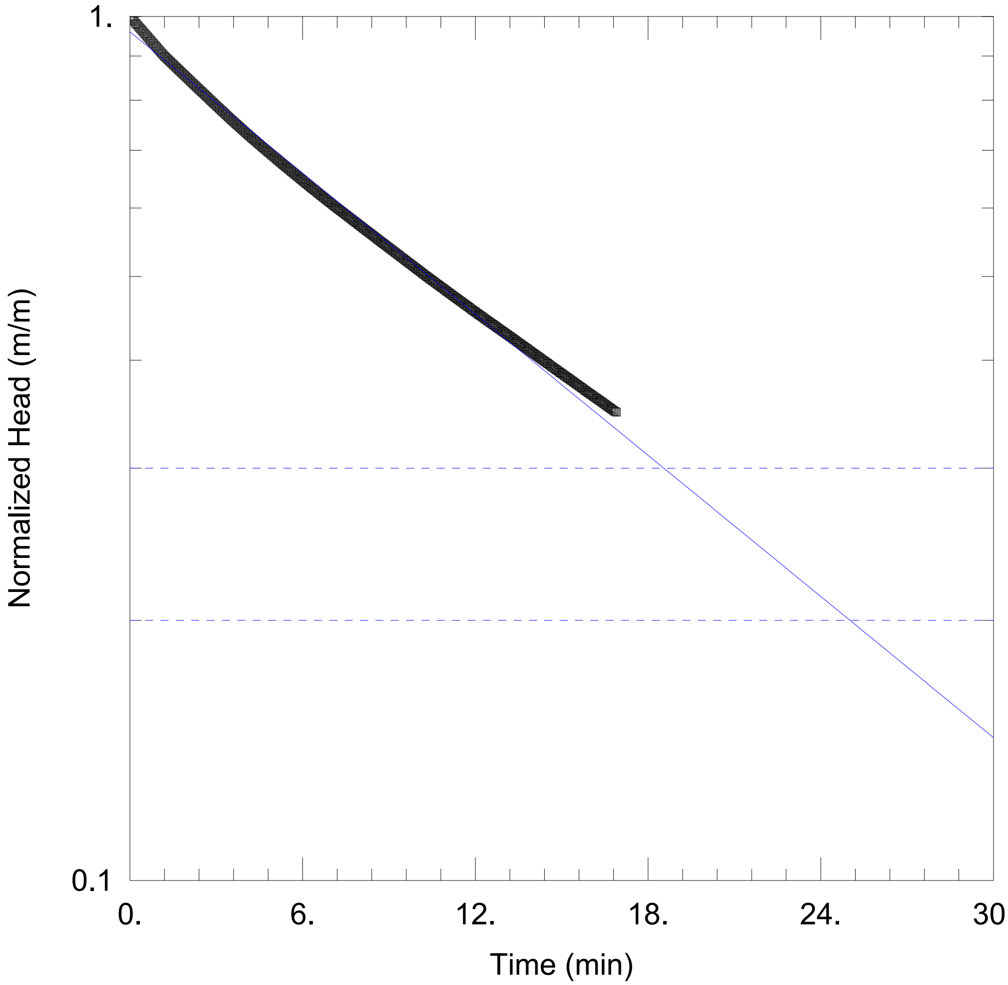
WELL DATA (MW17-1D Test 4)

Initial Displacement: 5.006 m
Static Water Column Height: 9.13 m
Total Well Penetration Depth: 3.2 m
Screen Length: 3.2 m
Casing Radius: 0.0389 m
Well Radius: 0.048 m

SOLUTION

Aquifer Model: Confined
Solution Method: Bouwer-Rice

K = 3.065E-5 m/sec
y0 = 5.236 m



PACKER TESTING MW17-2D (11.59 - 15.27 MBGS)

Data Set: Z:\...\MW17-2D Test 1_jlh.aqt
Date: 02/15/18 Time: 10:54:32

PROJECT INFORMATION

Company: Golder Associates
Client: Rankin
Project: 1771656
Location: Port Colborne
Test Well: MW17-2D Test 1
Test Date: March 30, 2017

AQUIFER DATA

Saturated Thickness: 9.24 m Anisotropy Ratio (Kz/Kr): 1.

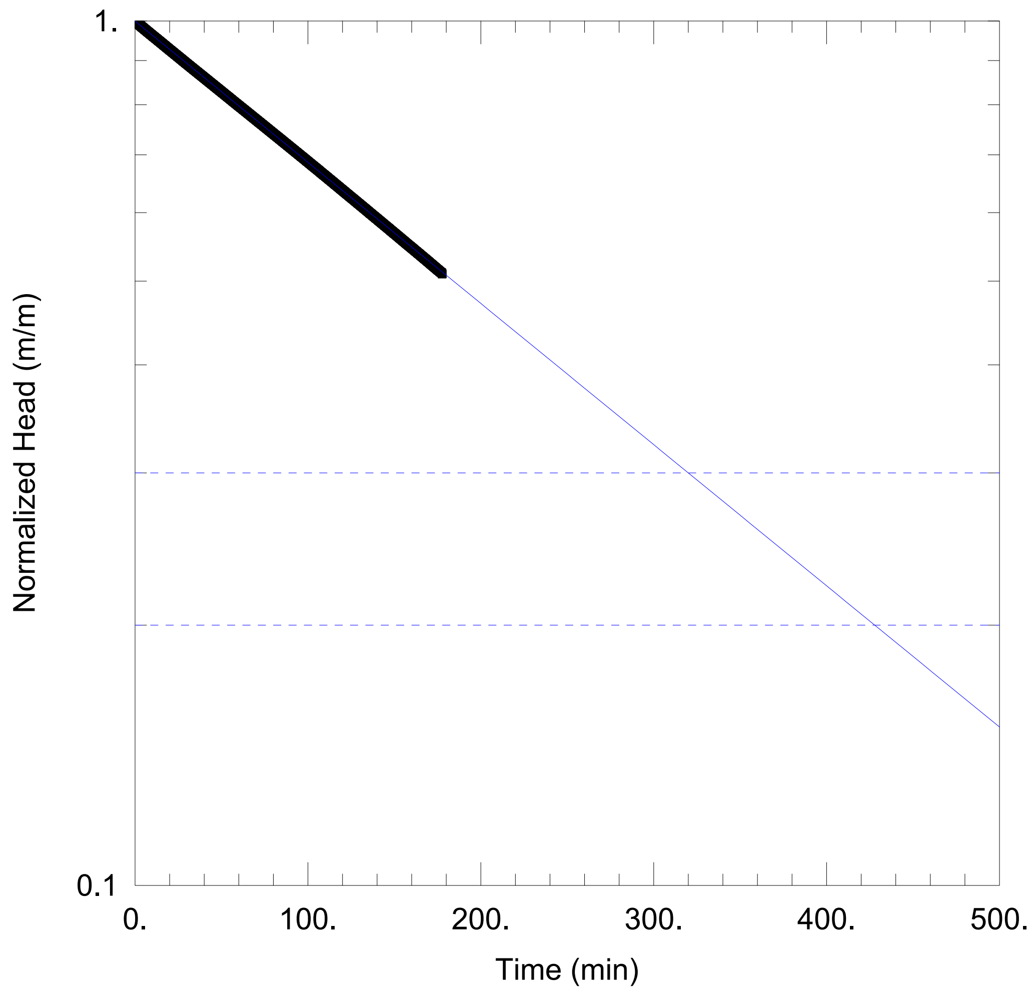
WELL DATA (MW17-2D Test 1)

Initial Displacement: 7.071 m Static Water Column Height: 9.24 m
Total Well Penetration Depth: 8.19 m Screen Length: 3.68 m
Casing Radius: 0.0389 m Well Radius: 0.048 m

SOLUTION

Aquifer Model: Confined Solution Method: Bouwer-Rice

K = 7.438E-7 m/sec y0 = 6.787 m



PACKER TESTING MW17-2D (9.45 - 12.65 MBGS)

Data Set: Z:\...\MW17-2D Test 2_jlh.aqt
Date: 02/15/18 Time: 10:55:02

PROJECT INFORMATION

Company: Golder Associates
Client: Rankin
Project: 1771656
Location: Port Colborne
Test Well: MW17-2D Test 2
Test Date: March 30, 2017

AQUIFER DATA

Saturated Thickness: 6.31 m Anisotropy Ratio (Kz/Kr): 1.

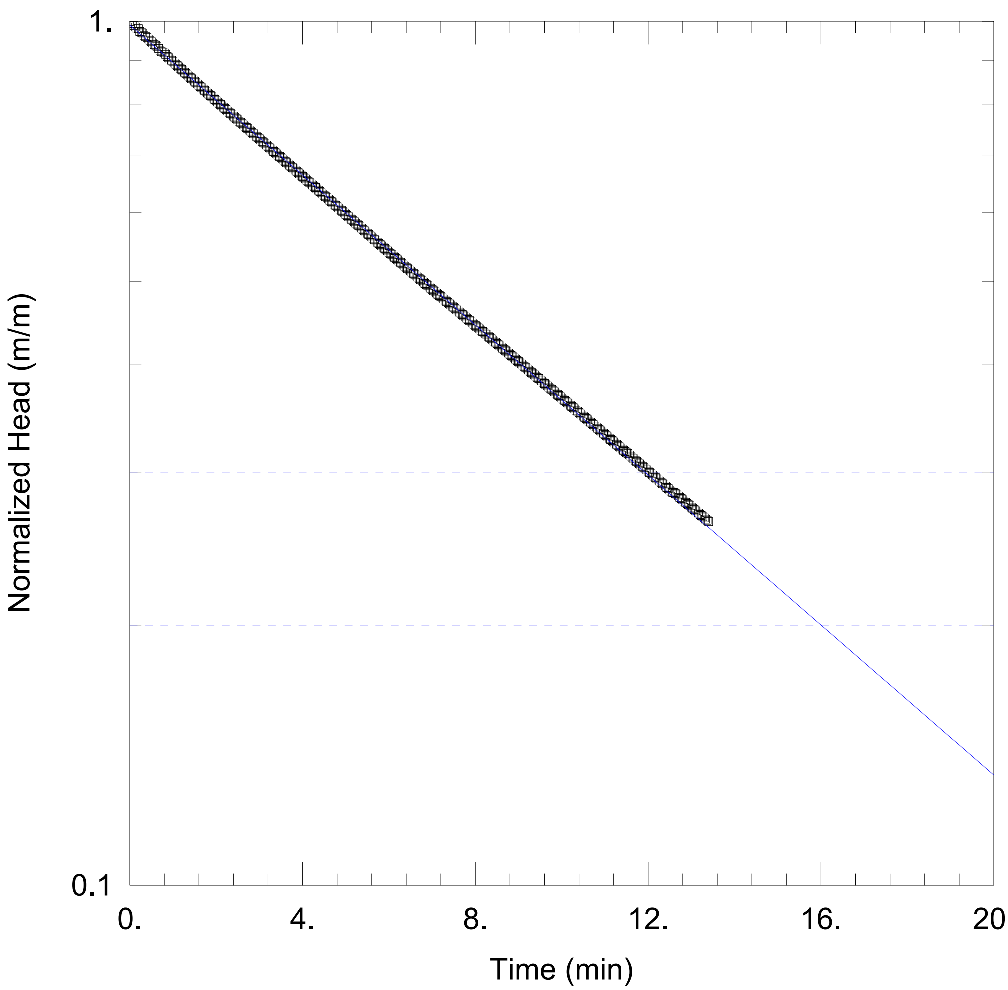
WELL DATA (MW17-2D Test 2)

Initial Displacement: 7.44 m
Total Well Penetration Depth: 3.2 m
Casing Radius: 0.0389 m
Static Water Column Height: 6.31 m
Screen Length: 3.2 m
Well Radius: 0.048 m

SOLUTION

Aquifer Model: Confined Solution Method: Bouwer-Rice

K = 4.221E-8 m/sec y0 = 7.437 m



PACKER TESTING MW17-3D (10.67 - 13.72 MBGS)

Data Set: Z:\...\MW17-3D Test 1_jlh.aqt
Date: 02/15/18 Time: 10:55:38

PROJECT INFORMATION

Company: Golder Associates
Client: Rankin
Project: 1771656
Location: Port Colborne
Test Well: MW17-3D Test 1
Test Date: March 27, 2017

AQUIFER DATA

Saturated Thickness: 9.24 m Anisotropy Ratio (Kz/Kr): 1.

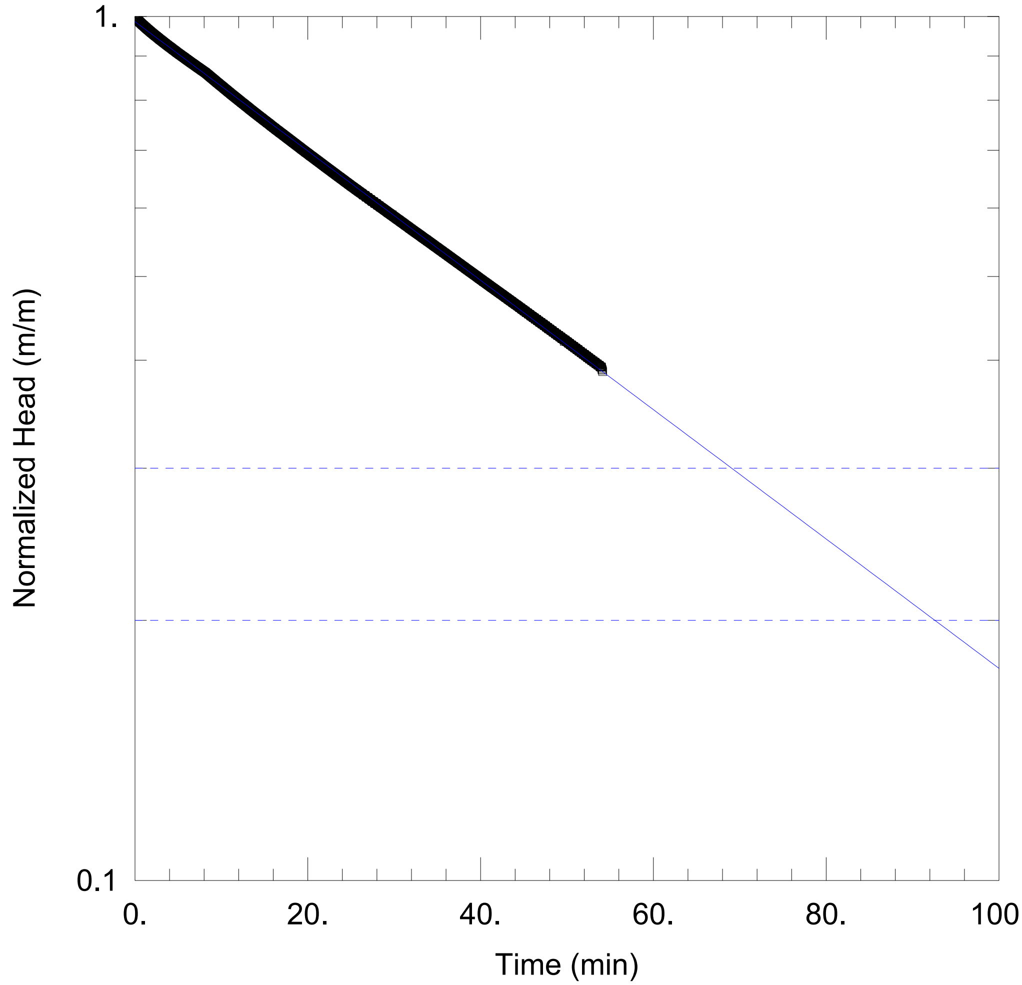
WELL DATA (MW17-3D Test 1)

Initial Displacement: 5.672 m Static Water Column Height: 9.24 m
Total Well Penetration Depth: 3.05 m Screen Length: 3.05 m
Casing Radius: 0.0389 m Well Radius: 0.048 m

SOLUTION

Aquifer Model: Confined Solution Method: Bouwer-Rice

K = 1.141E-6 m/sec y0 = 5.614 m



PACKER TESTING MW17-3D (7.77 - 10.98 MBGS)

Data Set: Z:\...\MW17-3D Test 2_jlh.aqt
Date: 02/15/18 Time: 10:56:04

PROJECT INFORMATION

Company: Golder Associates
Client: Rankin
Project: 1771656
Location: Port Colborne
Test Well: MW17-3D Test 2
Test Date: March 27, 2017

AQUIFER DATA

Saturated Thickness: 6.6 m Anisotropy Ratio (Kz/Kr): 1.

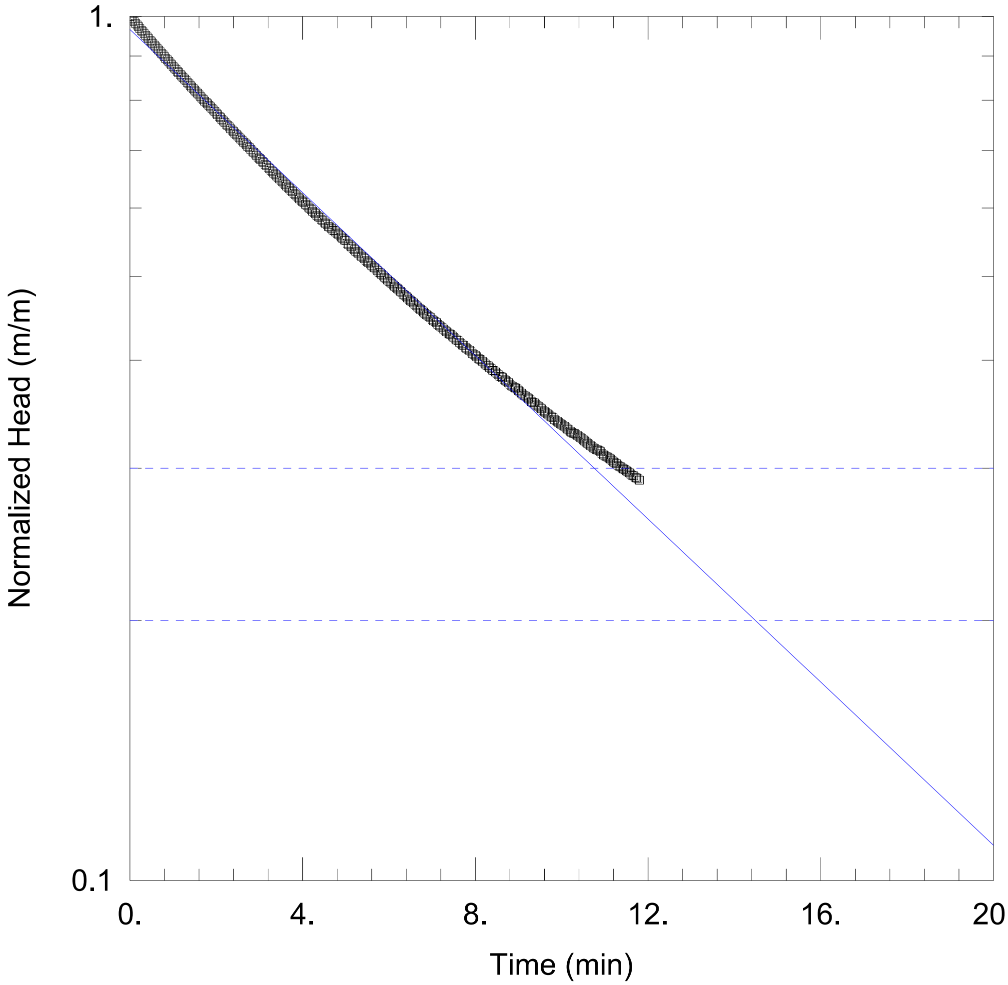
WELL DATA (MW17-3D)

Initial Displacement: 5.545 m
Total Well Penetration Depth: 3.2 m
Casing Radius: 0.0389 m
Static Water Column Height: 6.6 m
Screen Length: 3.2 m
Well Radius: 0.048 m

SOLUTION

Aquifer Model: Confined Solution Method: Bouwer-Rice

K = 1.93E-7 m/sec y0 = 5.469 m



PACKER TESTING MW17-4D (14.63 - 18.34 MBGS)

Data Set: Z:\...\MW17-4D Test 1_jlh.aqt
Date: 02/15/18 Time: 10:56:31

PROJECT INFORMATION

Company: Golder Associates
Client: Rankin
Project: 1771656
Location: Port Colborne
Test Well: MW17-4D Test 1
Test Date: February 28, 2017

AQUIFER DATA

Saturated Thickness: 11.39 m Anisotropy Ratio (Kz/Kr): 1.

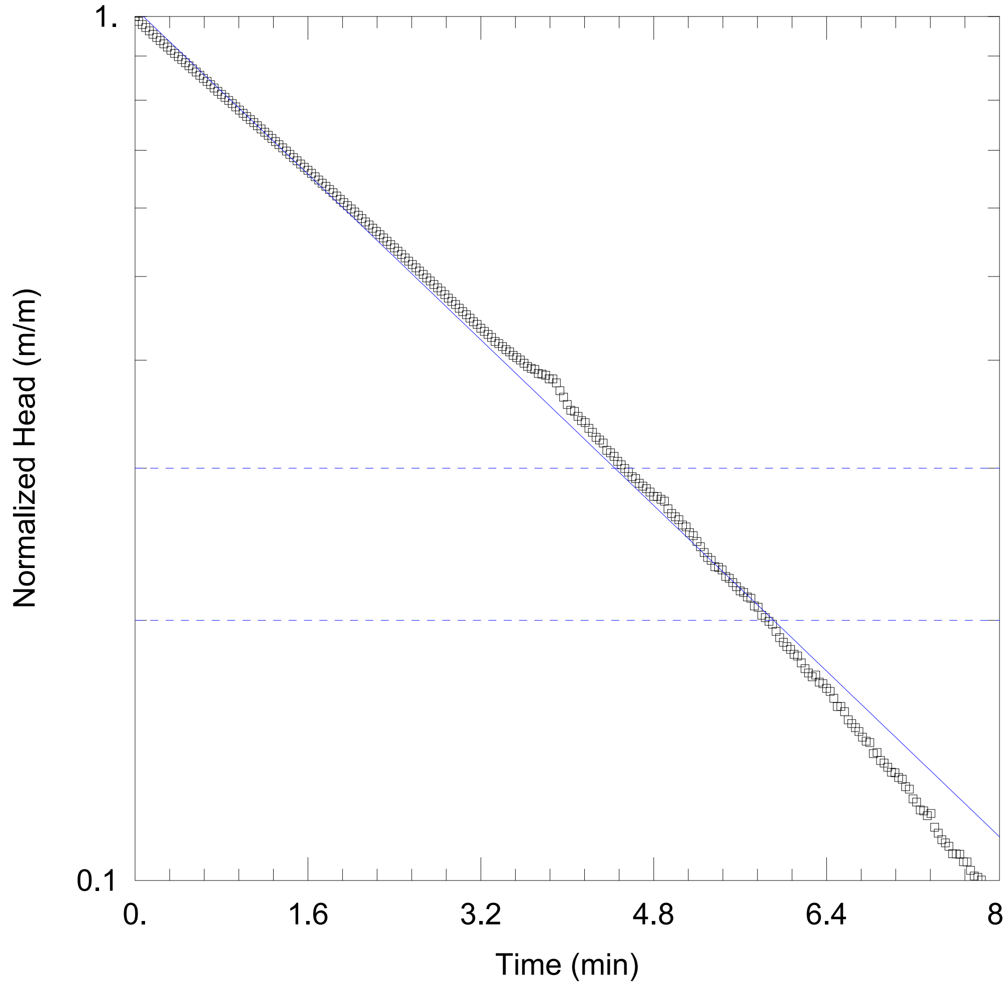
WELL DATA (MW17-4D Test 1)

Initial Displacement: 7.919 m Static Water Column Height: 11.39 m
Total Well Penetration Depth: 3.71 m Screen Length: 3.71 m
Casing Radius: 0.0389 m Well Radius: 0.048 m

SOLUTION

Aquifer Model: Confined Solution Method: Bouwer-Rice

K = 1.076E-6 m/sec y0 = 7.648 m



PACKER TESTING MW17-4D (11.74 - 14.94 MBGS)

Data Set: Z:\...\MW17-4D Test 2_jlh.aqt
Date: 02/15/18 Time: 10:57:01

PROJECT INFORMATION

Company: Golder Associates
Client: Rankin
Project: 1771656
Location: Port Colborne
Test Well: MW17-4D Test 2
Test Date: February 28, 2017

AQUIFER DATA

Saturated Thickness: 6.47 m Anisotropy Ratio (Kz/Kr): 1.

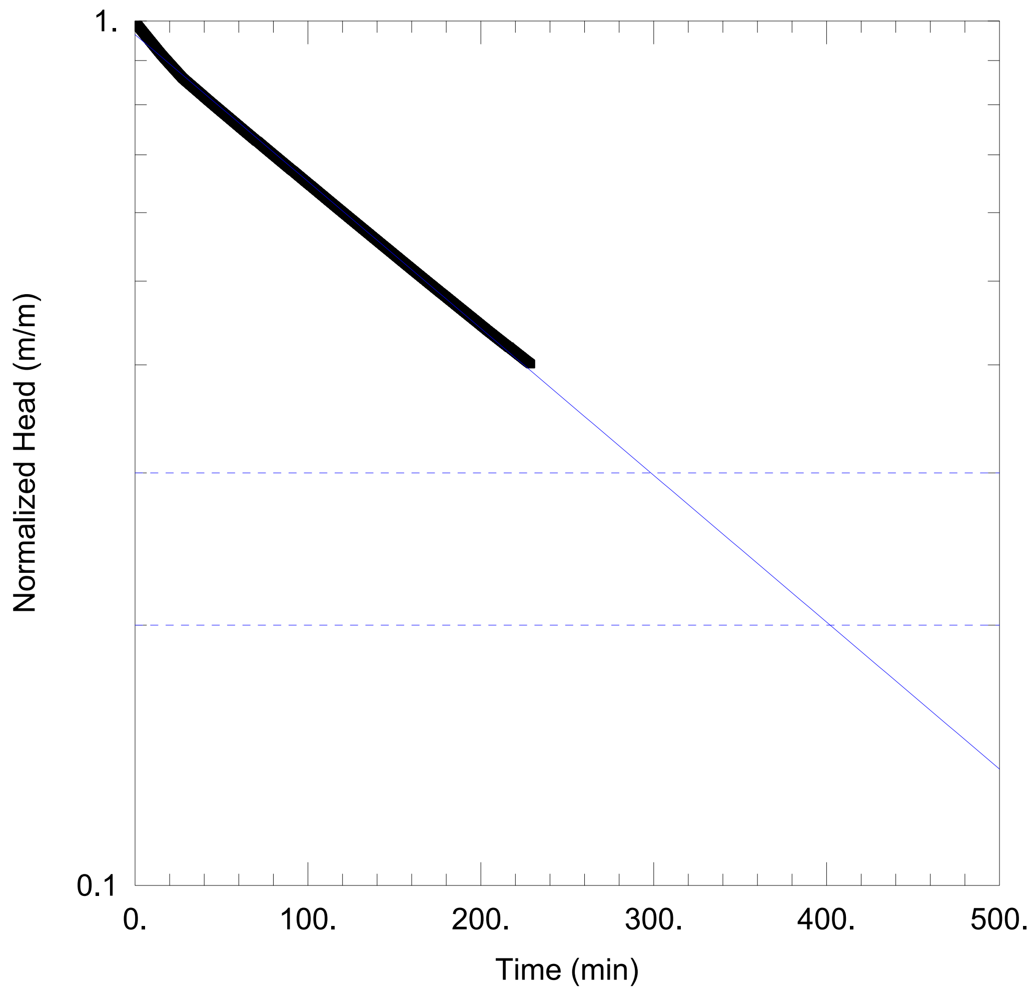
WELL DATA (MW17-4D Test 2)

Initial Displacement: 9.13 m Static Water Column Height: 6.47 m
Total Well Penetration Depth: 3.2 m Screen Length: 3.2 m
Casing Radius: 0.0389 m Well Radius: 0.048 m

SOLUTION

Aquifer Model: Confined Solution Method: Bouwer-Rice

K = 3.093E-6 m/sec y0 = 9.323 m



PACKER TESTING MW17-5D (15.85 - 19.69 MBGS)

Data Set: Z:\...\MW17-5D Test 1_jlh.aqt
Date: 02/15/18 Time: 10:57:36

PROJECT INFORMATION

Company: Golder Associates
Client: Rankin
Project: 1771656
Location: Port Colborne
Test Well: MW17-5D Test 1
Test Date: March 21, 2017

AQUIFER DATA

Saturated Thickness: 9.86 m Anisotropy Ratio (Kz/Kr): 1.

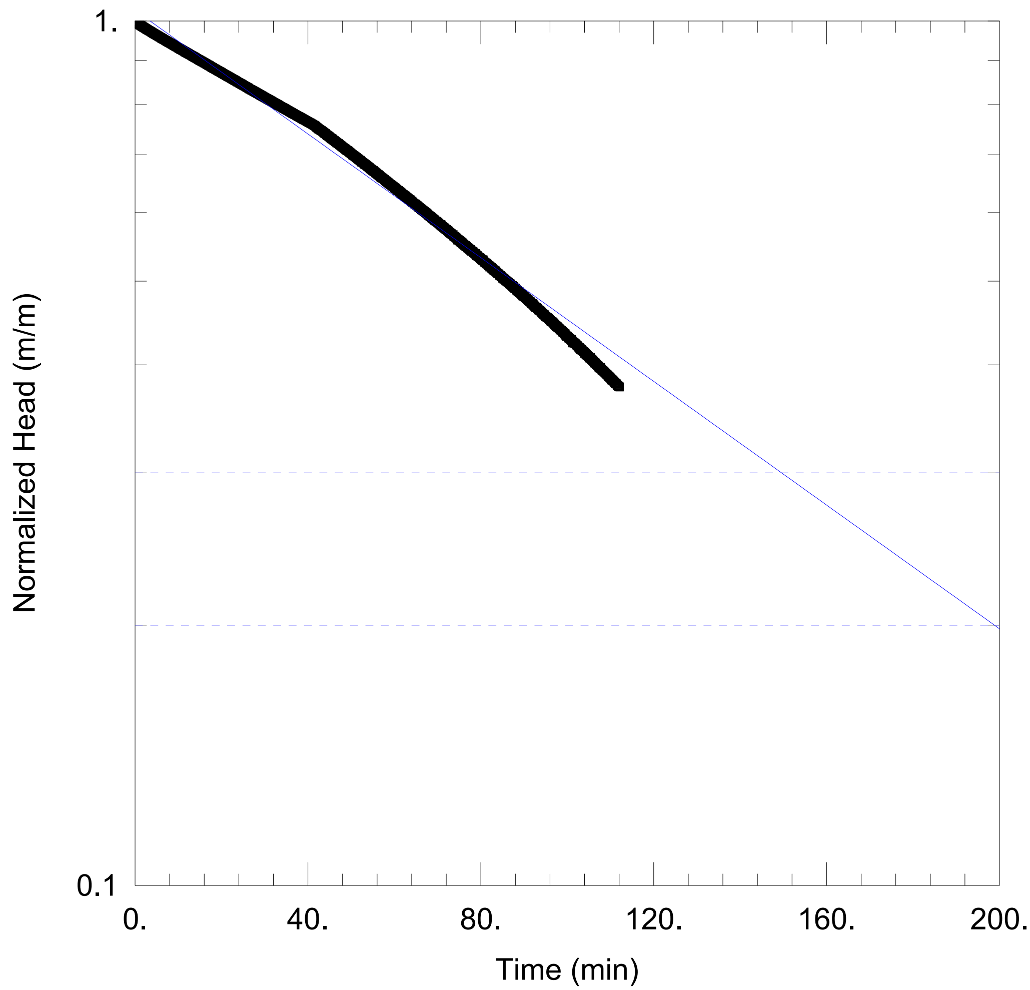
WELL DATA (MW17-5D Test 1)

Initial Displacement: 11.12 m Static Water Column Height: 9.86 m
Total Well Penetration Depth: 3.84 m Screen Length: 3.84 m
Casing Radius: 0.0389 m Well Radius: 0.048 m

SOLUTION

Aquifer Model: Confined Solution Method: Bouwer-Rice

K = 3.8E-8 m/sec y0 = 10.72 m



PACKER TESTING MW17-5D (12.96 - 16.16 MBGS)

Data Set: Z:\...\MW17-5D Test 2_jlh.aqt
Date: 02/15/18 Time: 10:58:14

PROJECT INFORMATION

Company: Golder Associates
Client: Rankin
Project: 1771656
Location: Port Colborne
Test Well: MW17-5D Test 2
Test Date: March 21, 2017

AQUIFER DATA

Saturated Thickness: 9.93 m Anisotropy Ratio (Kz/Kr): 1.

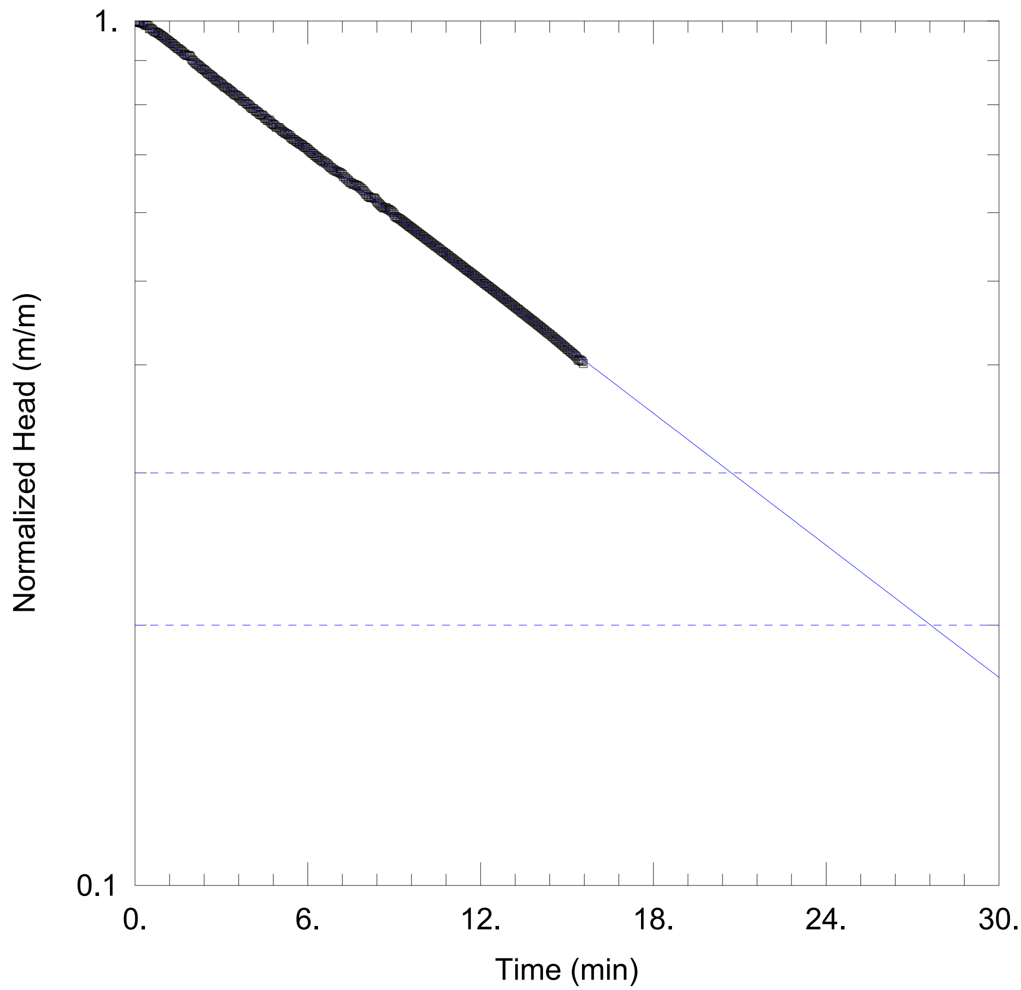
WELL DATA (MW17-5D Test 2)

Initial Displacement: 7.399 m Static Water Column Height: 9.93 m
Total Well Penetration Depth: 3.2 m Screen Length: 3.2 m
Casing Radius: 0.0389 m Well Radius: 0.048 m

SOLUTION

Aquifer Model: Confined Solution Method: Bouwer-Rice

K = 9.076E-8 m/sec y0 = 7.612 m



PACKER TESTING MW17-5D (10.06 - 13.26 MBGS)

Data Set: Z:\...\MW17-5D Test 3_jlh.aqt
Date: 02/15/18 Time: 10:59:13

PROJECT INFORMATION

Company: Golder Associates
Client: Rankin
Project: 1771656
Location: Port Colborne
Test Well: MW17-5D Test 3
Test Date: March 21, 2017

AQUIFER DATA

Saturated Thickness: 6.07 m Anisotropy Ratio (Kz/Kr): 1.

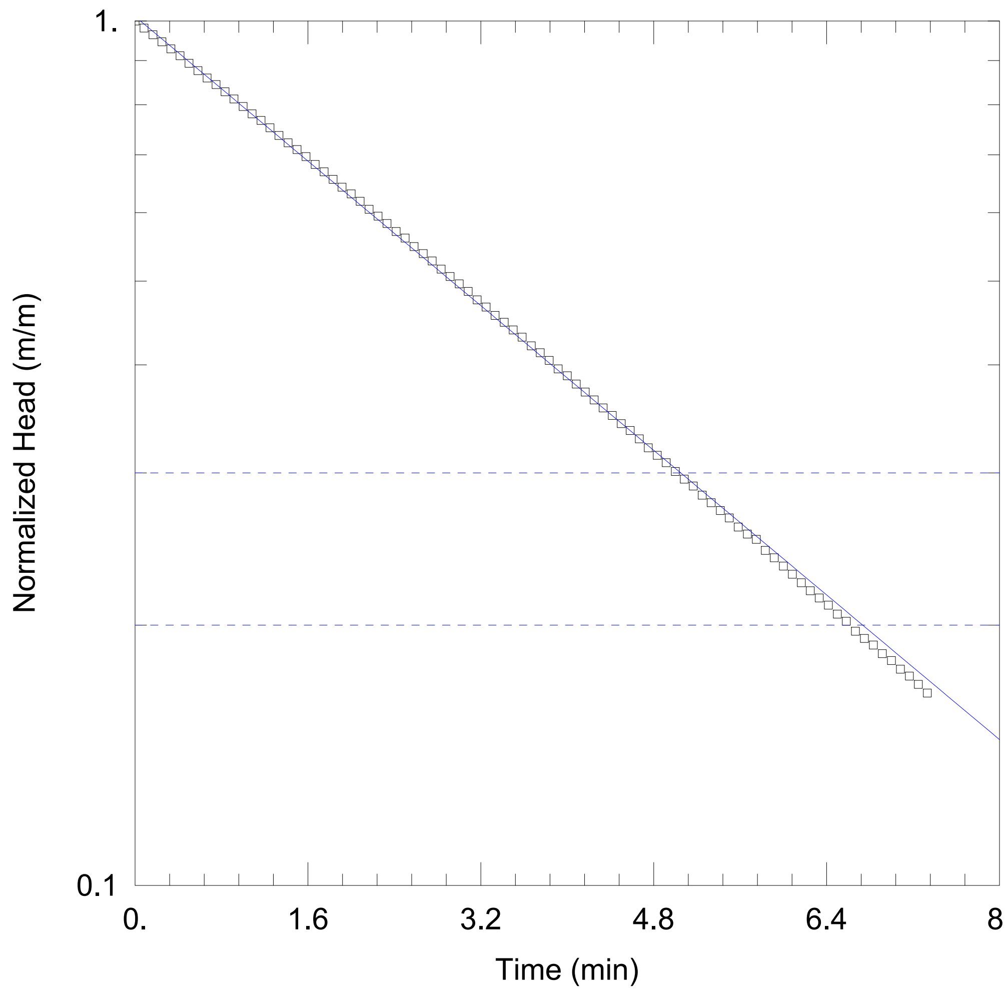
WELL DATA (MW17-5D Test3)

Initial Displacement: 8.274 m Static Water Column Height: 6.07 m
Total Well Penetration Depth: 3.2 m Screen Length: 3.2 m
Casing Radius: 0.0389 m Well Radius: 0.48 m

SOLUTION

Aquifer Model: Confined Solution Method: Bouwer-Rice

K = 2.523E-7 m/sec y0 = 8.36 m



PACKER TESTING MW17-6D (14.33 - 17.99 MBGS)

Data Set: Z:\...\MW17-6D Test 1_jlh.aqt
Date: 02/15/18 Time: 10:59:55

PROJECT INFORMATION

Company: Golder Associates
Client: Rankin
Project: 1771656
Location: Port Colborne
Test Well: MW17-6D Test 1
Test Date: February 22, 2017

AQUIFER DATA

Saturated Thickness: 12.26 m Anisotropy Ratio (Kz/Kr): 1.

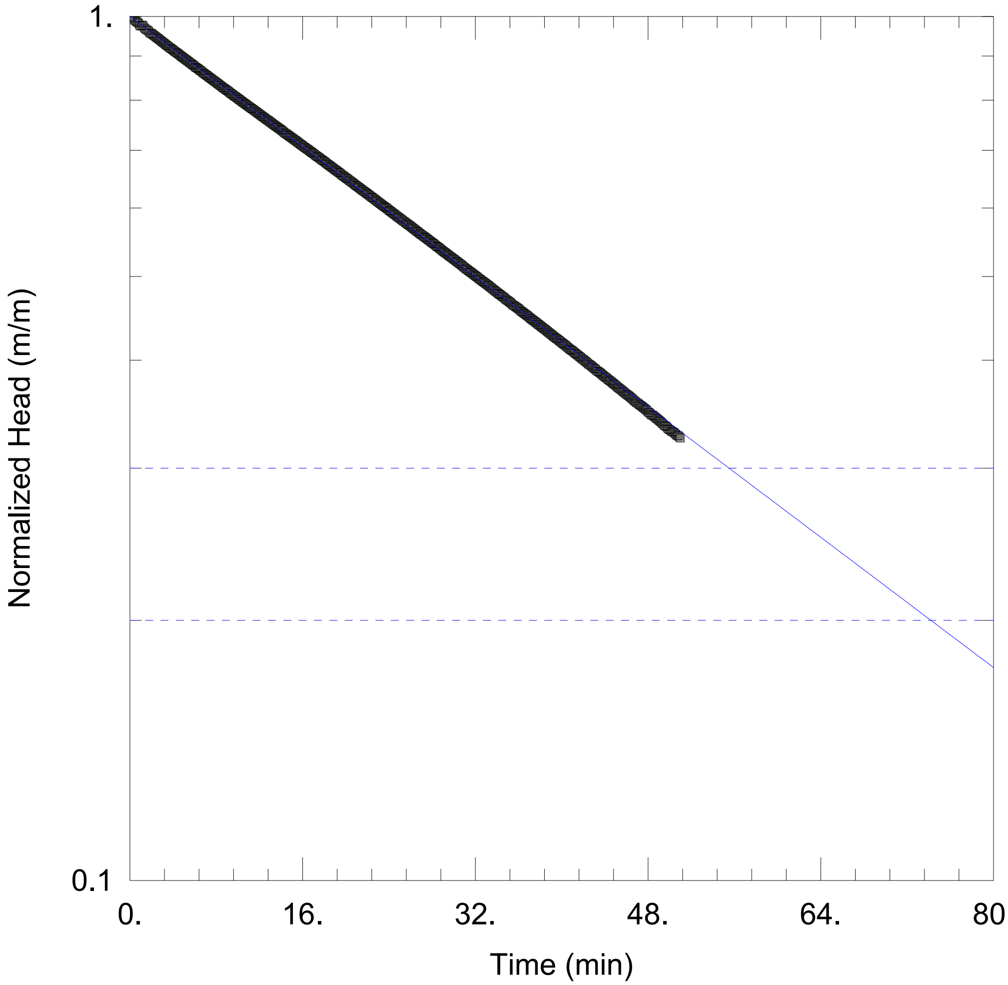
WELL DATA (MW17-6D Test 1)

Initial Displacement: 7.01 m Static Water Column Height: 12.26 m
Total Well Penetration Depth: 3.66 m Screen Length: 3.66 m
Casing Radius: 0.0389 m Well Radius: 0.048 m

SOLUTION

Aquifer Model: Confined Solution Method: Bouwer-Rice

K = 2.399E-6 m/sec y0 = 7.094 m



PACKER TESTING MW17-6D (11.43 - 14.63 MBGS)

Data Set: Z:\...\MW17-6D Test 2_jlh.aqt
Date: 02/15/18 Time: 11:00:23

PROJECT INFORMATION

Company: Golder Associates
Client: Rankin
Project: 1771656
Location: Port Colborne
Test Well: MW17-6D Test 2
Test Date: February 23, 2017

AQUIFER DATA

Saturated Thickness: 8.58 m Anisotropy Ratio (Kz/Kr): 1.

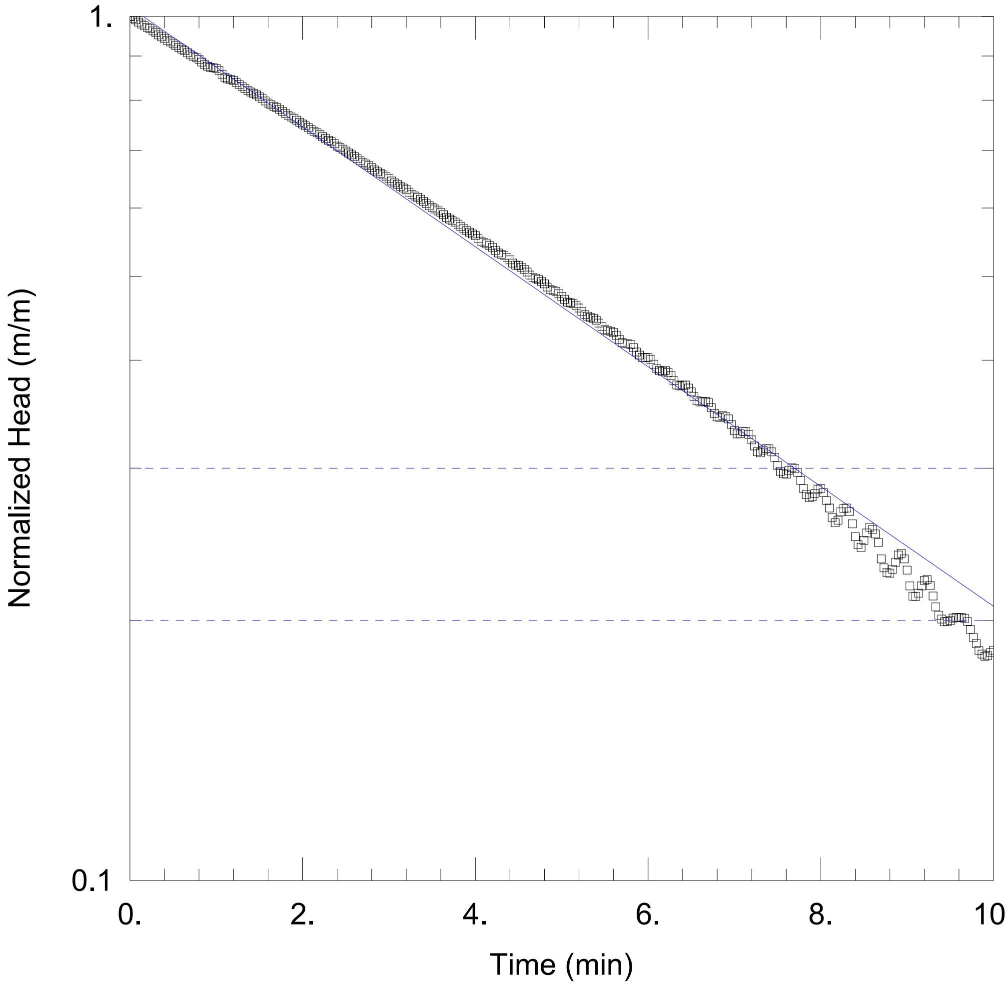
WELL DATA (MW17-6D Test 2)

Initial Displacement: 7.076 m Static Water Column Height: 8.58 m
Total Well Penetration Depth: 3.2 m Screen Length: 3.2 m
Casing Radius: 0.0389 m Well Radius: 0.048 m

SOLUTION

Aquifer Model: Confined Solution Method: Bouwer-Rice

K = 2.402E-7 m/sec y0 = 7.074 m



PACKER TESTING MW17-6D (9.88 - 13.08 MBGS)

Data Set: Z:\...\MW17-6D Test 3_jlh.aqt
Date: 02/15/18 Time: 11:00:43

PROJECT INFORMATION

Company: Golder Associates
Client: Rankin
Project: 1771656
Location: Port Colborne
Test Well: MW17-6D Test 3
Test Date: February 23, 2017

AQUIFER DATA

Saturated Thickness: 5.35 m
Anisotropy Ratio (Kz/Kr): 1.

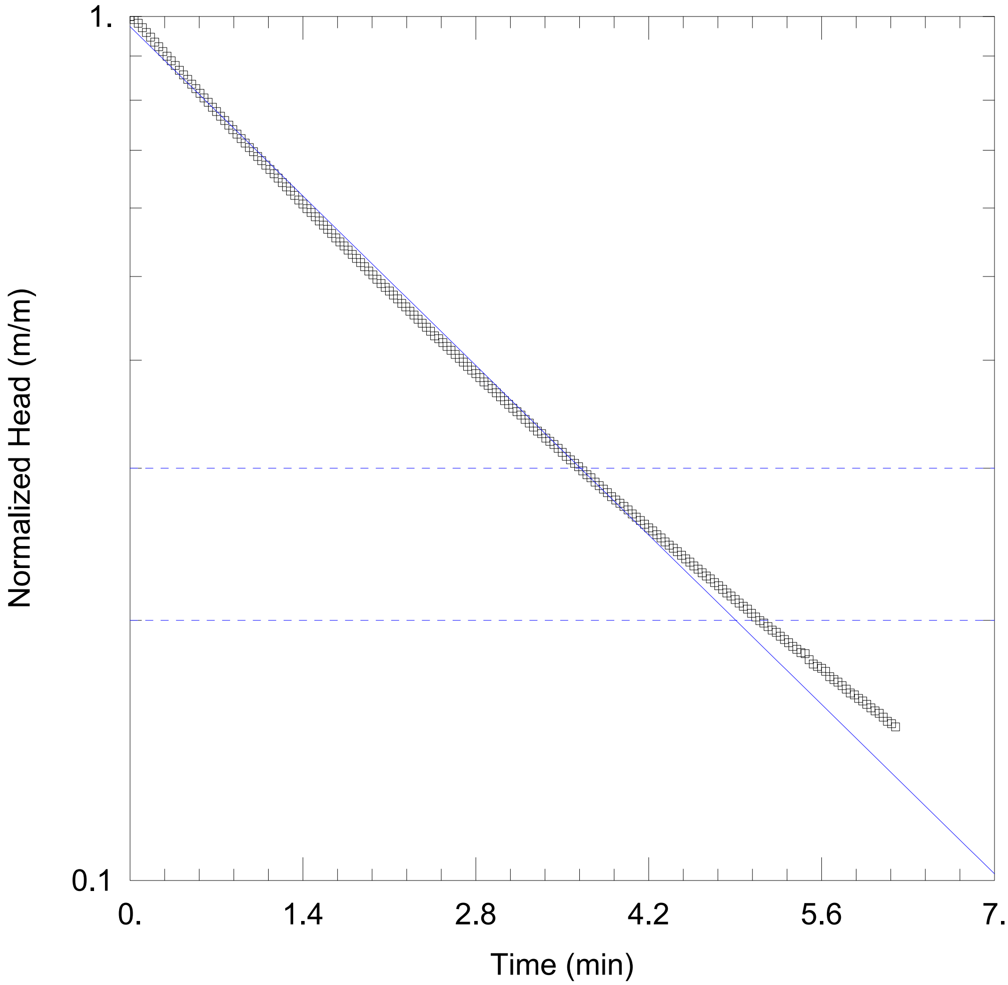
WELL DATA (MW17-6D Test 3)

Initial Displacement: 8.929 m
Static Water Column Height: 5.35 m
Total Well Penetration Depth: 3.2 m
Screen Length: 3.2 m
Casing Radius: 0.0389 m
Well Radius: 0.048 m

SOLUTION

Aquifer Model: Confined
Solution Method: Bouwer-Rice

K = 1.808E-6 m/sec
y0 = 9.151 m



PACKER TESTING MW17-7D (15.85 - 18.75 MBGS)

Data Set: Z:\...\MW17-7D Test 1_jlh.aqt
Date: 02/15/18 Time: 11:01:13

PROJECT INFORMATION

Company: Golder Associates
Client: Rankin
Project: 1771656
Location: Port Colborne
Test Well: MW17-7D Test 1
Test Date: March 2, 2017

AQUIFER DATA

Saturated Thickness: 11.56 m Anisotropy Ratio (Kz/Kr): 1.

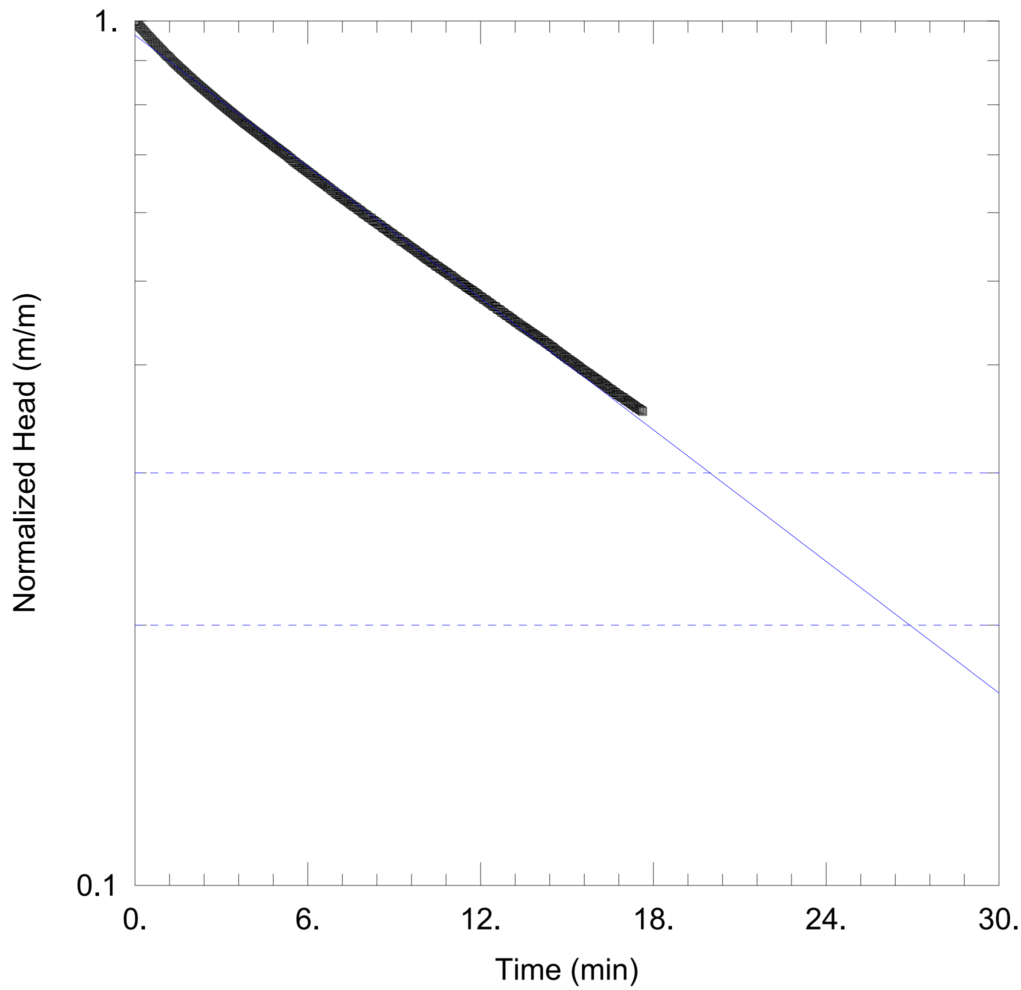
WELL DATA (MW17-7D Test 1)

Initial Displacement: 8.03 m Static Water Column Height: 11.56 m
Total Well Penetration Depth: 2.9 m Screen Length: 2.9 m
Casing Radius: 0.0389 m Well Radius: 0.048 m

SOLUTION

Aquifer Model: Confined Solution Method: Bouwer-Rice

K = 3.782E-6 m/sec y0 = 7.816 m



PACKER TESTING MW17-7D (12.96 - 16.17 MBGS)

Data Set: Z:\...\MW17-7D Test 2_jlh.aqt
Date: 02/15/18 Time: 11:01:46

PROJECT INFORMATION

Company: Golder Associates
Client: Rankin
Project: 1771656
Location: Port Colborne
Test Well: MW17-7D Test 2
Test Date: March 2, 2017

AQUIFER DATA

Saturated Thickness: 8.93 m Anisotropy Ratio (Kz/Kr): 1.

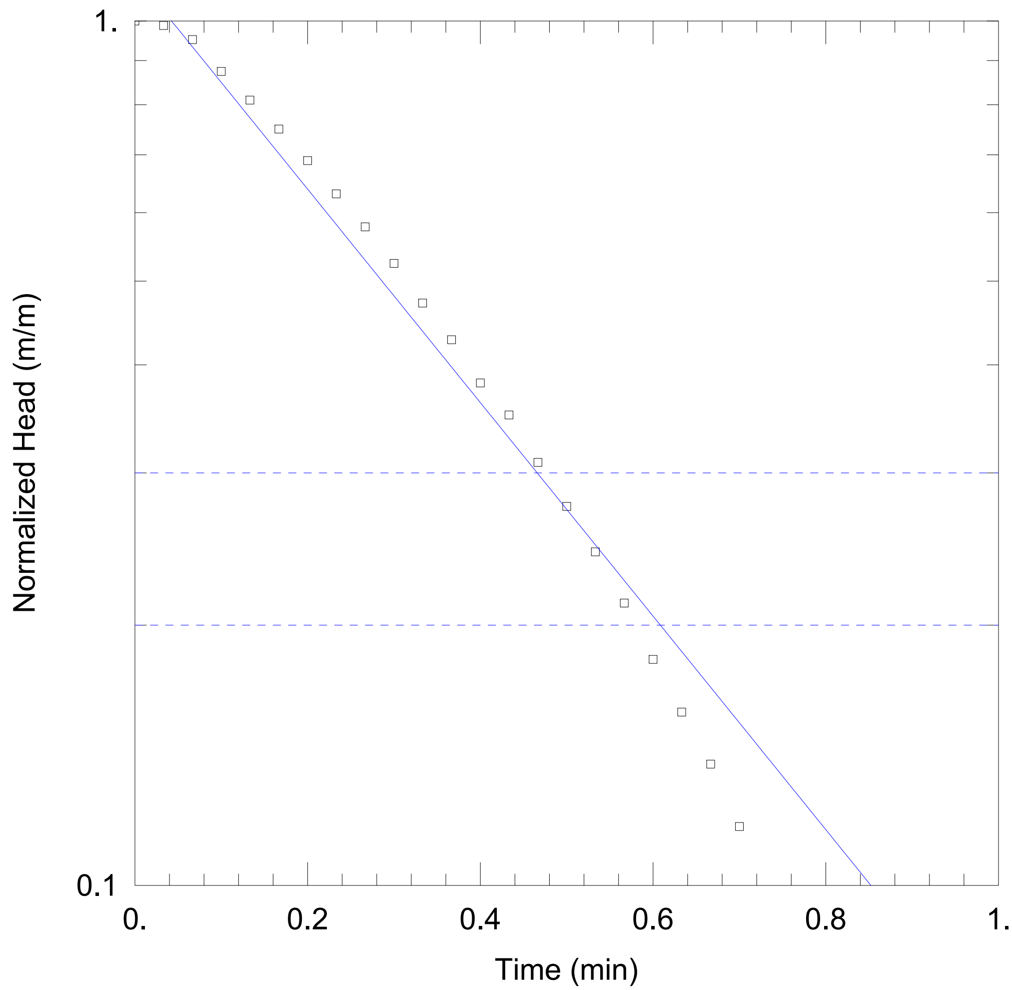
WELL DATA (MW17-7D Test 2)

Initial Displacement: 8.143 m Static Water Column Height: 8.93 m
Total Well Penetration Depth: 3.2 m Screen Length: 3.2 m
Casing Radius: 0.0389 m Well Radius: 0.048 m

SOLUTION

Aquifer Model: Confined Solution Method: Bouwer-Rice

K = 6.461E-7 m/sec y0 = 7.841 m



PACKER TESTING MW17-7D (10.06 - 13.26 MBGS)

Data Set: Z:\...\MW17-7D Test 3_jlh.aqt
Date: 02/15/18 Time: 11:02:05

PROJECT INFORMATION

Company: Golder Associates
Client: Rankin
Project: 1771656
Location: Port Colborne
Test Well: MW17-7D Test 3
Test Date: March 2, 2017

AQUIFER DATA

Saturated Thickness: 5.89 m Anisotropy Ratio (Kz/Kr): 1.

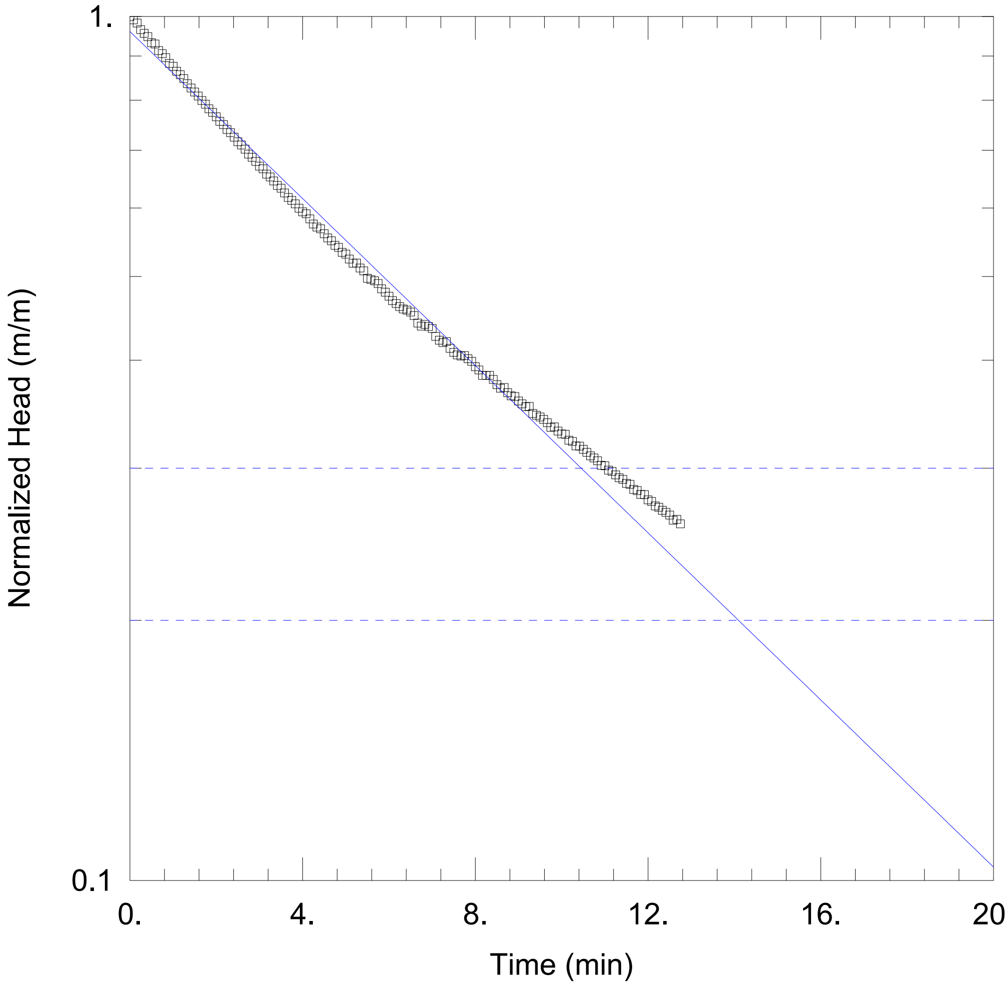
WELL DATA (MW17-7D Test 3)

Initial Displacement: 6.341 m Static Water Column Height: 5.89 m
Total Well Penetration Depth: 3.2 m Screen Length: 3.2 m
Casing Radius: 0.0389 m Well Radius: 0.048 m

SOLUTION

Aquifer Model: Confined Solution Method: Bouwer-Rice

K = 3.203E-5 m/sec y0 = 7.153 m



PACKER TESTING MW17-8D (17.68 - 21.29 MBGS)

Data Set: Z:\...\MW17-8D Test 1_jlh.aqt
Date: 02/15/18 Time: 11:03:17

PROJECT INFORMATION

Company: Golder Associates
Client: Rankin
Project: 1771656
Location: Port Colborne
Test Well: MW17-8D Test 1
Test Date: March 9, 2017

AQUIFER DATA

Saturated Thickness: 14. m Anisotropy Ratio (Kz/Kr): 1.

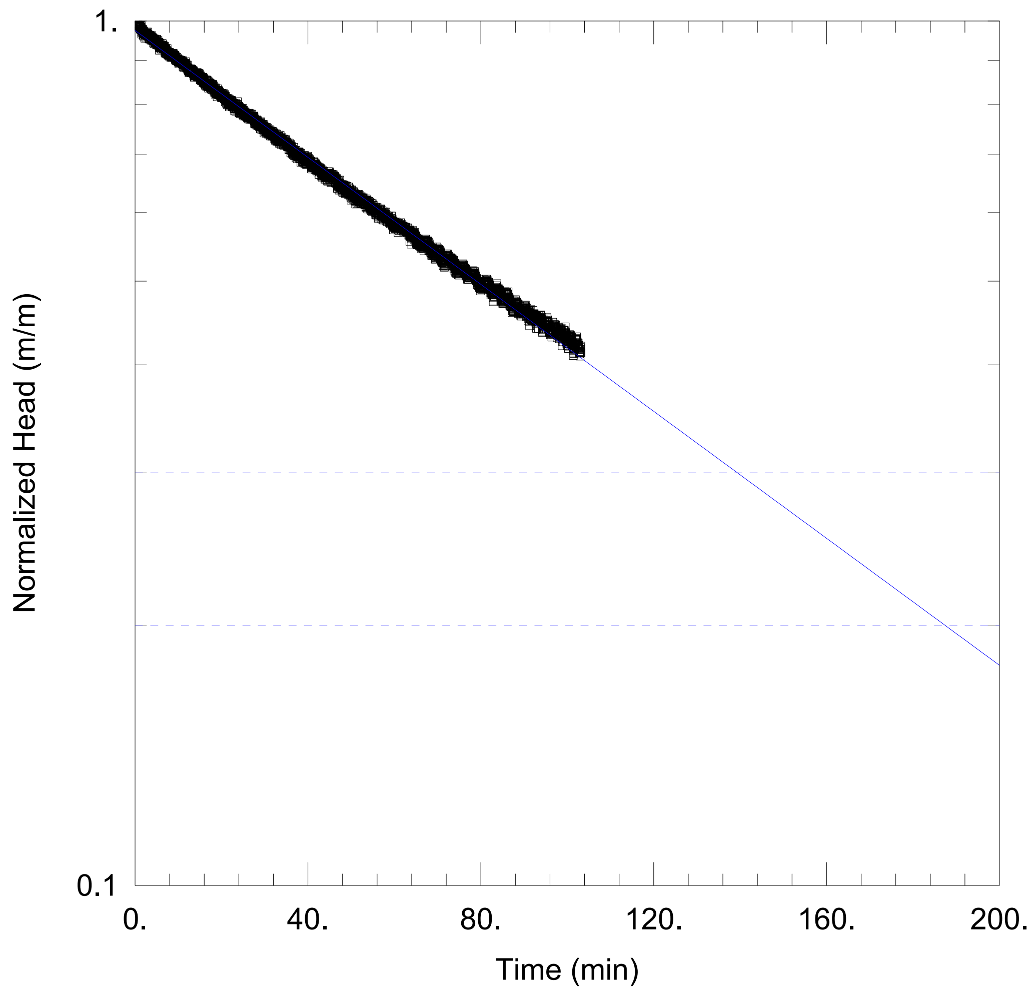
WELL DATA (MW17-8D Test 1)

Initial Displacement: 7.402 m Static Water Column Height: 14. m
Total Well Penetration Depth: 3.61 m Screen Length: 3.61 m
Casing Radius: 0.0389 m Well Radius: 0.048 m

SOLUTION

Aquifer Model: Confined Solution Method: Bouwer-Rice

K = 1.115E-6 m/sec y0 = 7.11 m



PACKER TESTING MW17-8D (14.79 - 17.99 MBGS)

Data Set: Z:\...\MW17-8D Test 2_jlh.aqt
Date: 02/15/18 Time: 11:03:39

PROJECT INFORMATION

Company: Golder Associates
Client: Rankin
Project: 1771656
Location: Port Colborne
Test Well: MW17-8D Test 2
Test Date: March 9, 2017

AQUIFER DATA

Saturated Thickness: 10.74 m Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (MW17-8D Test2)

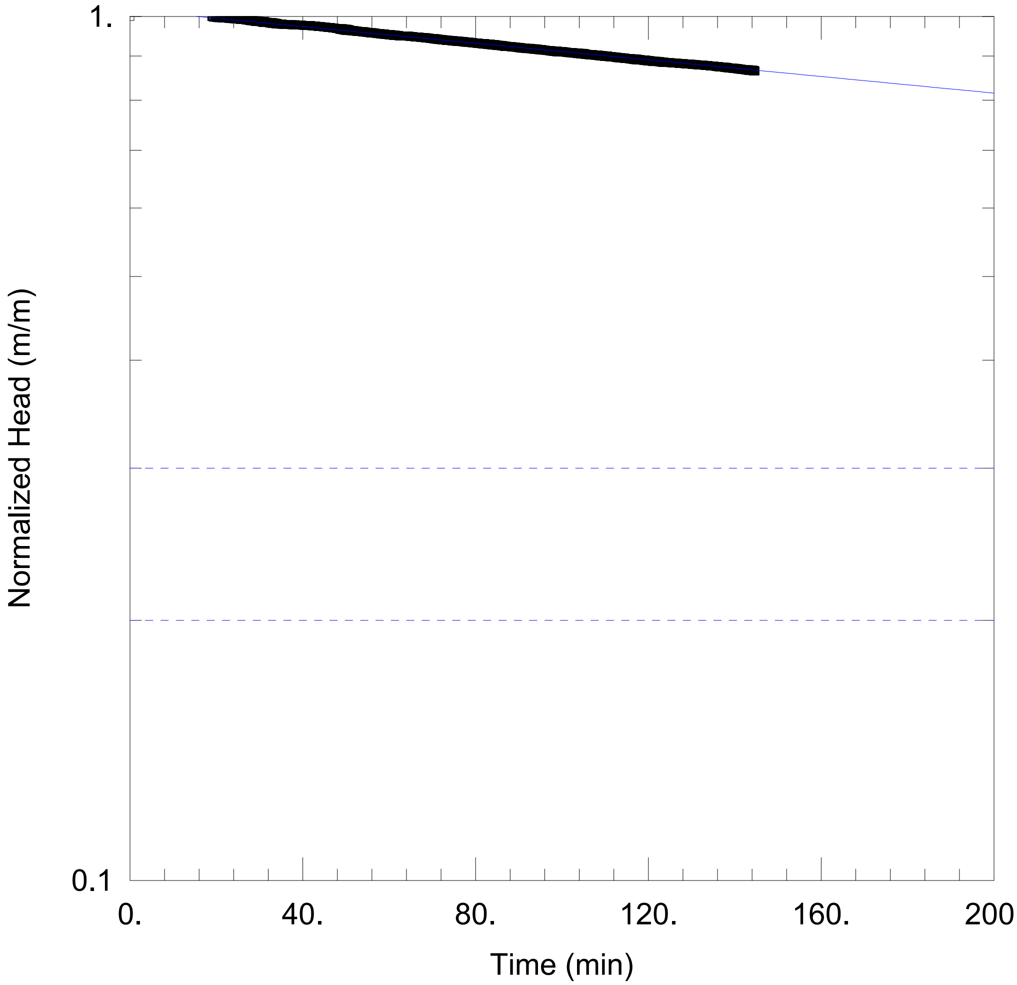
Initial Displacement: 8.953 m
Total Well Penetration Depth: 3.2 m
Casing Radius: 0.0389 m

Static Water Column Height: 10.74 m
Screen Length: 3.2 m
Well Radius: 0.048 m

SOLUTION

Aquifer Model: Confined Solution Method: Bouwer-Rice

K = 9.292E-8 m/sec y0 = 8.731 m



PACKER TESTING MW17-8D (11.89 - 15.09 MBGS)

Data Set: Z:\...\MW17-8D Test 3_jlh.aqt
Date: 02/15/18 Time: 11:04:01

PROJECT INFORMATION

Company: Golder Associates
Client: Rankin
Project: 1771656
Location: Port Colborne
Test Well: MW17-8D Test 3
Test Date: March 9, 2017

AQUIFER DATA

Saturated Thickness: 12.76 m
Anisotropy Ratio (Kz/Kr): 1.

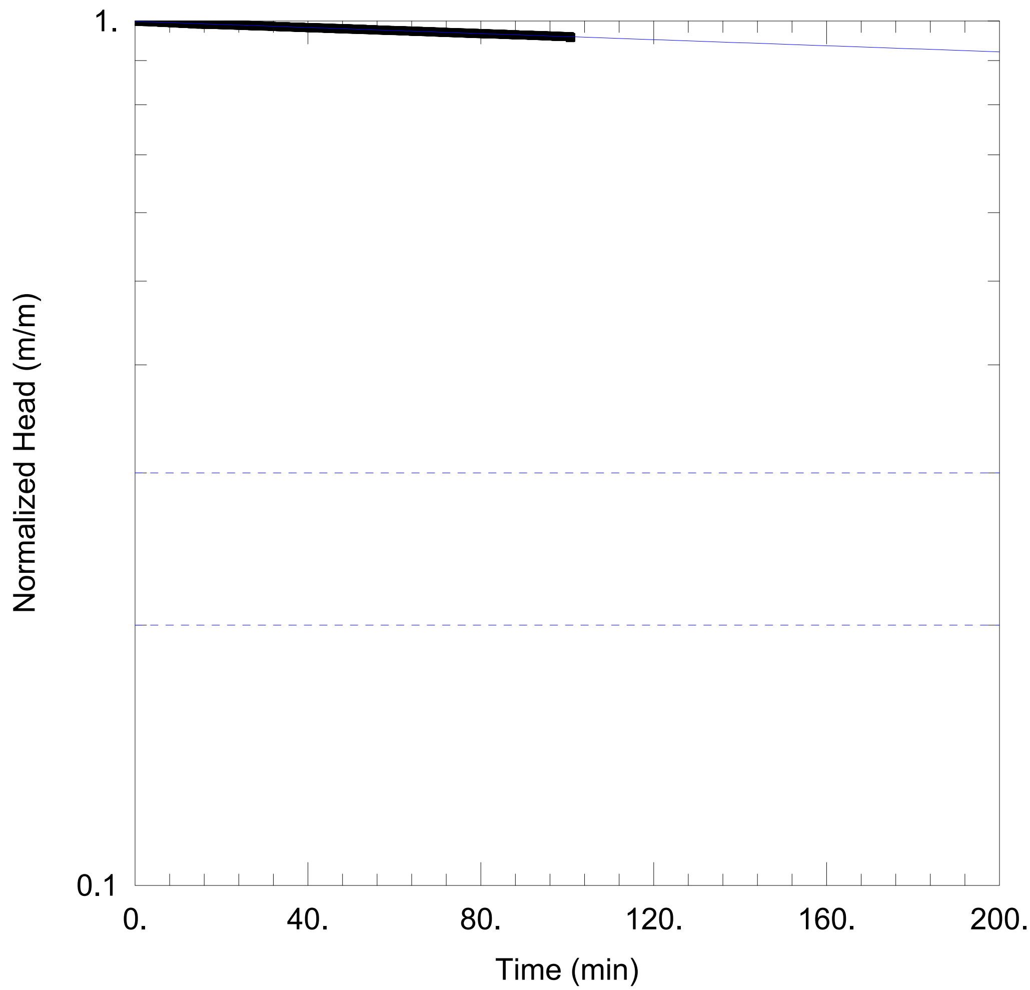
WELL DATA (MW17-8D Test 3)

Initial Displacement: 3.869 m
Static Water Column Height: 12.76 m
Total Well Penetration Depth: 3.2 m
Screen Length: 3.2 m
Casing Radius: 0.0389 m
Well Radius: 0.048 m

SOLUTION

Aquifer Model: Confined
Solution Method: Bouwer-Rice

K = 1.21E-8 m/sec
y0 = 3.936 m



PACKER TESTING MW17-8D (8.99 - 12.19 MBGS)

Data Set: Z:\...\MW17-8D Test 4_jlh.aqt
Date: 02/15/18 Time: 11:04:23

PROJECT INFORMATION

Company: Golder Associates
Client: Rankin
Project: 1771656
Location: Port Colborne
Test Well: MW17-8D Test 4
Test Date: March 13, 2017

AQUIFER DATA

Saturated Thickness: 9.63 m Anisotropy Ratio (Kz/Kr): 1.

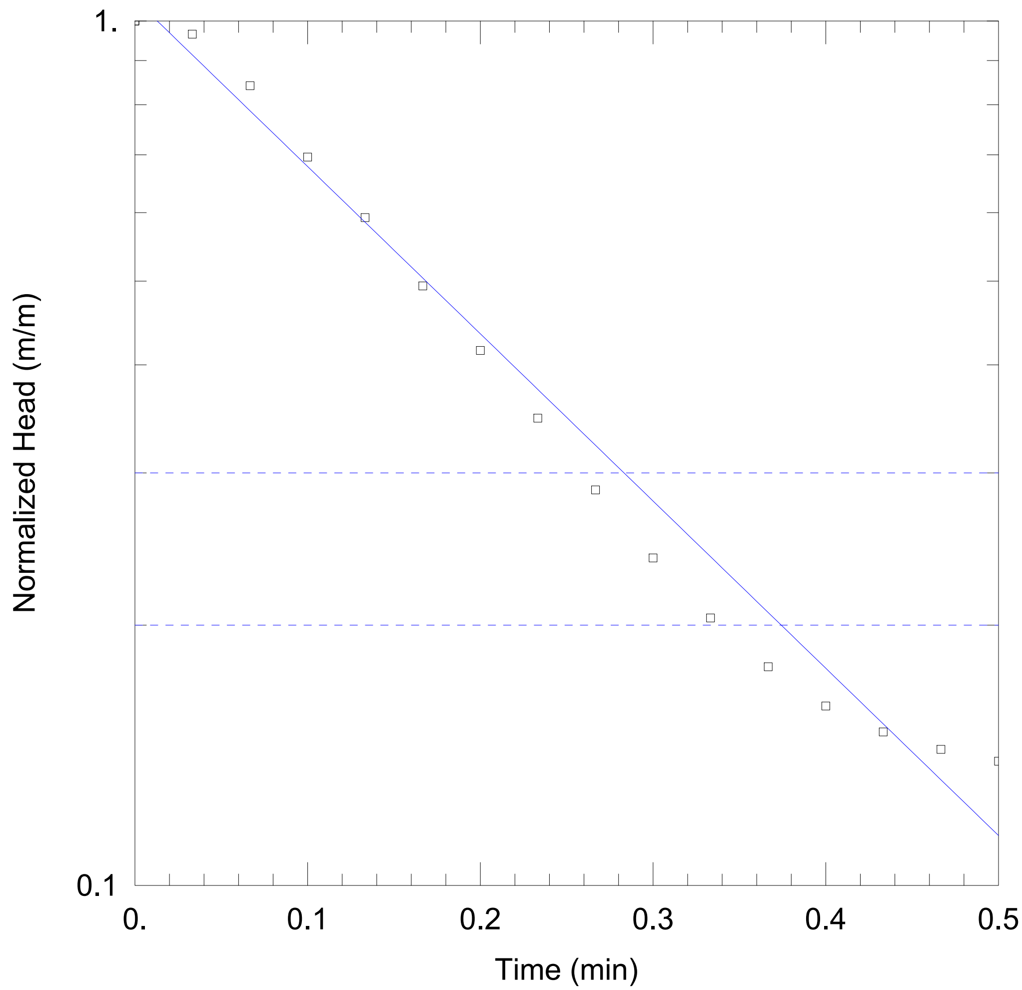
WELL DATA (MW17-8D Test 4)

Initial Displacement: 4.11 m Static Water Column Height: 9.63 m
Total Well Penetration Depth: 3.2 m Screen Length: 3.2 m
Casing Radius: 0.0389 m Well Radius: 0.048 m

SOLUTION

Aquifer Model: Confined Solution Method: Bouwer-Rice

K = 4.465E-9 m/sec y0 = 4.104 m



PACKER TESTING MW17-8D (6.10 - 9.30 MBGS)

Data Set: Z:\...\MW17-8D Test 5-2sec_jlh.aqt
Date: 02/15/18 Time: 11:04:46

PROJECT INFORMATION

Company: Golder Associates
Client: Rankin
Project: 1771656
Location: Port Colborne
Test Well: MW17-8D Test 5-2
Test Date: March 13, 2017

AQUIFER DATA

Saturated Thickness: 5.78 m
Anisotropy Ratio (Kz/Kr): 1.

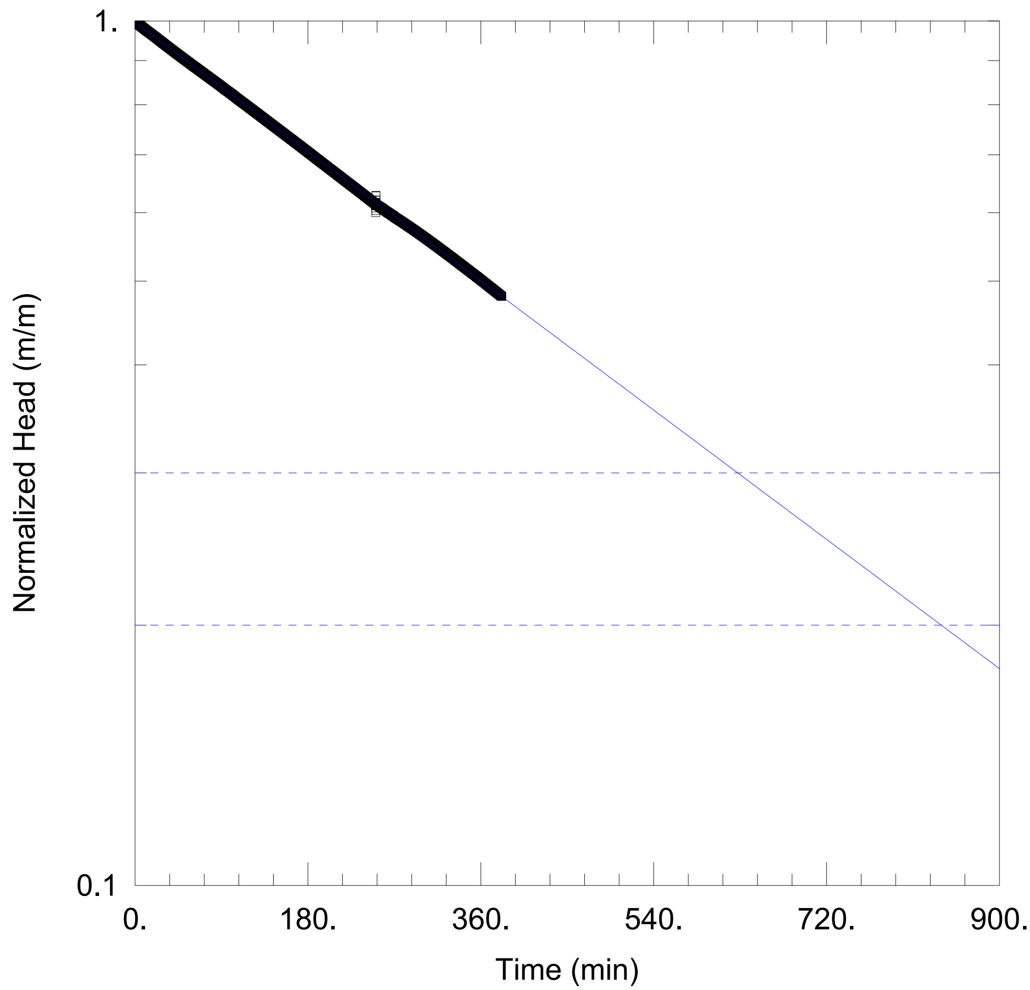
WELL DATA (MW17-8D Test5)

Initial Displacement: 3.572 m
Total Well Penetration Depth: 3.2 m
Casing Radius: 0.0389 m
Static Water Column Height: 5.78 m
Screen Length: 3.2 m
Well Radius: 0.048 m
Gravel Pack Porosity: 0.

SOLUTION

Aquifer Model: Confined
Solution Method: Bouwer-Rice

K = 5.023E-5 m/sec
y0 = 3.784 m



WELL TEST ANALYSIS

Data Set: Z:\...\MW17-9D Test 1_jlh.aqt
Date: 02/15/18 Time: 11:05:23

PROJECT INFORMATION

Company: Golder Associates
Client: Rankin
Project: 1771656
Location: Port Colborne
Test Well: MW17-9D Test 1
Test Date: February 15, 2017

AQUIFER DATA

Saturated Thickness: 13.63 m Anisotropy Ratio (Kz/Kr): 1.

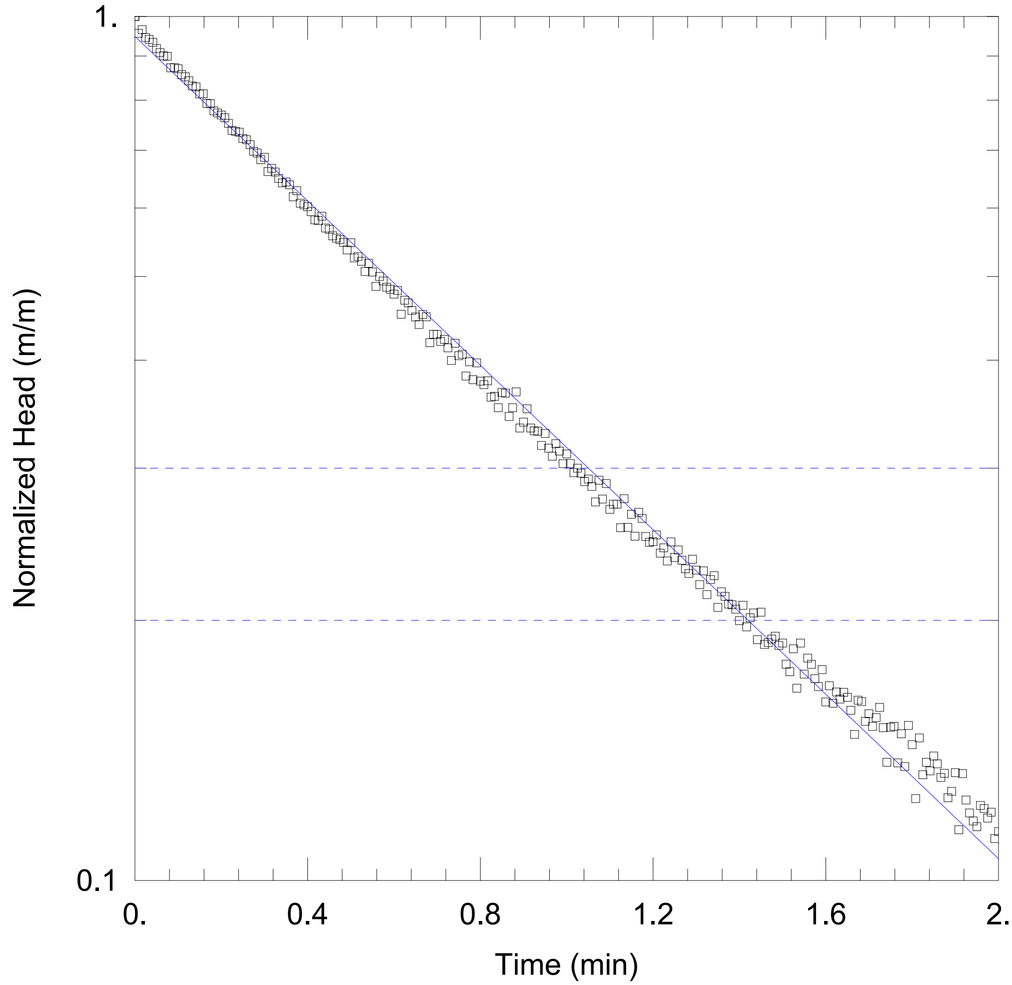
WELL DATA (MW17-9D Test 1)

Initial Displacement: 5.571 m Static Water Column Height: 13.63 m
Total Well Penetration Depth: 3.66 m Screen Length: 3.66 m
Casing Radius: 0.0389 m Well Radius: 0.048 m

SOLUTION

Aquifer Model: Confined Solution Method: Bouwer-Rice

K = 1.9E-8 m/sec y0 = 5.552 m



PACKER TESTING MW17-9D (13.11 - 16.31 MBGS)

Data Set: Z:\...\MW17-9D Test 2_jlh.aqt
Date: 02/15/18 Time: 11:05:58

PROJECT INFORMATION

Company: Golder Associates
Client: Rankin
Project: 1771656
Location: Port Colborne
Test Well: MW17-9D Test 2
Test Date: February 15, 2017

AQUIFER DATA

Saturated Thickness: 10.42 m Anisotropy Ratio (Kz/Kr): 1.

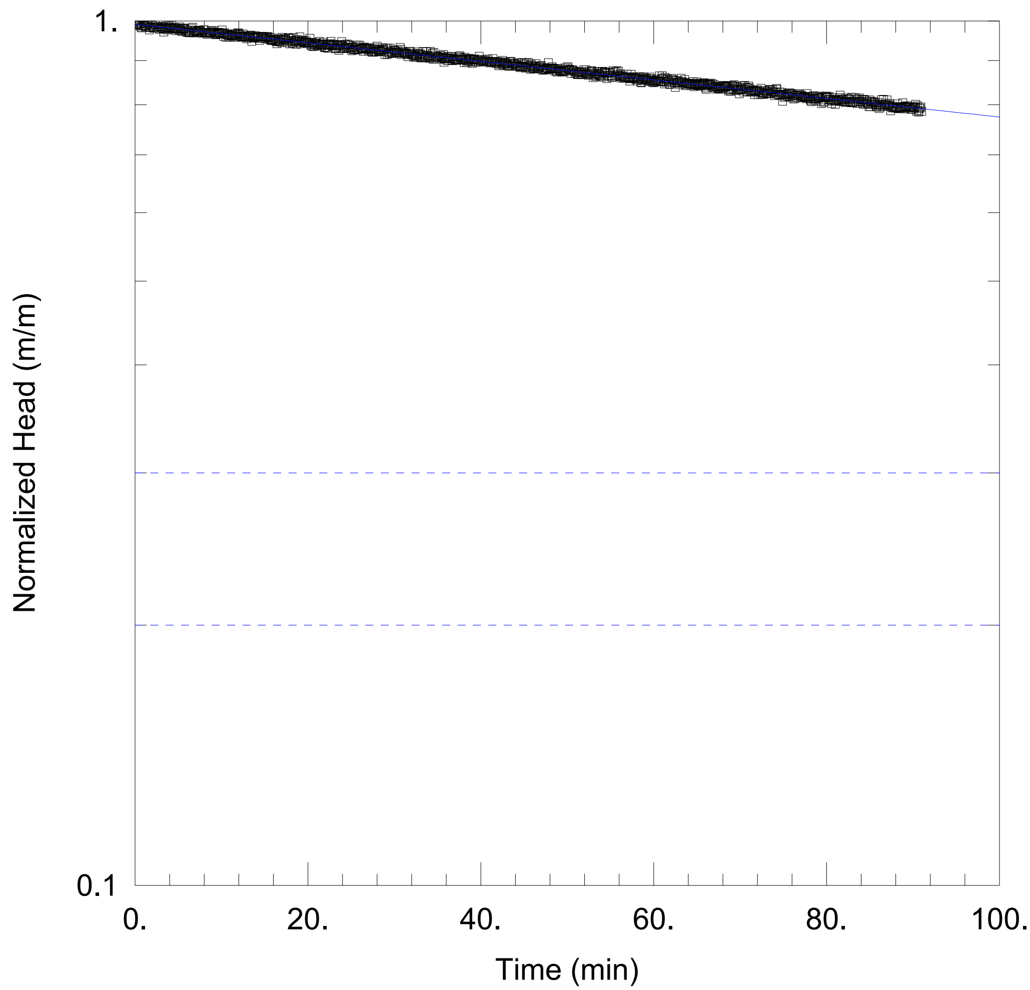
WELL DATA (MW17-9D Test 2)

Initial Displacement: 6.056 m Static Water Column Height: 10.42 m
Total Well Penetration Depth: 3.2 m Screen Length: 3.2 m
Casing Radius: 0.0389 m Well Radius: 0.048 m

SOLUTION

Aquifer Model: Confined Solution Method: Bouwer-Rice

K = 1.205E-5 m/sec y0 = 5.741 m



PACKER TESTING MW17-9D (10.21 - 13.41 MBGS)

Data Set: Z:\...\MW17-9D Test 3_jlh.aqt
Date: 02/15/18 Time: 11:06:19

PROJECT INFORMATION

Company: Golder Associates
Client: Rankin
Project: 1771656
Location: Port Colborne
Test Well: MW17-9D Test 3
Test Date: February 16, 2017

AQUIFER DATA

Saturated Thickness: 10.43 m Anisotropy Ratio (Kz/Kr): 1.

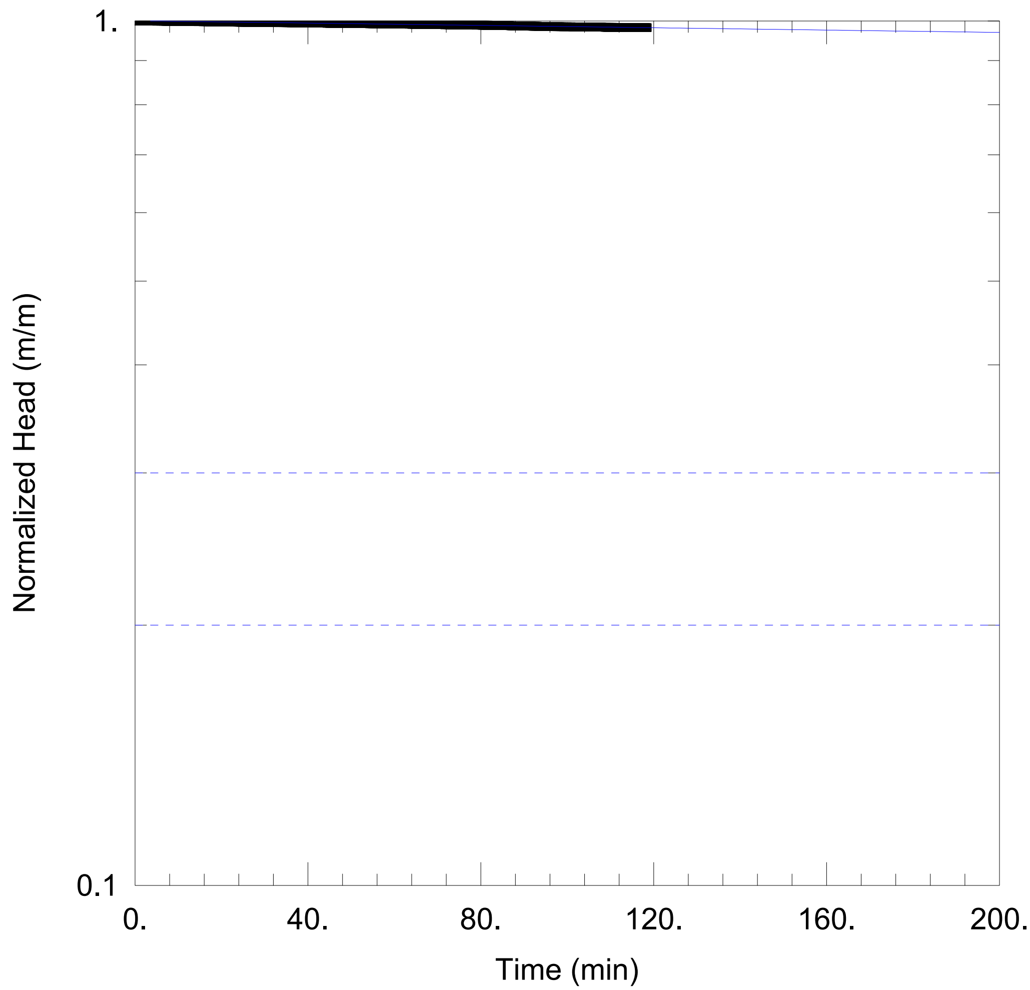
WELL DATA (MW17-9D Test 3)

Initial Displacement: 3.908 m Static Water Column Height: 10.43 m
Total Well Penetration Depth: 3.2 m Screen Length: 3.2 m
Casing Radius: 0.0389 m Well Radius: 0.048 m

SOLUTION

Aquifer Model: Confined Solution Method: Bouwer-Rice

K = 2.717E-8 m/sec y0 = 3.874 m



PACKER TESTING MW17-9D (7.16 - 10.36 MBGS)

Data Set: Z:\...\MW17-9D Test 4_jlh.aqt
Date: 02/15/18 Time: 11:06:43

PROJECT INFORMATION

Company: Golder Associates
Client: Rankin
Project: 1771656
Location: Port Colborne
Test Well: MW17-9D Test 4
Test Date: February 17, 2017

AQUIFER DATA

Saturated Thickness: 8.07 m Anisotropy Ratio (Kz/Kr): 1.

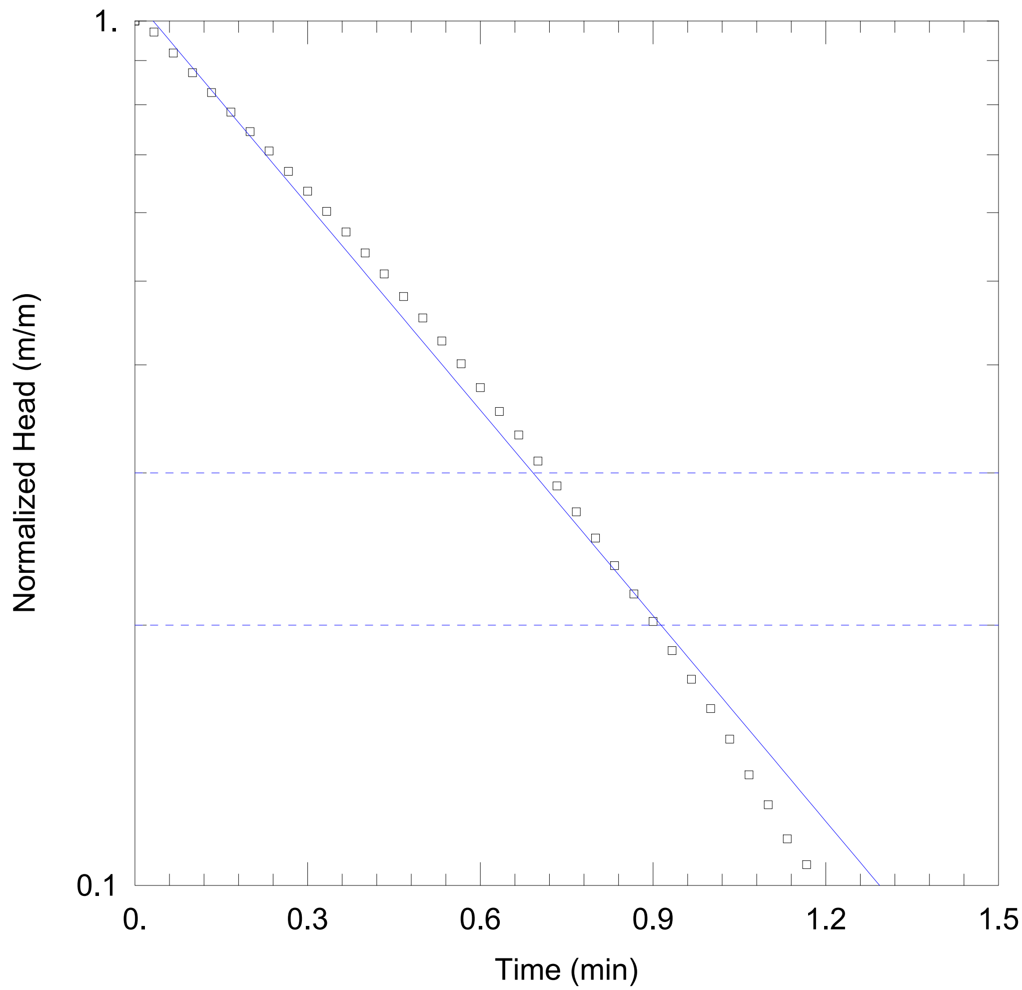
WELL DATA (MW17-9D Test 4)

Initial Displacement: 3.25 m Static Water Column Height: 8.07 m
Total Well Penetration Depth: 3.2 m Screen Length: 3.2 m
Casing Radius: 0.0389 m Well Radius: 0.048 m

SOLUTION

Aquifer Model: Confined Solution Method: Bouwer-Rice

K = 1.731E-9 m/sec y0 = 3.252 m



PACKER TESTING MW17-10D (10.06 - 13.72 MBGS)

Data Set: Z:\...\MW17-10D Test 1_jlh.aqt
Date: 02/15/18
Time: 11:07:15

PROJECT INFORMATION

Company: Golder Associates
Client: Rankin
Project: 1771656
Location: Port Colborne
Test Well: MW17-10D Test 1
Test Date: April 4, 2017

AQUIFER DATA

Saturated Thickness: 8.81 m
Anisotropy Ratio (Kz/Kr): 1.

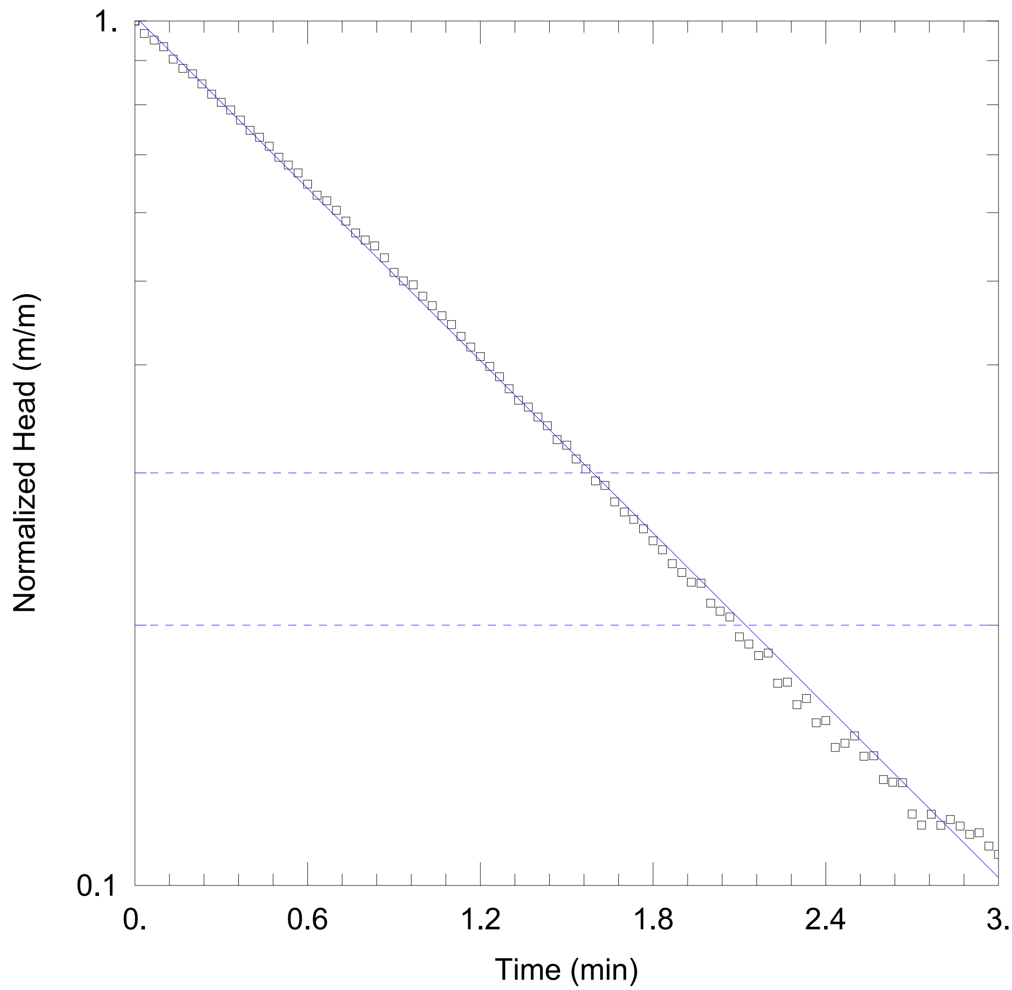
WELL DATA (MW17-10D Test 1)

Initial Displacement: 5.069 m
Static Water Column Height: 8.81 m
Total Well Penetration Depth: 3.66 m
Screen Length: 3.66 m
Casing Radius: 0.0389 m
Well Radius: 0.048 m

SOLUTION

Aquifer Model: Confined
Solution Method: Bouwer-Rice

K = 1.84E-5 m/sec
y0 = 5.371 m



PACKER TESTING MW17-10 D (7.01 - 10.21 MBGS)

Data Set: Z:\...\MW17-10D Test 2_jlh.aqt
Date: 02/15/18 Time: 11:08:25

PROJECT INFORMATION

Company: Golder Associates
Client: Rankin
Project: 1771656
Location: Port Colborne
Test Well: MW17-10D Test 2
Test Date: April 4, 2017

AQUIFER DATA

Saturated Thickness: 6.45 m
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (MW17-10D Test 2)

Initial Displacement: 4.846 m
Static Water Column Height: 6.45 m
Total Well Penetration Depth: 3.2 m
Screen Length: 3.2 m
Casing Radius: 0.0389 m
Well Radius: 0.048 m

SOLUTION

Aquifer Model: Confined
Solution Method: Bouwer-Rice

K = 8.573E-6 m/sec
y0 = 4.907 m

APPENDIX C

Groundwater Quality Analytical Results

Maxxam
A Bureau Veritas Group Company

Your Project #: 1771656 (1000/1003)
Your C.O.C. #: 605301-01-01, 605301-02-01

Attention:Byron Zwiep

Golder Associates Ltd
St. Catharines
110 Hanover Dr
Building A, Suite 203
St.Catharines, ON
CANADA L2W 1A4

Report Date: 2017/04/20
Report #: R4432611
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B772423
Received: 2017/04/11, 15:30

Sample Matrix: Water
Samples Received: 14

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Reference
Alkalinity	13	N/A	2017/04/13	CAM SOP-00448	SM 22 2320 B m
Alkalinity	1	N/A	2017/04/20	CAM SOP-00448	SM 22 2320 B m
Carbonate, Bicarbonate and Hydroxide	1	N/A	2017/04/13	CAM SOP-00102	APHA 4500-CO2 D
Carbonate, Bicarbonate and Hydroxide	13	N/A	2017/04/17	CAM SOP-00102	APHA 4500-CO2 D
Chloride by Automated Colourimetry	1	N/A	2017/04/13	CAM SOP-00463	EPA 325.2 m
Chloride by Automated Colourimetry	12	N/A	2017/04/17	CAM SOP-00463	EPA 325.2 m
Chloride by Automated Colourimetry	1	N/A	2017/04/20	CAM SOP-00463	EPA 325.2 m
Conductivity	14	N/A	2017/04/13	CAM SOP-00414	SM 22 2510 m
Dissolved Organic Carbon (DOC) (1)	13	N/A	2017/04/13	CAM SOP-00446	SM 22 5310 B m
Hardness (calculated as CaCO3)	7	N/A	2017/04/13	CAM SOP 00102/00408/00447	SM 2340 B
Hardness (calculated as CaCO3)	6	N/A	2017/04/17	CAM SOP 00102/00408/00447	SM 2340 B
Hardness (calculated as CaCO3)	1	N/A	2017/04/19	CAM SOP 00102/00408/00447	SM 2340 B
Lab Filtered Metals Analysis by ICP	1	2017/04/17	2017/04/18	CAM SOP-00408	EPA 6010C m
Dissolved Metals by ICPMS	6	N/A	2017/04/13	CAM SOP-00447	EPA 6020B m
Dissolved Metals by ICPMS	6	N/A	2017/04/17	CAM SOP-00447	EPA 6020B m
Dissolved Metals by ICPMS	1	N/A	2017/04/20	CAM SOP-00447	EPA 6020B m
Total Metals Analysis by ICPMS	1	N/A	2017/04/17	CAM SOP-00447	EPA 6020B m
Ion Balance (% Difference)	13	N/A	2017/04/18		
Anion and Cation Sum	13	N/A	2017/04/17		
Total Ammonia-N	10	N/A	2017/04/17	CAM SOP-00441	EPA GS I-2522-90 m
Total Ammonia-N	4	N/A	2017/04/18	CAM SOP-00441	EPA GS I-2522-90 m
Nitrate (NO3) and Nitrite (NO2) in Water (2)	14	N/A	2017/04/13	CAM SOP-00440	SM 22 4500-NO3I/NO2B
pH	14	N/A	2017/04/13	CAM SOP-00413	SM 4500H+ B m
Orthophosphate	1	N/A	2017/04/13	CAM SOP-00461	EPA 365.1 m
Orthophosphate	13	N/A	2017/04/17	CAM SOP-00461	EPA 365.1 m
Sat. pH and Langelier Index (@ 20C)	13	N/A	2017/04/18		

Your Project #: 1771656 (1000/1003)
Your C.O.C. #: 605301-01-01, 605301-02-01

Attention:Byron Zwiep

Golder Associates Ltd
St. Catharines
110 Hanover Dr
Building A, Suite 203
St.Catharines, ON
CANADA L2W 1A4

Report Date: 2017/04/20
Report #: R4432611
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B772423
Received: 2017/04/11, 15:30

Sample Matrix: Water
Samples Received: 14

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Reference
Sat. pH and Langelier Index (@ 20C)	1	N/A	2017/04/19		
Sat. pH and Langelier Index (@ 4C)	13	N/A	2017/04/18		
Sat. pH and Langelier Index (@ 4C)	1	N/A	2017/04/19		
Sulphate by Automated Colourimetry	1	N/A	2017/04/13	CAM SOP-00464	EPA 375.4 m
Sulphate by Automated Colourimetry	12	N/A	2017/04/17	CAM SOP-00464	EPA 375.4 m
Sulphate by Automated Colourimetry	1	N/A	2017/04/20	CAM SOP-00464	EPA 375.4 m
Total Dissolved Solids (TDS calc)	13	N/A	2017/04/18		
Total Dissolved Solids (TDS calc)	1	N/A	2017/04/19		
Total Organic Carbon (TOC) (3)	1	N/A	2017/04/13	CAM SOP-00446	SM 22 5310B m
Total Phosphorus (Colourimetric)	1	2017/04/13	2017/04/13	CAM SOP-00407	SM 22 4500 P B H m
Total Suspended Solids	2	2017/04/12	2017/04/12	CAM SOP-00428	SM 22 2540D m
Total Suspended Solids	2	2017/04/13	2017/04/13	CAM SOP-00428	SM 22 2540D m
Low Level Total Suspended Solids	3	2017/04/12	2017/04/12	CAM SOP-00428	SM 22 2540D m
Low Level Total Suspended Solids	2	2017/04/12	2017/04/13	CAM SOP-00428	SM 22 2540D m
Low Level Total Suspended Solids	5	2017/04/13	2017/04/13	CAM SOP-00428	SM 22 2540D m
Turbidity	1	N/A	2017/04/12	CAM SOP-00417	SM 22 2130 B m

Remarks:

Maxxam Analytics' laboratories are accredited to ISO/IEC 17025:2005 for specific parameters on scopes of accreditation. Unless otherwise noted, procedures used by Maxxam are based upon recognized Provincial, Federal or US method compendia such as CCME, MDDELCC, EPA, APHA.

All work recorded herein has been done in accordance with procedures and practices ordinarily exercised by professionals in Maxxam’s profession using accepted testing methodologies, quality assurance and quality control procedures (except where otherwise agreed by the client and Maxxam in writing). All data is in statistical control and has met quality control and method performance criteria unless otherwise noted. All method blanks are reported: unless indicated otherwise, associated sample data are not blank corrected.

Maxxam Analytics' liability is limited to the actual cost of the requested analyses, unless otherwise agreed in writing. There is no other warranty expressed or implied. Maxxam has been retained to provide analysis of samples provided by the Client using the testing methodology referenced in this report. Interpretation and use of test results are the sole responsibility of the Client and are not within the scope of services provided by Maxxam, unless otherwise agreed in writing.

Maxxam Analytics International Corporation o/a Maxxam Analytics 6740 Campobello Road, Mississauga, Ontario, L5N 2L8 Tel: (905) 817-5700 Toll-Free: 800-563-6266 Fax: (905) 817-5777 www.maxxam.ca

Your Project #: 1771656 (1000/1003)
Your C.O.C. #: 605301-01-01, 605301-02-01

Attention:Byron Zwiep

Golder Associates Ltd
St. Catharines
110 Hanover Dr
Building A, Suite 203
St.Catharines, ON
CANADA L2W 1A4

Report Date: 2017/04/20
Report #: R4432611
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B772423

Received: 2017/04/11, 15:30

Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope dilution methods.

Results relate to samples tested.

This Certificate shall not be reproduced except in full, without the written approval of the laboratory.

Reference Method suffix "m" indicates test methods incorporate validated modifications from specific reference methods to improve performance.

* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.

(1) Dissolved Organic Carbon (DOC) present in the sample should be considered as non-purgeable DOC.
(2) Values for calculated parameters may not appear to add up due to rounding of raw data and significant figures.
(3) Total Organic Carbon (TOC) present in the sample should be considered as non-purgeable TOC.

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Ema Gitej, Senior Project Manager
Email: EGitej@maxxam.ca
Phone# (905)817-5829
==
Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

Maxxam
A Bureau Veritas Group Company

Maxxam Job #: B772423
Report Date: 2017/04/20

Golder Associates Ltd
Client Project #: 1771656 (1000/1003)
Sampler Initials: TP

RESULTS OF ANALYSES OF WATER

Maxxam ID		EEV132			EEV133			EEV134		
Sampling Date		2017/04/10 14:45			2017/04/10 14:42			2017/04/10 16:30		
COC Number		605301-01-01			605301-01-01			605301-01-01		
	UNITS	**MW17-1D**	**RDL**	**QC Batch**	**MW17-1S**	**RDL**	**QC Batch**	**MW17-4S**	**RDL**	**QC Batch**
Calculated Parameters										
Anion Sum	me/L	24.7	N/A	4936806	10.4	N/A	4936806	13.9	N/A	4936806
Bicarb. Alkalinity (calc. as CaCO3)	mg/L	290	1.0	4936801	200	1.0	4936801	410	1.0	4936801
Calculated TDS	mg/L	1500	1.0	4936813	670	1.0	4936813	740	1.0	4936813
Carb. Alkalinity (calc. as CaCO3)	mg/L	1.0	1.0	4936801	2.7	1.0	4936801	2.5	1.0	4936801
Cation Sum	me/L	25.0	N/A	4936806	11.7	N/A	4936806	13.8	N/A	4936806
Hardness (CaCO3)	mg/L	1200	1.0	4936804	220	1.0	4936804	650	1.0	4936804
Ion Balance (% Difference)	%	0.540	N/A	4936805	5.94	N/A	4936805	0.370	N/A	4936805
Langelier Index (@ 20C)	N/A	0.933	N/A	4936811	0.643	N/A	4936811	0.954	N/A	4936811
Langelier Index (@ 4C)	N/A	0.689	N/A	4936812	0.396	N/A	4936812	0.708	N/A	4936812
Saturation pH (@ 20C)	N/A	6.64	N/A	4936811	7.51	N/A	4936811	6.85	N/A	4936811
Saturation pH (@ 4C)	N/A	6.89	N/A	4936812	7.76	N/A	4936812	7.10	N/A	4936812
Inorganics										
Total Ammonia-N	mg/L	1.3	0.050	4938710	0.43	0.050	4938710	0.093	0.050	4938710
Conductivity	umho/cm	2100	1.0	4937827	1200	1.0	4937809	1200	1.0	4937809
Dissolved Organic Carbon	mg/L	0.46	0.20	4937584	4.7	0.20	4938932	1.8	0.20	4937584
Orthophosphate (P)	mg/L	<0.010	0.010	4938098	0.017	0.010	4938098	<0.010	0.010	4938098
pH	pH	7.58	N/A	4937828	8.15	N/A	4937811	7.80	N/A	4937811
Total Suspended Solids	mg/L	630	5	4939006	9000	500	4937582	1300	5	4939006
Dissolved Sulphate (SO4)	mg/L	880	5.0	4938104	280	1.0	4938104	240	1.0	4938104
Alkalinity (Total as CaCO3)	mg/L	290	1.0	4937823	200	1.0	4937613	410	1.0	4937613
Dissolved Chloride (Cl)	mg/L	20	1.0	4938093	19	1.0	4938093	18	1.0	4938093
Nitrite (N)	mg/L	<0.010	0.010	4939014	<0.050	0.050	4937672	0.390	0.010	4937642
Nitrate (N)	mg/L	<0.10	0.10	4939014	0.58	0.50	4937672	1.46	0.10	4937642
Nitrate + Nitrite (N)	mg/L	<0.10	0.10	4939014	0.58	0.50	4937672	1.85	0.10	4937642

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
N/A = Not Applicable

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Maxxam
A Bureau Veritas Group Company

Maxxam Job #: B772423
Report Date: 2017/04/20

Golder Associates Ltd
Client Project #: 1771656 (1000/1003)
Sampler Initials: TP

RESULTS OF ANALYSES OF WATER

Maxxam ID		EEV135			EEV136	EEV136		
Sampling Date		2017/04/11 08:45			2017/04/10 15:14	2017/04/10 15:14		
COC Number		605301-01-01			605301-01-01	605301-01-01		
	UNITS	**MW17-2S**	**RDL**	**QC Batch**	**MW17-3D**	**MW17-3D Lab-Dup**	**RDL**	**QC Batch**
Calculated Parameters								
Anion Sum	me/L	10.8	N/A	4936806	12.5	N/A	N/A	4936806
Bicarb. Alkalinity (calc. as CaCO3)	mg/L	310	1.0	4936801	370	N/A	1.0	4936801
Calculated TDS	mg/L	590	1.0	4936813	680	N/A	1.0	4936813
Carb. Alkalinity (calc. as CaCO3)	mg/L	3.2	1.0	4936801	2.1	N/A	1.0	4936801
Cation Sum	me/L	10.3	N/A	4936806	12.2	N/A	N/A	4936806
Hardness (CaCO3)	mg/L	410	1.0	4936804	560	N/A	1.0	4936804
Ion Balance (% Difference)	%	2.57	N/A	4936805	1.41	N/A	N/A	4936805
Langelier Index (@ 20C)	N/A	0.952	N/A	4936811	0.935	N/A	N/A	4936811
Langelier Index (@ 4C)	N/A	0.705	N/A	4936812	0.688	N/A	N/A	4936812
Saturation pH (@ 20C)	N/A	7.08	N/A	4936811	6.84	N/A	N/A	4936811
Saturation pH (@ 4C)	N/A	7.33	N/A	4936812	7.08	N/A	N/A	4936812
Inorganics								
Total Ammonia-N	mg/L	0.25	0.050	4938710	0.50	N/A	0.050	4938715
Conductivity	umho/cm	960	1.0	4937809	1200	N/A	1.0	4937809
Dissolved Organic Carbon	mg/L	5.9	0.20	4937584	1.7	N/A	0.20	4937584
Orthophosphate (P)	mg/L	<0.010	0.010	4938098	<0.010	N/A	0.010	4938098
pH	pH	8.04	N/A	4937811	7.77	N/A	N/A	4937811
Total Suspended Solids	mg/L	1900	50	4937582	970	N/A	5	4939006
Dissolved Sulphate (SO4)	mg/L	190	1.0	4938104	190	N/A	1.0	4938104
Alkalinity (Total as CaCO3)	mg/L	320	1.0	4937613	380	N/A	1.0	4937613
Dissolved Chloride (Cl)	mg/L	18	1.0	4938093	36	N/A	1.0	4938093
Nitrite (N)	mg/L	<0.010	0.010	4937672	<0.010	<0.010	0.010	4939014
Nitrate (N)	mg/L	<0.10	0.10	4937672	<0.10	<0.10	0.10	4939014
Nitrate + Nitrite (N)	mg/L	<0.10	0.10	4937672	<0.10	<0.10	0.10	4939014

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
Lab-Dup = Laboratory Initiated Duplicate
N/A = Not Applicable

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Maxxam Job #: B772423
Report Date: 2017/04/20

Golder Associates Ltd
Client Project #: 1771656 (1000/1003)
Sampler Initials: TP

RESULTS OF ANALYSES OF WATER

Maxxam ID		EEV137			EEV138			EEV139		
Sampling Date		2017/04/10 13:28			2017/04/10 13:28			2017/04/10 13:00		
COC Number		605301-01-01			605301-01-01			605301-01-01		
	UNITS	MW17-6D	RDL	QC Batch	MW17-6S	RDL	QC Batch	MW17-9S	RDL	QC Batch
Calculated Parameters										
Anion Sum	me/L	10.8	N/A	4936806	13.5	N/A	4936806	18.5	N/A	4936806
Bicarb. Alkalinity (calc. as CaCO3)	mg/L	270	1.0	4936801	300	1.0	4936801	410	1.0	4936801
Calculated TDS	mg/L	600	1.0	4936813	740	1.0	4936813	980	1.0	4936813
Carb. Alkalinity (calc. as CaCO3)	mg/L	1.6	1.0	4936801	1.9	1.0	4936801	2.8	1.0	4936801
Cation Sum	me/L	9.81	N/A	4936806	12.4	N/A	4936806	18.0	N/A	4936806
Hardness (CaCO3)	mg/L	450	1.0	4936804	540	1.0	4936804	730	1.0	4936804
Ion Balance (% Difference)	%	4.62	N/A	4936805	4.21	N/A	4936805	1.25	N/A	4936805
Langelier Index (@ 20C)	N/A	0.800	N/A	4936811	0.880	N/A	4936811	0.956	N/A	4936811
Langelier Index (@ 4C)	N/A	0.553	N/A	4936812	0.633	N/A	4936812	0.710	N/A	4936812
Saturation pH (@ 20C)	N/A	6.99	N/A	4936811	6.94	N/A	4936811	6.90	N/A	4936811
Saturation pH (@ 4C)	N/A	7.24	N/A	4936812	7.18	N/A	4936812	7.14	N/A	4936812
Inorganics										
Total Ammonia-N	mg/L	0.96	0.050	4938715	0.50	0.050	4938715	0.14	0.050	4938715
Conductivity	umho/cm	980	1.0	4937809	1200	1.0	4937809	1800	1.0	4937809
Dissolved Organic Carbon	mg/L	0.57	0.20	4937584	1.9	0.20	4937584	2.1	0.20	4937584
Orthophosphate (P)	mg/L	<0.010	0.010	4938098	<0.010	0.010	4938098	<0.010	0.010	4938098
pH	pH	7.79	N/A	4937811	7.82	N/A	4937811	7.85	N/A	4937811
Total Suspended Solids	mg/L	2100	50	4939754	1900	5	4937462	270	3	4937540
Dissolved Sulphate (SO4)	mg/L	220	1.0	4938104	270	1.0	4938104	220	1.0	4938104
Alkalinity (Total as CaCO3)	mg/L	270	1.0	4937613	310	1.0	4937613	410	1.0	4937613
Dissolved Chloride (Cl)	mg/L	28	1.0	4938093	62	1.0	4938093	200	2.0	4938093
Nitrite (N)	mg/L	<0.010	0.010	4937672	<0.010	0.010	4937642	<0.010	0.010	4937642
Nitrate (N)	mg/L	<0.10	0.10	4937672	<0.10	0.10	4937642	1.34	0.10	4937642
Nitrate + Nitrite (N)	mg/L	<0.10	0.10	4937672	<0.10	0.10	4937642	1.34	0.10	4937642

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
N/A = Not Applicable

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Maxxam Job #: B772423
Report Date: 2017/04/20

Golder Associates Ltd
Client Project #: 1771656 (1000/1003)
Sampler Initials: TP

RESULTS OF ANALYSES OF WATER

Maxxam ID		EEV140	EEV140		EEV141		
Sampling Date		2017/04/10 12:53	2017/04/10 12:53		2017/04/10 12:53		
COC Number		605301-01-01	605301-01-01		605301-01-01		
	UNITS	**MW17-9D**	**MW17-9D Lab-Dup**	**QC Batch**	**MW17-99D**	**RDL**	**QC Batch**
Calculated Parameters							
Anion Sum	me/L	34.2	N/A	4936806	34.0	N/A	4936806
Bicarb. Alkalinity (calc. as CaCO3)	mg/L	300	N/A	4936801	310	1.0	4936801
Calculated TDS	mg/L	2200	N/A	4936813	2100	1.0	4936813
Carb. Alkalinity (calc. as CaCO3)	mg/L	1.7	N/A	4936801	1.8	1.0	4936801
Cation Sum	me/L	33.3	N/A	4936806	33.3	N/A	4936806
Hardness (CaCO3)	mg/L	1200	N/A	4936804	1200	1.0	4936804
Ion Balance (% Difference)	%	1.37	N/A	4936805	1.07	N/A	4936805
Langelier Index (@ 20C)	N/A	1.15	N/A	4936811	1.17	N/A	4936811
Langelier Index (@ 4C)	N/A	0.909	N/A	4936812	0.925	N/A	4936812
Saturation pH (@ 20C)	N/A	6.63	N/A	4936811	6.62	N/A	4936811
Saturation pH (@ 4C)	N/A	6.87	N/A	4936812	6.87	N/A	4936812
Inorganics							
Total Ammonia-N	mg/L	3.7	3.8	4938715	3.8	0.050	4938715
Conductivity	umho/cm	2900	N/A	4937809	2900	1.0	4937809
Dissolved Organic Carbon	mg/L	1.0	N/A	4937584	1.1	0.20	4937584
Orthophosphate (P)	mg/L	<0.010	<0.010	4938098	<0.010	0.010	4938098
pH	pH	7.78	N/A	4937811	7.79	N/A	4937811
Total Suspended Solids	mg/L	38	N/A	4937540	42	2	4937540
Dissolved Sulphate (SO4)	mg/L	1200	1200	4938104	1200	5.0	4938104
Alkalinity (Total as CaCO3)	mg/L	310	N/A	4937613	310	1.0	4937613
Dissolved Chloride (Cl)	mg/L	98	94	4938093	90	1.0	4938093
Nitrite (N)	mg/L	<0.010	N/A	4937642	<0.010	0.010	4937672
Nitrate (N)	mg/L	<0.10	N/A	4937642	<0.10	0.10	4937672
Nitrate + Nitrite (N)	mg/L	<0.10	N/A	4937642	<0.10	0.10	4937672

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Maxxam Analytics International Corporation o/a Maxxam Analytics 6740 Campobello Road, Mississauga, Ontario, L5N 2L8 Tel: (905) 817-5700 Toll-Free: 800-563-6266 Fax: (905) 817-5777 www.maxxam.ca

Maxxam Job #: B772423
Report Date: 2017/04/20

Golder Associates Ltd
Client Project #: 1771656 (1000/1003)
Sampler Initials: TP

RESULTS OF ANALYSES OF WATER

Maxxam ID		EEV142			EEV143			EEV144		
Sampling Date		2017/04/10 13:59			2017/04/10 13:56			2017/04/10 15:34		
COC Number		605301-02-01			605301-02-01			605301-02-01		
	UNITS	MW17-8D	RDL	QC Batch	MW17-8S	RDL	QC Batch	MW17-10D	RDL	QC Batch
Calculated Parameters										
Anion Sum	me/L	36.8	N/A	4936806	11.3	N/A	4936806	25.6	N/A	4936806
Bicarb. Alkalinity (calc. as CaCO3)	mg/L	320	1.0	4936801	340	1.0	4936801	310	1.0	4936801
Calculated TDS	mg/L	2300	1.0	4936813	590	1.0	4936813	1600	1.0	4936813
Carb. Alkalinity (calc. as CaCO3)	mg/L	1.3	1.0	4936801	2.1	1.0	4936801	<1.0	1.0	4936801
Cation Sum	me/L	34.7	N/A	4936806	10.7	N/A	4936806	25.6	N/A	4936806
Hardness (CaCO3)	mg/L	1500	1.0	4936804	470	1.0	4936804	1200	1.0	4936804
Ion Balance (% Difference)	%	2.95	N/A	4936805	2.32	N/A	4936805	0.120	N/A	4936805
Langelier Index (@ 20C)	N/A	1.13	N/A	4936811	0.813	N/A	4936811	0.945	N/A	4936811
Langelier Index (@ 4C)	N/A	0.886	N/A	4936812	0.565	N/A	4936812	0.701	N/A	4936812
Saturation pH (@ 20C)	N/A	6.52	N/A	4936811	7.00	N/A	4936811	6.57	N/A	4936811
Saturation pH (@ 4C)	N/A	6.76	N/A	4936812	7.25	N/A	4936812	6.81	N/A	4936812
Inorganics										
Total Ammonia-N	mg/L	2.5	0.050	4938715	0.44	0.050	4938715	0.58	0.050	4938715
Conductivity	umho/cm	2800	1.0	4937827	1000	1.0	4937827	2000	1.0	4937827
Dissolved Organic Carbon	mg/L	1.8	0.20	4937584	2.9	0.20	4937584	1.0	0.20	4937584
Orthophosphate (P)	mg/L	<0.010	0.010	4938098	0.015	0.010	4938098	<0.010	0.010	4938098
pH	pH	7.65	N/A	4937828	7.81	N/A	4937828	7.51	N/A	4937828
Total Suspended Solids	mg/L	170	3	4939006	1900	20	4939754	240	2	4939006
Dissolved Sulphate (SO4)	mg/L	1400	5.0	4938104	160	1.0	4938104	910	5.0	4946383
Alkalinity (Total as CaCO3)	mg/L	320	1.0	4937823	340	1.0	4937823	310	1.0	4946220
Dissolved Chloride (Cl)	mg/L	36	1.0	4938093	40	1.0	4938093	21	1.0	4946377
Nitrite (N)	mg/L	<0.010	0.010	4939014	<0.010	0.010	4939014	<0.010	0.010	4939014
Nitrate (N)	mg/L	<0.10	0.10	4939014	<0.10	0.10	4939014	<0.10	0.10	4939014
Nitrate + Nitrite (N)	mg/L	<0.10	0.10	4939014	<0.10	0.10	4939014	<0.10	0.10	4939014

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N/A = Not Applicable

Maxxam Job #: B772423
Report Date: 2017/04/20

Golder Associates Ltd
Client Project #: 1771656 (1000/1003)
Sampler Initials: TP

RESULTS OF ANALYSES OF WATER

Maxxam ID		EEV144			EEV145	EEV145		
Sampling Date		2017/04/10 15:34			2017/04/11 09:15	2017/04/11 09:15		
COC Number		605301-02-01			605301-02-01	605301-02-01		
	UNITS	**MW17-10D Lab-Dup**	**RDL**	**QC Batch**	**POND**	**POND Lab-Dup**	**RDL**	**QC Batch**
Calculated Parameters								
Bicarb. Alkalinity (calc. as CaCO3)	mg/L	N/A	1.0	4936801	140	N/A	1.0	4936801
Calculated TDS	mg/L	N/A	1.0	4936813	870	N/A	1.0	4936813
Carb. Alkalinity (calc. as CaCO3)	mg/L	N/A	1.0	4936801	1.1	N/A	1.0	4936801
Hardness (CaCO3)	mg/L	N/A	1.0	4936804	670	N/A	1.0	4936804
Langelier Index (@ 20C)	N/A	N/A	N/A	4936811	0.802	N/A	N/A	4936811
Langelier Index (@ 4C)	N/A	N/A	N/A	4936812	0.556	N/A	N/A	4936812
Saturation pH (@ 20C)	N/A	N/A	N/A	4936811	7.13	N/A	N/A	4936811
Saturation pH (@ 4C)	N/A	N/A	N/A	4936812	7.38	N/A	N/A	4936812
Inorganics								
Total Ammonia-N	mg/L	N/A	0.050	4938715	<0.050	N/A	0.050	4938715
Conductivity	umho/cm	2000	1.0	4937827	1300	N/A	1.0	4937260
Total Organic Carbon (TOC)	mg/L	N/A	0.20	N/A	2.1	2.1	0.20	4939254
Orthophosphate (P)	mg/L	N/A	0.010	4938098	<0.010	N/A	0.010	4937417
pH	pH	7.50	N/A	4937828	7.93	N/A	N/A	4937231
Total Phosphorus	mg/L	N/A	0.004	N/A	0.005	N/A	0.004	4938578
Total Suspended Solids	mg/L	N/A	2	4939006	<3	N/A	3	4937462
Dissolved Sulphate (SO4)	mg/L	N/A	5.0	4946383	460	N/A	2.0	4937418
Turbidity	NTU	N/A	N/A	N/A	1.5	N/A	0.1	4937002
Alkalinity (Total as CaCO3)	mg/L	N/A	1.0	4946220	140	N/A	1.0	4937223
Dissolved Chloride (Cl)	mg/L	N/A	1.0	4946377	45	N/A	1.0	4937408
Nitrite (N)	mg/L	N/A	0.010	4939014	<0.010	N/A	0.010	4937451
Nitrate (N)	mg/L	N/A	0.10	4939014	0.73	N/A	0.10	4937451

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Maxxam Job #: B772423
Report Date: 2017/04/20

Golder Associates Ltd
Client Project #: 1771656 (1000/1003)
Sampler Initials: TP

ELEMENTS BY ATOMIC SPECTROSCOPY (WATER)

Maxxam ID		EEV132	EEV132		EEV133	EEV134		
Sampling Date		2017/04/10 14:45	2017/04/10 14:45		2017/04/10 14:42	2017/04/10 16:30		
COC Number		605301-01-01	605301-01-01		605301-01-01	605301-01-01		
	UNITS	**MW17-1D**	**MW17-1D Lab-Dup**	**RDL**	**MW17-1S**	**MW17-4S**	**RDL**	**QC Batch**
Metals								
Dissolved Calcium (Ca)	mg/L	320	320	1.0	49	110	0.20	4937519
Dissolved Magnesium (Mg)	mg/L	84	81	0.050	25	90	0.050	4937519
Dissolved Potassium (K)	mg/L	11	10	0.20	4.0	3.0	0.20	4937519
Dissolved Sodium (Na)	mg/L	36	35	0.10	160	18	0.10	4937519
Dissolved Aluminum (Al)	mg/L	0.0059	0.0059	0.0050	0.018	0.0094	0.0050	4937519
Dissolved Antimony (Sb)	mg/L	<0.00050	<0.00050	0.00050	0.0017	<0.00050	0.00050	4937519
Dissolved Arsenic (As)	mg/L	<0.0010	<0.0010	0.0010	0.0028	<0.0010	0.0010	4937519
Dissolved Barium (Ba)	mg/L	0.016	0.016	0.0020	0.076	0.071	0.0020	4937519
Dissolved Beryllium (Be)	mg/L	<0.00050	<0.00050	0.00050	<0.00050	<0.00050	0.00050	4937519
Dissolved Boron (B)	mg/L	1.6	1.6	0.010	0.19	0.11	0.010	4937519
Dissolved Cadmium (Cd)	mg/L	<0.00010	<0.00010	0.00010	<0.00010	<0.00010	0.00010	4937519
Dissolved Chromium (Cr)	mg/L	<0.0050	<0.0050	0.0050	<0.0050	<0.0050	0.0050	4937519
Dissolved Cobalt (Co)	mg/L	<0.00050	<0.00050	0.00050	<0.00050	0.00075	0.00050	4937519
Dissolved Copper (Cu)	mg/L	<0.0010	<0.0010	0.0010	0.0030	0.0011	0.0010	4937519
Dissolved Iron (Fe)	mg/L	0.13	0.13	0.10	<0.10	<0.10	0.10	4937519
Dissolved Lead (Pb)	mg/L	<0.00050	<0.00050	0.00050	<0.00050	<0.00050	0.00050	4937519
Dissolved Manganese (Mn)	mg/L	0.011	0.010	0.0020	0.017	0.061	0.0020	4937519
Dissolved Molybdenum (Mo)	mg/L	<0.00050	<0.00050	0.00050	0.082	0.016	0.00050	4937519
Dissolved Nickel (Ni)	mg/L	<0.0010	<0.0010	0.0010	0.0016	0.0067	0.0010	4937519
Dissolved Phosphorus (P)	mg/L	<0.10	<0.10	0.10	<0.10	<0.10	0.10	4937519
Dissolved Selenium (Se)	mg/L	<0.0020	<0.0020	0.0020	<0.0020	<0.0020	0.0020	4937519
Dissolved Silicon (Si)	mg/L	7.0	6.8	0.050	2.8	3.9	0.050	4937519
Dissolved Silver (Ag)	mg/L	<0.00010	<0.00010	0.00010	<0.00010	<0.00010	0.00010	4937519
Dissolved Strontium (Sr)	mg/L	12	12	0.0010	1.8	2.2	0.0010	4937519
Dissolved Thallium (Tl)	mg/L	<0.000050	<0.000050	0.000050	<0.000050	<0.000050	0.000050	4937519
Dissolved Titanium (Ti)	mg/L	<0.0050	<0.0050	0.0050	<0.0050	<0.0050	0.0050	4937519
Dissolved Uranium (U)	mg/L	<0.00010	<0.00010	0.00010	0.011	0.026	0.00010	4937519
Dissolved Vanadium (V)	mg/L	<0.00050	<0.00050	0.00050	0.0021	0.0012	0.00050	4937519
Dissolved Zinc (Zn)	mg/L	<0.0050	<0.0050	0.0050	<0.0050	<0.0050	0.0050	4937519

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Maxxam Job #: B772423
Report Date: 2017/04/20

Golder Associates Ltd
Client Project #: 1771656 (1000/1003)
Sampler Initials: TP

ELEMENTS BY ATOMIC SPECTROSCOPY (WATER)

Maxxam ID		EEV135		EEV136	EEV137		EEV138		
Sampling Date		2017/04/11 08:45		2017/04/10 15:14	2017/04/10 13:28		2017/04/10 13:28		
COC Number		605301-01-01		605301-01-01	605301-01-01		605301-01-01		
	UNITS	MW17-2S	RDL	MW17-3D	MW17-6D	RDL	MW17-6S	RDL	QC Batch
Metals									
Dissolved Calcium (Ca)	mg/L	79	0.40	120	120	1.0	120	0.40	4937519
Dissolved Magnesium (Mg)	mg/L	51	0.050	61	39	0.050	57	0.050	4937519
Dissolved Potassium (K)	mg/L	3.4	0.20	5.0	7.8	0.20	5.3	0.20	4937519
Dissolved Sodium (Na)	mg/L	46	0.10	19	13	0.10	31	0.10	4937519
Dissolved Aluminum (Al)	mg/L	0.0065	0.0050	0.0057	0.0078	0.0050	0.0069	0.0050	4937519
Dissolved Antimony (Sb)	mg/L	<0.00050	0.00050	<0.00050	<0.00050	0.00050	<0.00050	0.00050	4937519
Dissolved Arsenic (As)	mg/L	<0.0010	0.0010	<0.0010	<0.0010	0.0010	<0.0010	0.0010	4937519
Dissolved Barium (Ba)	mg/L	0.065	0.0020	0.010	0.0051	0.0020	0.019	0.0020	4937519
Dissolved Beryllium (Be)	mg/L	<0.00050	0.00050	<0.00050	<0.00050	0.00050	<0.00050	0.00050	4937519
Dissolved Boron (B)	mg/L	0.28	0.010	0.20	0.50	0.010	0.38	0.010	4937519
Dissolved Cadmium (Cd)	mg/L	<0.00010	0.00010	<0.00010	<0.00010	0.00010	<0.00010	0.00010	4937519
Dissolved Chromium (Cr)	mg/L	<0.0050	0.0050	<0.0050	<0.0050	0.0050	<0.0050	0.0050	4937519
Dissolved Cobalt (Co)	mg/L	<0.00050	0.00050	<0.00050	<0.00050	0.00050	<0.00050	0.00050	4937519
Dissolved Copper (Cu)	mg/L	0.0021	0.0010	<0.0010	<0.0010	0.0010	<0.0010	0.0010	4937519
Dissolved Iron (Fe)	mg/L	<0.10	0.10	<0.10	<0.10	0.10	<0.10	0.10	4937519
Dissolved Lead (Pb)	mg/L	<0.00050	0.00050	<0.00050	<0.00050	0.00050	<0.00050	0.00050	4937519
Dissolved Manganese (Mn)	mg/L	0.094	0.0020	0.0038	0.0030	0.0020	0.012	0.0020	4937519
Dissolved Molybdenum (Mo)	mg/L	0.030	0.00050	0.0014	<0.00050	0.00050	<0.00050	0.00050	4937519
Dissolved Nickel (Ni)	mg/L	0.0040	0.0010	<0.0010	<0.0010	0.0010	<0.0010	0.0010	4937519
Dissolved Phosphorus (P)	mg/L	<0.10	0.10	<0.10	<0.10	0.10	<0.10	0.10	4937519
Dissolved Selenium (Se)	mg/L	<0.0020	0.0020	<0.0020	<0.0020	0.0020	<0.0020	0.0020	4937519
Dissolved Silicon (Si)	mg/L	3.3	0.050	10	7.5	0.050	5.6	0.050	4937519
Dissolved Silver (Ag)	mg/L	<0.00010	0.00010	<0.00010	<0.00010	0.00010	<0.00010	0.00010	4937519
Dissolved Strontium (Sr)	mg/L	5.1	0.0010	15	14	0.0010	7.0	0.0010	4937519
Dissolved Thallium (Tl)	mg/L	<0.000050	0.000050	<0.000050	<0.000050	0.000050	<0.000050	0.000050	4937519
Dissolved Titanium (Ti)	mg/L	<0.0050	0.0050	<0.0050	<0.0050	0.0050	<0.0050	0.0050	4937519
Dissolved Uranium (U)	mg/L	0.0058	0.00010	0.00019	<0.00010	0.00010	0.00060	0.00010	4937519
Dissolved Vanadium (V)	mg/L	0.00086	0.00050	<0.00050	<0.00050	0.00050	<0.00050	0.00050	4937519
Dissolved Zinc (Zn)	mg/L	<0.0050	0.0050	<0.0050	<0.0050	0.0050	<0.0050	0.0050	4937519

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Maxxam Job #: B772423
Report Date: 2017/04/20

Golder Associates Ltd
Client Project #: 1771656 (1000/1003)
Sampler Initials: TP

ELEMENTS BY ATOMIC SPECTROSCOPY (WATER)

Maxxam ID		EEV139		EEV140	EEV141	EEV142		
Sampling Date		2017/04/10 13:00		2017/04/10 12:53	2017/04/10 12:53	2017/04/10 13:59		
COC Number		605301-01-01		605301-01-01	605301-01-01	605301-02-01		
	UNITS	MW17-9S	RDL	MW17-9D	MW17-99D	MW17-8D	RDL	QC Batch
Metals								
Dissolved Calcium (Ca)	mg/L	110	0.20	350	350	440	0.40	4937519
Dissolved Magnesium (Mg)	mg/L	110	0.050	88	89	100	0.050	4937519
Dissolved Potassium (K)	mg/L	3.1	0.20	22	22	17	0.20	4937519
Dissolved Sodium (Na)	mg/L	79	0.10	170	170	83	0.10	4937519
Dissolved Aluminum (Al)	mg/L	0.0059	0.0050	0.016	0.0077	0.0078	0.0050	4937519
Dissolved Antimony (Sb)	mg/L	<0.00050	0.00050	<0.00050	<0.00050	<0.00050	0.00050	4937519
Dissolved Arsenic (As)	mg/L	<0.0010	0.0010	<0.0010	<0.0010	0.0010	0.0010	4937519
Dissolved Barium (Ba)	mg/L	0.023	0.0020	0.0094	0.010	0.015	0.0020	4937519
Dissolved Beryllium (Be)	mg/L	<0.00050	0.00050	<0.00050	<0.00050	<0.00050	0.00050	4937519
Dissolved Boron (B)	mg/L	0.096	0.010	3.9	3.9	2.4	0.010	4937519
Dissolved Cadmium (Cd)	mg/L	<0.00010	0.00010	<0.00010	<0.00010	<0.00010	0.00010	4937519
Dissolved Chromium (Cr)	mg/L	<0.0050	0.0050	<0.0050	<0.0050	<0.0050	0.0050	4937519
Dissolved Cobalt (Co)	mg/L	0.0012	0.00050	<0.00050	<0.00050	<0.00050	0.00050	4937519
Dissolved Copper (Cu)	mg/L	<0.0010	0.0010	<0.0010	<0.0010	<0.0010	0.0010	4937519
Dissolved Iron (Fe)	mg/L	<0.10	0.10	<0.10	<0.10	<0.10	0.10	4937519
Dissolved Lead (Pb)	mg/L	<0.00050	0.00050	<0.00050	<0.00050	<0.00050	0.00050	4937519
Dissolved Manganese (Mn)	mg/L	0.031	0.0020	0.0084	0.0079	0.019	0.0020	4937519
Dissolved Molybdenum (Mo)	mg/L	0.00070	0.00050	<0.00050	<0.00050	<0.00050	0.00050	4937519
Dissolved Nickel (Ni)	mg/L	0.0022	0.0010	<0.0010	<0.0010	<0.0010	0.0010	4937519
Dissolved Phosphorus (P)	mg/L	<0.10	0.10	<0.10	<0.10	<0.10	0.10	4937519
Dissolved Selenium (Se)	mg/L	0.0020	0.0020	<0.0020	<0.0020	<0.0020	0.0020	4937519
Dissolved Silicon (Si)	mg/L	4.4	0.050	4.1	4.0	3.9	0.050	4937519
Dissolved Silver (Ag)	mg/L	<0.00010	0.00010	<0.00010	<0.00010	<0.00010	0.00010	4937519
Dissolved Strontium (Sr)	mg/L	3.5	0.0010	8.1	8.2	10	0.0010	4937519
Dissolved Thallium (Tl)	mg/L	<0.000050	0.000050	<0.000050	<0.000050	<0.000050	0.000050	4937519
Dissolved Titanium (Ti)	mg/L	<0.0050	0.0050	<0.0050	<0.0050	<0.0050	0.0050	4937519
Dissolved Uranium (U)	mg/L	0.0036	0.00010	0.00033	0.00033	0.00054	0.00010	4937519
Dissolved Vanadium (V)	mg/L	<0.00050	0.00050	<0.00050	<0.00050	<0.00050	0.00050	4937519
Dissolved Zinc (Zn)	mg/L	<0.0050	0.0050	<0.0050	<0.0050	<0.0050	0.0050	4937519

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

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Maxxam Job #: B772423
Report Date: 2017/04/20

Golder Associates Ltd
Client Project #: 1771656 (1000/1003)
Sampler Initials: TP

ELEMENTS BY ATOMIC SPECTROSCOPY (WATER)

Maxxam ID		EEV143			EEV144			EEV145		
Sampling Date		2017/04/10 13:56			2017/04/10 15:34			2017/04/11 09:15		
COC Number		605301-02-01			605301-02-01			605301-02-01		
	UNITS	MW17-8S	RDL	QC Batch	MW17-10D	RDL	QC Batch	POND	RDL	QC Batch
Metals										
Dissolved Calcium (Ca)	mg/L	91	0.20	4937519	360	1.0	4946951	180	0.05	4941831
Dissolved Magnesium (Mg)	mg/L	59	0.050	4937519	81	0.050	4946951	53	0.05	4941831
Dissolved Potassium (K)	mg/L	2.9	0.20	4937519	5.8	0.20	4946951	6	1	4941831
Dissolved Sodium (Na)	mg/L	28	0.10	4937519	19	0.10	4946951	36	0.5	4941831
Dissolved Aluminum (Al)	mg/L	0.0077	0.0050	4937519	<0.0050	0.0050	4946951	N/A	N/A	N/A
Total Aluminum (Al)	mg/L	N/A	N/A	N/A	N/A	N/A	N/A	0.047	0.0050	4941659
Dissolved Antimony (Sb)	mg/L	<0.00050	0.00050	4937519	<0.00050	0.00050	4946951	N/A	N/A	N/A
Total Antimony (Sb)	mg/L	N/A	N/A	N/A	N/A	N/A	N/A	<0.00050	0.00050	4941659
Dissolved Arsenic (As)	mg/L	0.0010	0.0010	4937519	<0.0010	0.0010	4946951	N/A	N/A	N/A
Total Arsenic (As)	mg/L	N/A	N/A	N/A	N/A	N/A	N/A	<0.0010	0.0010	4941659
Dissolved Barium (Ba)	mg/L	0.023	0.0020	4937519	0.0073	0.0020	4946951	N/A	N/A	N/A
Total Barium (Ba)	mg/L	N/A	N/A	N/A	N/A	N/A	N/A	0.038	0.0020	4941659
Dissolved Beryllium (Be)	mg/L	<0.00050	0.00050	4937519	<0.00050	0.00050	4946951	N/A	N/A	N/A
Total Beryllium (Be)	mg/L	N/A	N/A	N/A	N/A	N/A	N/A	<0.00050	0.00050	4941659
Dissolved Boron (B)	mg/L	0.22	0.010	4937519	0.39	0.010	4946951	N/A	N/A	N/A
Total Boron (B)	mg/L	N/A	N/A	N/A	N/A	N/A	N/A	0.24	0.010	4941659
Dissolved Cadmium (Cd)	mg/L	<0.00010	0.00010	4937519	<0.00010	0.00010	4946951	N/A	N/A	N/A
Total Cadmium (Cd)	mg/L	N/A	N/A	N/A	N/A	N/A	N/A	<0.00010	0.00010	4941659
Total Calcium (Ca)	mg/L	N/A	N/A	N/A	N/A	N/A	N/A	170	0.20	4941659
Dissolved Chromium (Cr)	mg/L	<0.0050	0.0050	4937519	<0.0050	0.0050	4946951	N/A	N/A	N/A
Total Chromium (Cr)	mg/L	N/A	N/A	N/A	N/A	N/A	N/A	<0.0050	0.0050	4941659
Dissolved Cobalt (Co)	mg/L	<0.00050	0.00050	4937519	<0.00050	0.00050	4946951	N/A	N/A	N/A
Total Cobalt (Co)	mg/L	N/A	N/A	N/A	N/A	N/A	N/A	<0.00050	0.00050	4941659
Dissolved Copper (Cu)	mg/L	<0.0010	0.0010	4937519	<0.0010	0.0010	4946951	N/A	N/A	N/A
Total Copper (Cu)	mg/L	N/A	N/A	N/A	N/A	N/A	N/A	0.0014	0.0010	4941659
Dissolved Iron (Fe)	mg/L	0.13	0.10	4937519	<0.10	0.10	4946951	N/A	N/A	N/A
Total Iron (Fe)	mg/L	N/A	N/A	N/A	N/A	N/A	N/A	<0.10	0.10	4941659
Dissolved Lead (Pb)	mg/L	<0.00050	0.00050	4937519	<0.00050	0.00050	4946951	N/A	N/A	N/A
Total Lead (Pb)	mg/L	N/A	N/A	N/A	N/A	N/A	N/A	<0.00050	0.00050	4941659
Total Magnesium (Mg)	mg/L	N/A	N/A	N/A	N/A	N/A	N/A	52	0.050	4941659
Dissolved Manganese (Mn)	mg/L	0.021	0.0020	4937519	0.0055	0.0020	4946951	N/A	N/A	N/A
Total Manganese (Mn)	mg/L	N/A	N/A	N/A	N/A	N/A	N/A	0.0046	0.0020	4941659
Dissolved Molybdenum (Mo)	mg/L	0.0019	0.00050	4937519	<0.00050	0.00050	4946951	N/A	N/A	N/A
Total Molybdenum (Mo)	mg/L	N/A	N/A	N/A	N/A	N/A	N/A	0.0085	0.00050	4941659

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Maxxam Job #: B772423
Report Date: 2017/04/20

Golder Associates Ltd
Client Project #: 1771656 (1000/1003)
Sampler Initials: TP

ELEMENTS BY ATOMIC SPECTROSCOPY (WATER)

Maxxam ID		EEV143			EEV144			EEV145		
Sampling Date		2017/04/10 13:56			2017/04/10 15:34			2017/04/11 09:15		
COC Number		605301-02-01			605301-02-01			605301-02-01		
	UNITS	**MW17-8S**	**RDL**	**QC Batch**	**MW17-10D**	**RDL**	**QC Batch**	**POND**	**RDL**	**QC Batch**
Dissolved Nickel (Ni)	mg/L	0.0014	0.0010	4937519	<0.0010	0.0010	4946951	N/A	N/A	N/A
Total Nickel (Ni)	mg/L	N/A	N/A	N/A	N/A	N/A	N/A	0.0049	0.0010	4941659
Dissolved Phosphorus (P)	mg/L	0.10	0.10	4937519	<0.10	0.10	4946951	N/A	N/A	N/A
Total Potassium (K)	mg/L	N/A	N/A	N/A	N/A	N/A	N/A	5.4	0.20	4941659
Dissolved Selenium (Se)	mg/L	<0.0020	0.0020	4937519	<0.0020	0.0020	4946951	N/A	N/A	N/A
Total Selenium (Se)	mg/L	N/A	N/A	N/A	N/A	N/A	N/A	<0.0020	0.0020	4941659
Dissolved Silicon (Si)	mg/L	3.9	0.050	4937519	8.1	0.050	4946951	N/A	N/A	N/A
Total Silicon (Si)	mg/L	N/A	N/A	N/A	N/A	N/A	N/A	1.5	0.050	4941659
Dissolved Silver (Ag)	mg/L	<0.00010	0.00010	4937519	<0.00010	0.00010	4946951	N/A	N/A	N/A
Total Silver (Ag)	mg/L	N/A	N/A	N/A	N/A	N/A	N/A	<0.00010	0.00010	4941659
Total Sodium (Na)	mg/L	N/A	N/A	N/A	N/A	N/A	N/A	32	0.10	4941659
Dissolved Strontium (Sr)	mg/L	3.2	0.0010	4937519	11	0.0010	4946951	N/A	N/A	N/A
Total Strontium (Sr)	mg/L	N/A	N/A	N/A	N/A	N/A	N/A	4.8	0.0010	4941659
Dissolved Thallium (Tl)	mg/L	<0.000050	0.000050	4937519	<0.000050	0.000050	4946951	N/A	N/A	N/A
Total Thallium (Tl)	mg/L	N/A	N/A	N/A	N/A	N/A	N/A	<0.000050	0.000050	4941659
Dissolved Titanium (Ti)	mg/L	<0.0050	0.0050	4937519	<0.0050	0.0050	4946951	N/A	N/A	N/A
Total Titanium (Ti)	mg/L	N/A	N/A	N/A	N/A	N/A	N/A	<0.0050	0.0050	4941659
Dissolved Uranium (U)	mg/L	0.00070	0.00010	4937519	0.00011	0.00010	4946951	N/A	N/A	N/A
Dissolved Vanadium (V)	mg/L	0.00066	0.00050	4937519	<0.00050	0.00050	4946951	N/A	N/A	N/A
Total Vanadium (V)	mg/L	N/A	N/A	N/A	N/A	N/A	N/A	<0.00050	0.00050	4941659
Dissolved Zinc (Zn)	mg/L	<0.0050	0.0050	4937519	<0.0050	0.0050	4946951	N/A	N/A	N/A
Total Zinc (Zn)	mg/L	N/A	N/A	N/A	N/A	N/A	N/A	<0.0050	0.0050	4941659

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Maxxam Job #: B772423
Report Date: 2017/04/20

Golder Associates Ltd
Client Project #: 1771656 (1000/1003)
Sampler Initials: TP

TEST SUMMARY

Maxxam ID: EEV132
Sample ID: MW17-1D
Matrix: Water

Collected: 2017/04/10
Shipped:
Received: 2017/04/11

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Alkalinity	AT	4937823	N/A	2017/04/13	Surinder Rai
Carbonate, Bicarbonate and Hydroxide	CALC	4936801	N/A	2017/04/17	Automated Statchk
Chloride by Automated Colourimetry	KONE	4938093	N/A	2017/04/17	Alina Dobreanu
Conductivity	AT	4937827	N/A	2017/04/13	Surinder Rai
Dissolved Organic Carbon (DOC)	TOCV/NDIR	4937584	N/A	2017/04/13	Anastasia Hamanov
Hardness (calculated as CaCO3)		4936804	N/A	2017/04/13	Automated Statchk
Dissolved Metals by ICPMS	ICP/MS	4937519	N/A	2017/04/13	Thao Nguyen
Ion Balance (% Difference)	CALC	4936805	N/A	2017/04/18	Automated Statchk
Anion and Cation Sum	CALC	4936806	N/A	2017/04/17	Automated Statchk
Total Ammonia-N	LACH/NH4	4938710	N/A	2017/04/18	Charles Opoku-Ware
Nitrate (NO3) and Nitrite (NO2) in Water	LACH	4939014	N/A	2017/04/13	Chandra Nandlal
pH	AT	4937828	N/A	2017/04/13	Surinder Rai
Orthophosphate	KONE	4938098	N/A	2017/04/17	Alina Dobreanu
Sat. pH and Langelier Index (@ 20C)	CALC	4936811	N/A	2017/04/18	Automated Statchk
Sat. pH and Langelier Index (@ 4C)	CALC	4936812	N/A	2017/04/18	Automated Statchk
Sulphate by Automated Colourimetry	KONE	4938104	N/A	2017/04/17	Alina Dobreanu
Total Dissolved Solids (TDS calc)	CALC	4936813	N/A	2017/04/18	Automated Statchk
Low Level Total Suspended Solids	BAL	4939006	2017/04/13	2017/04/13	Arpan Shah

Maxxam ID: EEV132 Dup
Sample ID: MW17-1D
Matrix: Water

Collected: 2017/04/10
Shipped:
Received: 2017/04/11

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Dissolved Metals by ICPMS	ICP/MS	4937519	N/A	2017/04/13	Thao Nguyen

Maxxam ID: EEV133
Sample ID: MW17-1S
Matrix: Water

Collected: 2017/04/10
Shipped:
Received: 2017/04/11

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Alkalinity	AT	4937613	N/A	2017/04/13	Surinder Rai
Carbonate, Bicarbonate and Hydroxide	CALC	4936801	N/A	2017/04/17	Automated Statchk
Chloride by Automated Colourimetry	KONE	4938093	N/A	2017/04/17	Alina Dobreanu
Conductivity	AT	4937809	N/A	2017/04/13	Surinder Rai
Dissolved Organic Carbon (DOC)	TOCV/NDIR	4938932	N/A	2017/04/13	Anastasia Hamanov
Hardness (calculated as CaCO3)		4936804	N/A	2017/04/13	Automated Statchk
Dissolved Metals by ICPMS	ICP/MS	4937519	N/A	2017/04/13	Thao Nguyen
Ion Balance (% Difference)	CALC	4936805	N/A	2017/04/18	Automated Statchk
Anion and Cation Sum	CALC	4936806	N/A	2017/04/17	Automated Statchk
Total Ammonia-N	LACH/NH4	4938710	N/A	2017/04/18	Charles Opoku-Ware
Nitrate (NO3) and Nitrite (NO2) in Water	LACH	4937672	N/A	2017/04/13	Chandra Nandlal
pH	AT	4937811	N/A	2017/04/13	Surinder Rai
Orthophosphate	KONE	4938098	N/A	2017/04/17	Alina Dobreanu
Sat. pH and Langelier Index (@ 20C)	CALC	4936811	N/A	2017/04/18	Automated Statchk

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Maxxam Job #: B772423
Report Date: 2017/04/20

Golder Associates Ltd
Client Project #: 1771656 (1000/1003)
Sampler Initials: TP

TEST SUMMARY

Maxxam ID: EEV133
Sample ID: MW17-1S
Matrix: Water

Collected: 2017/04/10
Shipped:
Received: 2017/04/11

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Sat. pH and Langelier Index (@ 4C)	CALC	4936812	N/A	2017/04/18	Automated Statchk
Sulphate by Automated Colourimetry	KONE	4938104	N/A	2017/04/17	Alina Dobreanu
Total Dissolved Solids (TDS calc)	CALC	4936813	N/A	2017/04/18	Automated Statchk
Total Suspended Solids	BAL	4937582	2017/04/12	2017/04/12	Xue Zheng Li(Scott)

Maxxam ID: EEV134
Sample ID: MW17-4S
Matrix: Water

Collected: 2017/04/10
Shipped:
Received: 2017/04/11

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Alkalinity	AT	4937613	N/A	2017/04/13	Surinder Rai
Carbonate, Bicarbonate and Hydroxide	CALC	4936801	N/A	2017/04/17	Automated Statchk
Chloride by Automated Colourimetry	KONE	4938093	N/A	2017/04/17	Alina Dobreanu
Conductivity	AT	4937809	N/A	2017/04/13	Surinder Rai
Dissolved Organic Carbon (DOC)	TOCV/NDIR	4937584	N/A	2017/04/13	Anastasia Hamanov
Hardness (calculated as CaCO3)		4936804	N/A	2017/04/13	Automated Statchk
Dissolved Metals by ICPMS	ICP/MS	4937519	N/A	2017/04/17	Thao Nguyen
Ion Balance (% Difference)	CALC	4936805	N/A	2017/04/18	Automated Statchk
Anion and Cation Sum	CALC	4936806	N/A	2017/04/17	Automated Statchk
Total Ammonia-N	LACH/NH4	4938710	N/A	2017/04/18	Charles Opoku-Ware
Nitrate (NO3) and Nitrite (NO2) in Water	LACH	4937642	N/A	2017/04/13	Chandra Nandlal
pH	AT	4937811	N/A	2017/04/13	Surinder Rai
Orthophosphate	KONE	4938098	N/A	2017/04/17	Alina Dobreanu
Sat. pH and Langelier Index (@ 20C)	CALC	4936811	N/A	2017/04/18	Automated Statchk
Sat. pH and Langelier Index (@ 4C)	CALC	4936812	N/A	2017/04/18	Automated Statchk
Sulphate by Automated Colourimetry	KONE	4938104	N/A	2017/04/17	Alina Dobreanu
Total Dissolved Solids (TDS calc)	CALC	4936813	N/A	2017/04/18	Automated Statchk
Low Level Total Suspended Solids	BAL	4939006	2017/04/13	2017/04/13	Arpan Shah

Maxxam ID: EEV135
Sample ID: MW17-2S
Matrix: Water

Collected: 2017/04/11
Shipped:
Received: 2017/04/11

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Alkalinity	AT	4937613	N/A	2017/04/13	Surinder Rai
Carbonate, Bicarbonate and Hydroxide	CALC	4936801	N/A	2017/04/17	Automated Statchk
Chloride by Automated Colourimetry	KONE	4938093	N/A	2017/04/17	Alina Dobreanu
Conductivity	AT	4937809	N/A	2017/04/13	Surinder Rai
Dissolved Organic Carbon (DOC)	TOCV/NDIR	4937584	N/A	2017/04/13	Anastasia Hamanov
Hardness (calculated as CaCO3)		4936804	N/A	2017/04/13	Automated Statchk
Dissolved Metals by ICPMS	ICP/MS	4937519	N/A	2017/04/13	Thao Nguyen
Ion Balance (% Difference)	CALC	4936805	N/A	2017/04/18	Automated Statchk
Anion and Cation Sum	CALC	4936806	N/A	2017/04/17	Automated Statchk
Total Ammonia-N	LACH/NH4	4938710	N/A	2017/04/18	Charles Opoku-Ware
Nitrate (NO3) and Nitrite (NO2) in Water	LACH	4937672	N/A	2017/04/13	Chandra Nandlal

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Maxxam Job #: B772423
Report Date: 2017/04/20

Golder Associates Ltd
Client Project #: 1771656 (1000/1003)
Sampler Initials: TP

TEST SUMMARY

Maxxam ID: EEV135 **Collected:** 2017/04/11
Sample ID: MW17-2S **Shipped:**
Matrix: Water **Received:** 2017/04/11

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
pH	AT	4937811	N/A	2017/04/13	Surinder Rai
Orthophosphate	KONE	4938098	N/A	2017/04/17	Alina Dobreanu
Sat. pH and Langelier Index (@ 20C)	CALC	4936811	N/A	2017/04/18	Automated Statchk
Sat. pH and Langelier Index (@ 4C)	CALC	4936812	N/A	2017/04/18	Automated Statchk
Sulphate by Automated Colourimetry	KONE	4938104	N/A	2017/04/17	Alina Dobreanu
Total Dissolved Solids (TDS calc)	CALC	4936813	N/A	2017/04/18	Automated Statchk
Total Suspended Solids	BAL	4937582	2017/04/12	2017/04/12	Xue Zheng Li(Scott)

Maxxam ID: EEV136 **Collected:** 2017/04/10
Sample ID: MW17-3D **Shipped:**
Matrix: Water **Received:** 2017/04/11

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Alkalinity	AT	4937613	N/A	2017/04/13	Surinder Rai
Carbonate, Bicarbonate and Hydroxide	CALC	4936801	N/A	2017/04/17	Automated Statchk
Chloride by Automated Colourimetry	KONE	4938093	N/A	2017/04/17	Alina Dobreanu
Conductivity	AT	4937809	N/A	2017/04/13	Surinder Rai
Dissolved Organic Carbon (DOC)	TOCV/NDIR	4937584	N/A	2017/04/13	Anastasia Hamanov
Hardness (calculated as CaCO3)		4936804	N/A	2017/04/13	Automated Statchk
Dissolved Metals by ICPMS	ICP/MS	4937519	N/A	2017/04/13	Thao Nguyen
Ion Balance (% Difference)	CALC	4936805	N/A	2017/04/18	Automated Statchk
Anion and Cation Sum	CALC	4936806	N/A	2017/04/17	Automated Statchk
Total Ammonia-N	LACH/NH4	4938715	N/A	2017/04/17	Charles Opoku-Ware
Nitrate (NO3) and Nitrite (NO2) in Water	LACH	4939014	N/A	2017/04/13	Chandra Nandlal
pH	AT	4937811	N/A	2017/04/13	Surinder Rai
Orthophosphate	KONE	4938098	N/A	2017/04/17	Alina Dobreanu
Sat. pH and Langelier Index (@ 20C)	CALC	4936811	N/A	2017/04/18	Automated Statchk
Sat. pH and Langelier Index (@ 4C)	CALC	4936812	N/A	2017/04/18	Automated Statchk
Sulphate by Automated Colourimetry	KONE	4938104	N/A	2017/04/17	Alina Dobreanu
Total Dissolved Solids (TDS calc)	CALC	4936813	N/A	2017/04/18	Automated Statchk
Low Level Total Suspended Solids	BAL	4939006	2017/04/13	2017/04/13	Arpan Shah

Maxxam ID: EEV136 Dup **Collected:** 2017/04/10
Sample ID: MW17-3D **Shipped:**
Matrix: Water **Received:** 2017/04/11

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Nitrate (NO3) and Nitrite (NO2) in Water	LACH	4939014	N/A	2017/04/13	Chandra Nandlal

Maxxam ID: EEV137 **Collected:** 2017/04/10
Sample ID: MW17-6D **Shipped:**
Matrix: Water **Received:** 2017/04/11

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Alkalinity	AT	4937613	N/A	2017/04/13	Surinder Rai
Carbonate, Bicarbonate and Hydroxide	CALC	4936801	N/A	2017/04/17	Automated Statchk

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Maxxam Job #: B772423
Report Date: 2017/04/20

Golder Associates Ltd
Client Project #: 1771656 (1000/1003)
Sampler Initials: TP

TEST SUMMARY

Maxxam ID: EEV137
Sample ID: MW17-6D
Matrix: Water

Collected: 2017/04/10
Shipped:
Received: 2017/04/11

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Chloride by Automated Colourimetry	KONE	4938093	N/A	2017/04/17	Alina Dobreanu
Conductivity	AT	4937809	N/A	2017/04/13	Surinder Rai
Dissolved Organic Carbon (DOC)	TOCV/NDIR	4937584	N/A	2017/04/13	Anastasia Hamanov
Hardness (calculated as CaCO3)		4936804	N/A	2017/04/13	Automated Statchk
Dissolved Metals by ICPMS	ICP/MS	4937519	N/A	2017/04/13	Thao Nguyen
Ion Balance (% Difference)	CALC	4936805	N/A	2017/04/18	Automated Statchk
Anion and Cation Sum	CALC	4936806	N/A	2017/04/17	Automated Statchk
Total Ammonia-N	LACH/NH4	4938715	N/A	2017/04/17	Charles Opoku-Ware
Nitrate (NO3) and Nitrite (NO2) in Water	LACH	4937672	N/A	2017/04/13	Chandra Nandlal
pH	AT	4937811	N/A	2017/04/13	Surinder Rai
Orthophosphate	KONE	4938098	N/A	2017/04/17	Alina Dobreanu
Sat. pH and Langelier Index (@ 20C)	CALC	4936811	N/A	2017/04/18	Automated Statchk
Sat. pH and Langelier Index (@ 4C)	CALC	4936812	N/A	2017/04/18	Automated Statchk
Sulphate by Automated Colourimetry	KONE	4938104	N/A	2017/04/17	Alina Dobreanu
Total Dissolved Solids (TDS calc)	CALC	4936813	N/A	2017/04/18	Automated Statchk
Total Suspended Solids	BAL	4939754	2017/04/13	2017/04/13	Arpan Shah

Maxxam ID: EEV138
Sample ID: MW17-6S
Matrix: Water

Collected: 2017/04/10
Shipped:
Received: 2017/04/11

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Alkalinity	AT	4937613	N/A	2017/04/13	Surinder Rai
Carbonate, Bicarbonate and Hydroxide	CALC	4936801	N/A	2017/04/17	Automated Statchk
Chloride by Automated Colourimetry	KONE	4938093	N/A	2017/04/17	Alina Dobreanu
Conductivity	AT	4937809	N/A	2017/04/13	Surinder Rai
Dissolved Organic Carbon (DOC)	TOCV/NDIR	4937584	N/A	2017/04/13	Anastasia Hamanov
Hardness (calculated as CaCO3)		4936804	N/A	2017/04/17	Automated Statchk
Dissolved Metals by ICPMS	ICP/MS	4937519	N/A	2017/04/17	Thao Nguyen
Ion Balance (% Difference)	CALC	4936805	N/A	2017/04/18	Automated Statchk
Anion and Cation Sum	CALC	4936806	N/A	2017/04/17	Automated Statchk
Total Ammonia-N	LACH/NH4	4938715	N/A	2017/04/17	Charles Opoku-Ware
Nitrate (NO3) and Nitrite (NO2) in Water	LACH	4937642	N/A	2017/04/13	Chandra Nandlal
pH	AT	4937811	N/A	2017/04/13	Surinder Rai
Orthophosphate	KONE	4938098	N/A	2017/04/17	Alina Dobreanu
Sat. pH and Langelier Index (@ 20C)	CALC	4936811	N/A	2017/04/18	Automated Statchk
Sat. pH and Langelier Index (@ 4C)	CALC	4936812	N/A	2017/04/18	Automated Statchk
Sulphate by Automated Colourimetry	KONE	4938104	N/A	2017/04/17	Alina Dobreanu
Total Dissolved Solids (TDS calc)	CALC	4936813	N/A	2017/04/18	Automated Statchk
Low Level Total Suspended Solids	BAL	4937462	2017/04/12	2017/04/13	Bansari Ray

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Maxxam Job #: B772423
Report Date: 2017/04/20

Golder Associates Ltd
Client Project #: 1771656 (1000/1003)
Sampler Initials: TP

TEST SUMMARY

Maxxam ID: EEV139
Sample ID: MW17-9S
Matrix: Water

Collected: 2017/04/10
Shipped:
Received: 2017/04/11

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Alkalinity	AT	4937613	N/A	2017/04/13	Surinder Rai
Carbonate, Bicarbonate and Hydroxide	CALC	4936801	N/A	2017/04/17	Automated Statchk
Chloride by Automated Colourimetry	KONE	4938093	N/A	2017/04/17	Alina Dobreanu
Conductivity	AT	4937809	N/A	2017/04/13	Surinder Rai
Dissolved Organic Carbon (DOC)	TOCV/NDIR	4937584	N/A	2017/04/13	Anastasia Hamanov
Hardness (calculated as CaCO3)		4936804	N/A	2017/04/17	Automated Statchk
Dissolved Metals by ICPMS	ICP/MS	4937519	N/A	2017/04/17	Thao Nguyen
Ion Balance (% Difference)	CALC	4936805	N/A	2017/04/18	Automated Statchk
Anion and Cation Sum	CALC	4936806	N/A	2017/04/17	Automated Statchk
Total Ammonia-N	LACH/NH4	4938715	N/A	2017/04/17	Charles Opoku-Ware
Nitrate (NO3) and Nitrite (NO2) in Water	LACH	4937642	N/A	2017/04/13	Chandra Nandlal
pH	AT	4937811	N/A	2017/04/13	Surinder Rai
Orthophosphate	KONE	4938098	N/A	2017/04/17	Alina Dobreanu
Sat. pH and Langelier Index (@ 20C)	CALC	4936811	N/A	2017/04/18	Automated Statchk
Sat. pH and Langelier Index (@ 4C)	CALC	4936812	N/A	2017/04/18	Automated Statchk
Sulphate by Automated Colourimetry	KONE	4938104	N/A	2017/04/17	Alina Dobreanu
Total Dissolved Solids (TDS calc)	CALC	4936813	N/A	2017/04/18	Automated Statchk
Low Level Total Suspended Solids	BAL	4937540	2017/04/12	2017/04/12	Arpan Shah

Maxxam ID: EEV140
Sample ID: MW17-9D
Matrix: Water

Collected: 2017/04/10
Shipped:
Received: 2017/04/11

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Alkalinity	AT	4937613	N/A	2017/04/13	Surinder Rai
Carbonate, Bicarbonate and Hydroxide	CALC	4936801	N/A	2017/04/17	Automated Statchk
Chloride by Automated Colourimetry	KONE	4938093	N/A	2017/04/17	Alina Dobreanu
Conductivity	AT	4937809	N/A	2017/04/13	Surinder Rai
Dissolved Organic Carbon (DOC)	TOCV/NDIR	4937584	N/A	2017/04/13	Anastasia Hamanov
Hardness (calculated as CaCO3)		4936804	N/A	2017/04/17	Automated Statchk
Dissolved Metals by ICPMS	ICP/MS	4937519	N/A	2017/04/17	Thao Nguyen
Ion Balance (% Difference)	CALC	4936805	N/A	2017/04/18	Automated Statchk
Anion and Cation Sum	CALC	4936806	N/A	2017/04/17	Automated Statchk
Total Ammonia-N	LACH/NH4	4938715	N/A	2017/04/17	Charles Opoku-Ware
Nitrate (NO3) and Nitrite (NO2) in Water	LACH	4937642	N/A	2017/04/13	Chandra Nandlal
pH	AT	4937811	N/A	2017/04/13	Surinder Rai
Orthophosphate	KONE	4938098	N/A	2017/04/17	Alina Dobreanu
Sat. pH and Langelier Index (@ 20C)	CALC	4936811	N/A	2017/04/18	Automated Statchk
Sat. pH and Langelier Index (@ 4C)	CALC	4936812	N/A	2017/04/18	Automated Statchk
Sulphate by Automated Colourimetry	KONE	4938104	N/A	2017/04/17	Alina Dobreanu
Total Dissolved Solids (TDS calc)	CALC	4936813	N/A	2017/04/18	Automated Statchk
Low Level Total Suspended Solids	BAL	4937540	2017/04/12	2017/04/12	Arpan Shah

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Maxxam Job #: B772423
Report Date: 2017/04/20

Golder Associates Ltd
Client Project #: 1771656 (1000/1003)
Sampler Initials: TP

TEST SUMMARY

Maxxam ID: EEV140 Dup
Sample ID: MW17-9D
Matrix: Water

Collected: 2017/04/10
Shipped:
Received: 2017/04/11

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Chloride by Automated Colourimetry	KONE	4938093	N/A	2017/04/17	Alina Dobreanu
Total Ammonia-N	LACH/NH4	4938715	N/A	2017/04/17	Charles Opoku-Ware
Orthophosphate	KONE	4938098	N/A	2017/04/17	Alina Dobreanu
Sulphate by Automated Colourimetry	KONE	4938104	N/A	2017/04/17	Alina Dobreanu

Maxxam ID: EEV141
Sample ID: MW17-99D
Matrix: Water

Collected: 2017/04/10
Shipped:
Received: 2017/04/11

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Alkalinity	AT	4937613	N/A	2017/04/13	Surinder Rai
Carbonate, Bicarbonate and Hydroxide	CALC	4936801	N/A	2017/04/17	Automated Statchk
Chloride by Automated Colourimetry	KONE	4938093	N/A	2017/04/17	Alina Dobreanu
Conductivity	AT	4937809	N/A	2017/04/13	Surinder Rai
Dissolved Organic Carbon (DOC)	TOCV/NDIR	4937584	N/A	2017/04/13	Anastasia Hamanov
Hardness (calculated as CaCO3)		4936804	N/A	2017/04/17	Automated Statchk
Dissolved Metals by ICPMS	ICP/MS	4937519	N/A	2017/04/17	Thao Nguyen
Ion Balance (% Difference)	CALC	4936805	N/A	2017/04/18	Automated Statchk
Anion and Cation Sum	CALC	4936806	N/A	2017/04/17	Automated Statchk
Total Ammonia-N	LACH/NH4	4938715	N/A	2017/04/17	Charles Opoku-Ware
Nitrate (NO3) and Nitrite (NO2) in Water	LACH	4937672	N/A	2017/04/13	Chandra Nandlal
pH	AT	4937811	N/A	2017/04/13	Surinder Rai
Orthophosphate	KONE	4938098	N/A	2017/04/17	Alina Dobreanu
Sat. pH and Langelier Index (@ 20C)	CALC	4936811	N/A	2017/04/18	Automated Statchk
Sat. pH and Langelier Index (@ 4C)	CALC	4936812	N/A	2017/04/18	Automated Statchk
Sulphate by Automated Colourimetry	KONE	4938104	N/A	2017/04/17	Alina Dobreanu
Total Dissolved Solids (TDS calc)	CALC	4936813	N/A	2017/04/18	Automated Statchk
Low Level Total Suspended Solids	BAL	4937540	2017/04/12	2017/04/12	Arpan Shah

Maxxam ID: EEV142
Sample ID: MW17-8D
Matrix: Water

Collected: 2017/04/10
Shipped:
Received: 2017/04/11

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Alkalinity	AT	4937823	N/A	2017/04/13	Surinder Rai
Carbonate, Bicarbonate and Hydroxide	CALC	4936801	N/A	2017/04/17	Automated Statchk
Chloride by Automated Colourimetry	KONE	4938093	N/A	2017/04/17	Alina Dobreanu
Conductivity	AT	4937827	N/A	2017/04/13	Surinder Rai
Dissolved Organic Carbon (DOC)	TOCV/NDIR	4937584	N/A	2017/04/13	Anastasia Hamanov
Hardness (calculated as CaCO3)		4936804	N/A	2017/04/13	Automated Statchk
Dissolved Metals by ICPMS	ICP/MS	4937519	N/A	2017/04/13	Thao Nguyen
Ion Balance (% Difference)	CALC	4936805	N/A	2017/04/18	Automated Statchk
Anion and Cation Sum	CALC	4936806	N/A	2017/04/17	Automated Statchk
Total Ammonia-N	LACH/NH4	4938715	N/A	2017/04/17	Charles Opoku-Ware
Nitrate (NO3) and Nitrite (NO2) in Water	LACH	4939014	N/A	2017/04/13	Chandra Nandlal

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Maxxam Job #: B772423
Report Date: 2017/04/20

Golder Associates Ltd
Client Project #: 1771656 (1000/1003)
Sampler Initials: TP

TEST SUMMARY

Maxxam ID: EEV142
Sample ID: MW17-8D
Matrix: Water

Collected: 2017/04/10
Shipped:
Received: 2017/04/11

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
pH	AT	4937828	N/A	2017/04/13	Surinder Rai
Orthophosphate	KONE	4938098	N/A	2017/04/17	Alina Dobreanu
Sat. pH and Langelier Index (@ 20C)	CALC	4936811	N/A	2017/04/18	Automated Statchk
Sat. pH and Langelier Index (@ 4C)	CALC	4936812	N/A	2017/04/18	Automated Statchk
Sulphate by Automated Colourimetry	KONE	4938104	N/A	2017/04/17	Alina Dobreanu
Total Dissolved Solids (TDS calc)	CALC	4936813	N/A	2017/04/18	Automated Statchk
Low Level Total Suspended Solids	BAL	4939006	2017/04/13	2017/04/13	Arpan Shah

Maxxam ID: EEV143
Sample ID: MW17-8S
Matrix: Water

Collected: 2017/04/10
Shipped:
Received: 2017/04/11

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Alkalinity	AT	4937823	N/A	2017/04/13	Surinder Rai
Carbonate, Bicarbonate and Hydroxide	CALC	4936801	N/A	2017/04/17	Automated Statchk
Chloride by Automated Colourimetry	KONE	4938093	N/A	2017/04/17	Alina Dobreanu
Conductivity	AT	4937827	N/A	2017/04/13	Surinder Rai
Dissolved Organic Carbon (DOC)	TOCV/NDIR	4937584	N/A	2017/04/13	Anastasia Hamanov
Hardness (calculated as CaCO3)		4936804	N/A	2017/04/17	Automated Statchk
Dissolved Metals by ICPMS	ICP/MS	4937519	N/A	2017/04/17	Thao Nguyen
Ion Balance (% Difference)	CALC	4936805	N/A	2017/04/18	Automated Statchk
Anion and Cation Sum	CALC	4936806	N/A	2017/04/17	Automated Statchk
Total Ammonia-N	LACH/NH4	4938715	N/A	2017/04/17	Charles Opoku-Ware
Nitrate (NO3) and Nitrite (NO2) in Water	LACH	4939014	N/A	2017/04/13	Chandra Nandlal
pH	AT	4937828	N/A	2017/04/13	Surinder Rai
Orthophosphate	KONE	4938098	N/A	2017/04/17	Alina Dobreanu
Sat. pH and Langelier Index (@ 20C)	CALC	4936811	N/A	2017/04/18	Automated Statchk
Sat. pH and Langelier Index (@ 4C)	CALC	4936812	N/A	2017/04/18	Automated Statchk
Sulphate by Automated Colourimetry	KONE	4938104	N/A	2017/04/17	Alina Dobreanu
Total Dissolved Solids (TDS calc)	CALC	4936813	N/A	2017/04/18	Automated Statchk
Total Suspended Solids	BAL	4939754	2017/04/13	2017/04/13	Arpan Shah

Maxxam ID: EEV144
Sample ID: MW17-10D
Matrix: Water

Collected: 2017/04/10
Shipped:
Received: 2017/04/11

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Alkalinity	AT	4946220	N/A	2017/04/20	Surinder Rai
Carbonate, Bicarbonate and Hydroxide	CALC	4936801	N/A	2017/04/17	Automated Statchk
Chloride by Automated Colourimetry	KONE	4946377	N/A	2017/04/20	Alina Dobreanu
Conductivity	AT	4937827	N/A	2017/04/13	Surinder Rai
Dissolved Organic Carbon (DOC)	TOCV/NDIR	4937584	N/A	2017/04/13	Anastasia Hamanov
Hardness (calculated as CaCO3)		4936804	N/A	2017/04/17	Automated Statchk
Dissolved Metals by ICPMS	ICP/MS	4946951	N/A	2017/04/20	Cristina Petran
Ion Balance (% Difference)	CALC	4936805	N/A	2017/04/18	Automated Statchk

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Maxxam Job #: B772423
Report Date: 2017/04/20

Golder Associates Ltd
Client Project #: 1771656 (1000/1003)
Sampler Initials: TP

TEST SUMMARY

Maxxam ID: EEV144
Sample ID: MW17-10D
Matrix: Water

Collected: 2017/04/10
Shipped:
Received: 2017/04/11

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Anion and Cation Sum	CALC	4936806	N/A	2017/04/17	Automated Statchk
Total Ammonia-N	LACH/NH4	4938715	N/A	2017/04/17	Charles Opoku-Ware
Nitrate (NO3) and Nitrite (NO2) in Water	LACH	4939014	N/A	2017/04/13	Chandra Nandlal
pH	AT	4937828	N/A	2017/04/13	Surinder Rai
Orthophosphate	KONE	4938098	N/A	2017/04/17	Alina Dobreanu
Sat. pH and Langelier Index (@ 20C)	CALC	4936811	N/A	2017/04/18	Automated Statchk
Sat. pH and Langelier Index (@ 4C)	CALC	4936812	N/A	2017/04/18	Automated Statchk
Sulphate by Automated Colourimetry	KONE	4946383	N/A	2017/04/20	Alina Dobreanu
Total Dissolved Solids (TDS calc)	CALC	4936813	N/A	2017/04/18	Automated Statchk
Low Level Total Suspended Solids	BAL	4939006	2017/04/13	2017/04/13	Arpan Shah

Maxxam ID: EEV144 Dup
Sample ID: MW17-10D
Matrix: Water

Collected: 2017/04/10
Shipped:
Received: 2017/04/11

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Conductivity	AT	4937827	N/A	2017/04/13	Surinder Rai
pH	AT	4937828	N/A	2017/04/13	Surinder Rai

Maxxam ID: EEV145
Sample ID: POND
Matrix: Water

Collected: 2017/04/11
Shipped:
Received: 2017/04/11

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Alkalinity	AT	4937223	N/A	2017/04/13	Surinder Rai
Carbonate, Bicarbonate and Hydroxide	CALC	4936801	N/A	2017/04/13	Automated Statchk
Chloride by Automated Colourimetry	KONE	4937408	N/A	2017/04/13	Alina Dobreanu
Conductivity	AT	4937260	N/A	2017/04/13	Surinder Rai
Hardness (calculated as CaCO3)		4936804	N/A	2017/04/19	Automated Statchk
Lab Filtered Metals Analysis by ICP	ICP	4941831	2017/04/17	2017/04/18	Azita Fazaeli
Total Metals Analysis by ICPMS	ICP/MS	4941659	N/A	2017/04/17	Kevin Comerford
Total Ammonia-N	LACH/NH4	4938715	N/A	2017/04/17	Charles Opoku-Ware
Nitrate (NO3) and Nitrite (NO2) in Water	LACH	4937451	N/A	2017/04/13	Chandra Nandlal
pH	AT	4937231	N/A	2017/04/13	Surinder Rai
Orthophosphate	KONE	4937417	N/A	2017/04/13	Alina Dobreanu
Sat. pH and Langelier Index (@ 20C)	CALC	4936811	N/A	2017/04/19	Automated Statchk
Sat. pH and Langelier Index (@ 4C)	CALC	4936812	N/A	2017/04/19	Automated Statchk
Sulphate by Automated Colourimetry	KONE	4937418	N/A	2017/04/13	Alina Dobreanu
Total Dissolved Solids (TDS calc)	CALC	4936813	N/A	2017/04/19	Automated Statchk
Total Organic Carbon (TOC)	TOCV/NDIR	4939254	N/A	2017/04/13	Anastasia Hamanov
Total Phosphorus (Colourimetric)	LACH/P	4938578	2017/04/13	2017/04/13	Sarabjit Raina
Low Level Total Suspended Solids	BAL	4937462	2017/04/12	2017/04/13	Bansari Ray
Turbidity	AT	4937002	N/A	2017/04/12	Tahir Anwar

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TEST SUMMARY

Maxxam ID: EEV145 Dup
Sample ID: POND
Matrix: Water

Collected: 2017/04/11
Shipped:
Received: 2017/04/11

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Total Organic Carbon (TOC)	TOCV/NDIR	4939254	N/A	2017/04/13	Anastasia Hamanov

GENERAL COMMENTS

Each temperature is the average of up to three cooler temperatures taken at receipt

Package 1	0.3°C
Package 2	-0.7°C

Sample EEV133 [MW17-1S] : Nitrite+Nitrate: Due to the sample matrix, sample required dilution. Detection limits were adjusted accordingly.
ortho-Phosphate > Total Phosphorus: Both values fall within the method uncertainty for duplicates and are likely equivalent.

Results relate only to the items tested.

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Maxxam Job #: B772423
Report Date: 2017/04/20

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Client Project #: 1771656 (1000/1003)
Sampler Initials: TP

QUALITY ASSURANCE REPORT

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
4937002	TA1	Spiked Blank	Turbidity	2017/04/12		99	%	85 - 115
4937002	TA1	Method Blank	Turbidity	2017/04/12	<0.1		NTU	
4937002	TA1	RPD	Turbidity	2017/04/12	5.4		%	20
4937223	SAU	Spiked Blank	Alkalinity (Total as CaCO3)	2017/04/12		96	%	85 - 115
4937223	SAU	Method Blank	Alkalinity (Total as CaCO3)	2017/04/12	<1.0		mg/L	
4937223	SAU	RPD	Alkalinity (Total as CaCO3)	2017/04/12	0.74		%	20
4937231	SAU	Spiked Blank	pH	2017/04/12		101	%	98 - 103
4937231	SAU	RPD	pH	2017/04/12	0.068		%	N/A
4937260	SAU	Spiked Blank	Conductivity	2017/04/12		100	%	85 - 115
4937260	SAU	Method Blank	Conductivity	2017/04/12	<1.0		umho/c	
4937260	SAU	RPD	Conductivity	2017/04/12	0.16		%	25
4937408	ADB	Matrix Spike	Dissolved Chloride (Cl)	2017/04/13		96	%	80 - 120
4937408	ADB	Spiked Blank	Dissolved Chloride (Cl)	2017/04/13		103	%	80 - 120
4937408	ADB	Method Blank	Dissolved Chloride (Cl)	2017/04/13	<1.0		mg/L	
4937408	ADB	RPD	Dissolved Chloride (Cl)	2017/04/13	1.2		%	20
4937417	ADB	Matrix Spike	Orthophosphate (P)	2017/04/13		110	%	75 - 125
4937417	ADB	Spiked Blank	Orthophosphate (P)	2017/04/13		101	%	80 - 120
4937417	ADB	Method Blank	Orthophosphate (P)	2017/04/13	<0.010		mg/L	
4937417	ADB	RPD	Orthophosphate (P)	2017/04/13	18		%	25
4937418	ADB	Matrix Spike	Dissolved Sulphate (SO4)	2017/04/13		NC	%	75 - 125
4937418	ADB	Spiked Blank	Dissolved Sulphate (SO4)	2017/04/13		105	%	80 - 120
4937418	ADB	Method Blank	Dissolved Sulphate (SO4)	2017/04/13	<1.0		mg/L	
4937418	ADB	RPD	Dissolved Sulphate (SO4)	2017/04/13	0.15		%	20
4937451	C_N	Matrix Spike	Nitrite (N)	2017/04/13		94	%	80 - 120
			Nitrate (N)	2017/04/13		99	%	80 - 120
4937451	C_N	Spiked Blank	Nitrite (N)	2017/04/13		94	%	80 - 120
			Nitrate (N)	2017/04/13		105	%	80 - 120
4937451	C_N	Method Blank	Nitrite (N)	2017/04/13	<0.010		mg/L	
			Nitrate (N)	2017/04/13	<0.10		mg/L	
4937451	C_N	RPD	Nitrite (N)	2017/04/13	NC		%	20
			Nitrate (N)	2017/04/13	NC		%	20
4937462	RAY	QC Standard	Total Suspended Solids	2017/04/13		96	%	85 - 115
4937462	RAY	Method Blank	Total Suspended Solids	2017/04/13	<1		mg/L	
4937462	RAY	RPD	Total Suspended Solids	2017/04/13	NC		%	25
4937519	TNG	Matrix Spike [EEV132-04]	Dissolved Aluminum (Al)	2017/04/13		99	%	80 - 120
			Dissolved Antimony (Sb)	2017/04/13		105	%	80 - 120
			Dissolved Arsenic (As)	2017/04/13		101	%	80 - 120
			Dissolved Barium (Ba)	2017/04/13		100	%	80 - 120
			Dissolved Beryllium (Be)	2017/04/13		98	%	80 - 120
			Dissolved Boron (B)	2017/04/13		NC	%	80 - 120
			Dissolved Cadmium (Cd)	2017/04/13		102	%	80 - 120
			Dissolved Calcium (Ca)	2017/04/13		NC	%	80 - 120
			Dissolved Chromium (Cr)	2017/04/13		99	%	80 - 120
			Dissolved Cobalt (Co)	2017/04/13		97	%	80 - 120
			Dissolved Copper (Cu)	2017/04/13		99	%	80 - 120
			Dissolved Iron (Fe)	2017/04/13		98	%	80 - 120
			Dissolved Lead (Pb)	2017/04/13		96	%	80 - 120
			Dissolved Magnesium (Mg)	2017/04/13		NC	%	80 - 120
			Dissolved Manganese (Mn)	2017/04/13		99	%	80 - 120
			Dissolved Molybdenum (Mo)	2017/04/13		105	%	80 - 120
			Dissolved Nickel (Ni)	2017/04/13		96	%	80 - 120
			Dissolved Phosphorus (P)	2017/04/13		111	%	80 - 120
			Dissolved Potassium (K)	2017/04/13		97	%	80 - 120

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QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			Dissolved Selenium (Se)	2017/04/13		82	%	80 - 120
			Dissolved Silicon (Si)	2017/04/13		96	%	80 - 120
			Dissolved Silver (Ag)	2017/04/13		38 (1)	%	80 - 120
			Dissolved Sodium (Na)	2017/04/13		NC	%	80 - 120
			Dissolved Strontium (Sr)	2017/04/13		NC	%	80 - 120
			Dissolved Thallium (Tl)	2017/04/13		96	%	80 - 120
			Dissolved Titanium (Ti)	2017/04/13		99	%	80 - 120
			Dissolved Uranium (U)	2017/04/13		100	%	80 - 120
			Dissolved Vanadium (V)	2017/04/13		99	%	80 - 120
			Dissolved Zinc (Zn)	2017/04/13		95	%	80 - 120
4937519	TNG	Spiked Blank	Dissolved Aluminum (Al)	2017/04/13		100	%	80 - 120
			Dissolved Antimony (Sb)	2017/04/13		103	%	80 - 120
			Dissolved Arsenic (As)	2017/04/13		99	%	80 - 120
			Dissolved Barium (Ba)	2017/04/13		101	%	80 - 120
			Dissolved Beryllium (Be)	2017/04/13		100	%	80 - 120
			Dissolved Boron (B)	2017/04/13		99	%	80 - 120
			Dissolved Cadmium (Cd)	2017/04/13		101	%	80 - 120
			Dissolved Calcium (Ca)	2017/04/13		95	%	80 - 120
			Dissolved Chromium (Cr)	2017/04/13		98	%	80 - 120
			Dissolved Cobalt (Co)	2017/04/13		98	%	80 - 120
			Dissolved Copper (Cu)	2017/04/13		101	%	80 - 120
			Dissolved Iron (Fe)	2017/04/13		98	%	80 - 120
			Dissolved Lead (Pb)	2017/04/13		97	%	80 - 120
			Dissolved Magnesium (Mg)	2017/04/13		98	%	80 - 120
			Dissolved Manganese (Mn)	2017/04/13		98	%	80 - 120
			Dissolved Molybdenum (Mo)	2017/04/13		101	%	80 - 120
			Dissolved Nickel (Ni)	2017/04/13		98	%	80 - 120
			Dissolved Phosphorus (P)	2017/04/13		112	%	80 - 120
			Dissolved Potassium (K)	2017/04/13		98	%	80 - 120
			Dissolved Selenium (Se)	2017/04/13		96	%	80 - 120
			Dissolved Silicon (Si)	2017/04/13		99	%	80 - 120
			Dissolved Silver (Ag)	2017/04/13		98	%	80 - 120
			Dissolved Sodium (Na)	2017/04/13		97	%	80 - 120
			Dissolved Strontium (Sr)	2017/04/13		100	%	80 - 120
			Dissolved Thallium (Tl)	2017/04/13		97	%	80 - 120
			Dissolved Titanium (Ti)	2017/04/13		99	%	80 - 120
			Dissolved Uranium (U)	2017/04/13		98	%	80 - 120
			Dissolved Vanadium (V)	2017/04/13		97	%	80 - 120
			Dissolved Zinc (Zn)	2017/04/13		98	%	80 - 120
4937519	TNG	Method Blank	Dissolved Aluminum (Al)	2017/04/13	<0.0050		mg/L	
			Dissolved Antimony (Sb)	2017/04/13	<0.00050		mg/L	
			Dissolved Arsenic (As)	2017/04/13	<0.0010		mg/L	
			Dissolved Barium (Ba)	2017/04/13	<0.0020		mg/L	
			Dissolved Beryllium (Be)	2017/04/13	<0.00050		mg/L	
			Dissolved Boron (B)	2017/04/13	<0.010		mg/L	
			Dissolved Cadmium (Cd)	2017/04/13	<0.00010		mg/L	
			Dissolved Calcium (Ca)	2017/04/13	<0.20		mg/L	
			Dissolved Chromium (Cr)	2017/04/13	<0.0050		mg/L	
			Dissolved Cobalt (Co)	2017/04/13	<0.00050		mg/L	
			Dissolved Copper (Cu)	2017/04/13	<0.0010		mg/L	
			Dissolved Iron (Fe)	2017/04/13	<0.10		mg/L	
			Dissolved Lead (Pb)	2017/04/13	<0.00050		mg/L	
			Dissolved Magnesium (Mg)	2017/04/13	<0.050		mg/L	

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			Dissolved Manganese (Mn)	2017/04/13	<0.0020		mg/L	
			Dissolved Molybdenum (Mo)	2017/04/13	<0.00050		mg/L	
			Dissolved Nickel (Ni)	2017/04/13	<0.0010		mg/L	
			Dissolved Phosphorus (P)	2017/04/13	<0.10		mg/L	
			Dissolved Potassium (K)	2017/04/13	<0.20		mg/L	
			Dissolved Selenium (Se)	2017/04/13	<0.0020		mg/L	
			Dissolved Silicon (Si)	2017/04/13	<0.050		mg/L	
			Dissolved Silver (Ag)	2017/04/13	<0.00010		mg/L	
			Dissolved Sodium (Na)	2017/04/13	<0.10		mg/L	
			Dissolved Strontium (Sr)	2017/04/13	<0.0010		mg/L	
			Dissolved Thallium (Tl)	2017/04/13	<0.000050		mg/L	
			Dissolved Titanium (Ti)	2017/04/13	<0.0050		mg/L	
			Dissolved Uranium (U)	2017/04/13	<0.00010		mg/L	
			Dissolved Vanadium (V)	2017/04/13	<0.00050		mg/L	
			Dissolved Zinc (Zn)	2017/04/13	<0.0050		mg/L	
4937519	TNG	RPD [EEV132-04]	Dissolved Aluminum (Al)	2017/04/13	0.24		%	20
			Dissolved Antimony (Sb)	2017/04/13	NC		%	20
			Dissolved Arsenic (As)	2017/04/13	NC		%	20
			Dissolved Barium (Ba)	2017/04/13	0.20		%	20
			Dissolved Beryllium (Be)	2017/04/13	NC		%	20
			Dissolved Boron (B)	2017/04/13	0.70		%	20
			Dissolved Cadmium (Cd)	2017/04/13	NC		%	20
			Dissolved Calcium (Ca)	2017/04/13	1.4		%	20
			Dissolved Chromium (Cr)	2017/04/13	NC		%	20
			Dissolved Cobalt (Co)	2017/04/13	NC		%	20
			Dissolved Copper (Cu)	2017/04/13	NC		%	20
			Dissolved Iron (Fe)	2017/04/13	3.2		%	20
			Dissolved Lead (Pb)	2017/04/13	NC		%	20
			Dissolved Magnesium (Mg)	2017/04/13	3.2		%	20
			Dissolved Manganese (Mn)	2017/04/13	6.0		%	20
			Dissolved Molybdenum (Mo)	2017/04/13	NC		%	20
			Dissolved Nickel (Ni)	2017/04/13	NC		%	20
			Dissolved Phosphorus (P)	2017/04/13	NC		%	20
			Dissolved Potassium (K)	2017/04/13	4.3		%	20
			Dissolved Selenium (Se)	2017/04/13	NC		%	20
			Dissolved Silicon (Si)	2017/04/13	2.2		%	20
			Dissolved Silver (Ag)	2017/04/13	NC		%	20
			Dissolved Sodium (Na)	2017/04/13	2.8		%	20
			Dissolved Strontium (Sr)	2017/04/13	4.2		%	20
			Dissolved Thallium (Tl)	2017/04/13	NC		%	20
			Dissolved Titanium (Ti)	2017/04/13	NC		%	20
			Dissolved Uranium (U)	2017/04/13	NC		%	20
			Dissolved Vanadium (V)	2017/04/13	NC		%	20
			Dissolved Zinc (Zn)	2017/04/13	NC		%	20
4937540	AS6	QC Standard	Total Suspended Solids	2017/04/12		99	%	85 - 115
4937540	AS6	Method Blank	Total Suspended Solids	2017/04/12	<1		mg/L	
4937540	AS6	RPD	Total Suspended Solids	2017/04/12	4.7		%	25
4937582	XZH	QC Standard	Total Suspended Solids	2017/04/12		96	%	85 - 115
4937582	XZH	Method Blank	Total Suspended Solids	2017/04/12	<10		mg/L	
4937582	XZH	RPD	Total Suspended Solids	2017/04/12	4.6		%	25
4937584	AHA	Matrix Spike	Dissolved Organic Carbon	2017/04/13		103	%	80 - 120
4937584	AHA	Spiked Blank	Dissolved Organic Carbon	2017/04/13		104	%	80 - 120
4937584	AHA	Method Blank	Dissolved Organic Carbon	2017/04/13	<0.20		mg/L	

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4937584	AHA	RPD	Dissolved Organic Carbon	2017/04/13	1.6		%	20
4937613	SAU	Spiked Blank	Alkalinity (Total as CaCO3)	2017/04/13		97	%	85 - 115
4937613	SAU	Method Blank	Alkalinity (Total as CaCO3)	2017/04/13	<1.0		mg/L	
4937613	SAU	RPD	Alkalinity (Total as CaCO3)	2017/04/13	1.2		%	20
4937642	C_N	Matrix Spike	Nitrite (N)	2017/04/13		97	%	80 - 120
			Nitrate (N)	2017/04/13		102	%	80 - 120
4937642	C_N	Spiked Blank	Nitrite (N)	2017/04/13		96	%	80 - 120
			Nitrate (N)	2017/04/13		103	%	80 - 120
4937642	C_N	Method Blank	Nitrite (N)	2017/04/13	<0.010		mg/L	
			Nitrate (N)	2017/04/13	<0.10		mg/L	
4937642	C_N	RPD	Nitrite (N)	2017/04/13	NC		%	20
			Nitrate (N)	2017/04/13	NC		%	20
4937672	C_N	Matrix Spike	Nitrite (N)	2017/04/13		95	%	80 - 120
			Nitrate (N)	2017/04/13		102	%	80 - 120
4937672	C_N	Spiked Blank	Nitrite (N)	2017/04/13		96	%	80 - 120
			Nitrate (N)	2017/04/13		106	%	80 - 120
4937672	C_N	Method Blank	Nitrite (N)	2017/04/13	<0.010		mg/L	
			Nitrate (N)	2017/04/13	<0.10		mg/L	
4937672	C_N	RPD	Nitrite (N)	2017/04/13	NC		%	20
			Nitrate (N)	2017/04/13	NC		%	20
4937809	SAU	Spiked Blank	Conductivity	2017/04/13		100	%	85 - 115
4937809	SAU	Method Blank	Conductivity	2017/04/13	<1.0		umho/c	
4937809	SAU	RPD	Conductivity	2017/04/13	0.21		%	25
4937811	SAU	Spiked Blank	pH	2017/04/13		101	%	98 - 103
4937811	SAU	RPD	pH	2017/04/13	0.34		%	N/A
4937823	SAU	Spiked Blank	Alkalinity (Total as CaCO3)	2017/04/13		96	%	85 - 115
4937823	SAU	Method Blank	Alkalinity (Total as CaCO3)	2017/04/13	<1.0		mg/L	
4937827	SAU	Spiked Blank	Conductivity	2017/04/13		100	%	85 - 115
4937827	SAU	Method Blank	Conductivity	2017/04/13	<1.0		umho/c	
4937827	SAU	RPD [EEV144-01]	Conductivity	2017/04/13	0		%	25
4937828	SAU	Spiked Blank	pH	2017/04/13		101	%	98 - 103
4937828	SAU	RPD [EEV144-01]	pH	2017/04/13	0.14		%	N/A
4938093	ADB	Matrix Spike [EEV140-01]	Dissolved Chloride (Cl)	2017/04/17		NC	%	80 - 120
4938093	ADB	Spiked Blank	Dissolved Chloride (Cl)	2017/04/17		103	%	80 - 120
4938093	ADB	Method Blank	Dissolved Chloride (Cl)	2017/04/17	<1.0		mg/L	
4938093	ADB	RPD [EEV140-01]	Dissolved Chloride (Cl)	2017/04/17	4.0		%	20
4938098	ADB	Matrix Spike [EEV140-01]	Orthophosphate (P)	2017/04/17		110	%	75 - 125
4938098	ADB	Spiked Blank	Orthophosphate (P)	2017/04/17		101	%	80 - 120
4938098	ADB	Method Blank	Orthophosphate (P)	2017/04/17	<0.010		mg/L	
4938098	ADB	RPD [EEV140-01]	Orthophosphate (P)	2017/04/17	NC		%	25
4938104	ADB	Matrix Spike [EEV140-01]	Dissolved Sulphate (SO4)	2017/04/17		NC	%	75 - 125
4938104	ADB	Spiked Blank	Dissolved Sulphate (SO4)	2017/04/17		105	%	80 - 120
4938104	ADB	Method Blank	Dissolved Sulphate (SO4)	2017/04/17	<1.0		mg/L	
4938104	ADB	RPD [EEV140-01]	Dissolved Sulphate (SO4)	2017/04/17	0.18		%	20
4938578	SNR	Matrix Spike	Total Phosphorus	2017/04/13		88	%	80 - 120
4938578	SNR	QC Standard	Total Phosphorus	2017/04/13		91	%	80 - 120
4938578	SNR	Spiked Blank	Total Phosphorus	2017/04/13		92	%	80 - 120
4938578	SNR	Method Blank	Total Phosphorus	2017/04/13	<0.004		mg/L	
4938578	SNR	RPD	Total Phosphorus	2017/04/13	NC		%	20
4938710	COP	Matrix Spike	Total Ammonia-N	2017/04/18		92	%	80 - 120
4938710	COP	Spiked Blank	Total Ammonia-N	2017/04/18		99	%	85 - 115
4938710	COP	Method Blank	Total Ammonia-N	2017/04/18	<0.050		mg/L	
4938710	COP	RPD	Total Ammonia-N	2017/04/18	12		%	20

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4938715	COP	Matrix Spike [EEV140-02]	Total Ammonia-N	2017/04/17		NC	%	80 - 120
4938715	COP	Spiked Blank	Total Ammonia-N	2017/04/17		99	%	85 - 115
4938715	COP	Method Blank	Total Ammonia-N	2017/04/17	<0.050		mg/L	
4938715	COP	RPD [EEV140-02]	Total Ammonia-N	2017/04/17	0.42		%	20
4938932	AHA	Matrix Spike	Dissolved Organic Carbon	2017/04/13		103	%	80 - 120
4938932	AHA	Spiked Blank	Dissolved Organic Carbon	2017/04/13		107	%	80 - 120
4938932	AHA	Method Blank	Dissolved Organic Carbon	2017/04/13	<0.20		mg/L	
4938932	AHA	RPD	Dissolved Organic Carbon	2017/04/13	0.38		%	20
4939006	AS6	QC Standard	Total Suspended Solids	2017/04/13		95	%	85 - 115
4939006	AS6	Method Blank	Total Suspended Solids	2017/04/13	<1		mg/L	
4939006	AS6	RPD	Total Suspended Solids	2017/04/13	4.9		%	25
4939014	C_N	Matrix Spike [EEV136-01]	Nitrite (N)	2017/04/13		97	%	80 - 120
			Nitrate (N)	2017/04/13		100	%	80 - 120
4939014	C_N	Spiked Blank	Nitrite (N)	2017/04/13		95	%	80 - 120
			Nitrate (N)	2017/04/13		100	%	80 - 120
4939014	C_N	Method Blank	Nitrite (N)	2017/04/13	<0.010		mg/L	
			Nitrate (N)	2017/04/13	<0.10		mg/L	
4939014	C_N	RPD [EEV136-01]	Nitrite (N)	2017/04/13	NC		%	20
			Nitrate (N)	2017/04/13	NC		%	20
4939254	AHA	Matrix Spike [EEV145-02]	Total Organic Carbon (TOC)	2017/04/13		97	%	80 - 120
4939254	AHA	Spiked Blank	Total Organic Carbon (TOC)	2017/04/13		99	%	80 - 120
4939254	AHA	Method Blank	Total Organic Carbon (TOC)	2017/04/13	<0.20		mg/L	
4939254	AHA	RPD [EEV145-02]	Total Organic Carbon (TOC)	2017/04/13	0.96		%	20
4939754	AS6	QC Standard	Total Suspended Solids	2017/04/13		100	%	85 - 115
4939754	AS6	Method Blank	Total Suspended Solids	2017/04/13	<10		mg/L	
4939754	AS6	RPD	Total Suspended Solids	2017/04/13	13		%	25
4941659	KCO	Matrix Spike	Total Aluminum (Al)	2017/04/17		NC	%	80 - 120
			Total Antimony (Sb)	2017/04/17		109	%	80 - 120
			Total Arsenic (As)	2017/04/17		106	%	80 - 120
			Total Barium (Ba)	2017/04/17		104	%	80 - 120
			Total Beryllium (Be)	2017/04/17		97	%	80 - 120
			Total Boron (B)	2017/04/17		94	%	80 - 120
			Total Cadmium (Cd)	2017/04/17		106	%	80 - 120
			Total Calcium (Ca)	2017/04/17		NC	%	80 - 120
			Total Chromium (Cr)	2017/04/17		102	%	80 - 120
			Total Cobalt (Co)	2017/04/17		104	%	80 - 120
			Total Copper (Cu)	2017/04/17		106	%	80 - 120
			Total Iron (Fe)	2017/04/17		105	%	80 - 120
			Total Lead (Pb)	2017/04/17		98	%	80 - 120
			Total Magnesium (Mg)	2017/04/17		101	%	80 - 120
			Total Manganese (Mn)	2017/04/17		99	%	80 - 120
			Total Molybdenum (Mo)	2017/04/17		108	%	80 - 120
			Total Nickel (Ni)	2017/04/17		98	%	80 - 120
			Total Potassium (K)	2017/04/17		105	%	80 - 120
			Total Selenium (Se)	2017/04/17		104	%	80 - 120
			Total Silicon (Si)	2017/04/17		103	%	80 - 120
			Total Silver (Ag)	2017/04/17		102	%	80 - 120
			Total Sodium (Na)	2017/04/17		NC	%	80 - 120
			Total Strontium (Sr)	2017/04/17		104	%	80 - 120
			Total Thallium (Tl)	2017/04/17		99	%	80 - 120
			Total Titanium (Ti)	2017/04/17		113	%	80 - 120
			Total Vanadium (V)	2017/04/17		105	%	80 - 120
			Total Zinc (Zn)	2017/04/17		102	%	80 - 120

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4941659	KCO	Spiked Blank	Total Aluminum (Al)	2017/04/17		99	%	80 - 120
			Total Antimony (Sb)	2017/04/17		103	%	80 - 120
			Total Arsenic (As)	2017/04/17		101	%	80 - 120
			Total Barium (Ba)	2017/04/17		99	%	80 - 120
			Total Beryllium (Be)	2017/04/17		97	%	80 - 120
			Total Boron (B)	2017/04/17		95	%	80 - 120
			Total Cadmium (Cd)	2017/04/17		102	%	80 - 120
			Total Calcium (Ca)	2017/04/17		97	%	80 - 120
			Total Chromium (Cr)	2017/04/17		97	%	80 - 120
			Total Cobalt (Co)	2017/04/17		100	%	80 - 120
			Total Copper (Cu)	2017/04/17		102	%	80 - 120
			Total Iron (Fe)	2017/04/17		99	%	80 - 120
			Total Lead (Pb)	2017/04/17		100	%	80 - 120
			Total Magnesium (Mg)	2017/04/17		99	%	80 - 120
			Total Manganese (Mn)	2017/04/17		95	%	80 - 120
			Total Molybdenum (Mo)	2017/04/17		103	%	80 - 120
			Total Nickel (Ni)	2017/04/17		95	%	80 - 120
			Total Potassium (K)	2017/04/17		99	%	80 - 120
			Total Selenium (Se)	2017/04/17		101	%	80 - 120
			Total Silicon (Si)	2017/04/17		94	%	80 - 120
			Total Silver (Ag)	2017/04/17		99	%	80 - 120
			Total Sodium (Na)	2017/04/17		97	%	80 - 120
			Total Strontium (Sr)	2017/04/17		92	%	80 - 120
			Total Thallium (Tl)	2017/04/17		99	%	80 - 120
			Total Titanium (Ti)	2017/04/17		98	%	80 - 120
			Total Vanadium (V)	2017/04/17		97	%	80 - 120
			Total Zinc (Zn)	2017/04/17		98	%	80 - 120
4941659	KCO	Method Blank	Total Aluminum (Al)	2017/04/17	<0.0050		mg/L	
			Total Antimony (Sb)	2017/04/17	<0.00050		mg/L	
			Total Arsenic (As)	2017/04/17	<0.0010		mg/L	
			Total Barium (Ba)	2017/04/17	<0.0020		mg/L	
			Total Beryllium (Be)	2017/04/17	<0.00050		mg/L	
			Total Boron (B)	2017/04/17	<0.010		mg/L	
			Total Cadmium (Cd)	2017/04/17	<0.00010		mg/L	
			Total Calcium (Ca)	2017/04/17	<0.20		mg/L	
			Total Chromium (Cr)	2017/04/17	<0.0050		mg/L	
			Total Cobalt (Co)	2017/04/17	<0.00050		mg/L	
			Total Copper (Cu)	2017/04/17	<0.0010		mg/L	
			Total Iron (Fe)	2017/04/17	<0.10		mg/L	
			Total Lead (Pb)	2017/04/17	<0.00050		mg/L	
			Total Magnesium (Mg)	2017/04/17	<0.050		mg/L	
			Total Manganese (Mn)	2017/04/17	<0.0020		mg/L	
			Total Molybdenum (Mo)	2017/04/17	<0.00050		mg/L	
			Total Nickel (Ni)	2017/04/17	<0.0010		mg/L	
			Total Potassium (K)	2017/04/17	<0.20		mg/L	
			Total Selenium (Se)	2017/04/17	<0.0020		mg/L	
			Total Silicon (Si)	2017/04/17	<0.050		mg/L	
			Total Silver (Ag)	2017/04/17	<0.00010		mg/L	
			Total Sodium (Na)	2017/04/17	<0.10		mg/L	
			Total Strontium (Sr)	2017/04/17	<0.0010		mg/L	
			Total Thallium (Tl)	2017/04/17	<0.000050		mg/L	
			Total Titanium (Ti)	2017/04/17	<0.0050		mg/L	
			Total Vanadium (V)	2017/04/17	<0.00050		mg/L	

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A Bureau Veritas Group Company

Maxxam Job #: B772423
Report Date: 2017/04/20

Golder Associates Ltd
Client Project #: 1771656 (1000/1003)
Sampler Initials: TP

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			Total Zinc (Zn)	2017/04/17	<0.0050		mg/L	
4941659	KCO	RPD	Total Iron (Fe)	2017/04/17	5.1		%	20
4941831	AFZ	Matrix Spike	Dissolved Calcium (Ca)	2017/04/18		NC	%	80 - 120
			Dissolved Magnesium (Mg)	2017/04/18		NC	%	80 - 120
			Dissolved Potassium (K)	2017/04/18		NC	%	80 - 120
			Dissolved Sodium (Na)	2017/04/18		NC	%	80 - 120
4941831	AFZ	Spiked Blank	Dissolved Calcium (Ca)	2017/04/18		103	%	80 - 120
			Dissolved Magnesium (Mg)	2017/04/18		100	%	80 - 120
			Dissolved Potassium (K)	2017/04/18		102	%	80 - 120
			Dissolved Sodium (Na)	2017/04/18		101	%	80 - 120
4941831	AFZ	Method Blank	Dissolved Calcium (Ca)	2017/04/18	<0.05		mg/L	
			Dissolved Magnesium (Mg)	2017/04/18	<0.05		mg/L	
			Dissolved Potassium (K)	2017/04/18	<1		mg/L	
			Dissolved Sodium (Na)	2017/04/18	<0.5		mg/L	
4946220	SAU	Spiked Blank	Alkalinity (Total as CaCO3)	2017/04/20		96	%	85 - 115
4946220	SAU	Method Blank	Alkalinity (Total as CaCO3)	2017/04/20	<1.0		mg/L	
4946220	SAU	RPD	Alkalinity (Total as CaCO3)	2017/04/20	1.2		%	20
4946377	ADB	Matrix Spike	Dissolved Chloride (Cl)	2017/04/20		NC	%	80 - 120
4946377	ADB	Spiked Blank	Dissolved Chloride (Cl)	2017/04/20		102	%	80 - 120
4946377	ADB	Method Blank	Dissolved Chloride (Cl)	2017/04/20	<1.0		mg/L	
4946377	ADB	RPD	Dissolved Chloride (Cl)	2017/04/20	1.5		%	20
4946383	ADB	Matrix Spike	Dissolved Sulphate (SO4)	2017/04/20		NC	%	75 - 125
4946383	ADB	Spiked Blank	Dissolved Sulphate (SO4)	2017/04/20		104	%	80 - 120
4946383	ADB	Method Blank	Dissolved Sulphate (SO4)	2017/04/20	<1.0		mg/L	
4946383	ADB	RPD	Dissolved Sulphate (SO4)	2017/04/20	1.3		%	20
4946951	CPE	Matrix Spike	Dissolved Aluminum (Al)	2017/04/20		100	%	80 - 120
			Dissolved Antimony (Sb)	2017/04/20		102	%	80 - 120
			Dissolved Arsenic (As)	2017/04/20		99	%	80 - 120
			Dissolved Barium (Ba)	2017/04/20		99	%	80 - 120
			Dissolved Beryllium (Be)	2017/04/20		100	%	80 - 120
			Dissolved Boron (B)	2017/04/20		100	%	80 - 120
			Dissolved Cadmium (Cd)	2017/04/20		100	%	80 - 120
			Dissolved Calcium (Ca)	2017/04/20		NC	%	80 - 120
			Dissolved Chromium (Cr)	2017/04/20		98	%	80 - 120
			Dissolved Cobalt (Co)	2017/04/20		96	%	80 - 120
			Dissolved Copper (Cu)	2017/04/20		98	%	80 - 120
			Dissolved Iron (Fe)	2017/04/20		98	%	80 - 120
			Dissolved Lead (Pb)	2017/04/20		91	%	80 - 120
			Dissolved Magnesium (Mg)	2017/04/20		NC	%	80 - 120
			Dissolved Manganese (Mn)	2017/04/20		97	%	80 - 120
			Dissolved Molybdenum (Mo)	2017/04/20		103	%	80 - 120
			Dissolved Nickel (Ni)	2017/04/20		93	%	80 - 120
			Dissolved Phosphorus (P)	2017/04/20		108	%	80 - 120
			Dissolved Potassium (K)	2017/04/20		99	%	80 - 120
			Dissolved Selenium (Se)	2017/04/20		94	%	80 - 120
			Dissolved Silicon (Si)	2017/04/20		99	%	80 - 120
			Dissolved Silver (Ag)	2017/04/20		74 (1)	%	80 - 120
			Dissolved Sodium (Na)	2017/04/20		NC	%	80 - 120
			Dissolved Strontium (Sr)	2017/04/20		NC	%	80 - 120
			Dissolved Thallium (Tl)	2017/04/20		91	%	80 - 120
			Dissolved Titanium (Ti)	2017/04/20		99	%	80 - 120
			Dissolved Uranium (U)	2017/04/20		101	%	80 - 120
			Dissolved Vanadium (V)	2017/04/20		98	%	80 - 120

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Maxxam Job #: B772423
Report Date: 2017/04/20

Golder Associates Ltd
Client Project #: 1771656 (1000/1003)
Sampler Initials: TP

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			Dissolved Zinc (Zn)	2017/04/20		95	%	80 - 120
4946951	CPE	Spiked Blank	Dissolved Aluminum (Al)	2017/04/20		99	%	80 - 120
			Dissolved Antimony (Sb)	2017/04/20		100	%	80 - 120
			Dissolved Arsenic (As)	2017/04/20		98	%	80 - 120
			Dissolved Barium (Ba)	2017/04/20		98	%	80 - 120
			Dissolved Beryllium (Be)	2017/04/20		100	%	80 - 120
			Dissolved Boron (B)	2017/04/20		101	%	80 - 120
			Dissolved Cadmium (Cd)	2017/04/20		98	%	80 - 120
			Dissolved Calcium (Ca)	2017/04/20		96	%	80 - 120
			Dissolved Chromium (Cr)	2017/04/20		98	%	80 - 120
			Dissolved Cobalt (Co)	2017/04/20		98	%	80 - 120
			Dissolved Copper (Cu)	2017/04/20		99	%	80 - 120
			Dissolved Iron (Fe)	2017/04/20		99	%	80 - 120
			Dissolved Lead (Pb)	2017/04/20		94	%	80 - 120
			Dissolved Magnesium (Mg)	2017/04/20		100	%	80 - 120
			Dissolved Manganese (Mn)	2017/04/20		99	%	80 - 120
			Dissolved Molybdenum (Mo)	2017/04/20		99	%	80 - 120
			Dissolved Nickel (Ni)	2017/04/20		97	%	80 - 120
			Dissolved Phosphorus (P)	2017/04/20		107	%	80 - 120
			Dissolved Potassium (K)	2017/04/20		99	%	80 - 120
			Dissolved Selenium (Se)	2017/04/20		96	%	80 - 120
			Dissolved Silicon (Si)	2017/04/20		98	%	80 - 120
			Dissolved Silver (Ag)	2017/04/20		87	%	80 - 120
			Dissolved Sodium (Na)	2017/04/20		101	%	80 - 120
			Dissolved Strontium (Sr)	2017/04/20		98	%	80 - 120
			Dissolved Thallium (Tl)	2017/04/20		93	%	80 - 120
			Dissolved Titanium (Ti)	2017/04/20		100	%	80 - 120
			Dissolved Uranium (U)	2017/04/20		100	%	80 - 120
			Dissolved Vanadium (V)	2017/04/20		97	%	80 - 120
			Dissolved Zinc (Zn)	2017/04/20		99	%	80 - 120
4946951	CPE	Method Blank	Dissolved Aluminum (Al)	2017/04/20	<0.0050		mg/L	
			Dissolved Antimony (Sb)	2017/04/20	<0.00050		mg/L	
			Dissolved Arsenic (As)	2017/04/20	<0.0010		mg/L	
			Dissolved Barium (Ba)	2017/04/20	<0.0020		mg/L	
			Dissolved Beryllium (Be)	2017/04/20	<0.00050		mg/L	
			Dissolved Boron (B)	2017/04/20	<0.010		mg/L	
			Dissolved Cadmium (Cd)	2017/04/20	<0.00010		mg/L	
			Dissolved Calcium (Ca)	2017/04/20	<0.20		mg/L	
			Dissolved Chromium (Cr)	2017/04/20	<0.0050		mg/L	
			Dissolved Cobalt (Co)	2017/04/20	<0.00050		mg/L	
			Dissolved Copper (Cu)	2017/04/20	<0.0010		mg/L	
			Dissolved Iron (Fe)	2017/04/20	<0.10		mg/L	
			Dissolved Lead (Pb)	2017/04/20	<0.00050		mg/L	
			Dissolved Magnesium (Mg)	2017/04/20	<0.050		mg/L	
			Dissolved Manganese (Mn)	2017/04/20	<0.0020		mg/L	
			Dissolved Molybdenum (Mo)	2017/04/20	<0.00050		mg/L	
			Dissolved Nickel (Ni)	2017/04/20	<0.0010		mg/L	
			Dissolved Phosphorus (P)	2017/04/20	<0.10		mg/L	
			Dissolved Potassium (K)	2017/04/20	<0.20		mg/L	
			Dissolved Selenium (Se)	2017/04/20	<0.0020		mg/L	
			Dissolved Silicon (Si)	2017/04/20	<0.050		mg/L	
			Dissolved Silver (Ag)	2017/04/20	<0.00010		mg/L	
			Dissolved Sodium (Na)	2017/04/20	<0.10		mg/L	

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QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			Dissolved Strontium (Sr)	2017/04/20	<0.0010		mg/L	
			Dissolved Thallium (Tl)	2017/04/20	<0.000050		mg/L	
			Dissolved Titanium (Ti)	2017/04/20	<0.0050		mg/L	
			Dissolved Uranium (U)	2017/04/20	<0.00010		mg/L	
			Dissolved Vanadium (V)	2017/04/20	<0.00050		mg/L	
			Dissolved Zinc (Zn)	2017/04/20	<0.0050		mg/L	
4946951	CPE	RPD	Dissolved Aluminum (Al)	2017/04/20	NC		%	20
			Dissolved Antimony (Sb)	2017/04/20	NC		%	20
			Dissolved Arsenic (As)	2017/04/20	NC		%	20
			Dissolved Barium (Ba)	2017/04/20	1.6		%	20
			Dissolved Beryllium (Be)	2017/04/20	NC		%	20
			Dissolved Boron (B)	2017/04/20	2.0		%	20
			Dissolved Cadmium (Cd)	2017/04/20	NC		%	20
			Dissolved Calcium (Ca)	2017/04/20	1.9		%	20
			Dissolved Chromium (Cr)	2017/04/20	NC		%	20
			Dissolved Cobalt (Co)	2017/04/20	0.16		%	20
			Dissolved Copper (Cu)	2017/04/20	NC		%	20
			Dissolved Iron (Fe)	2017/04/20	0.45		%	20
			Dissolved Lead (Pb)	2017/04/20	NC		%	20
			Dissolved Magnesium (Mg)	2017/04/20	1.1		%	20
			Dissolved Manganese (Mn)	2017/04/20	0.92		%	20
			Dissolved Molybdenum (Mo)	2017/04/20	6.7		%	20
			Dissolved Nickel (Ni)	2017/04/20	0.96		%	20
			Dissolved Phosphorus (P)	2017/04/20	NC		%	20
			Dissolved Potassium (K)	2017/04/20	0.21		%	20
			Dissolved Selenium (Se)	2017/04/20	NC		%	20
			Dissolved Silicon (Si)	2017/04/20	2.3		%	20
			Dissolved Silver (Ag)	2017/04/20	NC		%	20
			Dissolved Sodium (Na)	2017/04/20	1.3		%	20
			Dissolved Strontium (Sr)	2017/04/20	1.7		%	20
			Dissolved Thallium (Tl)	2017/04/20	NC		%	20
			Dissolved Titanium (Ti)	2017/04/20	NC		%	20
			Dissolved Uranium (U)	2017/04/20	1.8		%	20
			Dissolved Vanadium (V)	2017/04/20	NC		%	20
			Dissolved Zinc (Zn)	2017/04/20	0.042		%	20

N/A = Not Applicable

Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.

Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate sample matrix interference.

QC Standard: A sample of known concentration prepared by an external agency under stringent conditions. Used as an independent check of method accuracy.

Spiked Blank: A blank matrix sample to which a known amount of the analyte, usually from a second source, has been added. Used to evaluate method accuracy.

Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.

NC (Matrix Spike): The recovery in the matrix spike was not calculated. The relative difference between the concentration in the parent sample and the spike amount was too small to permit a reliable recovery calculation (matrix spike concentration was less than the native sample concentration)

NC (Duplicate RPD): The duplicate RPD was not calculated. The concentration in the sample and/or duplicate was too low to permit a reliable RPD calculation (absolute difference <= 2x RDL).

(1) Recovery or RPD for this parameter is outside control limits. The overall quality control for this analysis meets acceptability criteria.

VALIDATION SIGNATURE PAGE

The analytical data and all QC contained in this report were reviewed and validated by the following individual(s).

Cristina Carriere, Scientific Services

CHARTERED Eva Pranjic CHEMIST

Ewa Pranjic, M.Sc., C.Chem, Scientific Specialist

Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

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IMMEDIATE TEST

CHAIN OF CUSTODY RECORD

Page 1 of 2

INVOICE TO:	REPORT TO:	PROJECT INFORMATION:	Laboratory Use Only:
Company Name: #29096 Golder Associates Ltd	Company Name:	Quotation #: B70916	Maxxam Job #: / Bottle Order #: 605301
Attention: Accounts Payable	Attention: Thomas Proks	P.O. #:	
Address: 110 Hanover Dr Building A, Suite 203, St.Catharines ON L2W 1A4	Address:	Project: 1771656 / 1000 / 1003	COC #: C#605301-01-01
		Project Name:	Project Manager: Ema Gitej
Tel: (905) 688-8217 x Fax: (905) 688-4227 x	Tel: (905) 688-8217 x Fax:	Site #:	
Email: AP_CustomerService@golder.com	Email: Thomas_Proks@golder.com	Sampled By: JP, PH, CS	

MOE REGULATED DRINKING WATER OR WATER INTENDED FOR HUMAN CONSUMPTION MUST BE SUBMITTED ON THE MAXXAM DRINKING WATER CHAIN OF CUSTODY

Regulation 153 (2011): Table 1 / Table 2 / Table 3 / Table ___ ; Res/Park / Ind/Comm / Agri/Other ; Medium/Fine / Coarse / For RSC

Other Regulations: CCME / Reg 558 / MISA / PWQO / Other ; Sanitary Sewer Bylaw / Storm Sewer Bylaw ; Municipality

Special Instructions

Include Criteria on Certificate of Analysis (Y/N)?

ANALYSIS REQUESTED (PLEASE BE SPECIFIC): Field Filtered (please circle): Metals / Hg / Cr VI ; RCAp - Comprehensive GW ; RCAP - Surface Water

11-Apr-17 15:30
Ema Gitej
B772423
TSP ENV-856

Turnaround Time (TAT) Required:
Please provide advance notice for rush projects

Regular (Standard) TAT: ☑
(will be applied if Rush TAT is not specified)
Standard TAT = 5-7 Working days for most tests
Please note: Standard TAT for certain tests such as BOD and Dioxins/Furans are > 5 days - contact your Project Manager for details.
Job Specific Rush TAT (if applies to entire submission)
Date Required: ______ Time Required: ______
Rush Confirmation Number: ______ (call lab for #)

	Sample Barcode Label	Sample (Location) Identification	Date Sampled	Time Sampled	Matrix	Field Filtered	RCAp - Comprehensive	RCAP - Surface Water	# of Bottles	Comments
1		MW17-1D	Apr 10, 2017	14:45	GW	Y	✓		4	
2		MW17-1S	↓	14:42	GW	Y	✓		4	silty sample proceed with analysis
3		MW17-4S	↓	16:30	GW	Y	✓		4	
4		MW17-2S	Apr 11, 2017	8:45	GW	Y	✓		4	
5		MW17-3D	Apr 10, 2017	15:14	GW	Y	✓		4	
6		MW17-6D		13:28	GW	Y	✓		4	
7		MW17-6S		13:28	GW	Y	✓		4	
8		MW17-9S		13:00	GW	Y	✓		4	
9		MW17-9D		12:53	GW	Y	✓		4	
10		MW17-99D	↓	12:53	GW	Y	✓		4	

* RELINQUISHED BY: (Signature/Print)	Date: (YY/MM/DD)	Time	RECEIVED BY: (Signature/Print)	Date: (YY/MM/DD)	Time	# jars used and not submitted	Time Sensitive	Temperature (°C) on Recei	Custody Seal	Yes	No
TOM PROKS	17/04/11	11:00	HARWIN MOHAN	2017/04/11	15:30			0/0/1 -1/-1/0	Present	✓	
									Intact	✓	

* UNLESS OTHERWISE AGREED TO IN WRITING, WORK SUBMITTED ON THIS CHAIN OF CUSTODY IS SUBJECT TO MAXXAM'S STANDARD TERMS AND CONDITIONS. SIGNING OF THIS CHAIN OF CUSTODY DOCUMENT IS ACKNOWLEDGMENT AND ACCEPTANCE OF OUR TERMS WHICH ARE AVAILABLE FOR VIEWING AT WWW.MAXXAM.CA/TERMS.

* IT IS THE RESPONSIBILITY OF THE RELINQUISHER TO ENSURE THE ACCURACY OF THE CHAIN OF CUSTODY RECORD. AN INCOMPLETE CHAIN OF CUSTODY MAY RESULT IN ANALYTICAL TAT DELAYS.

** SAMPLE CONTAINER, PRESERVATION, HOLD TIME AND PACKAGE INFORMATION CAN BE VIEWED AT HTTP://MAXXAM.CA/WP-CONTENT/UPLOADS/ONTARIO-COC.PDF.

SAMPLES MUST BE KEPT COOL (< 10° C) FROM TIME OF SAMPLING UNTIL DELIVERY TO MAXXAM

White: Maxxa Yellow: Client

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CHAIN OF CUSTODY RECORD

Page 2 of 2

INVOICE TO:
Company Name: #29096 Golder Associates Ltd
Attention: Accounts Payable
Address: 110 Hanover Dr Building A, Suite 203
St.Catharines ON L2W 1A4
Tel: (905) 688-8217 x Fax: (905) 688-4227 x
Email: AP_CustomerService@golder.com

REPORT TO:
Company Name:
Attention: Thomas Proks
Address:
Tel: (905) 688-8217 x Fax:
Email: Thomas_Proks@golder.com

PROJECT INFORMATION:
Quotation #: B70916
P.O. #:
Project: 1771656 / 1000 / 1003
Project Name:
Site #:
Sampled By: TP, PH, CS

Laboratory Use Only:
Maxxam Job #:
Bottle Order #: 605301
COC #: C#605301-02-01
Project Manager: Ema Gitej

MOE REGULATED DRINKING WATER OR WATER INTENDED FOR HUMAN CONSUMPTION MUST BE SUBMITTED ON THE MAXXAM DRINKING WATER CHAIN OF CUSTODY

Regulation 153 (2011): ☐ Table 1 ☐ Res/Park ☐ Medium/Fine ☐ Table 2 ☐ Ind/Comm ☐ Coarse ☐ Table 3 ☐ Agri/Other ☐ For RSC ☐ Table ___

Other Regulations: ☐ CCME ☐ Sanitary Sewer Bylaw ☐ Reg 558 ☐ Storm Sewer Bylaw ☐ MISA Municipality ___ ☐ PWQO ☐ Other ___

Special Instructions

Include Criteria on Certificate of Analysis (Y/N)? ___

ANALYSIS REQUESTED (PLEASE BE SPECIFIC)

Turnaround Time (TAT) Required:
Please provide advance notice for rush projects
Regular (Standard) TAT: ☑
(will be applied if Rush TAT is not specified)
Standard TAT = 5-7 Working days for most tests.
Please note: Standard TAT for certain tests such as BOD and Dioxins/Furans are > 5 days - contact your Project Manager for details.
Job Specific Rush TAT (if applies to entire submission)
Date Required: ___ Time Required: ___
Rush Confirmation Number: ___ (call lab for #)

#	Sample Barcode Label	Sample (Location) Identification	Date Sampled	Time Sampled	Matrix	Field Filtered (please circle) Metals / Hg / Cr VI	RCAp - Comprehensive GW	RCAP - Surface Water								# of Bottles	Comments
1		MW17-8D	Apr 10, 2017	13:59	GW	Y	✓									4	
2		MW17-8S		13:56	GW	Y	✓									4	
3		MW17-10D	↓	15:34	GW	Y	✓									4	
4		POND	Apr 11, 2017	9:15	SW	N		✓								3	
5		~~MW17~~			~~GW~~	-											
6		~~MW17~~			~~GW~~												
7		~~MW17~~			~~GW~~												
8		~~MW17~~			~~GW~~												
9		~~MW17~~			~~GW~~												
10		~~MW17~~			~~GW~~												

* RELINQUISHED BY: (Signature/Print)	Date: (YY/MM/DD)	Time	RECEIVED BY: (Signature/Print)	Date: (YY/MM/DD)	Time	# jars used and not submitted
/ TOM PROKS	17/04/11	11:00	HARWIN MOKHA	2017/04/11	15:30	

Laboratory Use Only: Time Sensitive; Temperature (°C) on Recei: 0 0 1 1 1 0; Custody Seal Present: Yes ✓; Intact: Yes ✓

* UNLESS OTHERWISE AGREED TO IN WRITING, WORK SUBMITTED ON THIS CHAIN OF CUSTODY IS SUBJECT TO MAXXAM'S STANDARD TERMS AND CONDITIONS. SIGNING OF THIS CHAIN OF CUSTODY DOCUMENT IS ACKNOWLEDGMENT AND ACCEPTANCE OF OUR TERMS WHICH ARE AVAILABLE FOR VIEWING AT WWW.MAXXAM.CA/TERMS.
* IT IS THE RESPONSIBILITY OF THE RELINQUISHER TO ENSURE THE ACCURACY OF THE CHAIN OF CUSTODY RECORD. AN INCOMPLETE CHAIN OF CUSTODY MAY RESULT IN ANALYTICAL TAT DELAYS.
** SAMPLE CONTAINER, PRESERVATION, HOLD TIME AND PACKAGE INFORMATION CAN BE VIEWED AT HTTP://MAXXAM.CA/WP-CONTENT/UPLOADS/ONTARIO-COC.PDF.

SAMPLES MUST BE KEPT COOL (< 10° C) FROM TIME OF SAMPLING UNTIL DELIVERY TO MAXXAM

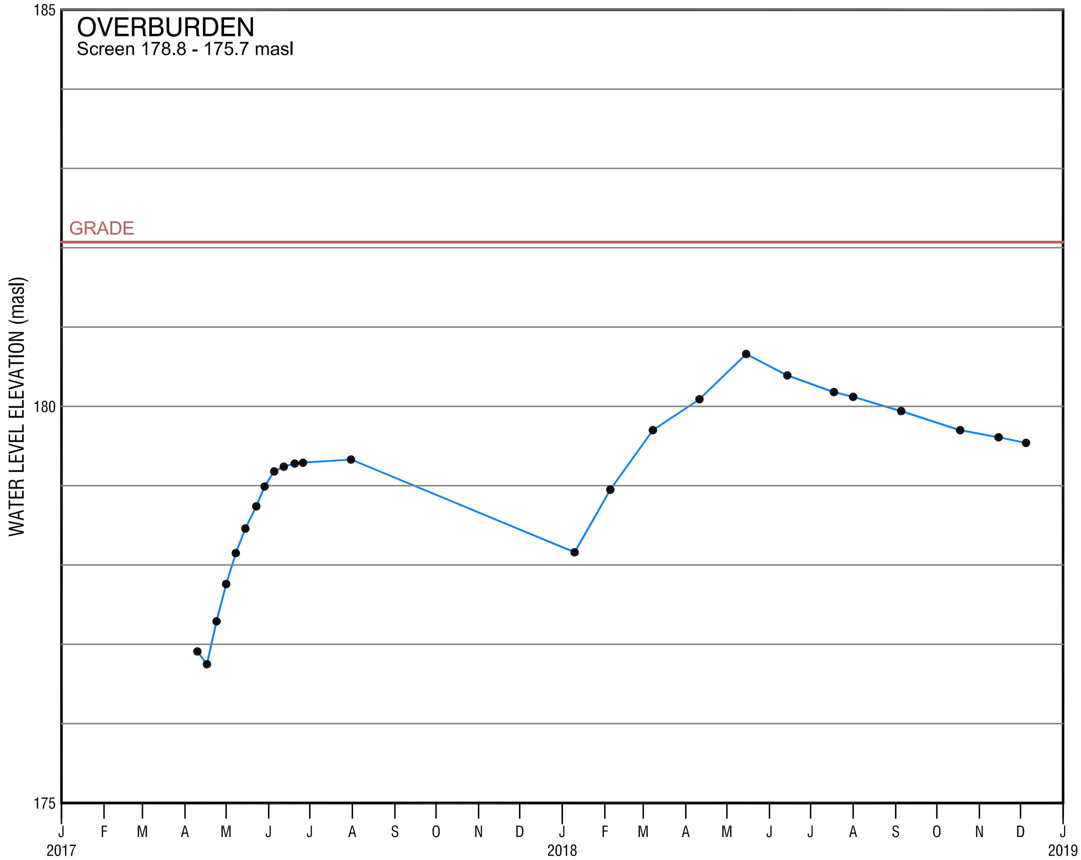
White: Maxxam Yellow: Client

Maxxam Analytics International Corporation o/a Maxxam Analytics

APPENDIX D

Hydrographs

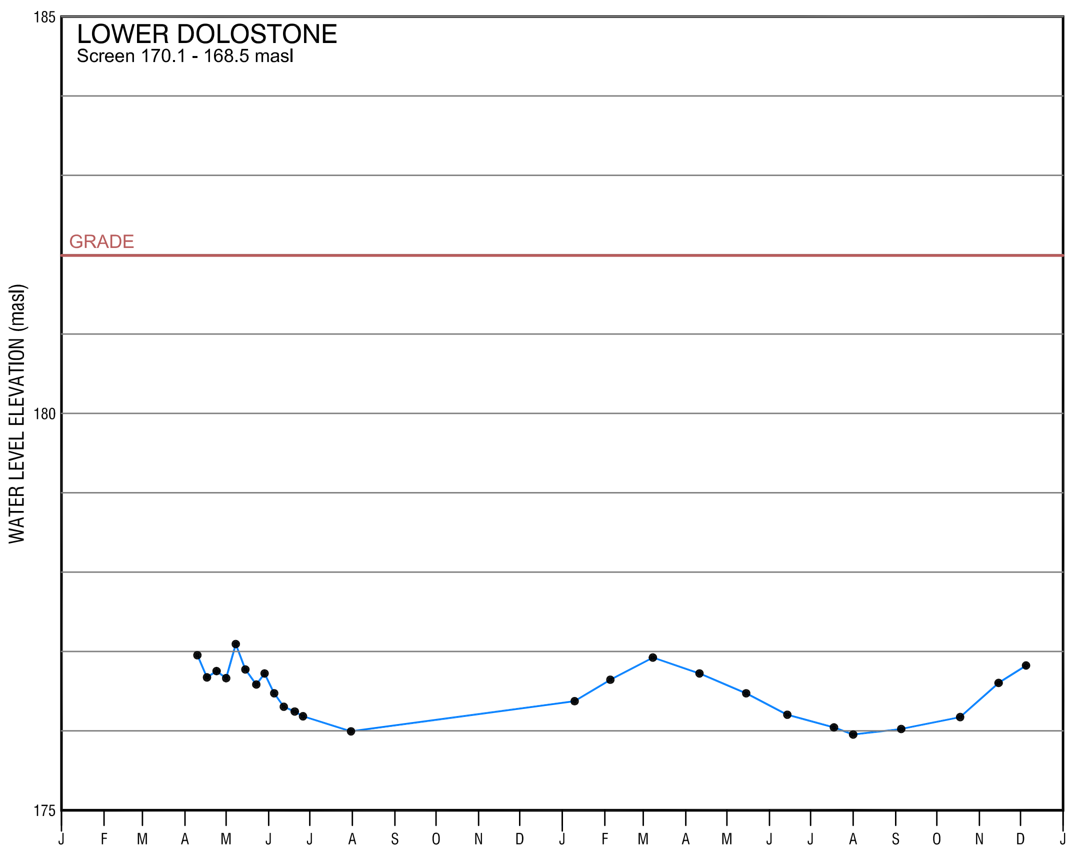
MW17-1S



MP Elevation 182.86 masl
Grade 182.1 masl

DATE	ELEVATION
10-Apr-17	176.91
17-Apr-17	176.75
24-Apr-17	177.29
01-May-17	177.76
08-May-17	178.15
15-May-17	178.46
23-May-17	178.74
29-May-17	178.99
05-Jun-17	179.18
12-Jun-17	179.24
20-Jun-17	179.28
26-Jun-17	179.29
31-Jul-17	179.33
10-Jan-18	178.16
05-Feb-18	178.95
08-Mar-18	179.70
11-Apr-18	180.09
15-May-18	180.66
14-Jun-18	180.39
18-Jul-18	180.18
01-Aug-18	180.12
05-Sep-18	179.94
18-Oct-18	179.70
15-Nov-18	179.61
05-Dec-18	179.54

MW17-1D



MP Elevation 182.92 masl
Grade 182.0 masl

DATE	ELEVATION
10-Apr-17	176.95
17-Apr-17	176.67
24-Apr-17	176.75
01-May-17	176.66
08-May-17	177.09
15-May-17	176.77
23-May-17	176.58
29-May-17	176.72
05-Jun-17	176.47
12-Jun-17	176.30
20-Jun-17	176.24
26-Jun-17	176.18
31-Jul-17	175.99
10-Jan-18	176.37
05-Feb-18	176.64
08-Mar-18	176.92
11-Apr-18	176.72
15-May-18	176.47
14-Jun-18	176.20
18-Jul-18	176.04
01-Aug-18	175.95
05-Sep-18	176.02
18-Oct-18	176.17
15-Nov-18	176.60
05-Dec-18	176.82

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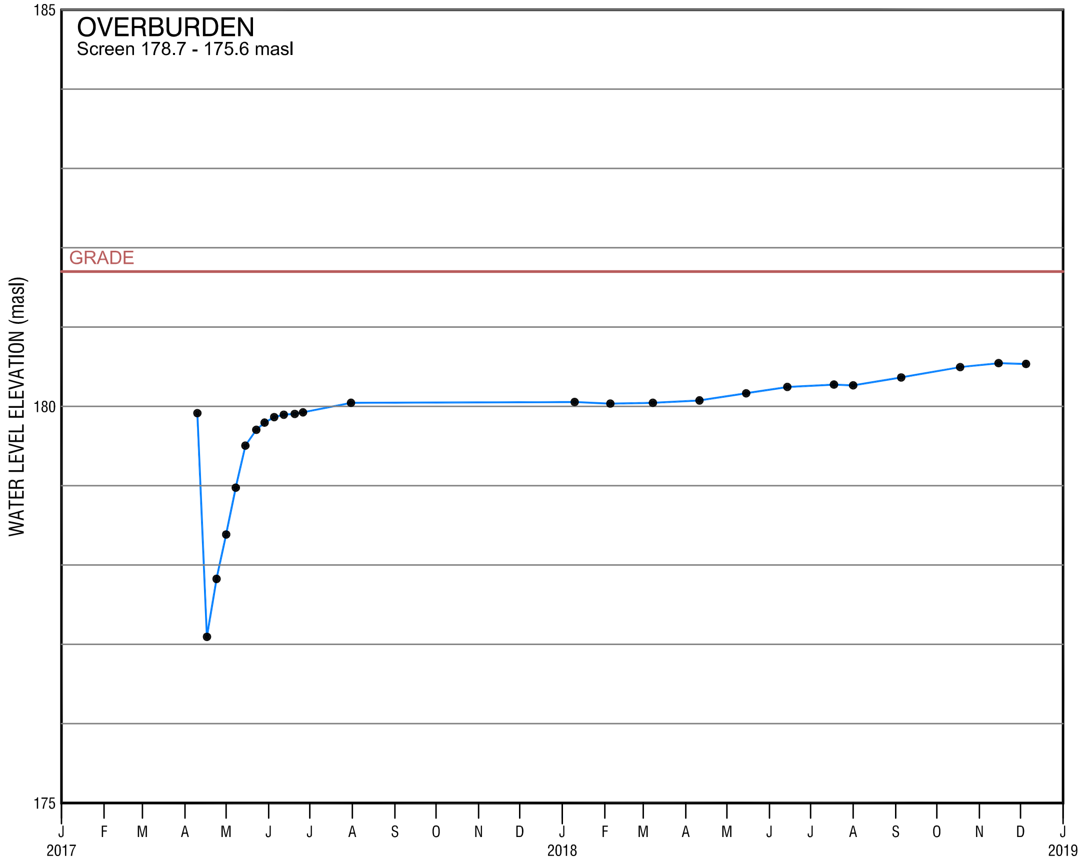
18G001

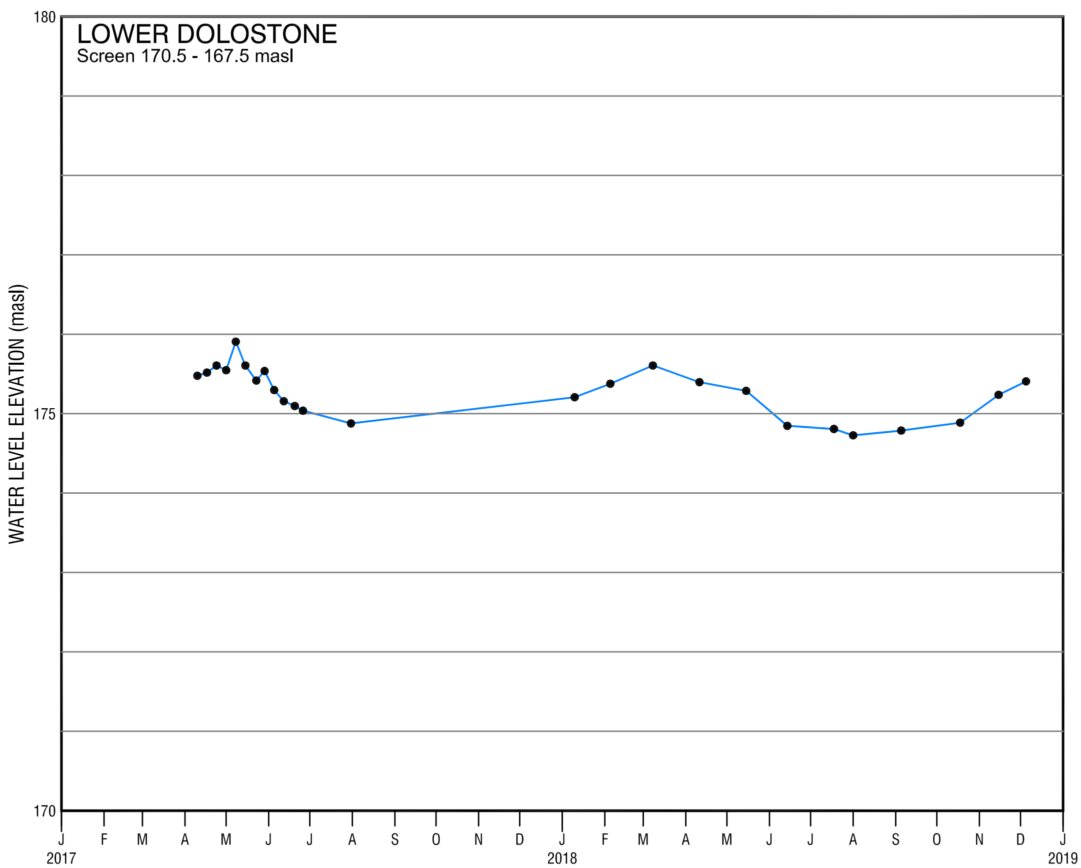
MW17-2S



MP Elevation 182.85 masl
Grade 181.7 masl

DATE	ELEVATION
10-Apr-17	179.91
17-Apr-17	177.10
24-Apr-17	177.82
01-May-17	178.38
08-May-17	178.98
15-May-17	179.51
23-May-17	179.71
29-May-17	179.79
05-Jun-17	179.87
12-Jun-17	179.90
20-Jun-17	179.90
26-Jun-17	179.93
31-Jul-17	180.04
10-Jan-18	180.05
05-Feb-18	180.04
08-Mar-18	180.04
11-Apr-18	180.07
15-May-18	180.16
14-Jun-18	180.24
18-Jul-18	180.27
01-Aug-18	180.26
05-Sep-18	180.37
18-Oct-18	180.49
15-Nov-18	180.54
05-Dec-18	180.54

MW17-2D



MP Elevation 182.64 masl
Grade 181.7 masl

DATE	ELEVATION
10-Apr-17	175.48
17-Apr-17	175.52
24-Apr-17	175.61
01-May-17	175.55
08-May-17	175.91
15-May-17	175.61
23-May-17	175.42
29-May-17	175.54
05-Jun-17	175.30
12-Jun-17	175.16
20-Jun-17	175.10
26-Jun-17	175.04
31-Jul-17	174.88
10-Jan-18	175.21
05-Feb-18	175.38
08-Mar-18	175.61
11-Apr-18	175.40
15-May-18	175.29
14-Jun-18	174.85
18-Jul-18	174.81
01-Aug-18	174.73
05-Sep-18	174.79
18-Oct-18	174.89
15-Nov-18	175.24
05-Dec-18	175.41

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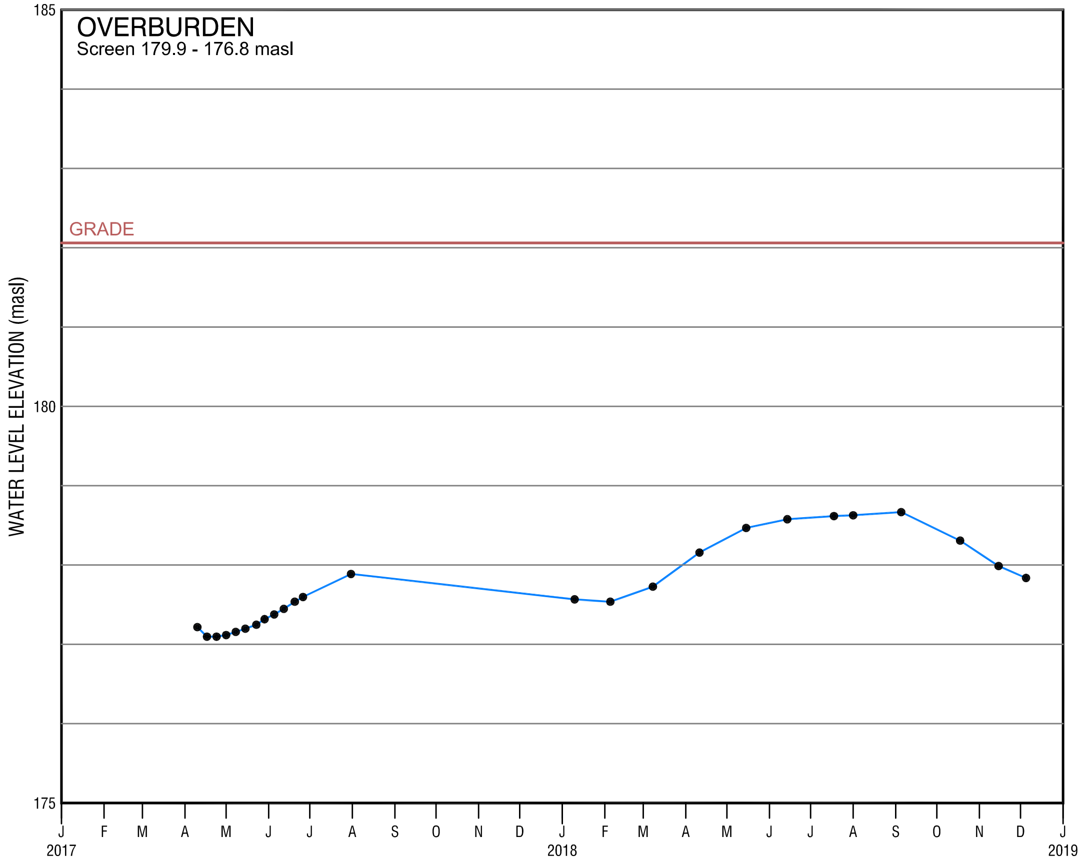
18G002

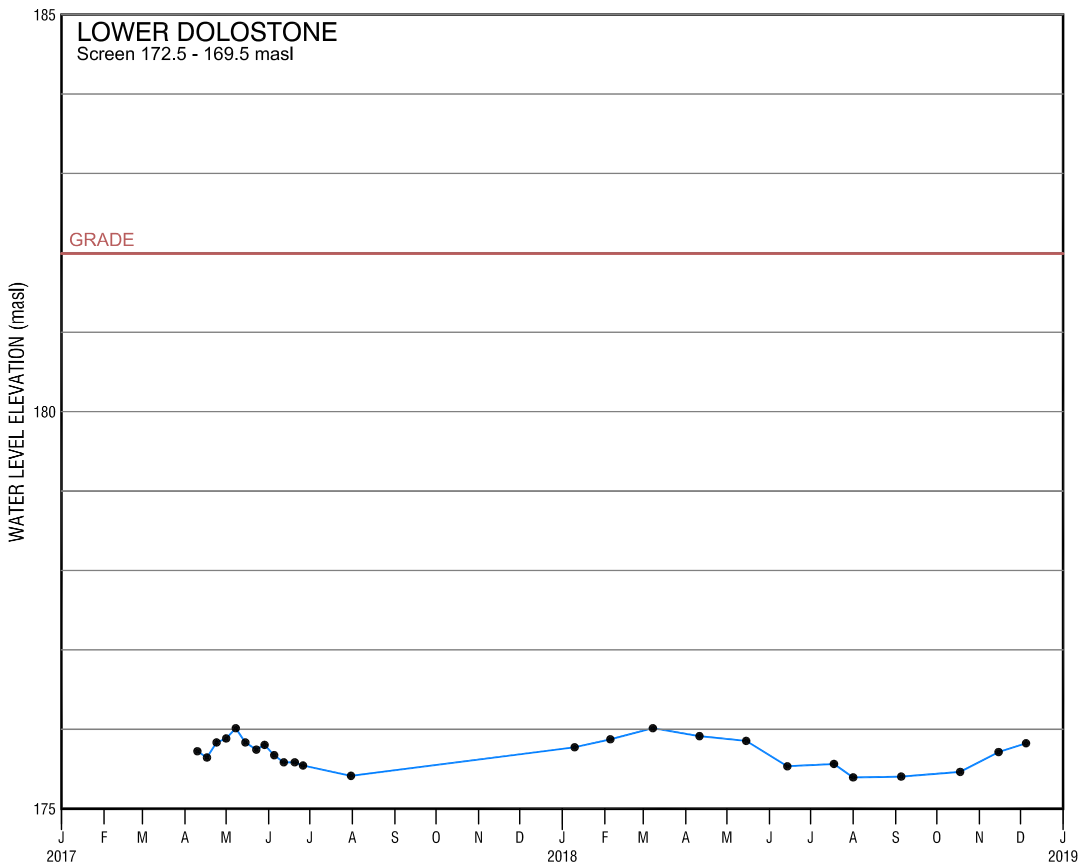
MW17-3S



MP Elevation 183.05 masl
Grade 182.1 masl

DATE	ELEVATION
10-Apr-17	177.22
17-Apr-17	177.10
24-Apr-17	177.10
01-May-17	177.12
08-May-17	177.16
15-May-17	177.20
23-May-17	177.25
29-May-17	177.32
05-Jun-17	177.38
12-Jun-17	177.45
20-Jun-17	177.54
26-Jun-17	177.60
31-Jul-17	177.89
10-Jan-18	177.57
05-Feb-18	177.54
08-Mar-18	177.73
11-Apr-18	178.16
15-May-18	178.47
14-Jun-18	178.58
18-Jul-18	178.62
01-Aug-18	178.63
05-Sep-18	178.67
18-Oct-18	178.31
15-Nov-18	177.99
05-Dec-18	177.84

MW17-3D

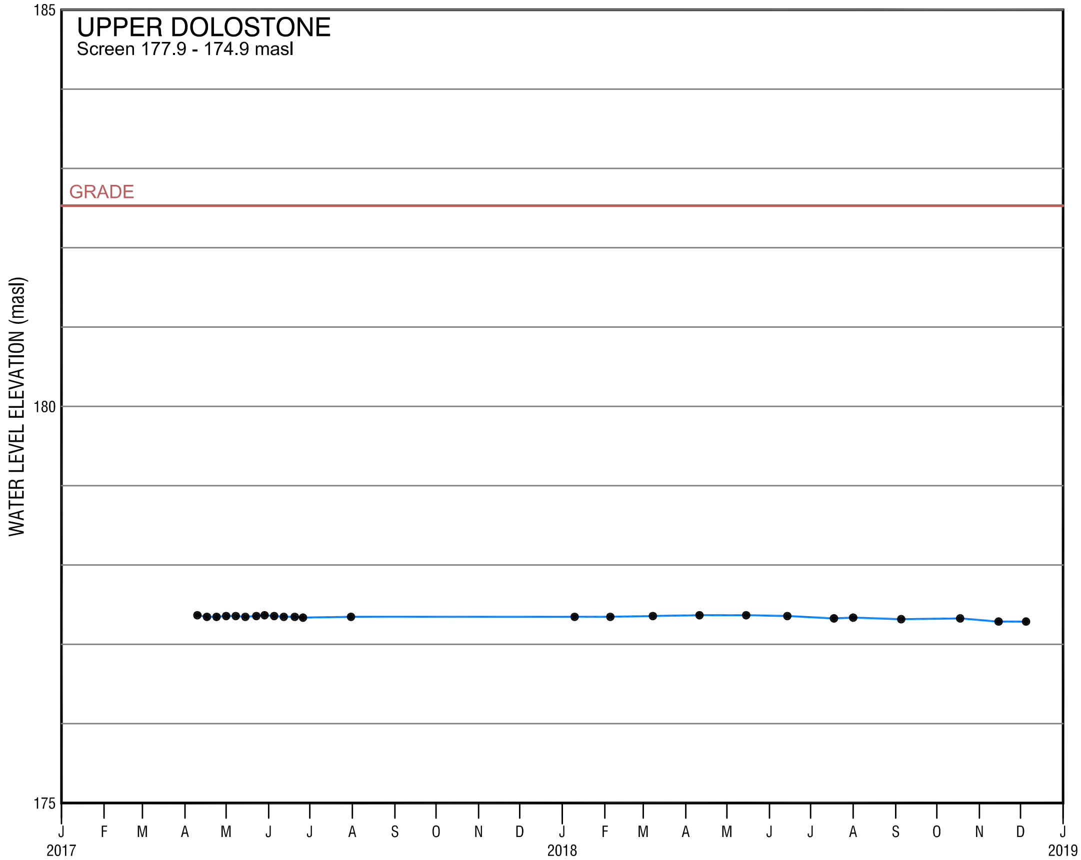


MP Elevation 183.00 masl
Grade 182.0 masl

DATE	ELEVATION
10-Apr-17	175.72
17-Apr-17	175.64
24-Apr-17	175.83
01-May-17	175.88
08-May-17	176.01
15-May-17	175.83
23-May-17	175.74
29-May-17	175.80
05-Jun-17	175.67
12-Jun-17	175.58
20-Jun-17	175.58
26-Jun-17	175.54
31-Jul-17	175.41
10-Jan-18	175.77
05-Feb-18	175.87
08-Mar-18	176.01
11-Apr-18	175.91
15-May-18	175.85
14-Jun-18	175.53
18-Jul-18	175.56
01-Aug-18	175.39
05-Sep-18	175.40
18-Oct-18	175.46
15-Nov-18	175.71
05-Dec-18	175.82

MW17-4S

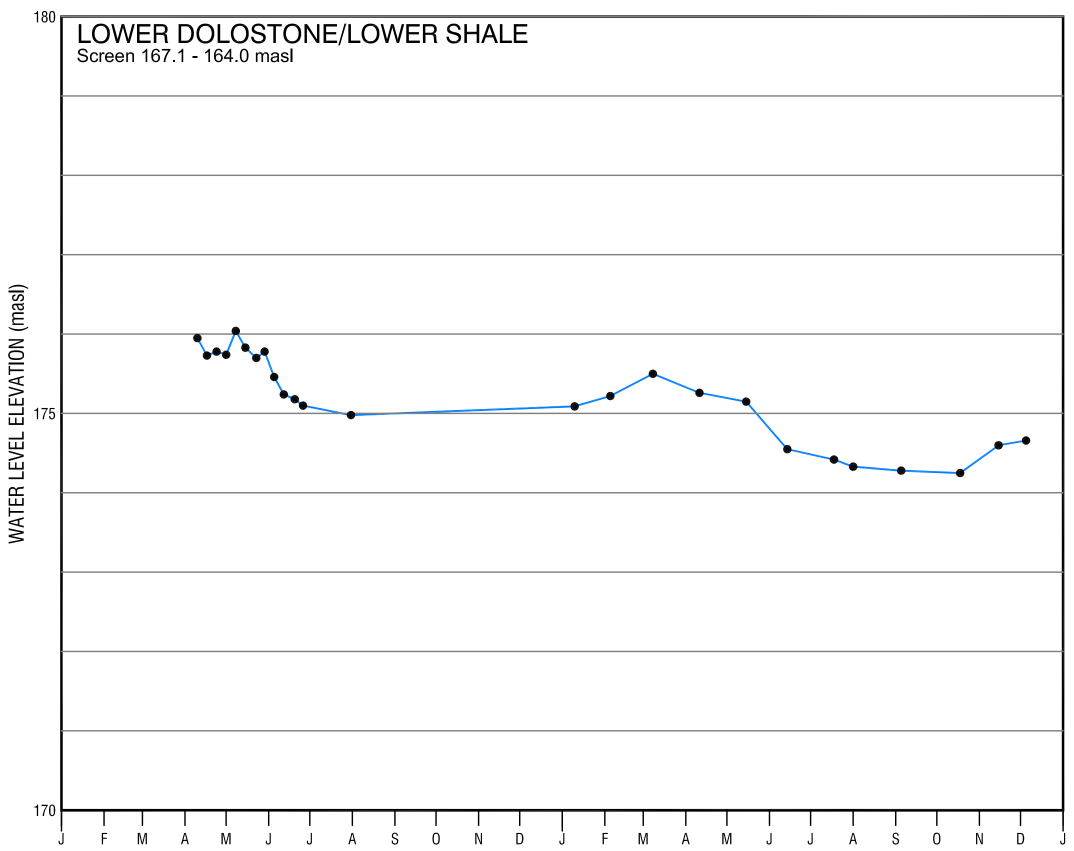
MP Elevation 183.47 masl
Grade 182.5 masl



DATE	ELEVATION
10-Apr-17	177.37
17-Apr-17	177.35
24-Apr-17	177.35
01-May-17	177.36
08-May-17	177.36
15-May-17	177.35
23-May-17	177.36
29-May-17	177.37
05-Jun-17	177.36
12-Jun-17	177.35
20-Jun-17	177.35
26-Jun-17	177.34
31-Jul-17	177.35
10-Jan-18	177.35
05-Feb-18	177.35
08-Mar-18	177.36
11-Apr-18	177.37
15-May-18	177.37
14-Jun-18	177.36
18-Jul-18	177.33
01-Aug-18	177.34
05-Sep-18	177.32
18-Oct-18	177.33
15-Nov-18	177.29
05-Dec-18	177.29

MW17-4D

MP Elevation 183.40 masl
Grade 182.5 masl

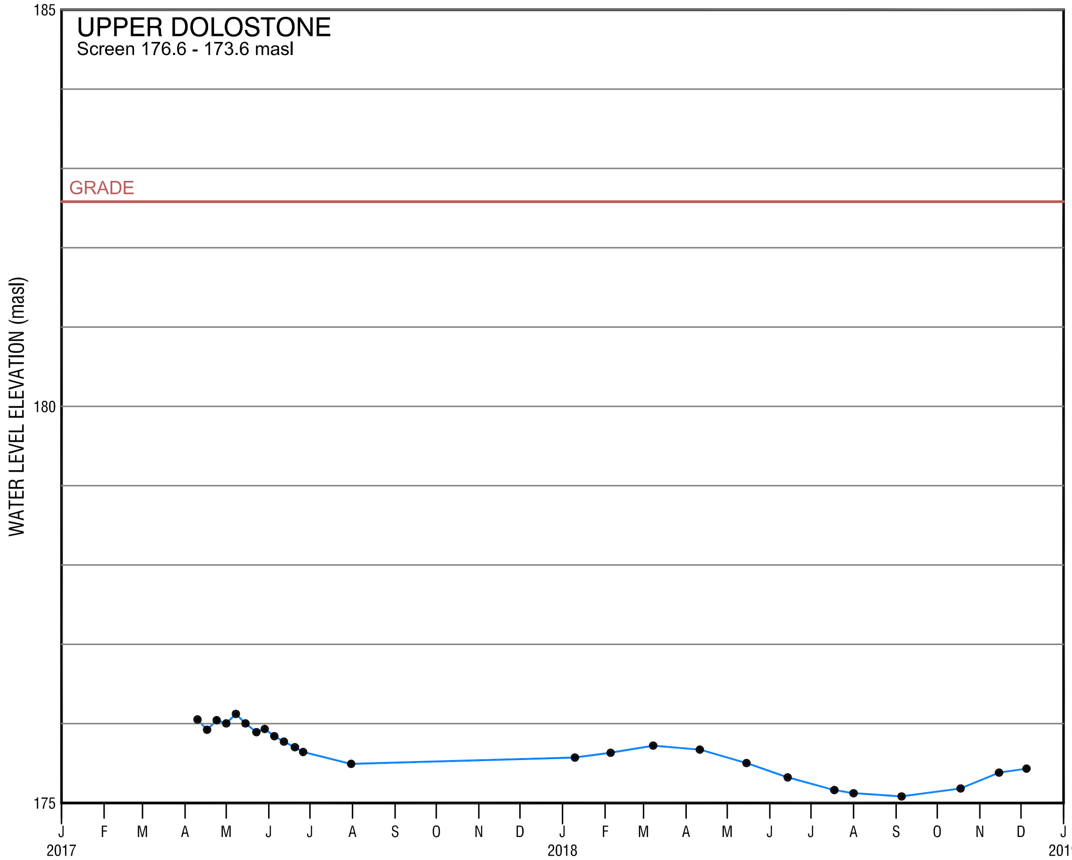


DATE	ELEVATION
10-Apr-17	175.95
17-Apr-17	175.73
24-Apr-17	175.78
01-May-17	175.74
08-May-17	176.04
15-May-17	175.83
23-May-17	175.70
29-May-17	175.78
05-Jun-17	175.46
12-Jun-17	175.24
20-Jun-17	175.18
26-Jun-17	175.10
31-Jul-17	174.98
10-Jan-18	175.09
05-Feb-18	175.22
08-Mar-18	175.50
11-Apr-18	175.26
15-May-18	175.15
14-Jun-18	174.55
18-Jul-18	174.42
01-Aug-18	174.33
05-Sep-18	174.28
18-Oct-18	174.25
15-Nov-18	174.60
05-Dec-18	174.66

MW17-5S

MP Elevation 183.63 masl
Grade 182.6 masl

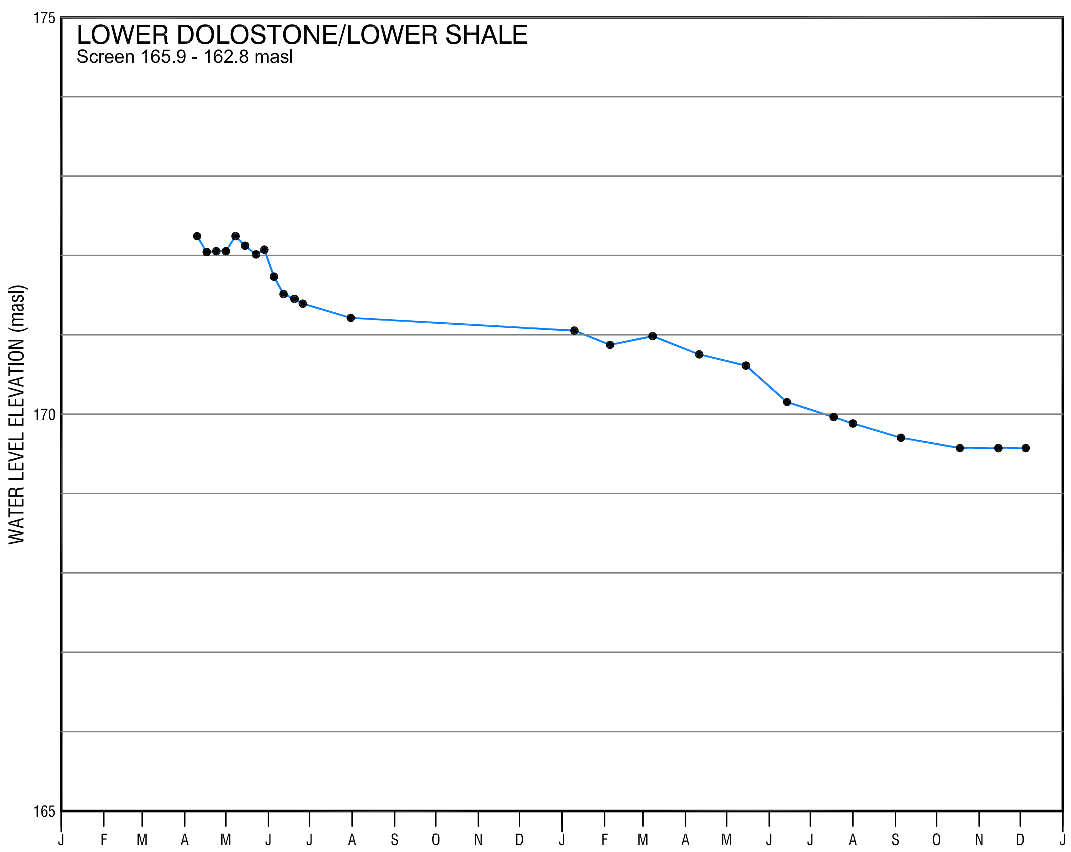
DATE	ELEVATION
10-Apr-17	176.05
17-Apr-17	175.92
24-Apr-17	176.04
01-May-17	176.00
08-May-17	176.12
15-May-17	176.00
23-May-17	175.89
29-May-17	175.93
05-Jun-17	175.84
12-Jun-17	175.77
20-Jun-17	175.70
26-Jun-17	175.64
31-Jul-17	175.49
10-Jan-18	175.57
05-Feb-18	175.63
08-Mar-18	175.72
11-Apr-18	175.67
15-May-18	175.50
14-Jun-18	175.32
18-Jul-18	175.16
01-Aug-18	175.12
05-Sep-18	175.08
18-Oct-18	175.18
15-Nov-18	175.38
05-Dec-18	175.43



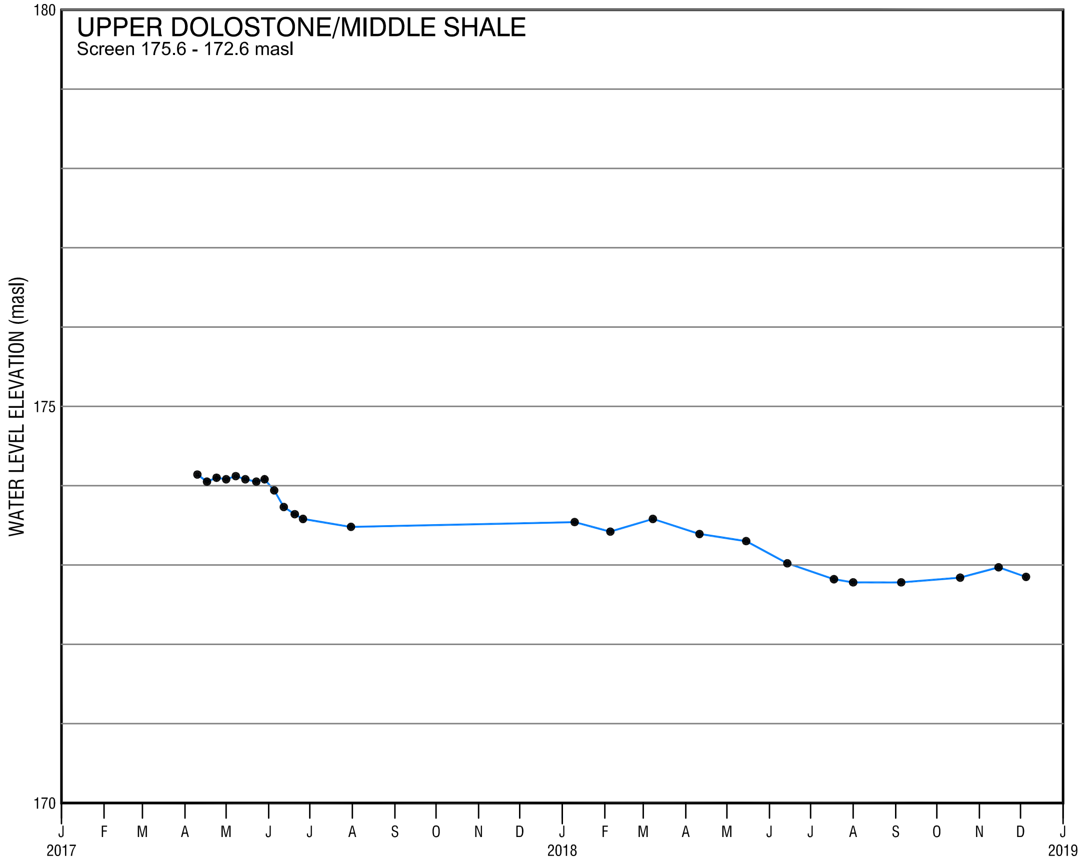
MW17-5D

MP Elevation 183.64 masl
Grade 182.6 masl

DATE	ELEVATION
10-Apr-17	172.24
17-Apr-17	172.04
24-Apr-17	172.05
01-May-17	172.05
08-May-17	172.24
15-May-17	172.12
23-May-17	172.01
29-May-17	172.07
05-Jun-17	171.73
12-Jun-17	171.51
20-Jun-17	171.45
26-Jun-17	171.39
31-Jul-17	171.21
10-Jan-18	171.05
05-Feb-18	170.87
08-Mar-18	170.98
11-Apr-18	170.75
15-May-18	170.61
14-Jun-18	170.15
18-Jul-18	169.96
01-Aug-18	169.88
05-Sep-18	169.70
18-Oct-18	169.57
15-Nov-18	169.57
05-Dec-18	169.57



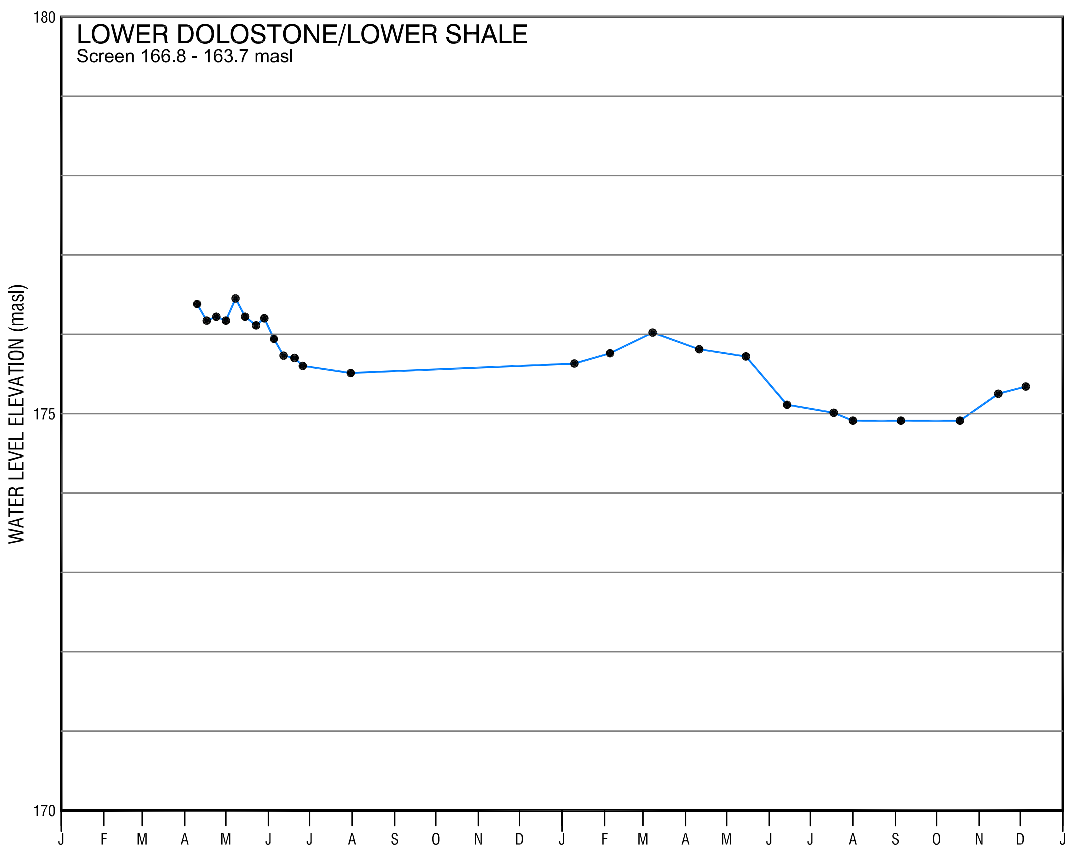
MW17-6S



MP Elevation 182.77 masl
Grade 181.8 masl

DATE	ELEVATION
10-Apr-17	174.14
17-Apr-17	174.05
24-Apr-17	174.10
01-May-17	174.08
08-May-17	174.12
15-May-17	174.08
23-May-17	174.05
29-May-17	174.08
05-Jun-17	173.94
12-Jun-17	173.73
20-Jun-17	173.64
26-Jun-17	173.58
31-Jul-17	173.48
10-Jan-18	173.54
05-Feb-18	173.42
08-Mar-18	173.58
11-Apr-18	173.39
15-May-18	173.30
14-Jun-18	173.02
18-Jul-18	172.82
01-Aug-18	172.78
05-Sep-18	172.78
18-Oct-18	172.84
15-Nov-18	172.97
05-Dec-18	172.85

MW17-6D



MP Elevation 182.84 masl
Grade 181.8 masl

DATE	ELEVATION
10-Apr-17	176.38
17-Apr-17	176.17
24-Apr-17	176.22
01-May-17	176.17
08-May-17	176.45
15-May-17	176.22
23-May-17	176.11
29-May-17	176.20
05-Jun-17	175.94
12-Jun-17	175.73
20-Jun-17	175.70
26-Jun-17	175.60
31-Jul-17	175.51
10-Jan-18	175.63
05-Feb-18	175.76
08-Mar-18	176.02
11-Apr-18	175.81
15-May-18	175.72
14-Jun-18	175.11
18-Jul-18	175.01
01-Aug-18	174.91
05-Sep-18	174.91
18-Oct-18	174.91
15-Nov-18	175.25
05-Dec-18	175.34

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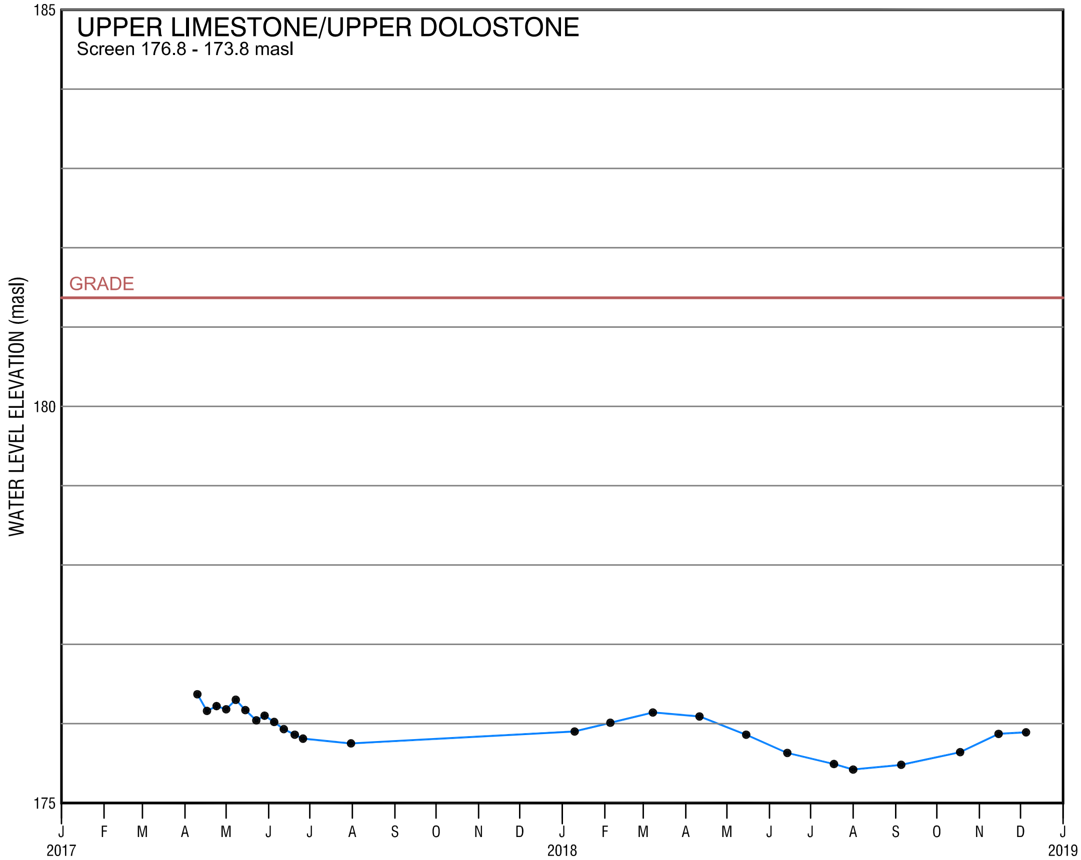
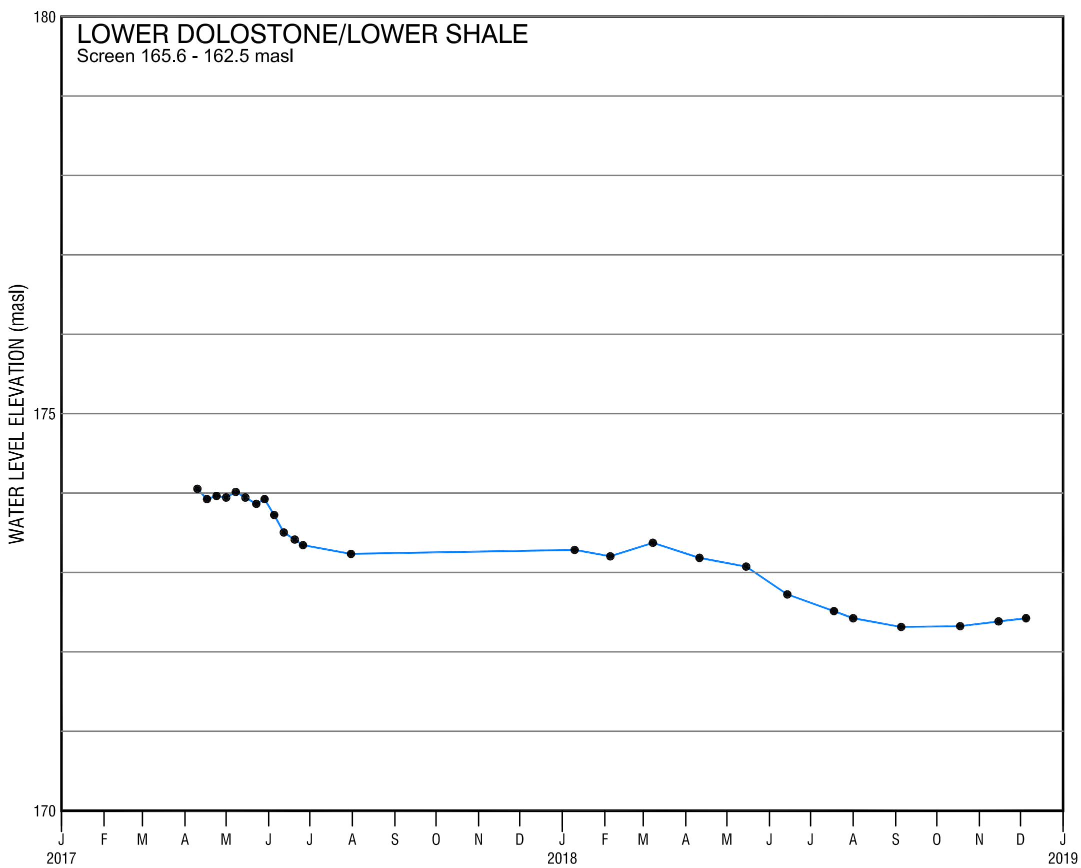
MW17-7S



MP Elevation 182.36 masl
Grade 181.4 masl

DATE	ELEVATION
10-Apr-17	176.37
17-Apr-17	176.16
24-Apr-17	176.22
01-May-17	176.18
08-May-17	176.30
15-May-17	176.17
23-May-17	176.04
29-May-17	176.10
05-Jun-17	176.02
12-Jun-17	175.93
20-Jun-17	175.86
26-Jun-17	175.81
31-Jul-17	175.75
10-Jan-18	175.90
05-Feb-18	176.01
08-Mar-18	176.14
11-Apr-18	176.09
15-May-18	175.86
14-Jun-18	175.63
18-Jul-18	175.49
01-Aug-18	175.42
05-Sep-18	175.48
18-Oct-18	175.64
15-Nov-18	175.87
05-Dec-18	175.89

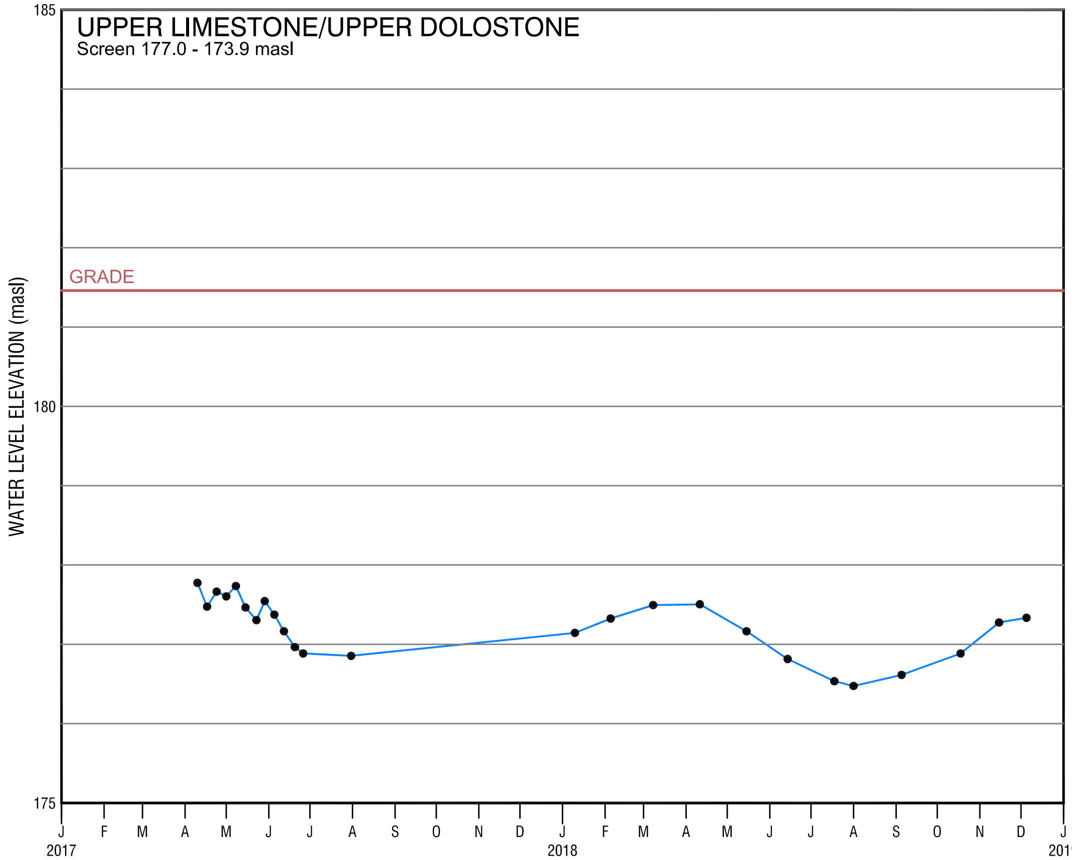
MW17-7D



MP Elevation 182.43 masl
Grade 181.4 masl

DATE	ELEVATION
10-Apr-17	174.05
17-Apr-17	173.92
24-Apr-17	173.96
01-May-17	173.94
08-May-17	174.01
15-May-17	173.94
23-May-17	173.86
29-May-17	173.92
05-Jun-17	173.72
12-Jun-17	173.50
20-Jun-17	173.41
26-Jun-17	173.34
31-Jul-17	173.23
10-Jan-18	173.28
05-Feb-18	173.20
08-Mar-18	173.37
11-Apr-18	173.18
15-May-18	173.07
14-Jun-18	172.72
18-Jul-18	172.51
01-Aug-18	172.42
05-Sep-18	172.31
18-Oct-18	172.32
15-Nov-18	172.38
05-Dec-18	172.42

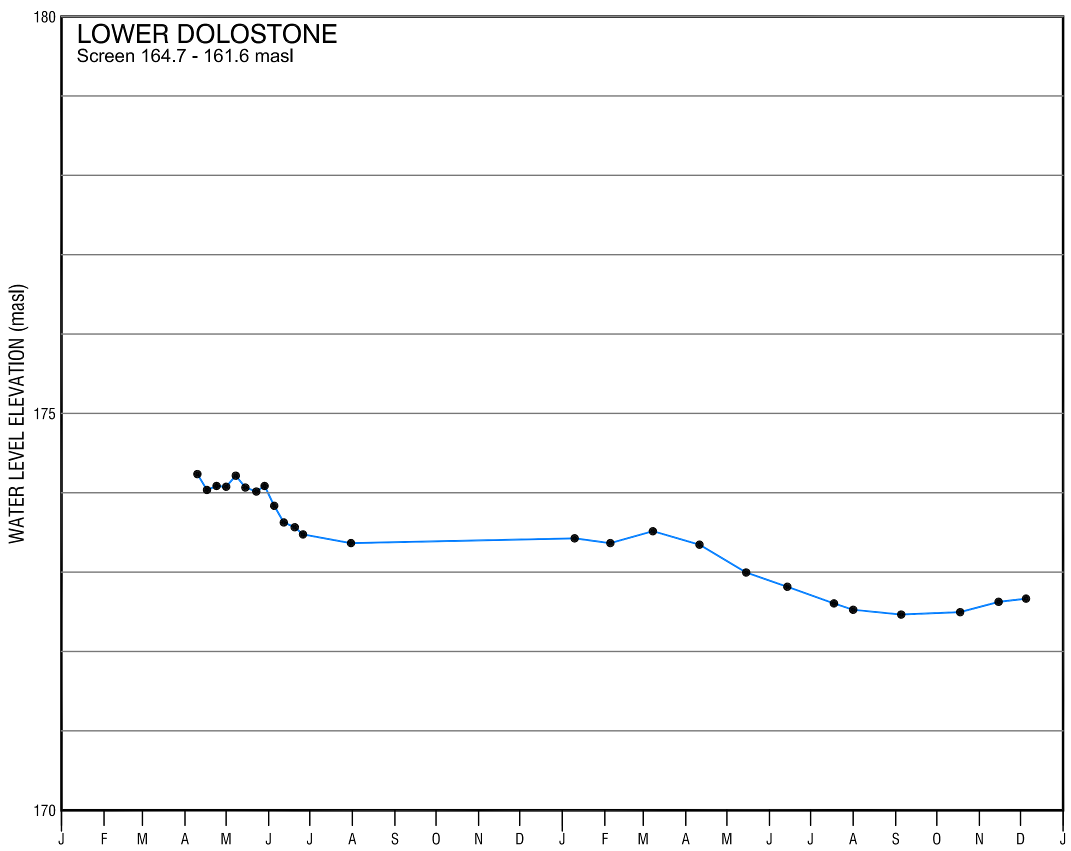
MW17-8S



MP Elevation 182.59 masl
Grade 181.5 masl

DATE	ELEVATION
10-Apr-17	177.77
17-Apr-17	177.48
24-Apr-17	177.66
01-May-17	177.60
08-May-17	177.74
15-May-17	177.46
23-May-17	177.30
29-May-17	177.54
05-Jun-17	177.38
12-Jun-17	177.16
20-Jun-17	176.96
26-Jun-17	176.88
31-Jul-17	176.85
10-Jan-18	177.15
05-Feb-18	177.32
08-Mar-18	177.49
11-Apr-18	177.51
15-May-18	177.16
14-Jun-18	176.82
18-Jul-18	176.54
01-Aug-18	176.48
05-Sep-18	176.62
18-Oct-18	176.88
15-Nov-18	177.27
05-Dec-18	177.34

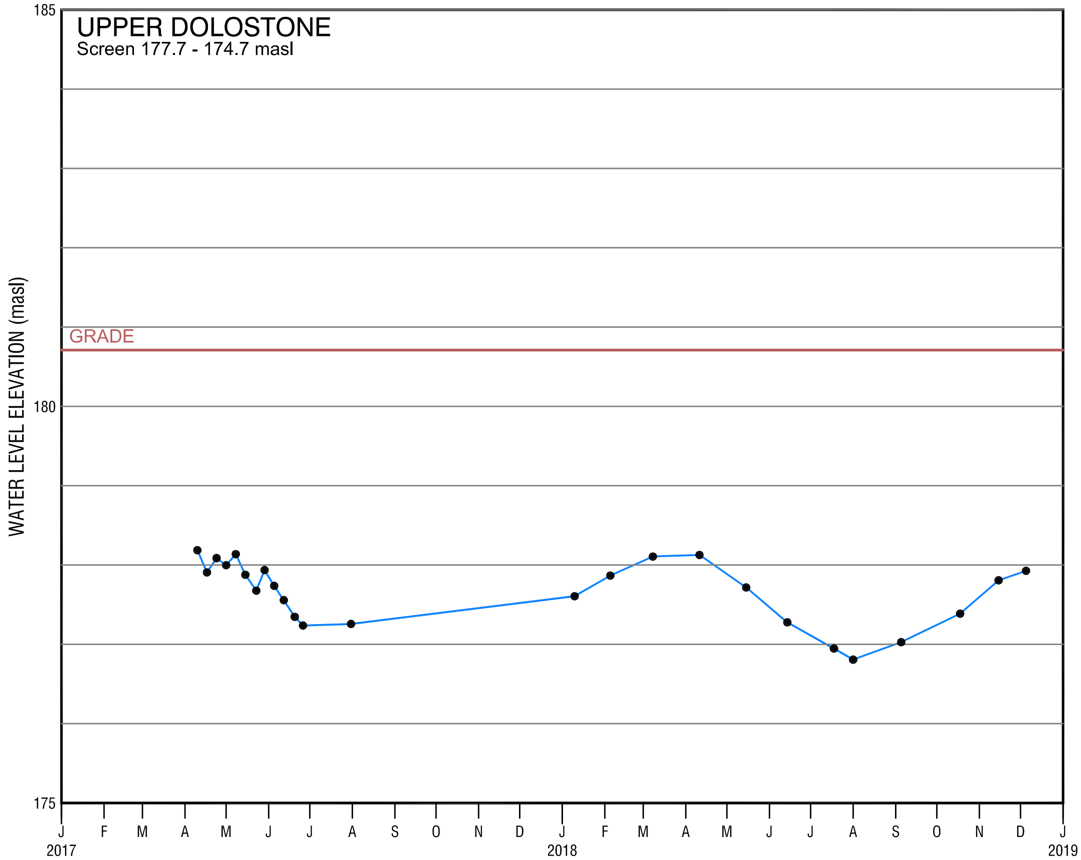
MW17-8D



MP Elevation 182.49 masl
Grade 181.4 masl

DATE	ELEVATION
10-Apr-17	174.24
17-Apr-17	174.04
24-Apr-17	174.09
01-May-17	174.08
08-May-17	174.22
15-May-17	174.07
23-May-17	174.02
29-May-17	174.09
05-Jun-17	173.84
12-Jun-17	173.63
20-Jun-17	173.57
26-Jun-17	173.48
31-Jul-17	173.37
10-Jan-18	173.43
05-Feb-18	173.37
08-Mar-18	173.52
11-Apr-18	173.35
15-May-18	173.00
14-Jun-18	172.82
18-Jul-18	172.61
01-Aug-18	172.53
05-Sep-18	172.47
18-Oct-18	172.50
15-Nov-18	172.63
05-Dec-18	172.67

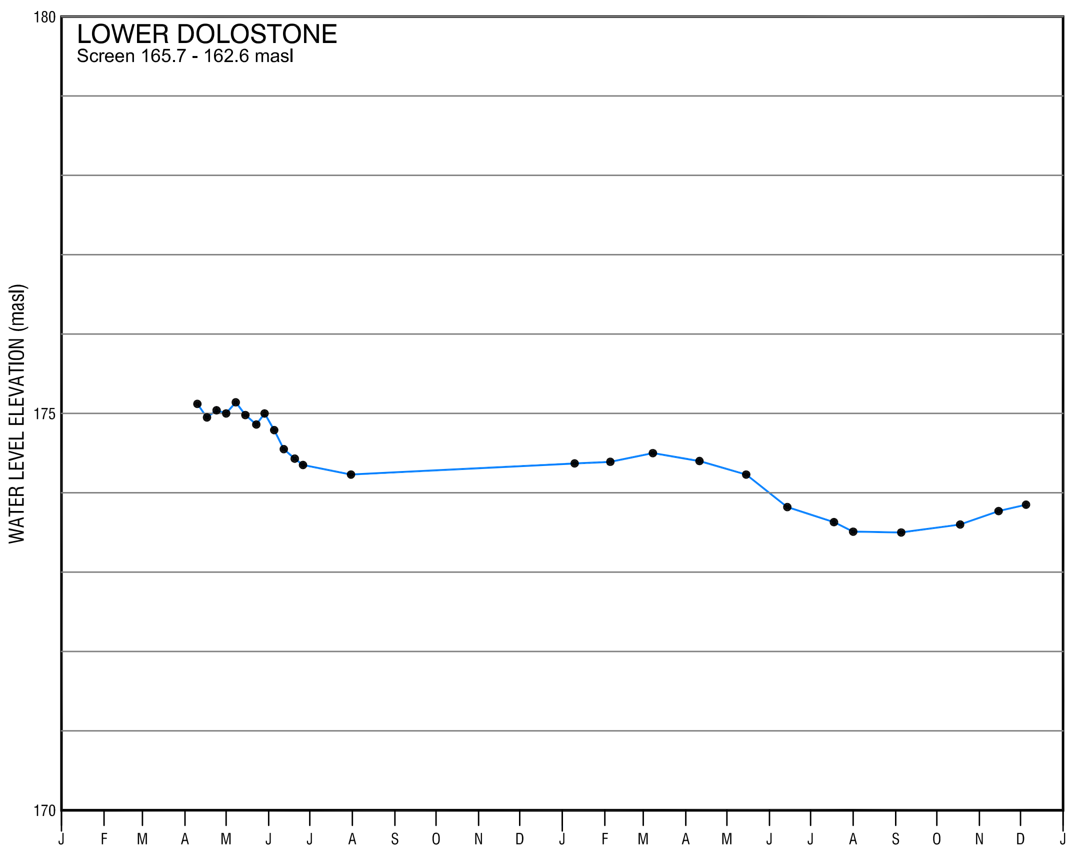
MW17-9S



MP Elevation 181.71 masl
Grade 180.7 masl

DATE	ELEVATION
10-Apr-17	178.19
17-Apr-17	177.91
24-Apr-17	178.09
01-May-17	178.00
08-May-17	178.14
15-May-17	177.88
23-May-17	177.68
29-May-17	177.94
05-Jun-17	177.74
12-Jun-17	177.56
20-Jun-17	177.35
26-Jun-17	177.24
31-Jul-17	177.26
10-Jan-18	177.61
05-Feb-18	177.87
08-Mar-18	178.11
11-Apr-18	178.13
15-May-18	177.72
14-Jun-18	177.28
18-Jul-18	176.95
01-Aug-18	176.81
05-Sep-18	177.03
18-Oct-18	177.39
15-Nov-18	177.81
05-Dec-18	177.93

MW17-9D



MP Elevation 181.73 masl
Grade 180.8 masl

DATE	ELEVATION
10-Apr-17	175.12
17-Apr-17	174.95
24-Apr-17	175.04
01-May-17	175.00
08-May-17	175.14
15-May-17	174.98
23-May-17	174.86
29-May-17	175.00
05-Jun-17	174.79
12-Jun-17	174.55
20-Jun-17	174.43
26-Jun-17	174.35
31-Jul-17	174.23
10-Jan-18	174.37
05-Feb-18	174.39
08-Mar-18	174.50
11-Apr-18	174.40
15-May-18	174.23
14-Jun-18	173.82
18-Jul-18	173.63
01-Aug-18	173.51
05-Sep-18	173.50
18-Oct-18	173.60
15-Nov-18	173.77
05-Dec-18	173.85

REGIONAL MUNICIPALITY OF NIAGARA

PORT COLBORNE QUARRY

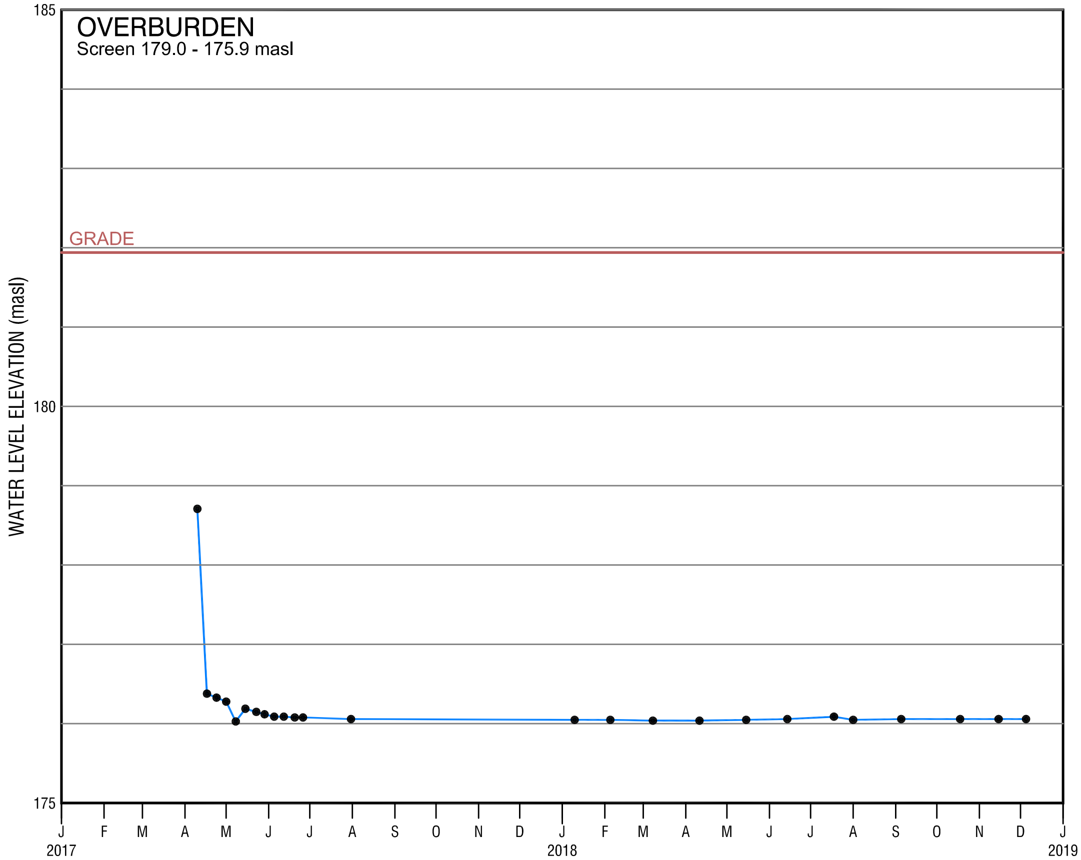
1771656

13 Mar 19

GOLDER

18G009

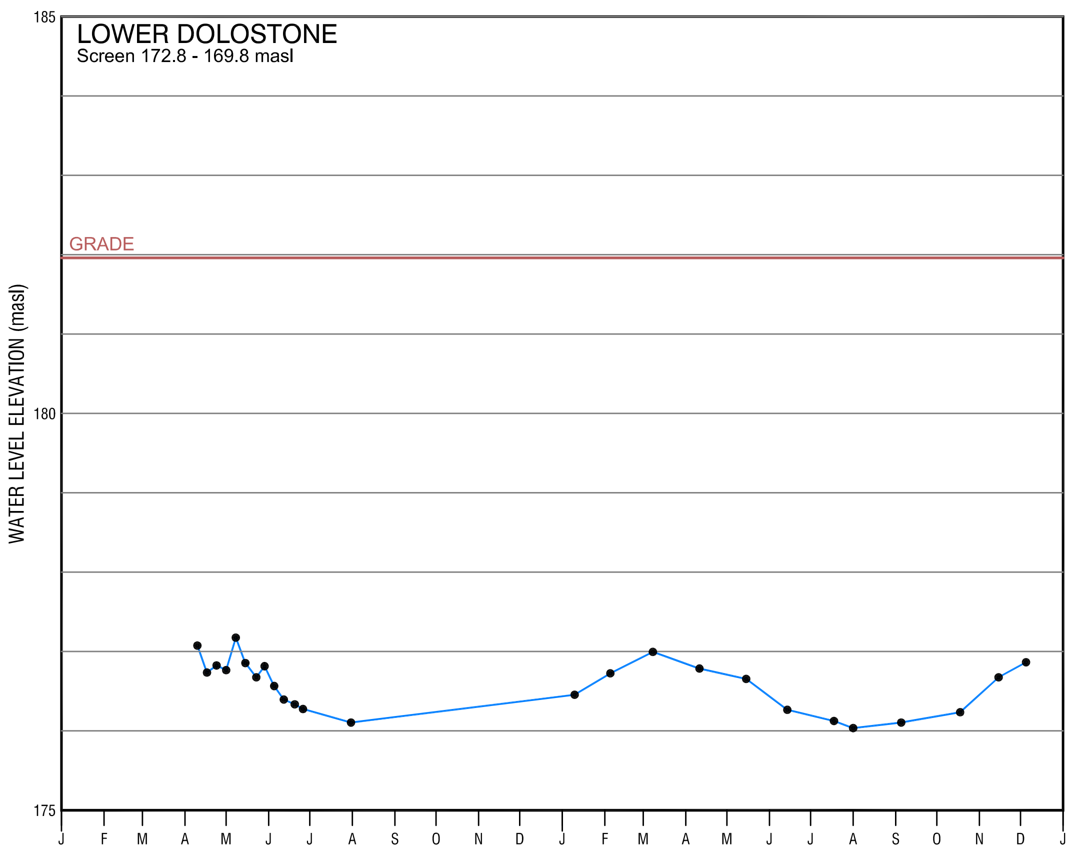
MW17-10S



MP Elevation 182.86 masl
Grade 181.9 masl

DATE	ELEVATION
10-Apr-17	178.71
17-Apr-17	176.38
24-Apr-17	176.33
01-May-17	176.28
08-May-17	176.03
15-May-17	176.19
23-May-17	176.15
29-May-17	176.12
05-Jun-17	176.09
12-Jun-17	176.09
20-Jun-17	176.08
26-Jun-17	176.08
31-Jul-17	176.06
10-Jan-18	176.05
05-Feb-18	176.05
08-Mar-18	176.04
11-Apr-18	176.04
15-May-18	176.05
14-Jun-18	176.06
18-Jul-18	176.09
01-Aug-18	176.05
05-Sep-18	176.06
18-Oct-18	176.06
15-Nov-18	176.06
05-Dec-18	176.06

MW17-10D



MP Elevation 183.04 masl
Grade 182.0 masl

DATE	ELEVATION
10-Apr-17	177.07
17-Apr-17	176.74
24-Apr-17	176.82
01-May-17	176.76
08-May-17	177.18
15-May-17	176.85
23-May-17	176.68
29-May-17	176.82
05-Jun-17	176.57
12-Jun-17	176.40
20-Jun-17	176.34
26-Jun-17	176.27
31-Jul-17	176.10
10-Jan-18	176.46
05-Feb-18	176.73
08-Mar-18	176.99
11-Apr-18	176.79
15-May-18	176.65
14-Jun-18	176.26
18-Jul-18	176.13
01-Aug-18	176.04
05-Sep-18	176.10
18-Oct-18	176.24
15-Nov-18	176.68
05-Dec-18	176.87

APPENDIX E

Zone of Influence Analysis Groundwater Seepage Calculation

Table E.1 - Theis Analysis

Geomean K 5.433E-07

Parameters:

K =	0.052	m/day	
B =	15.00		
H-h =	13.48		13.48
T =	0.778	m^2/day	
S =	0.0001		
t =	14	day	
Q =	10.58015	m^3/day	

r (m)	u	W(u)	$h-h_o$
1	2.3E-06	12.45	13.48
2	9.2E-06	11.03	11.94
3	2.1E-05	10.24	11.09
4	3.7E-05	9.65	10.45
5	5.7E-05	9.20	9.96
6	8.3E-05	8.83	9.56
7	1.1E-04	8.54	9.24
8	1.5E-04	8.30	8.98
9	1.9E-04	8.05	8.71
10	2.3E-04	7.84	8.49
15	5.2E-04	7.00	7.58
20	9.2E-04	6.43	6.96
30	2.1E-03	5.64	6.11
35	2.8E-03	5.30	5.74
40	3.7E-03	5.05	5.47
45	4.7E-03	4.81	5.21
50	5.7E-03	4.60	4.98
75	1.3E-02	3.86	4.18
100	2.3E-02	3.26	3.53
120	3.3E-02	2.87	3.10
150	5.2E-02	2.45	2.65
175	7.0E-02	2.15	2.33
200	9.2E-02	1.91	2.07
300	2.1E-01	1.22	1.32
350	2.8E-01	0.96	1.04
400	3.7E-01	0.77	0.84
500	5.7E-01	0.48	0.52
600	8.3E-01	0.30	0.32
700	1.1E+00	0.19	0.20
800	1.5E+00	0.12	0.13
900	1.9E+00	0.06	0.07
1000	2.3E+00	0.04	0.04

Geomean K (no Salina) 6.8E-07

Parameters:

K =	0.059	m/day
B =	15.00	
H-h =	13.48	
T =	0.879	m^2/day
S =	0.0001	
t =	14	day
Q =	11.86895	m^3/day

r (m)	u	W(u)	$h-h_o$
1	2.0E-06	12.55	13.48
2	8.1E-06	11.15	11.98
3	1.8E-05	10.35	11.12
4	3.3E-05	9.77	10.50
5	5.1E-05	9.33	10.02
6	7.3E-05	8.95	9.61
7	1.0E-04	8.64	9.29
8	1.3E-04	8.37	8.99
9	1.6E-04	8.16	8.77
10	2.0E-04	7.94	8.53
15	4.6E-04	7.13	7.66
20	8.1E-04	6.54	7.03
30	1.8E-03	5.74	6.17
35	2.5E-03	5.46	5.86
40	3.3E-03	5.17	5.56
45	4.1E-03	4.92	5.29
50	5.1E-03	4.73	5.08
75	1.1E-02	3.94	4.24
100	2.0E-02	3.35	3.60
120	2.9E-02	2.99	3.22
150	4.6E-02	2.57	2.76
175	6.2E-02	2.26	2.43
200	8.1E-02	2.02	2.17
300	1.8E-01	1.31	1.41
350	2.5E-01	1.08	1.16
400	3.3E-01	0.86	0.92
500	5.1E-01	0.56	0.60
600	7.3E-01	0.35	0.38
700	1.0E+00	0.22	0.24
800	1.3E+00	0.14	0.15
900	1.6E+00	0.09	0.09
1000	2.0E+00	0.05	0.05

Geomean K (no Salina) 6.8E-07

Maximum drawdown

Parameters:

K =	0.059	m/day
B =	16.76	
H-h =	16.76	
T =	0.989	m^2/day
S =	0.0001	
t =	14	day
Q =	16.46271	m^3/day

r (m)	u	W(u)	$h-h_o$
1	1.8E-06	12.65	16.76
2	7.2E-06	11.26	14.92
3	1.6E-05	10.47	13.87
4	2.9E-05	9.91	13.12
5	4.5E-05	9.43	12.50
6	6.5E-05	9.06	12.01
7	8.8E-05	8.76	11.61
8	1.2E-04	8.54	11.31
9	1.5E-04	8.30	10.99
10	1.8E-04	8.05	10.66
15	4.1E-04	7.25	9.60
20	7.2E-04	6.66	8.82
30	1.6E-03	5.86	7.77
35	2.2E-03	5.54	7.35
40	2.9E-03	5.30	7.03
45	3.7E-03	5.05	6.69
50	4.5E-03	4.83	6.40
75	1.0E-02	4.04	5.35
100	1.8E-02	3.46	4.58
120	2.6E-02	3.10	4.10
150	4.1E-02	2.68	3.55
175	5.5E-02	2.38	3.15
200	7.2E-02	2.12	2.81
300	1.6E-01	1.41	1.87
375	2.5E-01	1.04	1.38
400	2.9E-01	0.96	1.27
500	4.5E-01	0.63	0.83
600	6.5E-01	0.41	0.55
700	8.8E-01	0.27	0.36
800	1.2E+00	0.19	0.25
900	1.5E+00	0.12	0.15
1000	1.8E+00	0.06	0.09

Geomean K (no Salina) 6.8E-07

Minimum drawdown

Parameters:

K =	0.059	m/day
B =	10.35	
H-h =	10.35	
T =	0.611	m^2/day
S =	0.0001	
t =	14	day
Q =	6.524143	m^3/day

r (m)	u	W(u)	$h-h_o$
1	2.9E-06	12.17	10.35
2	1.2E-05	10.84	9.22
3	2.6E-05	9.98	8.49
4	4.7E-05	9.41	8.00
5	7.3E-05	8.95	7.61
6	1.1E-04	8.63	7.34
7	1.4E-04	8.30	7.05
8	1.9E-04	8.05	6.84
9	2.4E-04	7.80	6.63
10	2.9E-04	7.57	6.43
15	6.6E-04	6.76	5.75
20	1.2E-03	6.24	5.30
30	2.6E-03	5.38	4.57
35	3.6E-03	5.08	4.32
40	4.7E-03	4.81	4.09
45	5.9E-03	4.56	3.88
50	7.3E-03	4.35	3.70
75	1.6E-02	3.57	3.04
100	2.9E-02	2.99	2.54
120	4.2E-02	2.63	2.24
150	6.6E-02	2.22	1.89
175	9.0E-02	1.93	1.64
200	1.2E-01	1.74	1.48
300	2.6E-01	1.01	0.86
350	3.6E-01	0.79	0.68
400	4.7E-01	0.61	0.52
500	7.3E-01	0.35	0.30
600	1.1E+00	0.22	0.19
700	1.4E+00	0.12	0.10
800	1.9E+00	0.06	0.06
900	2.4E+00	0.03	0.03
1000	2.9E+00	0.01	0.01

Geomean K (no Salina) 6.8E-07

Intermediate drawdown

Parameters:

K =	0.059	m/day
B =	13.64	
H-h =	13.64	
T =	0.805	m^2/day
S =	0.0001	
t =	14	day
Q =	11.07966	m^3/day

r (m)	u	W(u)	$h-h_o$
1	2.2E-06	12.45	13.64
2	8.9E-06	11.06	12.12
3	2.0E-05	10.29	11.28
4	3.6E-05	9.68	10.61
5	5.5E-05	9.23	10.11
6	8.0E-05	8.87	9.72
7	1.1E-04	8.63	9.46
8	1.4E-04	8.30	9.09
9	1.8E-04	8.10	8.88
10	2.2E-04	7.84	8.59
15	5.0E-04	7.04	7.72
20	8.9E-04	6.46	7.08
30	2.0E-03	5.69	6.23
35	2.7E-03	5.34	5.85
40	3.6E-03	5.08	5.57
45	4.5E-03	4.85	5.32
50	5.5E-03	4.63	5.07
75	1.2E-02	3.86	4.23
100	2.2E-02	3.26	3.57
120	3.2E-02	2.93	3.21
150	5.0E-02	2.49	2.72
175	6.8E-02	2.19	2.40
200	8.9E-02	1.94	2.12
300	2.0E-01	1.26	1.39
350	2.7E-01	0.98	1.08
400	3.6E-01	0.79	0.87
500	5.5E-01	0.50	0.55
600	8.0E-01	0.32	0.35
700	1.1E+00	0.22	0.24
800	1.4E+00	0.12	0.13
900	1.8E+00	0.07	0.08
1000	2.2E+00	0.04	0.04

Table E.2 - Darcy Flux

		Long Wall			Short Wall		
		Min DD	*Max DD*	*Int DD*	*Min DD*	*Max DD*	*Int DD*
K	Hydraulic Conductivity (m/day)	0.059	0.059	0.059	0.059	0.059	0.059
I	ROI (m)	500	500	500	500	500	500
	Drawdown (m)	10.35	16.76	13.56	10.35	16.76	13.56
A	Length (m)	1400	1400	1400	400	400	400
	Drawdown (m)	10.35	16.76	13.555	10.35	16.76	13.555
Q	(m^3/day)	17.7	46.4	30.4	5.1	13.3	8.7

		Total Q - 3 walls (quarry faces)		
		Min DD	*Max DD*	*Int DD*
Q	(m^3/day)	27.8	72.9	47.7

Predicted Drawdown vs. Distance (based on Theis Equation)

FIGURE E.1

DATE: August 2020

PROJECT: 1771656

Prepared by: **AM**

CHK: **SM**

APPENDIX F

Well Water Survey Responses
MECP Water Well Records

LABEL	CON LOT	DATE mmm-yr	EASTING NORTHING	ELEV masl	WTR FND mbgl Qu	SCR TOP LEN mbgl m	SWL mbgl	RATE L/min	TIME min	PL mbgl	DRILLER METHOD	TYPE STAT	WELL NAME DESCRIPTION OF MATERIALS
6600870	1 16	Jun-67	647750 4750356	178.3	14.3 Su 9.8 Su		FLW	9	15	13.7	1702 CT	WS DO	**MOE# 6600870** 0.0 BRWN CLAY 3.0 SHLE GRVL 4.3 LMSN 15.2
6600871	1 16	Nov-67	647518 4750362	178.9	17.4 Su		0.3	9	120	15.2	4720 CT	WS DO	**MOE# 6600871** 0.0 BRWN CLAY 7.3 LMSN 17.4
6600880	1 19	May-57	646259 4750312	179.2	6.7 Su		0.6	5	60	6.1	2526 CT	WS DO	**MOE# 6600880** 0.0 CLAY 4.6 LMSN 7.6
6600881	1 19	Sep-60	646581 4750278	179.8	4.6 Fr		1.5	91	30	2.4	5425 CT	WS DO	**MOE# 6600881** 0.0 TPSL 0.3 BRWN CLAY 1.8 BRWN LMSN 4.9
6600884	1 20	Jan-52	646160 4750310	179.5	7.9 Su		2.4	18	30	2.4	4720 CT	WS DO	**MOE# 6600884** 0.0 CLAY 0.9 LMSN 7.9
6600886	1 21	Sep-52	645390 4750294	178.0	5.8 Fr		1.8	14	30	1.8	4720 CT	WS DO	**MOE# 6600886** 0.0 TPSL CLAY 2.1 LMSN 5.8
6600890	1 21	Jul-61	645466 4750312	178.3	6.1 Fr		1.8	32	90	5.5	4720 CT	WS DO	**MOE# 6600890** 0.0 CLAY 1.8 LMSN 6.1
6600895	1 21	Jul-63	645738 4750550	180.1	9.1 Fr		3.0	9	90	8.5	4720 CT	WS DO	**MOE# 6600895** 0.0 CLAY 2.7 LMSN 9.1
6600898	1 22	Jun-51	645292 4750306	178.0	8.2 Mn		1.2				1915 CT	WS DO	**MOE# 6600898** 0.0 CLAY 1.5 LMSN 8.2
6600954	2 14	Feb-47	648505 4750524	181.4			NR				3204 CT	WS DO	**MOE# 6600954** 0.0 TPSL CLAY 2.4 LMSN 4.0
6600955	2 14	May-52	648342 4750490	180.7	6.7 Fr		2.4			2.4	3210 CT	WS DO	**MOE# 6600955** 0.0 CLAY STNS 2.4 LMSN 6.7
6600956	2 14	Aug-54	648277 4752434	181.1	10.1 Fr		5.8	36	10	5.8	3208 CT	WS DO	**MOE# 6600956** 0.0 CLAY 1.2 BRWN LMSN 10.1
6600957	2 14	Nov-54	648446 4750518	180.1	3.4 Fr		NR	91	120	1.2	3536 CT	WS DO	**MOE# 6600957** 0.0 LMSN 3.4
6600958	2 14	Jul-59	648324 4750752	180.1	8.8 Su		3.7	23	60	4.3	2526 CT	WS DO	**MOE# 6600958** 0.0 CLAY 3.7 LMSN 8.8
6600959	2 14	Apr-64	648277 4752176	182.9	15.2 Fr		4.9	23	90	12.2	4720 CT	WS DO	**MOE# 6600959** 0.0 RED CLAY 8.2 SHLE 15.2
6600960	2 14	Nov-65	648502 4750502	180.4	9.8 Fr		1.2	45	90	4.6	4720 CT	WS DO	**MOE# 6600960** 0.0 CLAY 3.7 LMSN 9.8
6600961	2 15	Jun-51	648256 4750556	179.8	11.0 Fr		1.5				1915 CT	WS DO	**MOE# 6600961** 0.0 CLAY 4.6 GREY LMSN 11.0
6600962	2 15	Jul-53	648246 4750576	180.1	9.1 Fr		NR	23	120		3210 CT	WS DO	**MOE# 6600962** 0.0 CLAY MSND STNS 1.2 RED CLAY 5.2 GREY SHLE 9.4
6600963	2 15	May-54	648237 4750570	180.1	16.5 Fr		0.9	136	60	0.9	3208 CT	WS DO	**MOE# 6600963** 0.0 CLAY 5.5 LMSN 16.5
6600964	2 15	Jul-54	648232 4750590	180.4	9.1 Fr		1.5	364	15	1.5	3208 CT	WS DO	**MOE# 6600964** 0.0 CLAY 4.9 LMSN 9.1
6600965	2 15	Jun-56	648258 4750634	180.1	6.7 Fr		1.5	227	60	3.0	2526 CT	WS DO	**MOE# 6600965** 0.0 CLAY 2.4 LMSN 6.7
6600966	2 15	May-65	648159 4750630	180.1	8.5 Su		0.6	91	60	0.6	4720 CT	WS DO	**MOE# 6600966** 0.0 CLAY 3.7 LMSN 8.5
6600967	2 15	Nov-66	648104 4750456	179.8	9.1 Su		1.8	45	90	3.7	4720 CT	WS DO	**MOE# 6600967** 0.0 CLAY 4.6 LMSN 9.1

LABEL	CON LOT	DATE mmm-yr	EASTING NORTHING	ELEV masl	WTR FND mbgl Qu	SCR TOP LEN mbgl m	SWL mbgl	RATE L/min	TIME min	PL mbgl	DRILLER METHOD	TYPE STAT	WELL NAME DESCRIPTION OF MATERIALS
6600968	2	Aug-49	647594	185.6	13.1 Fr		7.6				3204	WS	**MOE# 6600968**
	16		4752384								CT	DO	0.0 CLAY GRVL 3.0 CLAY 9.1 LMSN 13.7
6600969	2	May-54	647466	184.7	8.2 Fr		2.4	68	60	2.4	3210	WS	**MOE# 6600969**
	16		4752258								CT	DO	0.0 TPSL 0.6 CLAY 5.5 QSND 7.6 LMSN 9.4
6600970	2	Oct-63	647728	188.7	16.8 Fr		10.7	45	90	12.8	4720	WS	**MOE# 6600970**
	16		4752278								CT	DO	0.0 TPSL 0.6 MSND 13.7 LMSN 16.8
6600971	2	Jul-48	647384	179.2	7.9 Su		0.6	9	60	8.2	3017	WS	**MOE# 6600971**
	17		4750440								CT	DO	0.0 RED CLAY 2.7 LMSN 8.8
6600972	2	Mar-52	647437	180.1	8.2 Su		2.4			2.4	3210	WS	**MOE# 6600972**
	17		4750906								CT	DO	0.0 CLAY 5.2 CLAY GRVL 5.8 LMSN 9.1
6600973	2	Aug-54	647284	182.9	7.3 Fr		3.0	45	60	3.0	3209	WS	**MOE# 6600973**
	17		4752120								CT	DO	0.0 TPSL 0.6 CLAY 6.4 LMSN 7.3
6600974	2	May-58	647418	179.8	12.2 Fr		2.4	68	30	2.4	4720	WS	**MOE# 6600974**
	17		4750632								CT	IR	0.0 RED CLAY 4.6 BLUE CLAY 7.9 LMSN 12.2
6600975	2	Sep-49	647028	180.1	8.5 Fr		3.7	18	30	6.1	3204	WS	**MOE# 6600975**
	18		4750826								CT	DO	0.0 TPSL 0.9 LMSN 9.1
6600976	2	Jul-51	646664	180.1	8.5 Fr		2.4				4754	WS	**MOE# 6600976**
	18		4750690								CT	DO	0.0 CLAY 0.9 LMSN 9.1
6600977	2	Nov-51	646663	178.3	19.2 Fr		5.2	18	30	5.2	4720	WS	**MOE# 6600977**
	18		4750558								CT	ST	0.0 CLAY 1.8 BRWN SHLE 19.2
6600978	2	Jul-57	646825	180.1	6.4 Fr		2.1	45	30	2.1	4720	WS	**MOE# 6600978**
	18		4750408								CT	DO	0.0 RED CLAY 2.4 LMSN 6.4
6600979	2	Jan-59	646965	180.1	6.4 Fr		1.8	227	60	2.4	2526	WS	**MOE# 6600979**
	18		4750418								CT	DO	0.0 CLAY 2.1 LMSN 6.4
6600980	2	Jun-61	646861	180.1	6.1 Fr		0.9	68	60	0.9	4720	WS	**MOE# 6600980**
	18		4750434								CT	DO	0.0 TPSL CLAY 0.6 LMSN 6.1
6600981	2	Dec-47	646271	179.2	4.0 Fr		0.3				4629	WS	**MOE# 6600981**
	19		4750442								CT	DO	0.0 CLAY 3.0 LMSN 4.0
6600982	2	Dec-47	646272	179.2	7.9 Fr		0.3				4629	WS	**MOE# 6600982**
	19		4750442								CT	DO	0.0 CLAY 4.6 LMSN 7.9
6600983	2	May-52	646514	179.8	4.6 Su		0.6			0.6	3210	WS	**MOE# 6600983**
	19		4750406								CT	DO	0.0 CLAY 2.4 LMSN 4.6
6600984	2	Jul-52	646623	179.2	6.4 Su		1.2			1.2	3210	WS	**MOE# 6600984**
	19		4750488								CT	DO	0.0 RED CLAY 3.0 LMSN 6.4
6600985	2	Jul-53	646593	179.8	11.9 Su		8.2	18	120	9.1	3210	WS	**MOE# 6600985**
	19		4750406								CT	DO	0.0 CLAY MSND STNS 3.4 GREY SHLE 11.9
6600986	2	Jul-53	645864	179.2	4.9 Su		0.3	9	120	0.9	3210	WS	**MOE# 6600986**
	19		4750382								CT	DO	0.0 CLAY MSND STNS 1.8 GREY SHLE 4.9
6600987	2	May-52	645837	178.9	7.6 Su		2.1			2.1	3210	WS	**MOE# 6600987**
	20		4750396								CT	DO	0.0 CLAY 1.5 LMSN 7.6
6600988	2	Mar-67	646213	179.5	7.9 Su		0.6	68	60	0.6	4720	WS	**MOE# 6600988**
	20		4750418								CT	DO	0.0 CLAY 3.7 LMSN 7.9
6600989	2	Jul-48	645750	179.8	8.5 Fr		2.4	23	30	7.6	3017	WS	**MOE# 6600989**
	21		4750390								CT	DO	0.0 CLAY GRVL 4.3 LMSN 8.8
6600990	2	Mar-50	645708	182.3	8.8 Fr		1.2			9.4	3809	WS	**MOE# 6600990**
	21		4751222								CT	DO	0.0 TPSL 0.6 LMSN 9.4

LABEL	CON LOT	DATE mmm-yr	EASTING NORTHING	ELEV masl	WTR FND mbgl Qu	SCR TOP LEN mbgl m	SWL mbgl	RATE L/min	TIME min	PL mbgl	DRILLER METHOD	TYPE STAT	WELL NAME DESCRIPTION OF MATERIALS
6600991	2	Apr-53	645784	179.8	4.9 Fr		1.2	23			3210	WS	**MOE# 6600991**
	21		4750466								CT	DO	0.0 CLAY MSND STNS 0.9 GREY SHLE 4.9
6600992	2	Oct-53	645764	180.4	7.3 Su		1.2	18	30	7.3	4720	WS	**MOE# 6600992**
	21		4750468								CT	DO	0.0 CLAY 2.7 LMSN 7.3
6600994	2	Sep-59	645768	182.0	5.8 Fr		1.5	18	60	2.4	2526	WS	**MOE# 6600994**
	21		4751138								CT	DO	0.0 TPSL STNS 0.6 LMSN 5.8
6600995	2	Mar-62	645701	182.6	9.8 Fr		4.6	45	60	6.1	4720	WS	**MOE# 6600995**
	21		4751196								CT	DO	0.0 LMSN 9.8
6600996	2	Dec-48	645166	180.1	4.9 Fr		0.9				3204	WS	**MOE# 6600996**
	22		4751336								CT	DO	0.0 TPSL CLAY 2.4 LMSN 4.9
6600997	2	Mar-52	645177	180.7	6.4 Su		3.4	18	30	3.4	4720	WS	**MOE# 6600997**
	22		4751486								CT	DO	0.0 TPSL CLAY 2.4 BLCK SHLE 6.7
6600998	2	Aug-57	644994	180.7	4.3 Fr		1.8	14	30	2.7	2526	WS	**MOE# 6600998**
	22		4751486								CT	DO	0.0 CLAY 2.4 LMSN 4.3
6600999	2	May-58	645033	181.7	7.6 Su		1.2	9	30	7.6	4720	WS	**MOE# 6600999**
	22		4751700								CT	DO	0.0 RED CLAY 1.8 SHLE 7.6
6601000	2	Jul-59	645047	181.1	10.7 Su		3.7		90		4720	WS	**MOE# 6601000**
	22		4751582								CT	DO	0.0 CLAY 1.8 GREY LMSN 10.7
6601001	2	May-59	644985	180.1	6.7 Su		3.7	23	60	6.1	2526	WS	**MOE# 6601001**
	22		4751410								CT	DO	0.0 CLAY 1.8 LMSN 7.9
6601002	2	May-59	645037	180.1	3.0 Fr		1.5	9	60	2.1	2526	WS	**MOE# 6601002**
	22		4751430								CT	DO	0.0 CLAY 1.8 LMSN 3.7
6601003	2	Apr-54	644925	179.8	6.7 Fr		4.6	45	60	4.6	2526	WS	**MOE# 6601003**
	23		4751318								CT	DO	0.0 CLAY 3.4 LMSN 6.7
6601091	3	May-58	647479	185.0	7.9 Fr		2.4	68	30	2.4	4720	WS	**MOE# 6601091**
	16		4752844								CT	DO	0.0 RED CLAY 3.7 SHLE 7.9
6601092	3	Nov-65	647608	185.3	12.8 Fr		6.1	68	90	6.1	4720	WS	**MOE# 6601092**
	16		4752492								CT	CO	0.0 BLUE CLAY 7.9 GRVL 8.8 SHLE 12.8
6601093	3	Oct-66	647603	185.3	12.5 Fr		6.7	91	90	8.2	4720	WS	**MOE# 6601093**
	16		4752514								CT	ST	0.0 CLAY 6.7 GRVL MSND 8.2 LMSN 12.5
6601094	3	Aug-47	647036	184.1	8.5 Fr		8.5				1915	WS	**MOE# 6601094**
	17		4752450								CT	DO	0.0 TPSL 0.6 MSND 4.3 LMSN 8.5
6601099	3	Mar-59	647386	184.7	9.4 Fr		3.0	45	30	3.0	4720	WS	**MOE# 6601099**
	17		4752618								CT	DO	0.0 RED CLAY 5.2 GREY LMSN 9.4
6601100	3	Mar-59	647385	184.4	10.1 Fr		3.7	45	30	3.7	4720	WS	**MOE# 6601100**
	17		4752496								CT	DO	0.0 RED CLAY 5.8 GREY LMSN 10.1
6601102	3	Jul-61	647396	184.7	8.8 Fr		2.4	32	60	4.6	4720	WS	**MOE# 6601102**
	17		4752714								CT	DO	0.0 CLAY 4.9 LMSN 8.8
6601103	3	Apr-62	647381	185.3	8.2 Fr		1.2	45	60	3.7	4720	WS	**MOE# 6601103**
	17		4753086								CT	DO	0.0 BRWN CLAY 3.7 LMSN 8.2
6601104	3	Sep-65	647379	186.8	9.4 Fr		3.7	32	90	6.1	4720	WS	**MOE# 6601104**
	17		4753240								CT	DO	0.0 CLAY 2.4 SHLE 6.7 LMSN 9.4
6601112	3	Sep-46	646224	184.1	11.0 Fr		NR				4629	WS	**MOE# 6601112**
	19		4752458								CT	DO	0.0 CLAY 3.0 LMSN 14.0
6601121	3	Apr-47	646152	184.4	15.2 Fr		NR				1915	WS	**MOE# 6601121**
	20		4752446								CT	DO	0.0 CLAY 3.4 LMSN 15.2

LABEL	CON LOT	DATE mmm-yr	EASTING NORTHING	ELEV masl	WTR FND mbgl Qu	SCR TOP LEN mbgl m	SWL mbgl	RATE L/min	TIME min	PL mbgl	DRILLER METHOD	TYPE STAT	WELL NAME DESCRIPTION OF MATERIALS
6601125	3	Jun-57	645642	185.0	11.9 Fr		2.7	45	30	2.7	4720	WS	**MOE# 6601125**
	21		4752420								CT	DO	0.0 TPSL CLAY 0.9 SHLE 3.0 LMSN 11.9
6601126	3	Jun-58	645359	185.0	15.8 Fr		5.2	18	30	15.8	4720	WS	**MOE# 6601126**
	21		4752424								CT	DO	0.0 RED CLAY 8.5 GREY LMSN 15.8
6602558	2	Oct-70	647415	182.0	10.7 Fr		2.4	45	60	12.2	5405	WS	**MOE# 6602558**
	17		4751882								CT	DO	0.0 RED CLAY STNS 5.8 LMSN 13.7
6602629	2	Aug-71	648277	182.9	12.2 Fr		5.8	55	60	9.1	3640	WS	**MOE# 6602629**
	14		4752182								CT	ST	0.0 BRWN CLAY 7.0 GREY CLAY 8.5 GREY SHLE 9.1 GREY LMSN 15.2
6602667	2	May-72	647375	182.0	13.4 Fr		2.1	36	60	4.0	3640	WS	**MOE# 6602667**
	17		4751782								CT	DO	0.0 BRWN CLAY 6.4 GREY LMSN 13.7
6602706	2	Sep-72	646605	180.7	6.7 Su		2.4	36	60	3.0	3640	WS	**MOE# 6602706**
	19		4750922								CT	DO	0.0 BRWN CLAY 2.1 GREY LMSN 7.0
6602785	2	Sep-73	646943	180.7	17.7 Su		3.0	5	60	18.3	3640	AQ	**MOE# 6602785**
	18		4750898		10.7 Su						CT	-	0.0 BRWN CLAY 4.0 GREY SHLE LMSN 4.6 GREY LMSN 18.3
					4.6 Su								
6602786	2	Oct-73	646950	180.4	4.3 Fr		1.2	18	60	10.1	3640	WS	**MOE# 6602786**
	18		4750872								CT	DO	0.0 BRWN CLAY 4.0 GREY GRVL 4.3 GREY SHLE 4.6 GREY LMSN 10.1
6602787	2	Oct-73	646960	180.1	7.0 Fr		1.5	64	60	2.1	3640	WS	**MOE# 6602787**
	18		4750418								CT	DO	0.0 BRWN TPSL 0.6 GREY LMSN 7.3
6602789	2	Oct-73	647425	182.3	11.3 Su		4.9	64	60	6.1	3640	WS	**MOE# 6602789**
	17		4751476								CT	DO	0.0 BRWN CLAY 3.4 GREY LMSN 11.6
6602790	2	Oct-73	647398	183.5	13.7 Fr		4.0	18	75	16.2	3640	WS	**MOE# 6602790**
	17		4752144								CT	DO	0.0 BRWN CLAY 6.1 BRWN FSND 7.6 BRWN STNS 8.5 GREY SHLE 9.1 GREY LMSN 16.2
6602929	1	Feb-74	645228	178.0	7.6 Su		1.2	55	60	3.0	3640	WS	**MOE# 6602929**
	22		4750302								CT	DO	0.0 BRWN CLAY 2.1 GREY LMSN 8.2
6602990	2	Sep-74	647423	182.3	11.6 Fr		4.9	68	60	6.1	3661	WS	**MOE# 6602990**
	17		4751726								CT	DO	0.0 TPSL 0.6 CLAY PCKD 5.5 BRWN CLAY SOFT 8.2 GREY LMSN 12.2
6603052	2	Feb-75	648102	185.3	16.2 Fr		9.1	68	75	10.1	3640	WS	**MOE# 6603052**
	15		4752186								CT	ST	0.0 BRWN TPSL 0.6 BRWN SAND GRVL 12.2 GREY LMSN 16.5
6603087	3	Jun-75	647661	185.9	10.7 Fr		6.7	114	180	11.6	2102	WS	**MOE# 6603087**
	16		4752570								CT	CO	0.0 BRWN CLAY 1.5 GREY CLAY 10.7 ROCK 22.6
6603090	3	Aug-75	647459	186.2	7.9 Fr		1.8	23	60	8.2	3571	WS	**MOE# 6603090**
	16		4753252								CT	DO	0.0 BLCK TPSL 0.3 BRWN CLAY 2.4 GREY LMSN 9.1
6603186	2	Nov-74	644995	181.1	12.2 Fr		7.0	23	60	12.2	3640	WS	**MOE# 6603186**
	22		4751522								CT	DO	0.0 BRWN CLAY PCKD 0.6 BRWN SHLE LOOS 1.2 GREY LMSN LYRD 12.2
6603188	2	Dec-76	646495	179.8	3.7 Su		0.9	36	60	3.0	3640	WS	**MOE# 6603188**
	19		4750402								CT	DO	0.0 BRWN CLAY PCKD 2.1 GREY LMSN FLNT LYRD 6.1
6603189	3	Dec-76	647355	185.3	6.1 Fr		1.2	73	60	3.0	3640	WS	**MOE# 6603189**
	17		4753062		4.0 Fr						CT	DO	0.0 BRWN CLAY PCKD 2.1 BRWN CLAY GRVL PCKD 3.4 GREY LMSN LYRD 7.6

LABEL	CON LOT	DATE mmm-yr	EASTING NORTHING	ELEV masl	WTR FND mbgl Qu	SCR TOP LEN mbgl m	SWL mbgl	RATE L/min	TIME min	PL mbgl	DRILLER METHOD	TYPE STAT	WELL NAME DESCRIPTION OF MATERIALS
6603234	2 19	Oct-77	646595 4750402	179.8	6.1 Su		0.6	9	60	7.3	3640 CT	WS DO	**MOE# 6603234** 0.0 BRWN TPSL SOFT 0.3 BRWN CLAY PCKD 2.4 BRWN SHLE LYRD 3.0 GREY LMSN LYRD 7.6
6603237	1 20	Sep-77	645815 4750322	179.5	9.1 Su		3.0	136	60	4.6	5417 CT	WS DO	**MOE# 6603237** 0.0 BRWN CLAY SNDY 1.8 GREY FLNT 9.8
6603301	3 16	May-78	647455 4752742	184.7	10.4 Su		6.7	91	150	9.8	2123 CT	WS ST	**MOE# 6603301** 0.0 BRWN CLAY 2.4 GREY CLAY 6.7 CLAY GRVL 9.8 ROCK 17.4
6603379	2 16	Sep-79	647575 4752682	184.4	9.1 Fr		8.5	45		12.2	2123 CT	WS ST	**MOE# 6603379** 0.0 CLAY TPSL 0.9 GREY CLAY 4.6 GREY CLAY GRVL 8.5 UNKN 16.8
6603653	2 17	Jul-85	647245 4750861	180.4	4.0 Fr		2.7	68	60	3.7	3640 CT	WS DO	**MOE# 6603653** 0.0 BRWN CLAY DNSE 4.0 GREY SHLE 4.6 GREY LMSN SHLE LYRD 6.1
6603670	3 17	Oct-85	647392 4752587	184.1	19.2 - 12.2 Mn		8.2	36	60	15.2	3640 CT	WS DO	**MOE# 6603670** 0.0 GREY LMSN LYRD 19.5
6603793	2 16	Jan-88	647989 4750574	179.8	10.1 Su		0.9	95	180	1.5	4795 CT	WS DO	**MOE# 6603793** 0.0 BLUE CLAY STNS PCKD 0.9 BRWN CLAY PCKD 5.8 GREY FLNT LYRD 8.2 GREY LMSN LYRD 10.7
6603811	2 22	Apr-88	645594 4751181	181.4	5.2 Fr 3.0 Fr		2.4	27	120	2.4	4795 CT	WS DO	**MOE# 6603811** 0.0 BRWN CLAY PCKD 2.7 GREY LMSN LYRD 5.5
6603826	2 22	Aug-88	644991 4751315	179.8			NR				4795 CT	- -	**MOE# 6603826** 0.0 BRWN CLAY PCKD 2.7 GREY FGVL CLAY PCKD 3.4 GREY FLNT LMSN LYRD 5.5 GREY LMSN FLNT 9.1
6604059	2 17	Jan-92	647364 4750288	178.3	13.1 Fr		4.9	55	60	13.1	2123 RA	WS DO	**MOE# 6604059** 0.0 BRWN CLAY 1.2 GREY CLAY 4.6 RED CLAY GRVL 11.3 ROCK 13.4
6604078	2 16	Aug-92	647841 4752311	189.0	60.0 Su 49.7 Su 47.2 Su		12.8	159	120	12.2	2123 RA	WS IN	**MOE# 6604078** 0.0 BRWN CLAY 0.9 BRWN SAND 6.1 BRWN SAND STNS 14.0 ROCK 90.8
6604079	2 16	Aug-92	647801 4752212	188.7	46.9 Su		NR	9			2123 RA	AS IN	**MOE# 6604079** 0.0 BRWN CLAY 1.2 BRWN SAND 4.6 BRWN SAND GRVL 7.9 BRWN SAND BLDR 10.1 ROCK 90.8
6604129	2 20	Dec-92	645942 4750422	179.2	14.9 Su 8.8 Su		4.0	23	90	13.7	4795 CT	WS DO	**MOE# 6604129** 0.0 BRWN CLAY PCKD 1.5 GREY LMSN LYRD 14.9
6604207	1 21	Jun-95	646585 4750348	179.2	4.6 Fr 3.7 Fr		3.4	27	150	7.0	4795 CT	WS DO	**MOE# 6604207** 0.0 BLCK TPSL PCKD 0.3 BRWN CLAY PCKD 2.4 GREY LMSN LYRD 7.6
6604324	2 17	Aug-98	647429 4751579	182.9	14.3 Fr		6.1	91	150	6.1	4795 CT	WS DO	**MOE# 6604324** 0.0 BLCK TPSL PCKD 0.3 BRWN CLAY FGVL PCKD 1.2 GREY LMSN LYRD 14.6
6604339	2 19	Mar-99	646477 4750399	180.1	5.2 Fr		0.9	50	90	6.1	4795 CT	WS DO	**MOE# 6604339** 0.0 BLCK TPSL PCKD 0.3 RED CLAY PCKD 2.4 GREY LMSN LYRD 6.7
6604521	3 16	Sep-00	647602 4752548	185.0	8.8 Fr	2.1 -6.1	NR				6571 PC	OW -	**MOE# 6604521** 0.0 BRWN TPSL LOOS 0.9 GREY LMSN LYRD 14.3

LABEL	CON LOT	DATE mmm-yr	EASTING NORTHING	ELEV masl	WTR FND mbgl Qu	SCR TOP LEN mbgl m	SWL mbgl	RATE L/min	TIME min	PL mbgl	DRILLER METHOD	TYPE STAT	WELL NAME DESCRIPTION OF MATERIALS
6604522	3 16	Sep-00	647648 4752476	186.5	8.2 Fr	0.6 -6.1	NR				6571 PC	OW -	**MOE# 6604522** 0.0 BRWN TPSL LOOS 0.9 GREY LMSN LYRD 12.8
6604662	2	Jun-02	646618 4750522	179.5	7.9 Fr		0.6	45	90	9.1	4795 CT	WS DO	**MOE# 6604662** 0.0 BLCK TPSL PCKD 0.6 BRWN CLAY PCKD 3.0 GREY LMSN LYRD 10.1
7041805		Feb-07	646849 4751165	181.7		3.7 -3.0	NR				6809 -	OW -	**MOE# 7041805 TAG#A052598** 0.0 RED CLAY SILT 1.5 GREY LMSN 6.7
7160241	2 15	Feb-11	648246 4750504	180.1	5.2 Fr		2.7	95	240	3.4	4795 CT	WS CO	**MOE# 7160241 TAG#A079412** 0.0 BRWN CLAY PCKD 1.5 GREY LMSN SHLE LOOS 5.5 GREY LMSN DNSE 7.3
7161328		Mar-11	645720 4751259	182.0		0.9 -2.4	NR				7241 DM	OW TH	**MOE# 7161328 TAG#A107756** 0.0 BRWN TPSL SAND SOFT 0.6 GREY ROCK HARD 3.4
7184673		Jul-12	647889 4752484	188.7			7.6		60		2123 -	AB Oth	**MOE# 7184673 TAG#A073942** 0.0
7185636	1 16	Jul-12	647454 4750081	178.0	17.1 Su		3.0	18	60	11.3	7294 CT	WS DO	**MOE# 7185636 TAG#A115943** 0.0 BRWN TPSL 0.6 BRWN CLAY GRVL 7.0 GREY LMSN 18.9
7185637	1 16	Jul-12	647454 4750081	177.7			NR				7294 -	AQ DO	**MOE# 7185637** 0.0

QUALITY:		TYPE:		USE:				METHOD :	
Fr	Fresh	WS	Water Supply	CO	Comercial	NU	Not Used	CT	Cable Tool
Mn	Mineral	AQ	Abandoned Quality	DO	Domestic	IR	Irrigation	JT	Jetting
Sa	Salty	AS	Abandoned Supply	MU	Municipal	AL	Alteration	RC	Rotary Conventional
Su	Sulphur	AB	Abandonment Record	PU	Public	MO	Monitoring	RA	Rotary Air
--	Unrecorded	TH	Test Hole or Observation	ST	Stock	-	Not Recorded	BR	Boring

Easting and Northings UTM NAD 83 Zone 17, Translated from Recorded UTM NAD, subject to Field Verified Location or Improved Location Accuracy.

 Selected information tabulated to metric with changes and corrections subject to Driller's Records.

Table E-1
2018 Water Well Survey Results
Port Colborne Quarries

Address		Water Supply			Well Details		Other Groundwater Related Issues/Complaints/Notes
		No. Wells	No. Cisterns	Municipal Water	Depth Well	Water Description	
352	Chippawa Road	1	1	No		Hard & Sulphurous	
458	Chippawa Road	1	1	No	65	Sulphurous	
622	Chippawa Road	1	-	No			
717	Chippawa Road	1	1	No	74	Hard	Stated when the quarry began operations the wells in the area went dry. No compensation was ever received for pumping the wells dry.
731	Chippawa Road	1	-	No	90	Hard & Sulphurous	Deepened well from 60' to 90' due to low quantity.
739	Chippawa Road	1	-	No	62	Hard & Sulphurous	Drought problems in the last 10 years.
962	Chippawa Road	1	-	No	65	Hard & Sulphurous	Stated quarry is affecting water quality of well due to excessive heavy blasting. Water quantity issues in 2010 resulting in deepening of the well.
975	Chippawa Road	1	-	No	65	Hard	Stated issues with quantity, well deepened by 17' in 1999. Iron problems, have tried using bleach (didn't work) and hydrogen peroxide to treat. Another well previously present on property, decommissioned in 1990.
998	Chippawa Road	1	1	No		Fresh	Stopped using well approximately 20 years ago because water level was too low for pump depth.
1196	Chippawa Road	1	-	No	90		Previous owner drilled well to 90' but kept pump at original depth of 60'.
959	Highway 3 E	1	1	No	56	Sulphurous	Problems with quantity due to drought in 2005. Well has lower water level in last 15 years, but seems to good recovery following pumping.
991	Highway 3 E	1	-	No		Fresh	
1331	Highway 3 E	1	-	No	22	Hard	Well had a rotted steel plug due to hard water, updated pump, piping and treatment in 2016.
1838	Highway 3 E	1	1	No	25	Hard & Sulphurous	
909	Killaly Street East	1	-	No		Hard	
925	Killaly Street East	1	-	No			
977	Killaly Street East	1	1	No		Hard & Sulphurous	
1096	Killaly Street East	1	1	No	49	Sulphurous	Stated well had high capacity until fall of 2016 when it started passing air through the system.
1133	Killaly Street East	1	1	No	25	Iron & Sulphur	Quantity and quality(iron and sulphur) problems beginning in 2006-2008. Failure in dry summers and quality worsened in last 10 years.
1246	Killaly Street East	1	-	No	12	Fresh	Problems with taste and clarity 3-4 years ago, bought RO and a softener to treat.
1324	Killaly Street East	1	-	No	13	Fresh & Hard	Problems in the past with bacteria and drought.
1640	Killaly Street East	1	1	No	25	Hard	Drought problems in 2016.
1704	Killaly Street East	1	1	No	25	Fresh & Hard	Bad smell and tea coloured in 1999, self corrected in 6 months. Water problem caused by too much chicken manure spread on bordering field, followed by 2 weeks of heavy rain. Installed a cistern and used it for 6 months, then back to well.
1051	Lorraine Road	1	1	No	25	Hard & Sulphurous	Insufficient water supply for 2 adults and 2 children historically, put in a cistern in 1953.
1413	Lorraine Road	1	-	Yes	21	Fresh & Hard	Drought problem in 2008.
1630	Miller Road	1	1	No		Hard & Sulphurous	Problems due to drought.
1732	Miller Road	1	-	No	60	Hard & Sulphurous	Problems 5 years ago due to sand infiltration.
2084	Miller Road	1	-	Yes			Well not usable, partially abandoned.
2282	Miller Road	1	-	No			.During dry periods (drought) notice a slight sulphurous smell to the water, and in the last 2 months a slight yellowish tinge to the water.
2085	Ramey Road	1	1	No			Well went dry after the quarry came in. Drilled deeper and then put a cistern in.
211	Second Concession Road	1	-	No			
420	Second Concession Road	1	-	No	80	Fresh & Hard	

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2018 Water Well Survey Results
Port Colborne Quarries

Address		Water Supply			Well Details		Other Groundwater Related Issues/Complaints/Notes
		No. Wells	No. Cisterns	Municipal Water	Depth Well	Water Description	
1559	Snider Road	1	1	No	51	Sulphurous	The water was fine for the first couple of months, then went sulphurous. It makes the house smell and the water filters must be changed constantly.
1266	Weaver Road	1	-	No		Fresh	My water system was overhauled just 4 months ago, have owned this farm organic 35 years and have always had good water.
2489	Carl Road	2	1	No		Fresh	
755	Highway 3 E	1	-	No	30	Sulphurous & Hard	
787	Highway 3 E	2	1	No	24	Hard & Iron	Problems in 2001 and 2006 due to pump failure and increased usage.
1577	Highway 3 E	2	1	No	22, 22	Hard & Sulphurous	One well on property went dry in 2016. Waited 8 months and only partially returned to strength.
1162	Weaver Road	2	1	No		Fresh	
448	Chippawa Road	-	1	No			
529	Chippawa Road	-	3	No			Stated that prior to purchasing the property a well had been in use but the quarry caused quantity issues. Now they use a 200 gallon tank along with two cisterns.
549	Chippawa Road	-	1	No			
665	Chippawa Road	-	1	No			
677	Chippawa Road	-	1	No			
930	Chippawa Road	-	1	No			
427	Highway 3 E	-	-	Yes			
705	Highway 3 E	-	1	No			
966	Highway 3 E	-	1	No			
1305	Highway 3 E	-	1	No			
1695	Highway 3 E	-	1	-			
1540	Lorraine/Babion Road	-	1	No			
642	Second Concession Road	-	-	Yes			
1246	Second Concession Road	-	1	Yes			
640	Second Concession Road						Survey Blank

Table E-1
2018 Water Well Survey Results
Port Colborne Quarries

Survey Delivered But No Response Received							
2199	Babion Road	667	Hwy 3 E	911	Killaly Street East	2051	Ramey Road
459	Chippawa Road	683	Hwy 3 E	913	Killaly Street East	2075	Ramey Road
475	Chippawa Road	702	Hwy 3 E	941	Killaly Street East	2095	Ramey Road
517	Chippawa Road	722	Hwy 3 E	953	Killaly Street East	2105	Ramey Road
572	Chippawa Road			961	Killaly Street East	2125	Ramey Road
612	Chippawa Road	770	Hwy 3 E	965	Killaly Street East	275	Second Concession Road
647	Chippawa Road	831	Hwy 3 E	1007	Killaly Street East	291	Second Concession Road
650	Chippawa Road	919	Hwy 3 E	1233	Killaly Street East	316	Second Concession Road
657	Chippawa Road	971	Hwy 3 E	1268	Killaly Street East	386	Second Concession Road
672	Chippawa Road	981	Hwy 3 E	1288	Killaly Street East	408	Second Concession Road
702	Chippawa Road	1252	Hwy 3 E	1384	Killaly Street East	456	Second Concession Road
709	Chippawa Road	1326	Hwy 3 E	1394	Killaly Street East	530	Second Concession Road
736	Chippawa Road	1627	Hwy 3 E	1408	Killaly Street East	636	Second Concession Road
755	Chippawa Road	1716	Killaly Street East	1446	Killaly Street East	644	Second Concession Road
760	Chippawa Road	1751	Killaly Street East	1627	Killaly Street East	662	Second Concession Road
776	Chippawa Road	530	Killaly Street East	1014	Lorraine Road	708	Second Concession Road
880	Chippawa Road	551	Killaly Street East	1077	Lorraine Road	874	Second Concession Road
889	Chippawa Road	571	Killaly Street East	1096	Lorraine Road	1645	Second Concession Road
900	Chippawa Road	673	Killaly Street East	1314	Lorraine Road	1740	Second Concession Road
906	Chippawa Road	697	Killaly Street East	1368	Lorraine Road	1549	Snider Road
1024	Chippawa Road	741	Killaly Street East	1386	Lorraine Road	1587	Snider Road
1072	Chippawa Road	758	Killaly Street East	1516	Lorraine Road	1607	Snider Road
1112	Chippawa Road	759	Killaly Street East	1498	Miller Road	2062	Snider Road
1132	Chippawa Road	769	Killaly Street East	1580	Miller Road	1142	Weaver Road
1244	Chippawa Road	779	Killaly Street East	1682	Miller Road	1152	Weaver Road
1245	Chippawa Road	791	Killaly Street East	1778	Miller Road	974	Weaver Road/Carl Road
1246	Chippawa Road	806	Killaly Street East	1826	Miller Road	1030	Weaver Road/Carl Road
401	Hwy 3 E	806	Killaly Street East	1864	Miller Road	1054	Weaver Road/Carl Road
439	Hwy 3 E	877	Killaly Street East	2024	Miller Road	1080	Weaver Road/Carl Road
455	Hwy 3 E	893	Killaly Street East	2168	Miller Road	1110	Weaver Road/Carl Road
523	Hwy 3 E	896	Killaly Street East	1965	Ramey Road		
548	Hwy 3 E	901	Killaly Street East	2033	Ramey Road		
Survey Undeliverable							
2129	Chippawa Road	1413	Hwy 3 E	1379	Killaly Street East	1094	Weaver Road/Carl Road
391	Hwy 3 E	1193	Killaly Street East	1828	Miller Road		
TOTALS							
185	Surveys						
7	Undeliverable						
178	Delivered						
53	Response Received						
30%	Response Rate						

2017 Sept 26, 2017

PRIVATE WATER WELL SURVEY
QUESTIONNAIRE

TYPE OF DWELLING: ☑ Residential ☐ Commercial ☐ Institutional ☐ Other: ....

Is the owner willing to participate in the survey? **Yes** ☑ **No** ☐

(If no, record address below)

I. OWNER / OCCUPANT INFORMATION AND GENERAL QUESTIONS:

OWNER:

Name: [redacted] Telephone No. (business) ....

Address: 1590 Miller Rd Telephone No. (home) ....

Number of Bathrooms .... Number of Occupants ....

OCCUPANT (if other than Owner):

Name: .... Telephone No. (business) ....

Address: .... Telephone No. (home) ....

Number of Bathrooms .... Number of Occupants ....

GENERAL QUESTIONS

How long have you owned/occupied this dwelling? 2-3 year

Is the property used year-round or seasonally?.. Yr-l

Is well water used for drinking water supply? Yes ☑ No ☐

If no, why not? ....

Are there any other wells or water supplies used on the property?...... ~~Ab~~ Yes decommissioned

If no, how long has it been since well water was used for drinking? 14 year ago on-site - drive

If no, what is the origin of drinking water? Old well on site filled + capped

II. WATER WELL

A. WELL CONSTRUCTION DETAILS:

Do you have a copy of the MOE Water Well Record? ☐ Yes (Well Record # ....) ☐ No

ATTACH A COPY OF WATER WELL RECORD, IF POSSIBLE

Date or Year Constructed 14 years ago Contractor ....

Type of Well: Drilled ☑ Dug ☐ Well Diameter (inches) ....

Present Well Depth: .... Original Well Depth .... ☐ Same as Present

Is Well Vented and How?: ....

Top of Well Casing is:

1) Above ground surface ☑ 2) Buried inside a well pit ☐ 3) Buried, but not in a well pit ☐

The accurate location of the well is Known ☑ Unknown ☐

GPS coordinates: E.......... N..........

Type of pump: Submersible ☑ Jet ~~Pump~~ ☐ Depth of Pump Intake (if known) ....

Well completed into: Bedrock ...✓... Overburden (Soil) .... Both ....

B. WELL WATER LEVELS:

Indicate whether measured from ☐ ground level or ☑ from top of casing

Original water level depth in metres (on water well record) ....

Subsequent water level measurements (give depths in metres and dates) ....

....

....

C. WATER QUANTITY

Does your well supply enough water for your use? Yes ☑ No ☐

If no, is this the case: All the time ☐ Some of the time ☐ Seasonally ☐ Other ....

Use: Domestic: No ☐ Yes ☑ No. of persons using water from well ....

Domestic includes (circle all that apply) Drinking Washing Cooking

Pool: No ☑ Yes ☐ Lawn Watering/Garden: No ☐ Yes ☑

Livestock: No ☐ Yes ☑

Industrial: No ☑ Yes ☐ (provide details)..........

Irrigation: No ☐ Yes ☑ (provide details)..........

Other Uses .... Daily Usage (if known) ....

Have you ever experienced any problems with your well? ....NO..........

If so, when? ....

What was the cause of the problem? ☐ Drought ☐ Pump Failure ☐ Plugging

☐ Increased Usage ☐ Interference ☐ Other (Please Specify) ....

Did you ever have your well deepened or cleaned, or a new well constructed? ......NO............

If so, why?..

Pump test conducted? ....

If yes, record pumping rate, duration and water levels (static, pumping and recovery)

....

....

....

....

....

D. WATER TREATMENT AND QUALITY

Fresh ☐ Sulphur ☐ Salty ☐ Iron Staining ☑ Soft ☐ Hard ☑

Water Treatment equipment: Softener ☐ UV ☐ Reverse Osmosis ☐ Filters ☐

Other equipment in use (if any): ....

Has your well recently been chlorinated and, if so, when? .....NO.............................

How would you describe the quality of your water? ☐ Poor ☐ Good ☑ Excellent

Has your water quality previously been tested? No ☐ Yes ☑ Good

If yes, for what and how often? (bacteriological, chemical analyses, etc.) ....

....

ATTACH COPY OF ANY PREVIOUS CHEMICAL AND/OR BACTERIOLOGICAL ANALYSIS RESULTS ON THE WELL WATER, IF AVAILABLE

Water sample collected during this survey: ....

Where was the sample collected: ....

....

....

Field Measurements: Conductivity...732... Temperature ...14.4... pH...7.35...

E. SURFACE WATER

Are there any ponds, creeks etc. on the property?.......NO.......................................

If yes, indicate size and depth? Use?...

III. SEWAGE DISPOSAL SYSTEM

SYSTEM DETAILS

What type of sewage disposal system do you have:

- ☑ Holding Tank (sewage removed by regular pump-outs)
- ☑ Septic Tank and Leaching Bed
- ☐ Other method of on-site disposal. Specify ....
- ☐ Do not know

Date or year Constructed ..18.. Contractor

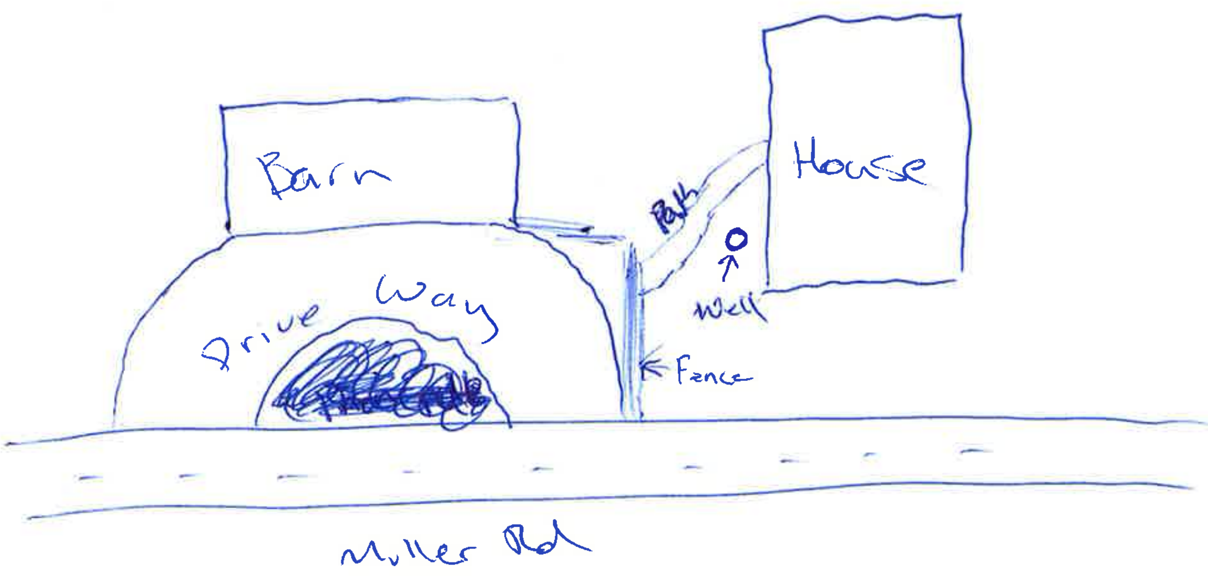
How often do you have the holding tank or septic tank pumped out? ....

When was the last time? Crosby every 2nd year

Have you ever had any problems with your sewage disposal systems? (e.g. leaks from holding tank, failure of septic system including surficial release of sewage, visibly stained areas, unusual odours, soft ground, etc.) Never

IV. PROPERTY SKETCH AND PHOTOGRAPHS

Sketch the location of the septic system (including approximate leaching bed area), the well and the on-site structures, giving the best approximated distance between each of them. Include ground surface slope (in degrees or percentage). Note any indications of septic system failure such as stained areas, surficial release of sewage, unusual odours, soft ground, etc. Identify on-site and/or adjacent roads, ditches, surface water bodies. Record the GPS coordinates for the top of the well casing (x,y,z). Record height of top of well casing above ground surface. Include photographs of well head, etc.



Completed by: P. Hering Date Sept 26, 2017

2017 Sept

PRIVATE WATER WELL SURVEY QUESTIONNAIRE

TYPE OF DWELLING: ☑ Residential ☐ Commercial ☐ Institutional ☐ Other: ....

Is the owner willing to participate in the survey? **Yes** ☑ **No** ☐

(If no, record address below)

I. OWNER / OCCUPANT INFORMATION AND GENERAL QUESTIONS:

OWNER:

Name: [redacted] Telephone No. (business) ......N/A......

Address: ....2015 Killaly.......... Telephone No. (home) ....

Number of Bathrooms .... Number of Occupants ....

OCCUPANT (if other than Owner):

Name: .... Telephone No. (business) ....

Address: .... Telephone No. (home) ....

Number of Bathrooms .... Number of Occupants ....

GENERAL QUESTIONS

How long have you owned/occupied this dwelling? ....35 years........

Is the property used year-round or seasonally?.. ....Yes........

Is well water used for drinking water supply? Yes ☐ No ☑

If no, why not? ....taste........

Are there any other wells or water supplies used on the property?....NO........

If no, how long has it been since well water was used for drinking? ....years ago........

If no, what is the origin of drinking water? ....water coolers........

II. WATER WELL

A. WELL CONSTRUCTION DETAILS:

Do you have a copy of the MOE Water Well Record? ☐ Yes (Well Record # ....)
☐ No

ATTACH A COPY OF WATER WELL RECORD, IF POSSIBLE

Date or Year Constructed ....5 years........ Contractor ....Circle Eddie........

Type of Well: Drilled ☑ Dug ☐ Well Diameter (inches) ....

Present Well Depth: .... Original Well Depth .... ☐ Same as Present

Is Well Vented and How?:...

Top of Well Casing is:

1) Above ground surface ☑ 2) Buried inside a well pit ☐ 3) Buried, but not in a well pit ☐

The accurate location of the well is Known ☑ Unknown ☐

GPS coordinates: E.............................. N..............................

Type of pump: Submersible ☑ Jet Pump ☐ Depth of Pump Intake (if known) ....

Well completed into: Bedrock .... Overburden (Soil) .... Both ....

B. WELL WATER LEVELS:

Indicate whether measured from ☐ ground level or ☐ from top of casing

Original water level depth in metres (on water well record) ....

Subsequent water level measurements (give depths in metres and dates) ....

....

....

C. WATER QUANTITY

Does your well supply enough water for your use? Yes ☑ No ☑

If no, is this the case: All the time ☐ Some of the time ☑ Seasonally ☐ Other ....

Use: Domestic: No ☐ Yes ☑ No. of persons using water from well ....

Domestic includes (circle all that apply) Drinking Washing Cooking

Pool: No ☑ Yes ☐ Lawn Watering/Garden: No ☐ Yes ☑

Livestock: No ☑ Yes ☐

Industrial: No ☑ Yes ☐ (provide details)..

Irrigation: No ☑ Yes ☐ (provide details)..

Other Uses .... Daily Usage (if known) ....

Have you ever experienced any problems with your well? high use dried well out

If so, when? ....

What was the cause of the problem? ☑ Drought ☐ Pump Failure ☐ Plugging

☑ Increased Usage ☐ Interference ☐ Other (Please Specify) ....

Did you ever have your well deepened or cleaned, or a new well constructed? ....

If so, why?..

Pump test conducted? ....

If yes, record pumping rate, duration and water levels (static, pumping and recovery)

....

....

....

....

....

D. WATER TREATMENT AND QUALITY

Fresh ☐ Sulphur ☑ Salty ☐ Iron Staining ☐ Soft ☐ Hard ☑

Water Treatment equipment: Softener ☑ UV ☐ Reverse Osmosis ☐ Filters ☑

Other equipment in use (if any): ....Peroxide Treatment..........................

Has your well recently been chlorinated and, if so, when? ....

How would you describe the quality of your water? ☑ Poor ☐ Good ☐ Excellent

Has your water quality previously been tested? No ☑ Yes ☐

If yes, for what and how often? (bacteriological, chemical analyses, etc.) ....

....

ATTACH COPY OF ANY PREVIOUS CHEMICAL AND/OR BACTERIOLOGICAL ANALYSIS RESULTS ON THE WELL WATER, IF AVAILABLE

Water sample collected during this survey: ....Yes....................................

Where was the sample collected: ....tap outside behind garage, runs through peroxide system

....

....

Field Measurements: Conductivity..1333.. Temperature ..21.2.. pH..7.22..

E. SURFACE WATER

Are there any ponds, creeks etc. on the property? ..marshland in back corner

If yes, indicate size and depth? Use?...

III. SEWAGE DISPOSAL SYSTEM

SYSTEM DETAILS

What type of sewage disposal system do you have:

- ☐ Holding Tank (sewage removed by regular pump-outs)
- ☑ Septic Tank and Leaching Bed
- ☐ Other method of on-site disposal. Specify ....
- ☐ Do not know

Date or year Constructed .... Contractor

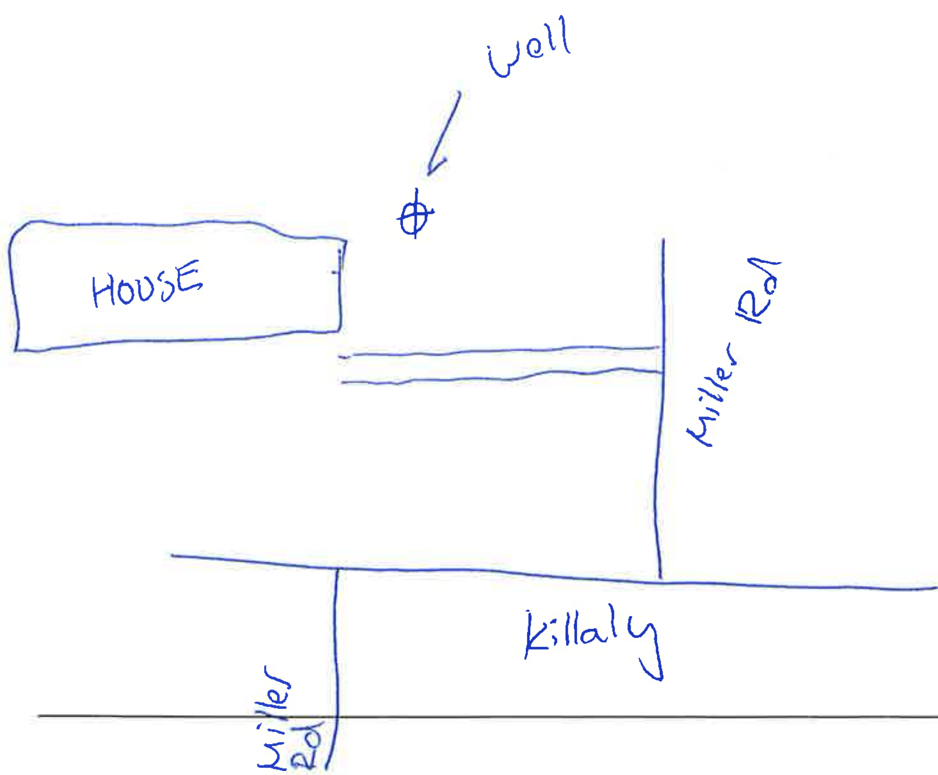
How often do you have the holding tank or septic tank pumped out? Every two years

When was the last time? ....

Have you ever had any problems with your sewage disposal systems? (e.g. leaks from holding tank, failure of septic system including surficial release of sewage, visibly stained areas, unusual odours, soft ground, etc.) ....

IV. PROPERTY SKETCH AND PHOTOGRAPHS

Sketch the location of the septic system (including approximate leaching bed area), the well and the on-site structures, giving the best approximated distance between each of them. Include ground surface slope (in degrees or percentage). Note any indications of septic system failure such as stained areas, surficial release of sewage, unusual odours, soft ground, etc. Identify on-site and/or adjacent roads, ditches, surface water bodies. Record the GPS coordinates for the top of the well casing (x,y,z). Record height of top of well casing above ground surface. Include photographs of well head, etc.



Completed by: .... Date ....

2017

Sept 19

PRIVATE WATER WELL SURVEY QUESTIONNAIRE

TYPE OF DWELLING: ☑ Residential ☐ Commercial ☐ Institutional ☐ Other: ....

Is the owner willing to participate in the survey? **Yes** ☑ **No** ☐

(If no, record address below)

Cistern + 2 wells

I. OWNER / OCCUPANT INFORMATION AND GENERAL QUESTIONS:

OWNER: [redacted]

Name: .... Telephone No. (business) ....

Address: 1326 Hwy 3 .... Telephone No. (home) ....

Number of Bathrooms .... Number of Occupants ....

One is black water

OCCUPANT (if other than Owner):

Name: .... Telephone No. (business) ....

Address: .... Telephone No. (home) ....

Number of Bathrooms .... Number of Occupants ....

GENERAL QUESTIONS

How long have you owned/occupied this dwelling? 1986

Is the property used year-round or seasonally?.. Yes

Is well water used for drinking water supply? Yes ☐ No ☑

If no, why not? Quality / Money /

Are there any other wells or water supplies used on the property? 2 wells, black water in well in barn

If no, how long has it been since well water was used for drinking? ....

If no, what is the origin of drinking water? water Cooler

II. WATER WELL

A. WELL CONSTRUCTION DETAILS:

Do you have a copy of the MOE Water Well Record? ☐ Yes (Well Record # ....) ☑ No

ATTACH A COPY OF WATER WELL RECORD, IF POSSIBLE

Date or Year Constructed .... Contractor ....

Type of Well: Drilled ☑ Dug ☐ Well Diameter (inches) ....

Present Well Depth: 19'-20' Original Well Depth .... ☐ Same as Present

Is Well Vented and How?: ....

Top of Well Casing is:

1) Above ground surface ☐ 2) Buried inside a well pit ☐ 3) Buried, but not in a well pit ☐

The accurate location of the well is Known ☑ Unknown ☐

GPS coordinates: E.......... N..........

Type of pump: Submersible ☐ Jet Pump ☑ Depth of Pump Intake (if known) ....

Well completed into: Bedrock ....✓.... Overburden (Soil) .... Both ....

B. WELL WATER LEVELS:

Indicate whether measured from ☐ ground level or ☐ from top of casing

Original water level depth in metres (on water well record) ....

Subsequent water level measurements (give depths in metres and dates) ....

....

....

C. WATER QUANTITY

Does your well supply enough water for your use? Yes ☑ No ☐

If no, is this the case: All the time ☐ Some of the time ☐ Seasonally ☐ Other ....

Use: Domestic: No ☐ Yes ☑ No. of persons using water from well ....

Domestic includes (circle all that apply) Drinking Washing Cooking

Pool: No ☑ Yes ☐ Lawn Watering/Garden: No ☐ Yes ☑

Livestock: No ☑ Yes ☐

Industrial: No ☑ Yes ☐ (provide details)..........

Irrigation: No ☑ Yes ☐ (provide details)..........

Other Uses .... Daily Usage (if known) ....

Have you ever experienced any problems with your well? ....No..........

If so, when? ....

What was the cause of the problem? ☐ Drought ☐ Pump Failure ☐ Plugging

☐ Increased Usage ☐ Interference ☐ Other (Please Specify) ....

Did you ever have your well deepened or cleaned, or a new well constructed? ....

If so, why?...

Pump test conducted? ....

If yes, record pumping rate, duration and water levels (static, pumping and recovery)

....

....

....

....

....

D. WATER TREATMENT AND QUALITY

Fresh ☐ Sulphur ☐ Salty ☐ Iron Staining ☑ Soft ☐ Hard ☐

Water Treatment equipment: Softener ☐ UV ☐ Reverse Osmosis ☐ Filters ☐

Other equipment in use (if any): ....

Has your well recently been chlorinated and, if so, when? ...bleached the well 5-6 years

How would you describe the quality of your water? ☐ Poor ☑ Good ☐ Excellent

Has your water quality previously been tested? No ☐ Yes ☑

If yes, for what and how often? (bacteriological, chemical analyses, etc.) .no issues.....

....

ATTACH COPY OF ANY PREVIOUS CHEMICAL AND/OR BACTERIOLOGICAL ANALYSIS RESULTS ON THE WELL WATER, IF AVAILABLE

Water sample collected during this survey: ....NO...

Where was the sample collected: ....N/A...

....

....

Field Measurements: Conductivity.................. Temperature .... pH.....................

E. SURFACE WATER

Are there any ponds, creeks etc. on the property?..

If yes, indicate size and depth? Use?..

III. SEWAGE DISPOSAL SYSTEM

SYSTEM DETAILS

What type of sewage disposal system do you have:

- ☐ Holding Tank (sewage removed by regular pump-outs)
- ☑ Septic Tank and Leaching Bed
- ☐ Other method of on-site disposal. Specify ....
- ☐ Do not know

Date or year Constructed .... Contractor

How often do you have the holding tank or septic tank pumped out? never pump

When was the last time? Never been pumped

Have you ever had any problems with your sewage disposal systems? (e.g. leaks from holding tank, failure of septic system including surficial release of sewage, visibly stained areas, unusual odours, soft ground, etc.) No problems

IV. PROPERTY SKETCH AND PHOTOGRAPHS

Sketch the location of the septic system (including approximate leaching bed area), the well and the on-site structures, giving the best approximated distance between each of them. Include ground surface slope (in degrees or percentage). Note any indications of septic system failure such as stained areas, surficial release of sewage, unusual odours, soft ground, etc. Identify on-site and/or adjacent roads, ditches, surface water bodies. Record the GPS coordinates for the top of the well casing (x,y,z). Record height of top of well casing above ground surface. Include photographs of well head, etc.

Did not see wells on
the visit

Completed by: T. Proks Date Sept 19, 2017

2017

Sept 19
2146 2nd Conc
City Water
Plus 2 wells

PRIVATE WATER WELL SURVEY QUESTIONNAIRE

TYPE OF DWELLING: ☑ Residential ☑ Commercial
☐ Institutional ☐ Other: ....

Is the owner willing to participate in the survey? **Yes** ☑ **No** ☐

(If no, record address below)

I. OWNER / OCCUPANT INFORMATION AND GENERAL QUESTIONS:

OWNER:

Name: [redacted] Telephone No. (business) ....

Address: ....2146 2nd Concession Telephone No. (home) ....

Number of Bathrooms .... Number of Occupants ....

OCCUPANT (if other than Owner):

Name: .... Telephone No. (business) ....

Address: .... Telephone No. (home) ....

Number of Bathrooms .... Number of Occupants ....

GENERAL QUESTIONS

How long have you owned/occupied this dwelling? ....1953..........

Is the property used year-round or seasonally?.. ....Yes..........

Is well water used for drinking water supply? Yes ☐ No ☑

If no, why not? ....City Water, Checked..........

Are there any other wells or water supplies used on the property?....2 wells..........

If no, how long has it been since well water was used for drinking? ....not used..........

If no, what is the origin of drinking water? ....city water..........

II. WATER WELL

A. WELL CONSTRUCTION DETAILS:

2 wells

Do you have a copy of the MOE Water Well Record? ☐ Yes (Well Record # .. ..)
☑ No

ATTACH A COPY OF WATER WELL RECORD, IF POSSIBLE

Date or Year Constructed .... Contractor ....

Type of Well: Drilled ☐ Dug ☐ Well Diameter (inches) ....

Present Well Depth: .... Original Well Depth .... ☐ Same as Present

Is Well Vented and How?: ....

Top of Well Casing is:

1) Above ground surface ☑ 2) Buried inside a well pit ☐ 3) Buried, but not in a well pit ☐

The accurate location of the well is Known ☑ Unknown ☐

GPS coordinates: E.......... N..........

Type of pump: Submersible ☑ Jet Pump ☐ Depth of Pump Intake (if known) ....

Well completed into: Bedrock ✓ Overburden (Soil) .... Both ....

B. WELL WATER LEVELS:

Indicate whether measured from ☐ ground level or ☐ from top of casing

Original water level depth in metres (on water well record) ....

Subsequent water level measurements (give depths in metres and dates) ....

....

....

C. WATER QUANTITY

Does your well supply enough water for your use? Yes ☑ No ☐

If no, is this the case: All the time ☐ Some of the time ☐ Seasonally ☐ Other ....

Use: Domestic: No ☑ Yes ☐ No. of persons using water from well ....

Domestic includes (circle all that apply) Drinking Washing Cooking

Pool: No ☐ Yes ☐ Lawn Watering/Garden: No ☐ Yes ☐

Livestock: No ☐ Yes ☑

Industrial: No ☐ Yes ☐ (provide details)..........

Irrigation: No ☐ Yes ☐ (provide details)..........

Other Uses .... Daily Usage (if known) ....

Have you ever experienced any problems with your well? ....NO..........

If so, when? ....

What was the cause of the problem? ☐ Drought ☐ Pump Failure ☐ Plugging

☐ Increased Usage ☐ Interference ☐ Other (Please Specify) ....

Did you ever have your well deepened or cleaned, or a new well constructed? Yes

If so, why? more supply for chickens

Pump test conducted? ....

If yes, record pumping rate, duration and water levels (static, pumping and recovery)

....

D. WATER TREATMENT AND QUALITY

Fresh ☑ Sulphur ☑ Salty ☐ Iron Staining ☐ Soft ☐ Hard ☐

Water Treatment equipment: Softener ☐ UV ☐ Reverse Osmosis ☐ Filters ☐

Other equipment in use (if any): ....

Has your well recently been chlorinated and, if so, when? ....

How would you describe the quality of your water? ☐ Poor ☑ Good ☐ Excellent

Has your water quality previously been tested? No ☐ Yes ☑

If yes, for what and how often? (bacteriological, chemical analyses, etc.) 2 x year / yearly

ATTACH COPY OF ANY PREVIOUS CHEMICAL AND/OR BACTERIOLOGICAL ANALYSIS RESULTS ON THE WELL WATER, IF AVAILABLE

Water sample collected during this survey: NO

Where was the sample collected: ....

Field Measurements: Conductivity.................. Temperature .... pH....................

E. SURFACE WATER

Are there any ponds, creeks etc. on the property? old pond, has been filled in

If yes, indicate size and depth? Use? ....

III. SEWAGE DISPOSAL SYSTEM

SYSTEM DETAILS

What type of sewage disposal system do you have:

☐ Holding Tank (sewage removed by regular pump-outs)

☑ Septic Tank and Leaching Bed

☐ Other method of on-site disposal. Specify ....

☐ Do not know

Date or year Constructed .... Contractor 10 years ago replaced

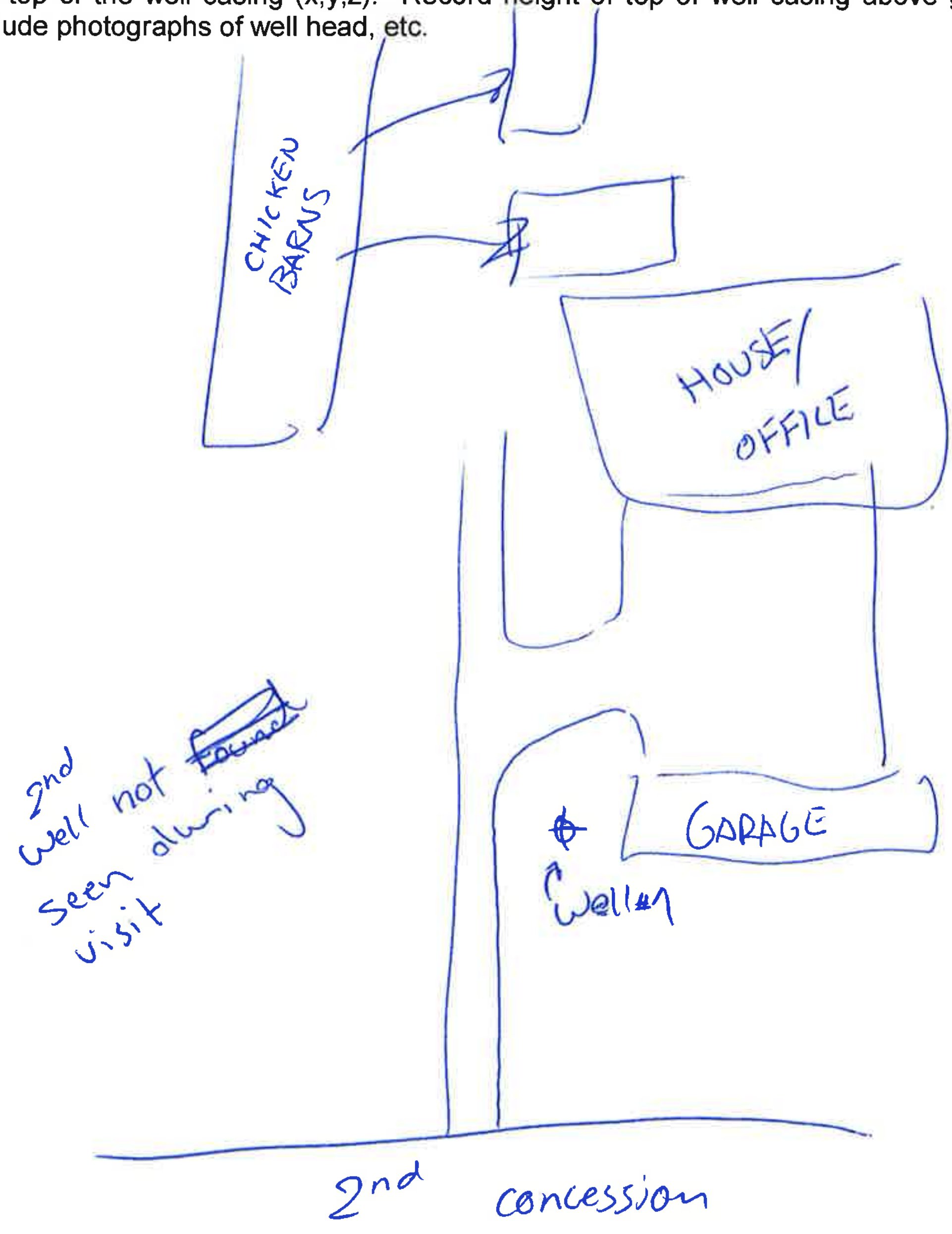
How often do you have the holding tank or septic tank pumped out? very seldom used

When was the last time? ....

Have you ever had any problems with your sewage disposal systems? (e.g. leaks from holding tank, failure of septic system including surficial release of sewage, visibly stained areas, unusual odours, soft ground, etc.) ....

IV. PROPERTY SKETCH AND PHOTOGRAPHS

Sketch the location of the septic system (including approximate leaching bed area), the well and the on-site structures, giving the best approximated distance between each of them. Include ground surface slope (in degrees or percentage). Note any indications of septic system failure such as stained areas, surficial release of sewage, unusual odours, soft ground, etc. Identify on-site and/or adjacent roads, ditches, surface water bodies. Record the GPS coordinates for the top of the well casing (x,y,z). Record height of top of well casing above ground surface. Include photographs of well head, etc.



Completed by: .... Date ....

2017

Sept 19

**PRIVATE WATER WELL SURVEY
QUESTIONNAIRE**

TYPE OF DWELLING: ☑ Residential ☐ Commercial
☐ Institutional ☐ Other: ....

Is the owner willing to participate in the survey? **Yes** ☑ **No** ☐

(If no, record address below)

I. OWNER / OCCUPANT INFORMATION AND GENERAL QUESTIONS:

OWNER:

Name: [redacted] Telephone No. (business) ....

Address: 2478 Miller Rd Telephone No. (home) ....

Number of Bathrooms .... Number of Occupants ....

OCCUPANT (if other than Owner):

Name: .... Telephone No. (business) ....

Address: .... Telephone No. (home) ....

Number of Bathrooms .... Number of Occupants ....

GENERAL QUESTIONS

How long have you owned/occupied this dwelling? 1 year

Is the property used year-round or seasonally?.. yes

Is well water used for drinking water supply? Yes ☑ No ☐

If no, why not? ....

Are there any other wells or water supplies used on the property?....................

If no, how long has it been since well water was used for drinking? ....

If no, what is the origin of drinking water? ....

II. WATER WELL

A. WELL CONSTRUCTION DETAILS:

Do you have a copy of the MOE Water Well Record? ☐ Yes (Well Record # .. ..)
☑ No

ATTACH A COPY OF WATER WELL RECORD, IF POSSIBLE

Date or Year Constructed .... Contractor ....

Type of Well: Drilled ☐ Dug ☑ Well Diameter (inches) ....

Present Well Depth: .... Original Well Depth .... ☐ Same as Present

Is Well Vented and How?: ....

Top of Well Casing is:

1) Above ground surface ☑ 2) Buried inside a well pit ☐ 3) Buried, but not in a well pit ☐

The accurate location of the well is Known ☑ Unknown ☐ Did not see well on visit

GPS coordinates: E.............................. N..............................

Type of pump: Submersible ☑ Jet Pump ☐ Depth of Pump Intake (if known) ....

Well completed into: Bedrock .... Overburden (Soil) .... Both ....

B. WELL WATER LEVELS:

Indicate whether measured from ☐ ground level or ☐ from top of casing

Original water level depth in metres (on water well record) ....

Subsequent water level measurements (give depths in metres and dates) ....

....

....

C. WATER QUANTITY

Does your well supply enough water for your use? Yes ☑ No ☐

If no, is this the case: All the time ☐ Some of the time ☐ Seasonally ☐ Other ....

Use: Domestic: No ☐ Yes ☑ No. of persons using water from well ....

Domestic includes (circle all that apply) Drinking Washing Cooking

Pool: No ☐ Yes ☐ Lawn Watering/Garden: No ☐ Yes ☑

Livestock: No ☐ Yes ☑

Industrial: No ☐ Yes ☐ (provide details)..

Irrigation: No ☐ Yes ☐ (provide details)..

Other Uses .... Daily Usage (if known) ....

Have you ever experienced any problems with your well? .....no..

If so, when? ....

What was the cause of the problem? ☐ Drought ☐ Pump Failure ☐ Plugging

☐ Increased Usage ☐ Interference ☐ Other (Please Specify) ....

Did you ever have your well deepened or cleaned, or a new well constructed? ....
If so, why? ....
Pump test conducted? ....
If yes, record pumping rate, duration and water levels (static, pumping and recovery)
....
....
....
....
....

D. WATER TREATMENT AND QUALITY

Fresh ☑ Sulphur ☐ Salty ☐ Iron Staining ☑ Soft ☐ Hard ☐

Water Treatment equipment: Softener ☑ UV ☑ Reverse Osmosis ☐ Filters ☑

Other equipment in use (if any): ....
Has your well recently been chlorinated and, if so, when? ....
How would you describe the quality of your water? ☐ Poor ☑ Good ☐ Excellent

Has your water quality previously been tested? No ☐ Yes ☐

If yes, for what and how often? (bacteriological, chemical analyses, etc.) ....
....

ATTACH COPY OF ANY PREVIOUS CHEMICAL AND/OR BACTERIOLOGICAL ANALYSIS RESULTS ON THE WELL WATER, IF AVAILABLE

Water sample collected during this survey: Yes
Where was the sample collected: from outside garden hose @ back of house
....
....
Field Measurements: Conductivity 1419 Temperature 24.15 pH 7.32

E. SURFACE WATER

Are there any ponds, creeks etc. on the property? NO
If yes, indicate size and depth? Use? ....

III. SEWAGE DISPOSAL SYSTEM

SYSTEM DETAILS

What type of sewage disposal system do you have:

- ☐ Holding Tank (sewage removed by regular pump-outs)
- ☑ Septic Tank and Leaching Bed
- ☐ Other method of on-site disposal. Specify ....
- ☐ Do not know

Date or year Constructed .... Contractor new tank put in

How often do you have the holding tank or septic tank pumped out? .... 1 month ago

When was the last time? ....

Have you ever had any problems with your sewage disposal systems? (e.g. leaks from holding tank, failure of septic system including surficial release of sewage, visibly stained areas, unusual odours, soft ground, etc.) ....

IV. PROPERTY SKETCH AND PHOTOGRAPHS

Sketch the location of the septic system (including approximate leaching bed area), the well and the on-site structures, giving the best approximated distance between each of them. Include ground surface slope (in degrees or percentage). Note any indications of septic system failure such as stained areas, surficial release of sewage, unusual odours, soft ground, etc. Identify on-site and/or adjacent roads, ditches, surface water bodies. Record the GPS coordinates for the top of the well casing (x,y,z). Record height of top of well casing above ground surface. Include photographs of well head, etc.

Did not see well on visit.

Completed by: T. Proks Date Sept 19, 2017

2017

Sept 19

PRIVATE WATER WELL SURVEY
QUESTIONNAIRE

TYPE OF DWELLING: ☑ Residential ☐ Commercial
☐ Institutional ☐ Other: ....

Is the owner willing to participate in the survey? **Yes** ☑ **No** ☐

(If no, record address below)

I. OWNER / OCCUPANT INFORMATION AND GENERAL QUESTIONS:

OWNER:

Name: ....[redacted]........
Address: ....1739 Killa[illegible]....................
Number of Bathrooms ....

Telephone No. (business) ....
Telephone No. (home) ....
Number of Occupants ....

OCCUPANT (if other than Owner):

Name: ....
Address: ....
Number of Bathrooms ....

Telephone No. (business) ....
Telephone No. (home) ....
Number of Occupants ....

GENERAL QUESTIONS

How long have you owned/occupied this dwelling? ....~~8~~ 3 years....
Is the property used year-round or seasonally?.. ....Yes....
Is well water used for drinking water supply? Yes ☑ No ☐
If no, why not? ....
Are there any other wells or water supplies used on the property?....no....
If no, how long has it been since well water was used for drinking? ....
If no, what is the origin of drinking water? ....

II. WATER WELL

A. WELL CONSTRUCTION DETAILS:

Do you have a copy of the MOE Water Well Record? ☐ Yes (Well Record # ....)
☑ No

ATTACH A COPY OF WATER WELL RECORD, IF POSSIBLE

Date or Year Constructed .....No..................... Contractor ....
Type of Well: Drilled ☑ Dug ☐ Well Diameter (inches) ....
Present Well Depth: ....25'........ Original Well Depth................ ☐ Same as Present

Is Well Vented and How?: ....

Top of Well Casing is:

1) Above ground surface ☑ 2) Buried inside a well pit ☐ 3) Buried, but not in a well pit ☐

The accurate location of the well is Known ☑ Unknown ☐

GPS coordinates: E............................ N............................

Type of pump: Submersible ☐ Jet Pump ☑ Depth of Pump Intake (if known) ....

Well completed into: Bedrock .... Overburden (Soil) .... Both ....

B. WELL WATER LEVELS:

Indicate whether measured from ☐ ground level or ☐ from top of casing

Original water level depth in metres (on water well record) ....

Subsequent water level measurements (give depths in metres and dates) ....

....

....

C. WATER QUANTITY

Does your well supply enough water for your use? Yes ☑ No ☐

If no, is this the case: All the time ☐ Some of the time ☐ Seasonally ☐ Other ....

Use: Domestic: No ☐ Yes ☑ No. of persons using water from well ....

Domestic includes (circle all that apply) Drinking Washing Cooking

Pool: No ☑ Yes ☐ Lawn Watering/Garden: No ☐ Yes ☑

Livestock: No ☑ Yes ☐

Industrial: No ☑ Yes ☐ (provide details)..

Irrigation: No ☑ Yes ☐ (provide details)..

Other Uses .... Daily Usage (if known) ....

Have you ever experienced any problems with your well? ....

If so, when? ....

What was the cause of the problem? ☐ Drought ☐ Pump Failure ☑ Plugging mud in bottom of well)

☐ Increased Usage ☐ Interference ☐ Other (Please Specify) ....

Did you ever have your well deepened or cleaned, or a new well constructed? ....

If so, why?..

Pump test conducted? ....

If yes, record pumping rate, duration and water levels (static, pumping and recovery)

....

....

....

....

....

D. WATER TREATMENT AND QUALITY

Fresh ☐ Sulphur ☑ Salty ☐ Iron Staining ☐ Soft ☐ Hard ☑

Water Treatment equipment: Softener ☑ UV ☑ Reverse Osmosis ☐ Filters ☐ Ionization ☑

Other equipment in use (if any): ....

Has your well recently been chlorinated and, if so, when? ....

How would you describe the quality of your water? ☐ Poor ☑ Good ☐ Excellent

Has your water quality previously been tested? No ☐ Yes ☑

If yes, for what and how often? (bacteriological, chemical analyses, etc.) 3 years ago

....

ATTACH COPY OF ANY PREVIOUS CHEMICAL AND/OR BACTERIOLOGICAL ANALYSIS RESULTS ON THE WELL WATER, IF AVAILABLE

Water sample collected during this survey: ....

Where was the sample collected: ....

....

....

Field Measurements: Conductivity 669 Temperature 21.87 pH 7.76

E. SURFACE WATER

Are there any ponds, creeks etc. on the property? half a pond

If yes, indicate size and depth? Use? ....

III. SEWAGE DISPOSAL SYSTEM

SYSTEM DETAILS

What type of sewage disposal system do you have:

- ☐ Holding Tank (sewage removed by regular pump-outs)
- ☑ Septic Tank and Leaching Bed
- ☐ Other method of on-site disposal. Specify ....
- ☐ Do not know

Date or year Constructed .... Contractor (never pumped before)

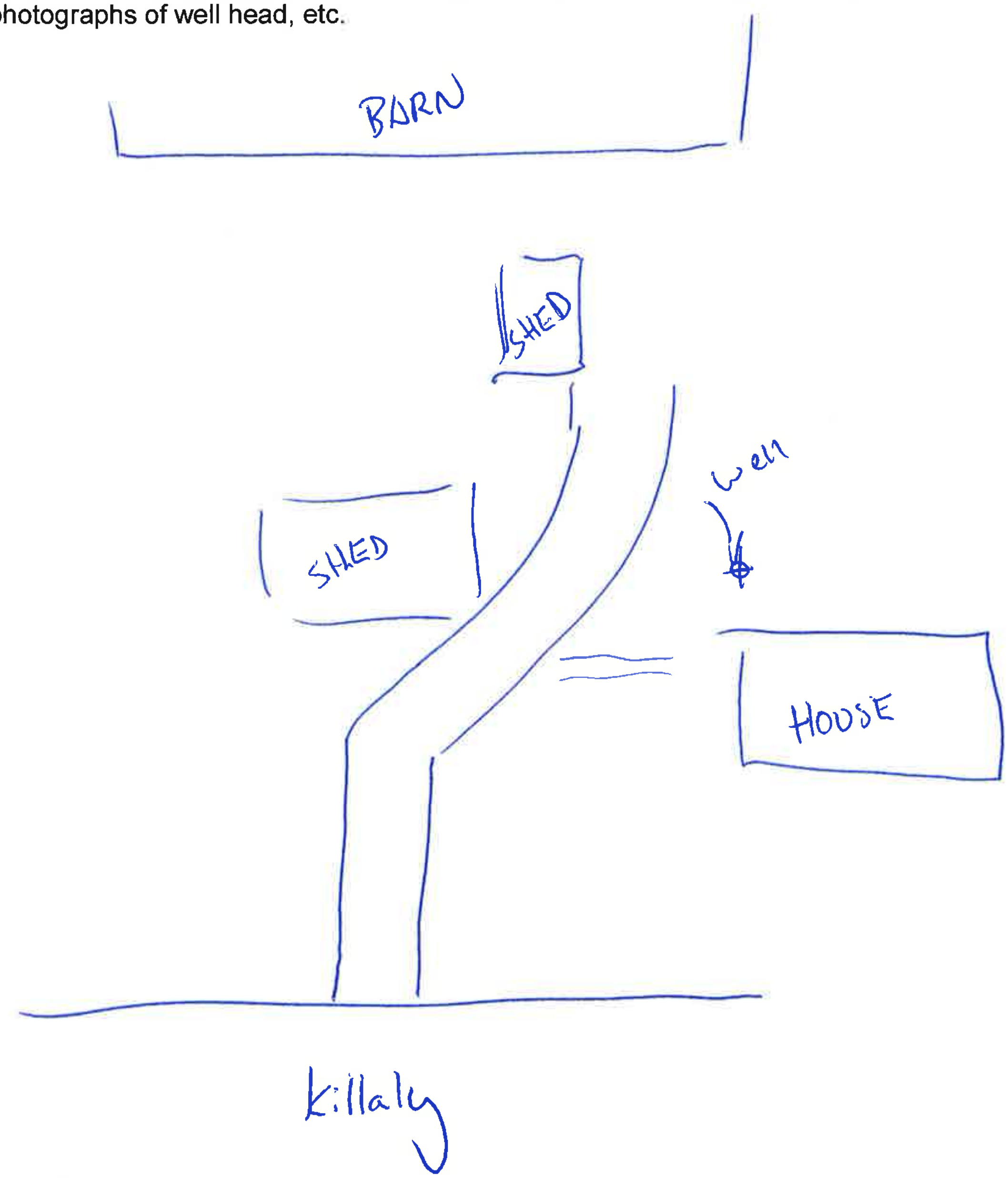
How often do you have the holding tank or septic tank pumped out? pumped last year

When was the last time? ....

Have you ever had any problems with your sewage disposal systems? (e.g. leaks from holding tank, failure of septic system including surficial release of sewage, visibly stained areas, unusual odours, soft ground, etc.) ....

IV. PROPERTY SKETCH AND PHOTOGRAPHS

Sketch the location of the septic system (including approximate leaching bed area), the well and the on-site structures, giving the best approximated distance between each of them. Include ground surface slope (in degrees or percentage). Note any indications of septic system failure such as stained areas, surficial release of sewage, unusual odours, soft ground, etc. Identify on-site and/or adjacent roads, ditches, surface water bodies. Record the GPS coordinates for the top of the well casing (x,y,z). Record height of top of well casing above ground surface. Include photographs of well head, etc.



Completed by: .... Date ....

2017

PRIVATE WATER WELL SURVEY QUESTIONNAIRE

Sept 19

TYPE OF DWELLING: ☐ Residential ☐ Commercial
☐ Institutional ☐ Other: ....

Is the owner willing to participate in the survey? **Yes** ☑ **No** ☐

(If no, record address below)

I. OWNER / OCCUPANT INFORMATION AND GENERAL QUESTIONS:

OWNER: [redacted]

Name: ....
Address: ....1740 Killaly..........
Number of Bathrooms ....

Telephone No. (business) ....
Telephone No. (home) ....
Number of Occupants ....

OCCUPANT (if other than Owner):

Name: ....
Address: ....
Number of Bathrooms ....

Telephone No. (business) ....
Telephone No. (home) ....
Number of Occupants ....

GENERAL QUESTIONS

How long have you owned/occupied this dwelling? ....~~4 years~~ 1 year.........
Is the property used year-round or seasonally?.. ......Yes......
Is well water used for drinking water supply? Yes ☐ No ☑
If no, why not? ......Quality..........
Are there any other wells or water supplies used on the property?..........
If no, how long has it been since well water was used for drinking? ....
If no, what is the origin of drinking water? ....Water Cooler.........

II. WATER WELL

A. WELL CONSTRUCTION DETAILS:

Do you have a copy of the MOE Water Well Record? ☐ Yes (Well Record # ....)
☑ No

ATTACH A COPY OF WATER WELL RECORD, IF POSSIBLE

Date or Year Constructed ....N/A.......... Contractor ....N/A..........
Type of Well: Drilled ☐ Dug ☐ Well Diameter (inches) ....
Present Well Depth: .... Original Well Depth .... ☐ Same as Present

Is Well Vented and How?: ....

Top of Well Casing is:

1) Above ground surface ☑ 2) Buried inside a well pit ☐ 3) Buried, but not in a well pit ☐

The accurate location of the well is Known ☑ Unknown ☐ Did not see well on visit

GPS coordinates: E.............................. N..............................

Type of pump: Submersible ☐ Jet Pump ☑ Depth of Pump Intake (if known) ....

Well completed into: Bedrock .... Overburden (Soil) .... Both ....

B. WELL WATER LEVELS:

Indicate whether measured from ☐ ground level or ☐ from top of casing

Original water level depth in metres (on water well record) ....

Subsequent water level measurements (give depths in metres and dates) ....

....

....

C. WATER QUANTITY

Does your well supply enough water for your use? Yes ☑ No ☐

If no, is this the case: All the time ☐ Some of the time ☐ Seasonally ☐ Other ....

Use: Domestic: No ☐ Yes ☐ No. of persons using water from well ....

Domestic includes (circle all that apply) Drinking Washing Cooking

Pool: No ☑ Yes ☐ Lawn Watering/Garden: No ☐ Yes ☑

Livestock: No ☑ Yes ☐

Industrial: No ☐ Yes ☐ (provide details)..

Irrigation: No ☐ Yes ☐ (provide details)..

Other Uses .... Daily Usage (if known) ....

Have you ever experienced any problems with your well? ....

If so, when? ....

What was the cause of the problem? ☐ Drought ☐ Pump Failure ☑ Plugging

☐ Increased Usage ☐ Interference ☐ Other (Please Specify) ....

Did you ever have your well deepened or cleaned, or a new well constructed? ......NO..................

If so, why?..................N/A..

Pump test conducted? ....N/A...

If yes, record pumping rate, duration and water levels (static, pumping and recovery)

..............................N/A..

....

....

....

....

D. WATER TREATMENT AND QUALITY

Fresh ☐ Sulphur ☑ Salty ☑ Iron Staining ☑ Soft ☐ Hard ☐

Water Treatment equipment: Softener ☐ UV ☐ Reverse Osmosis ☐ Filters ☐

Other equipment in use (if any): ....

Has your well recently been chlorinated and, if so, when? ....

How would you describe the quality of your water? ☑ Poor ☐ Good ☐ Excellent

Has your water quality previously been tested? No ☑ Yes ☐

If yes, for what and how often? (bacteriological, chemical analyses, etc.) ....

....

ATTACH COPY OF ANY PREVIOUS CHEMICAL AND/OR BACTERIOLOGICAL ANALYSIS RESULTS ON THE WELL WATER, IF AVAILABLE

Water sample collected during this survey: ....Yes..

Where was the sample collected: ...from outside tap @ back of house

....

....

Field Measurements: Conductivity...763...... Temperature ..24.68..... pH...7.58.....

E. SURFACE WATER

Are there any ponds, creeks etc. on the property? ....NONE.....................................

If yes, indicate size and depth? Use?..........N/A..

III. SEWAGE DISPOSAL SYSTEM

SYSTEM DETAILS

What type of sewage disposal system do you have:

☐ Holding Tank (sewage removed by regular pump-outs)

☑ Septic Tank and Leaching Bed

☐ Other method of on-site disposal. Specify ....

☐ Do not know

Date or year Constructed 5 yrs ago .... Contractor

How often do you have the holding tank or septic tank pumped out? ....

When was the last time? last year ....

Have you ever had any problems with your sewage disposal systems? (e.g. leaks from holding tank, failure of septic system including surficial release of sewage, visibly stained areas, unusual odours, soft ground, etc.) ....

IV. PROPERTY SKETCH AND PHOTOGRAPHS

Sketch the location of the septic system (including approximate leaching bed area), the well and the on-site structures, giving the best approximated distance between each of them. Include ground surface slope (in degrees or percentage). Note any indications of septic system failure such as stained areas, surficial release of sewage, unusual odours, soft ground, etc. Identify on-site and/or adjacent roads, ditches, surface water bodies. Record the GPS coordinates for the top of the well casing (x,y,z). Record height of top of well casing above ground surface. Include photographs of well head, etc.

Did not see well on visit

Completed by: T. Proks Date Sept 19, 2017

2017

PRIVATE WATER WELL SURVEY QUESTIONNAIRE

Sept 19

TYPE OF DWELLING: ☑ Residential ☐ Commercial ☐ Institutional ☐ Other: ....

Is the owner willing to participate in the survey? **Yes** ☑ **No** ☐

(If no, record address below)

I. OWNER / OCCUPANT INFORMATION AND GENERAL QUESTIONS:

OWNER: [redacted]

Name: .... Telephone No. (business) ....

Address: 974 Weaver Telephone No. (home) ....

Number of Bathrooms .... Number of Occupants ....

OCCUPANT (if other than Owner):

Name: .... Telephone No. (business) ....

Address: .... Telephone No. (home) ....

Number of Bathrooms .... Number of Occupants ....

GENERAL QUESTIONS

How long have you owned/occupied this dwelling? 3 years

Is the property used year-round or seasonally?.. Yes

Is well water used for drinking water supply? Yes ☐ No ☑

If no, why not? Quality

Are there any other wells or water supplies used on the property? NO

If no, how long has it been since well water was used for drinking? NO

If no, what is the origin of drinking water? Water Cooler

II. WATER WELL

A. WELL CONSTRUCTION DETAILS:

Do you have a copy of the MOE Water Well Record? ☐ Yes (Well Record # ....)
☑ No

ATTACH A COPY OF WATER WELL RECORD, IF POSSIBLE

Date or Year Constructed .... Contractor ....

Type of Well: Drilled ☑ Dug ☐ Well Diameter (inches) ....

Present Well Depth: .... Original Well Depth .... ☐ Same as Present

Is Well Vented and How?: ....

Top of Well Casing is:

1) Above ground surface ☑ 2) Buried inside a well pit ☐ 3) Buried, but not in a well pit ☐

The accurate location of the well is Known ☑ Unknown ☐

GPS coordinates: E............................ N............................

Type of pump: Submersible ☐ Jet Pump ☑ Depth of Pump Intake (if known) ....

Well completed into: Bedrock .... Overburden (Soil) .... Both ....

B. WELL WATER LEVELS:

Indicate whether measured from ☐ ground level or ☐ from top of casing

Original water level depth in metres (on water well record) ....

Subsequent water level measurements (give depths in metres and dates) ....

....

....

C. WATER QUANTITY

Does your well supply enough water for your use? Yes ☑ No ☐

If no, is this the case: All the time ☐ Some of the time ☐ Seasonally ☐ Other ....

Use: Domestic: No ☐ Yes ☑ No. of persons using water from well ....

Domestic includes (circle all that apply) Drinking Washing Cooking

Pool: No ☑ Yes ☐ Lawn Watering/Garden: No ☐ Yes ☑

Livestock: No ☐ Yes ☑ chickens

Industrial: No ☑ Yes ☐ (provide details)..

Irrigation: No ☑ Yes ☐ (provide details)..

Other Uses .... Daily Usage (if known) ....

Have you ever experienced any problems with your well? ......NO..

If so, when? ....

What was the cause of the problem? ☐ Drought ☐ Pump Failure ☐ Plugging

☐ Increased Usage ☐ Interference ☐ Other (Please Specify) ....

Did you ever have your well deepened or cleaned, or a new well constructed? ....NO.........
If so, why?..
Pump test conducted? ....

If yes, record pumping rate, duration and water levels (static, pumping and recovery)

....
....
....
....
....

D. WATER TREATMENT AND QUALITY

Fresh ☑ Sulphur ☐ Salty ☐ Iron Staining ☑ Soft ☐ Hard ☑

Water Treatment equipment: Softener ☑ UV ☐ Reverse Osmosis ☐ Filters ☑

Other equipment in use (if any): ....
Has your well recently been chlorinated and, if so, when? ....
How would you describe the quality of your water? ☐ Poor ☑ Good ☐ Excellent

Has your water quality previously been tested? No ☐ Yes ☑

If yes, for what and how often? (bacteriological, chemical analyses, etc.) ......3 years ago
....

ATTACH COPY OF ANY PREVIOUS CHEMICAL AND/OR BACTERIOLOGICAL ANALYSIS RESULTS ON THE WELL WATER, IF AVAILABLE

Water sample collected during this survey: ...YES...
Where was the sample collected: ....from outsite tap @ back of house
....
....
Field Measurements: Conductivity...817..... Temperature ....15.35...... pH...7.68.....

E. SURFACE WATER

Are there any ponds, creeks etc. on the property? ....
If yes, indicate size and depth? Use? ....

III. SEWAGE DISPOSAL SYSTEM

SYSTEM DETAILS

What type of sewage disposal system do you have:

☐ Holding Tank (sewage removed by regular pump-outs)

☑ Septic Tank and Leaching Bed

☐ Other method of on-site disposal. Specify ....

☐ Do not know

Date or year Constructed NB .... Contractor

How often do you have the holding tank or septic tank pumped out? NOT SINCE OWNING

When was the last time? ✓

Have you ever had any problems with your sewage disposal systems? (e.g. leaks from holding tank, failure of septic system including surficial release of sewage, visibly stained areas, unusual odours, soft ground, etc.) NONE

IV. PROPERTY SKETCH AND PHOTOGRAPHS

Sketch the location of the septic system (including approximate leaching bed area), the well and the on-site structures, giving the best approximated distance between each of them. Include ground surface slope (in degrees or percentage). Note any indications of septic system failure such as stained areas, surficial release of sewage, unusual odours, soft ground, etc. Identify on-site and/or adjacent roads, ditches, surface water bodies. Record the GPS coordinates for the top of the well casing (x,y,z). Record height of top of well casing above ground surface. Include photographs of well head, etc.

Did not see well
on visit

Completed by: T. Proks Date Sept 19, 2017

2017 Sept 5

PRIVATE WATER WELL SURVEY QUESTIONNAIRE

TYPE OF DWELLING: ☑ Residential ☐ Commercial
☐ Institutional ☐ Other: ....

Is the owner willing to participate in the survey? **Yes** ☑ **No** ☐

(If no, record address below)

I. OWNER / OCCUPANT INFORMATION AND GENERAL QUESTIONS:

OWNER:

Name: [redacted] .... Telephone No. (business) ....

Address: 1359 Miller Rd .... Telephone No. (home) ....

Number of Bathrooms .... Number of Occupants 1 + guests

OCT/NOV 2004

55'/54'

OCCUPANT (if other than Owner):

Name: .... Telephone No. (business) ....

Address: .... Telephone No. (home) ....

Number of Bathrooms .... Number of Occupants ....

GENERAL QUESTIONS

How long have you owned/occupied this dwelling? 2004

Is the property used year-round or seasonally?.. YES

Is well water used for drinking water supply? Yes ☐ No ☑

If no, why not? slight smell (sulpher) and black particles

Are there any other wells or water supplies used on the property? old wells, a few (been capped)

If no, how long has it been since well water was used for drinking? ....

If no, what is the origin of drinking water? bottled water

II. WATER WELL

A. WELL CONSTRUCTION DETAILS:

Do you have a copy of the MOE Water Well Record? ☐ Yes (Well Record # ....)
☑ No

ATTACH A COPY OF WATER WELL RECORD, IF POSSIBLE

Date or Year Constructed 2004 Contractor driller from crystal beach

Type of Well: Drilled ☑ Dug ☐ Well Diameter (inches) ....

Present Well Depth: 54-55' Original Well Depth .... ☐ Same as Present

Is Well Vented and How?: ....

Top of Well Casing is:

1) Above ground surface ☑ 2) Buried inside a well pit ☐ 3) Buried, but not in a well pit ☐

The accurate location of the well is Known ☑ Unknown ☐

GPS coordinates: E.......... N..........

Type of pump: Submersible ☑ Jet Pump ☐ Depth of Pump Intake (if known) ....

Well completed into: Bedrock ..✓.. Overburden (Soil) .... Both ....

B. WELL WATER LEVELS:

Indicate whether measured from ☐ ground level or ☐ from top of casing

Original water level depth in metres (on water well record) ....

Subsequent water level measurements (give depths in metres and dates) ....

....

....

C. WATER QUANTITY

Does your well supply enough water for your use? Yes ☑ No ☐

If no, is this the case: All the time ☐ Some of the time ☐ Seasonally ☐ Other ....

Use: Domestic: No ☐ Yes ☑ No. of persons using water from well ....

Domestic includes (circle all that apply) Drinking Washing Cooking

Pool: No ☑ Yes ☐ Lawn Watering/Garden: No ☐ Yes ☑

Livestock: No ☐ Yes ☑

Industrial: No ☑ Yes ☐ (provide details)..........

Irrigation: No ☑ Yes ☐ (provide details)..........

Other Uses .... Daily Usage (if known) ....

Have you ever experienced any problems with your well? slight sulphur smell, some black particle

If so, when? pipe frozen 1 year

What was the cause of the problem? ☐ Drought ☐ Pump Failure ☑ Plugging

☐ Increased Usage ☐ Interference ☐ Other (Please Specify) ....

Did you ever have your well deepened or cleaned, or a new well constructed? NO
If so, why?
Pump test conducted? maybe when constructed
If yes, record pumping rate, duration and water levels (static, pumping and recovery)

UNSURE

D. WATER TREATMENT AND QUALITY

Fresh ☐ Sulphur ☑ Salty ☐ Iron Staining ☑ Soft ☐ Hard ☐

Water Treatment equipment: Softener ☐ UV ☐ Reverse Osmosis ☐ Filters ☐

Other equipment in use (if any):
Has your well recently been chlorinated and, if so, when?
How would you describe the quality of your water? ☐ Poor ☑ Good ☐ Excellent
Has your water quality previously been tested? No ☐ Yes ☐ N/A
If yes, for what and how often? (bacteriological, chemical analyses, etc.) N/A

ATTACH COPY OF ANY PREVIOUS CHEMICAL AND/OR BACTERIOLOGICAL ANALYSIS RESULTS ON THE WELL WATER, IF AVAILABLE

Water sample collected during this survey: DID NOT WANT TO GIVE WATER SAMPLE!
Where was the sample collected:

Field Measurements: Conductivity Temperature pH

E. SURFACE WATER

Are there any ponds, creeks etc. on the property? NO
If yes, indicate size and depth? Use?

III. SEWAGE DISPOSAL SYSTEM

SYSTEM DETAILS

What type of sewage disposal system do you have:

☐ Holding Tank (sewage removed by regular pump-outs)

☑ Septic Tank and Leaching Bed

☐ Other method of on-site disposal. Specify ....

☐ Do not know

Date or year Constructed ..N/A.. Contractor N/A

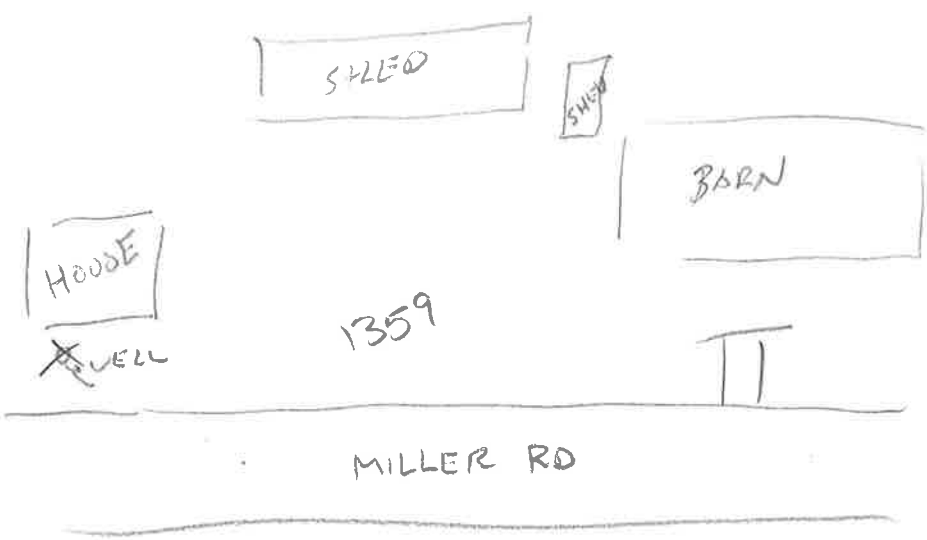
How often do you have the holding tank or septic tank pumped out? HASN'T BEEN EMPTIED EVER

When was the last time? ....

Have you ever had any problems with your sewage disposal systems? (e.g. leaks from holding tank, failure of septic system including surficial release of sewage, visibly stained areas, unusual odours, soft ground, etc.) ....

IV. PROPERTY SKETCH AND PHOTOGRAPHS

Sketch the location of the septic system (including approximate leaching bed area), the well and the on-site structures, giving the best approximated distance between each of them. Include ground surface slope (in degrees or percentage). Note any indications of septic system failure such as stained areas, surficial release of sewage, unusual odours, soft ground, etc. Identify on-site and/or adjacent roads, ditches, surface water bodies. Record the GPS coordinates for the top of the well casing (x,y,z). Record height of top of well casing above ground surface. Include photographs of well head, etc.



Completed by: .... Date ....

2017 Sept 5

PRIVATE WATER WELL SURVEY QUESTIONNAIRE

TYPE OF DWELLING: ☑ Residential ☐ Commercial ☐ Institutional ☐ Other: ....

Is the owner willing to participate in the survey? **Yes** ☑ **No** ☐

(If no, record address below)

I. OWNER / OCCUPANT INFORMATION AND GENERAL QUESTIONS:

OWNER:

Name: [redacted]

Address: 1630 Miller Rd

Number of Bathrooms ....

Telephone No. (business) ....

Telephone No. (home) ....

Number of Occupants ....

OCCUPANT (if other than Owner):

Name: ....

Address: ....

Number of Bathrooms ....

Telephone No. (business) ....

Telephone No. (home) ....

Number of Occupants ....

GENERAL QUESTIONS

How long have you owned/occupied this dwelling? 4 years

Is the property used year-round or seasonally?.. YES

Is well water used for drinking water supply? Yes ☐ No ☑

If no, why not? QUALITY, corroded pipes in the house, before they bought

Are there any other wells or water supplies used on the property? NO

If no, how long has it been since well water was used for drinking? UNSURE

If no, what is the origin of drinking water? ....

II. WATER WELL

A. WELL CONSTRUCTION DETAILS:

Do you have a copy of the MOE Water Well Record? ☐ Yes (Well Record # ....) ☑ No

ATTACH A COPY OF WATER WELL RECORD, IF POSSIBLE

Date or Year Constructed N/A

Contractor N/A

Type of Well: Drilled ☑ Dug ☐

Well Diameter (inches) ~~N/A~~ UNSURE

Present Well Depth: N/A

Original Well Depth N/A

☐ Same as Present

Is Well Vented and How?:..

Top of Well Casing is:

1) Above ground surface ☑ 2) Buried inside a well pit ☐ 3) Buried, but not in a well pit ☐

The accurate location of the well is Known ☑ Unknown ☐

GPS coordinates: E.................................. N..................................

Type of pump: Submersible ☑ Jet Pump ☐ Depth of Pump Intake (if known) ....

Well completed into: Bedrock ...X..... N/A Overburden (Soil) .... Both ....N/A.....................

B. WELL WATER LEVELS:

Indicate whether measured from ☐ ground level or ☐ from top of casing

Original water level depth in metres (on water well record) ....

Subsequent water level measurements (give depths in metres and dates) ....

....

....

C. WATER QUANTITY

Does your well supply enough water for your use? Yes ☑ No ☐

If no, is this the case: All the time ☐ Some of the time ☐ Seasonally ☐ Other ....

Use: Domestic: No ☑ Yes ☐ No. of persons using water from well ....

Domestic includes (circle all that apply) Drinking Washing Cooking

Pool: No ☐ Yes ☐ Lawn Watering/Garden: No ☐ Yes ☑

Livestock: No ☐ Yes ☑

Industrial: No ☐ Yes ☐ (provide details)...

Irrigation: No ☐ Yes ☑ (provide details)...

Other Uses .... Daily Usage (if known) ROUGHLY 3 TONS DAILY

Have you ever experienced any problems with your well? ....

If so, when? ....

What was the cause of the problem? ☐ Drought ☐ Pump Failure ☐ Plugging

☐ Increased Usage ☐ Interference ☐ Other (Please Specify) ....

Did you ever have your well deepened or cleaned, or a new well constructed? ....NO..........

If so, why?..........

Pump test conducted? ....

If yes, record pumping rate, duration and water levels (static, pumping and recovery)

....

....

....

....

....

D. WATER TREATMENT AND QUALITY

Fresh ☐ Sulphur ☑ Salty ☐ Iron Staining ☑ Soft ☐ Hard ☐

Water Treatment equipment: Softener ☐ UV ☐ Reverse Osmosis ☐ Filters ☐

Other equipment in use (if any): ....NONE..........

Has your well recently been chlorinated and, if so, when? ....

How would you describe the quality of your water? ☐ Poor ☑ Good ☐ Excellent

Has your water quality previously been tested? No ☐ Yes ☐ UNSURE

If yes, for what and how often? (bacteriological, chemical analyses, etc.)..........

....

ATTACH COPY OF ANY PREVIOUS CHEMICAL AND/OR BACTERIOLOGICAL ANALYSIS RESULTS ON THE WELL WATER, IF AVAILABLE

Water sample collected during this survey: ....YES..........

Where was the sample collected: ....Right from the well with built in pump

....

....

Field Measurements: Conductivity 972 ..... Temperature ...17.6..... pH...8.06...

E. SURFACE WATER

Are there any ponds, creeks etc. on the property? ....No..........

If yes, indicate size and depth? Use?..........NO..........

III. SEWAGE DISPOSAL SYSTEM

SYSTEM DETAILS

What type of sewage disposal system do you have:

☐ Holding Tank (sewage removed by regular pump-outs)

☑ Septic Tank and Leaching Bed

☐ Other method of on-site disposal. Specify ....

☐ Do not know

Date or year Constructed .... Contractor

How often do you have the holding tank or septic tank pumped out? ....

When was the last time? ....

Have you ever had any problems with your sewage disposal systems? (e.g. leaks from holding tank, failure of septic system including surficial release of sewage, visibly stained areas, unusual odours, soft ground, etc.) ....

IV. PROPERTY SKETCH AND PHOTOGRAPHS

Sketch the location of the septic system (including approximate leaching bed area), the well and the on-site structures, giving the best approximated distance between each of them. Include ground surface slope (in degrees or percentage). Note any indications of septic system failure such as stained areas, surficial release of sewage, unusual odours, soft ground, etc. Identify on-site and/or adjacent roads, ditches, surface water bodies. Record the GPS coordinates for the top of the well casing (x,y,z). Record height of top of well casing above ground surface. Include photographs of well head, etc.

Completed by: T. Proks Date Sept 5

2017 Sept 5

PRIVATE WATER WELL SURVEY QUESTIONNAIRE

TYPE OF DWELLING: ☐ Residential ☐ Commercial ☐ Institutional ☐ Other: ....

Is the owner willing to participate in the survey? **Yes** ☑ **No** ☐

(If no, record address below)

I. OWNER / OCCUPANT INFORMATION AND GENERAL QUESTIONS:

OWNER: [redacted]

Name: [redacted] Telephone No. (business) ....

Address: 1778 Miller Rd Telephone No. (home) ....

Number of Bathrooms .... Number of Occupants ....

OCCUPANT (if other than Owner):

Name: .... Telephone No. (business) ....

Address: .... Telephone No. (home) ....

Number of Bathrooms .... Number of Occupants ....

GENERAL QUESTIONS

How long have you owned/occupied this dwelling? 25

Is the property used year-round or seasonally?.. YES

Is well water used for drinking water supply? Yes ☐ No ☑

If no, why not? QUALITY

Are there any other wells or water supplies used on the property? NO

If no, how long has it been since well water was used for drinking? 20+ years

If no, what is the origin of drinking water? ....

II. WATER WELL

A. WELL CONSTRUCTION DETAILS:

Do you have a copy of the MOE Water Well Record? ☐ Yes (Well Record # ....) ☐ No

ATTACH A COPY OF WATER WELL RECORD, IF POSSIBLE

Date or Year Constructed N/A Contractor N/A

Type of Well: Drilled ☑ Dug ☐ Well Diameter (inches) ....

Present Well Depth: .... Original Well Depth .... ☐ Same as Present

Is Well Vented and How?: ....

Top of Well Casing is:

1) Above ground surface ☐ 2) Buried inside a well pit ☑ 3) Buried, but not in a well pit ☐

The accurate location of the well is Known ☐ Unknown ☑

GPS coordinates: E.. N..............................

Type of pump: Submersible ☑ Jet Pump ☐ Depth of Pump Intake (if known) ....

Well completed into: Bedrock .... Overburden (Soil) .... Both ....
UNSURE

B. WELL WATER LEVELS:

Indicate whether measured from ☐ ground level or ☐ from top of casing

Original water level depth in metres (on water well record) ....

Subsequent water level measurements (give depths in metres and dates) ....

....

....

C. WATER QUANTITY

Does your well supply enough water for your use? Yes ☑ No ☐

If no, is this the case: All the time ☐ Some of the time ☐ Seasonally ☐ Other ....

Use: Domestic: No ☐ Yes ☑ No. of persons using water from well ....

Domestic includes (circle all that apply) Drinking Washing Cooking

Pool: No ☑ Yes ☐ Lawn Watering/Garden: No ☐ Yes ☑

Livestock: No ☑ Yes ☐

Industrial: No ☑ Yes ☐ (provide details)..

Irrigation: No ☑ Yes ☐ (provide details)..

Other Uses .... Daily Usage (if known) ....

Have you ever experienced any problems with your well? .....NONE..................................

If so, when? ....

What was the cause of the problem? ☐ Drought ☐ Pump Failure ☐ Plugging

☐ Increased Usage ☐ Interference ☐ Other (Please Specify) ....

Did you ever have your well deepened or cleaned, or a new well constructed? ......NO......

If so, why?......

Pump test conducted? ......

If yes, record pumping rate, duration and water levels (static, pumping and recovery)

......

......

......

......

......

D. WATER TREATMENT AND QUALITY

Fresh ☐ Sulphur ☑ ← sometimes Salty ☐ Iron Staining ☑ Soft ☐ Hard ☑

Water Treatment equipment: Softener ☐ UV ☐ Reverse Osmosis ☐ Filters ☑

Other equipment in use (if any): ......NO......

Has your well recently been chlorinated and, if so, when? ......NO......

How would you describe the quality of your water? ☑ Poor ☐ Good ☐ Excellent

Has your water quality previously been tested? No ☑ Yes ☐

If yes, for what and how often? (bacteriological, chemical analyses, etc.) ......NO......

......

ATTACH COPY OF ANY PREVIOUS CHEMICAL AND/OR BACTERIOLOGICAL ANALYSIS RESULTS ON THE WELL WATER, IF AVAILABLE

Water sample collected during this survey: ......YES......

Where was the sample collected: ......from backyard hose......

......

......

Field Measurements: Conductivity......783...... Temperature ......20...... pH......8.20......

E. SURFACE WATER

Are there any ponds, creeks etc. on the property? ......NO......

If yes, indicate size and depth? Use?......

III. SEWAGE DISPOSAL SYSTEM

SYSTEM DETAILS

What type of sewage disposal system do you have:

☐ Holding Tank (sewage removed by regular pump-outs)

☑ Septic Tank and Leaching Bed

☐ Other method of on-site disposal. Specify ....

☐ Do not know

Date or year Constructed .... Contractor reinstalled 20+ years

How often do you have the holding tank or septic tank pumped out? ....

When was the last time? ....

Have you ever had any problems with your sewage disposal systems? (e.g. leaks from holding tank, failure of septic system including surficial release of sewage, visibly stained areas, unusual odours, soft ground, etc.) ....

IV. PROPERTY SKETCH AND PHOTOGRAPHS

Sketch the location of the septic system (including approximate leaching bed area), the well and the on-site structures, giving the best approximated distance between each of them. Include ground surface slope (in degrees or percentage). Note any indications of septic system failure such as stained areas, surficial release of sewage, unusual odours, soft ground, etc. Identify on-site and/or adjacent roads, ditches, surface water bodies. Record the GPS coordinates for the top of the well casing (x,y,z). Record height of top of well casing above ground surface. Include photographs of well head, etc.

Did not see
well on visit
Owners think it is buried

Completed by: T. Proks Date Sept 5, 2017

2017 Sept 5

PRIVATE WATER WELL SURVEY QUESTIONNAIRE

TYPE OF DWELLING: ☑ Residential ☐ Commercial
☐ Institutional ☐ Other: ....

Is the owner willing to participate in the survey? **Yes** ☑ **No** ☐

(If no, record address below)

I. OWNER / OCCUPANT INFORMATION AND GENERAL QUESTIONS:

OWNER:

Name: [redacted]
Address: 1903 Miller Rd
Number of Bathrooms ....
Telephone No. (business) ....
Telephone No. (home) ....
Number of Occupants ....

OCCUPANT (if other than Owner):

Name: ....
Address: ....
Number of Bathrooms ....
Telephone No. (business) ....
Telephone No. (home) ....
Number of Occupants ....

GENERAL QUESTIONS

How long have you owned/occupied this dwelling? 1979
Is the property used year-round or seasonally?.. YES
Is well water used for drinking water supply? Yes ☑ No ☐
If no, why not? ....
Are there any other wells or water supplies used on the property? NO
If no, how long has it been since well water was used for drinking? ....
If no, what is the origin of drinking water? ....

II. WATER WELL

A. WELL CONSTRUCTION DETAILS:

Do you have a copy of the MOE Water Well Record? ☐ Yes (Well Record # .. ..)
☐ No

ATTACH A COPY OF WATER WELL RECORD, IF POSSIBLE

Date or Year Constructed ✓ 1977 Contractor ....
Type of Well: Drilled ☑ Dug ☐ Well Diameter (inches) ....
Present Well Depth: ✓ 40' Original Well Depth .... ☐ Same as Present

Is Well Vented and How?: ....

Top of Well Casing is:

1) Above ground surface ☑ 2) Buried inside a well pit ☐ 3) Buried, but not in a well pit ☐

The accurate location of the well is Known ☑ Unknown ☐

GPS coordinates: E.............................. N..............................

Type of pump: Submersible ☑ Jet Pump ☐ Depth of Pump Intake (if known) ....

Well completed into: Bedrock ....✓..... Overburden (Soil) .... Both ....

B. WELL WATER LEVELS:

Indicate whether measured from ☐ ground level or ☐ from top of casing

Original water level depth in metres (on water well record) ....

Subsequent water level measurements (give depths in metres and dates) ....

....

....

C. WATER QUANTITY

Does your well supply enough water for your use? Yes ☑ No ☐

If no, is this the case: All the time ☐ Some of the time ☐ Seasonally ☐ Other ....

Use: Domestic: No ☐ Yes ☑ No. of persons using water from well ....

Domestic includes (circle all that apply) Drinking Washing Cooking

Pool: No ☑ Yes ☐ Lawn Watering/Garden: No ☐ Yes ☑

Livestock: No ☐ Yes ☑

Industrial: No ☑ Yes ☐ (provide details)...

Irrigation: No ☑ Yes ☐ (provide details)...

Other Uses .... Daily Usage (if known) ....

Have you ever experienced any problems with your well? ....NONE..............................

If so, when? ....

What was the cause of the problem? ☐ Drought ☐ Pump Failure ☐ Plugging

☐ Increased Usage ☐ Interference ☐ Other (Please Specify) ....

Did you ever have your well deepened or cleaned, or a new well constructed? ......NO..................

If so, why?...

Pump test conducted? ....NO...

If yes, record pumping rate, duration and water levels (static, pumping and recovery)

....

....

....

....

....

D. WATER TREATMENT AND QUALITY

Fresh ☐ Sulphur ☑ Salty ☐ Iron Staining ☑ Soft ☐ Hard ☑

Water Treatment equipment: Softener ☑ UV ☐ Reverse Osmosis ☑ Filters ☑

Other equipment in use (if any): ....

Has your well recently been chlorinated and, if so, when? ......IN THE HOUSE..................

How would you describe the quality of your water? ☐ Poor ☑ Good ☐ Excellent

Has your water quality previously been tested? No ☐ Yes ☑

If yes, for what and how often? (bacteriological, chemical analyses, etc.)..........3-4 times a year

....

ATTACH COPY OF ANY PREVIOUS CHEMICAL AND/OR BACTERIOLOGICAL ANALYSIS RESULTS ON THE WELL WATER, IF AVAILABLE

Water sample collected during this survey: ...no tap before treatment system

Where was the sample collected: ....

....

....

Field Measurements: Conductivity.................. Temperature .... pH.....................

E. SURFACE WATER

Are there any ponds, creeks etc. on the property?........YES / POND..............................

If yes, indicate size and depth? Use?...80'x40' x 18'...

III. SEWAGE DISPOSAL SYSTEM

SYSTEM DETAILS

What type of sewage disposal system do you have:

- ☐ Holding Tank (sewage removed by regular pump-outs)
- ☑ Septic Tank and Leaching Bed
- ☐ Other method of on-site disposal. Specify ....
- ☐ Do not know

Date or year Constructed 1995 Contractor

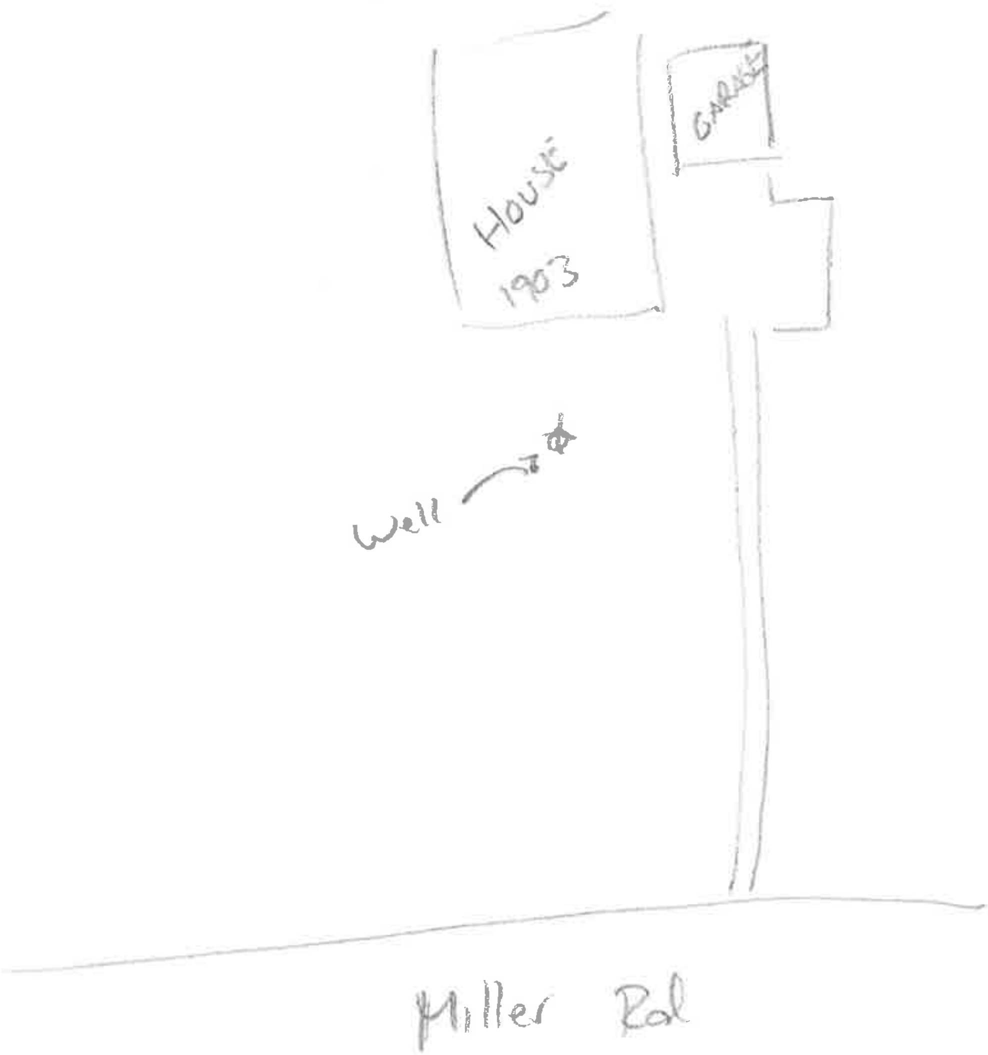
How often do you have the holding tank or septic tank pumped out? ~~one~~ 5+ years

When was the last time? 5-6 years

Have you ever had any problems with your sewage disposal systems? (e.g. leaks from holding tank, failure of septic system including surficial release of sewage, visibly stained areas, unusual odours, soft ground, etc.) ....

IV. PROPERTY SKETCH AND PHOTOGRAPHS

Sketch the location of the septic system (including approximate leaching bed area), the well and the on-site structures, giving the best approximated distance between each of them. Include ground surface slope (in degrees or percentage). Note any indications of septic system failure such as stained areas, surficial release of sewage, unusual odours, soft ground, etc. Identify on-site and/or adjacent roads, ditches, surface water bodies. Record the GPS coordinates for the top of the well casing (x,y,z). Record height of top of well casing above ground surface. Include photographs of well head, etc.



Completed by: T. Proks Date Sept 5, 2017

2017 Sept 5

PRIVATE WATER WELL SURVEY QUESTIONNAIRE

TYPE OF DWELLING: ☑ Residential ☐ Commercial
☐ Institutional ☐ Other: ....

Is the owner willing to participate in the survey? **Yes** ☑ **No** ☐

(If no, record address below)

I. OWNER / OCCUPANT INFORMATION AND GENERAL QUESTIONS:

OWNER: [redacted]

Name: .... Telephone No. (business) ....

Address: ...2282 Miller Rd............ Telephone No. (home) ....

Number of Bathrooms ......2+............ Number of Occupants ......6..........

OCCUPANT (if other than Owner):

Name: .... Telephone No. (business) ....

Address: .... Telephone No. (home) ....

Number of Bathrooms .... Number of Occupants ....

GENERAL QUESTIONS

How long have you owned/occupied this dwelling? ......2 years in Dec......

Is the property used year-round or seasonally?.. ....

Is well water used for drinking water supply? Yes ☑ No ☐

If no, why not? ......N/A..

Are there any other wells or water supplies used on the property?......NO..........

If no, how long has it been since well water was used for drinking? ....

If no, what is the origin of drinking water? ....

II. WATER WELL

A. WELL CONSTRUCTION DETAILS:

Do you have a copy of the MOE Water Well Record? ☐ Yes (Well Record # .. ..)
☐ No

ATTACH A COPY OF WATER WELL RECORD, IF POSSIBLE

Date or Year Constructed .... Contractor ....

Type of Well: Drilled ☑ Dug ☐ Well Diameter (inches) ....

Present Well Depth: ~40'.............. Original Well Depth............... ☐ Same as Present

Is Well Vented and How?: ....

Top of Well Casing is:

1) Above ground surface ☐ 2) Buried inside a well pit ☑ 3) Buried, but not in a well pit ☐

The accurate location of the well is Known ☑ Unknown ☐ Did not see well on visit

GPS coordinates: E.......... N..........

Type of pump: Submersible ☑ Jet Pump ☐ Depth of Pump Intake (if known) SHALLOW WELL PUMP

Well completed into: Bedrock ✓ Overburden (Soil) .... Both ....

B. WELL WATER LEVELS:

Indicate whether measured from ☐ ground level or ☐ from top of casing

Original water level depth in metres (on water well record) ....

Subsequent water level measurements (give depths in metres and dates) ....

....

....

C. WATER QUANTITY

Does your well supply enough water for your use? Yes ☑ No ☐

If no, is this the case: All the time ☐ Some of the time ☐ Seasonally ☐ Other ....

Use: Domestic: No ☐ Yes ☑ No. of persons using water from well ....

Domestic includes (circle all that apply) Drinking Washing Cooking

Pool: No ☑ Yes ☐ Lawn Watering/Garden: No ☐ Yes ☐

Livestock: No ☐ Yes ☑

Industrial: No ☑ Yes ☐ (provide details)..........

Irrigation: No ☑ Yes ☐ (provide details)..........

Other Uses .... Daily Usage (if known) ....

Have you ever experienced any problems with your well? NO

If so, when? ....

What was the cause of the problem? ☐ Drought ☐ Pump Failure ☐ Plugging

☐ Increased Usage ☐ Interference ☐ Other (Please Specify) ....

Did you ever have your well deepened or cleaned, or a new well constructed? NO

If so, why?

Pump test conducted?

If yes, record pumping rate, duration and water levels (static, pumping and recovery)

D. WATER TREATMENT AND QUALITY

Fresh ☑ Sulphur ☑ Salty ☐ Iron Staining ☐ Soft ☐ Hard ☑

Water Treatment equipment: Softener ☑ UV ☐ Reverse Osmosis ☐ Filters ☑

Other equipment in use (if any):

Has your well recently been chlorinated and, if so, when? NO

How would you describe the quality of your water? ☐ Poor ☑ Good ☐ Excellent

Has your water quality previously been tested? No ☐ Yes ☑

If yes, for what and how often? (bacteriological, chemical analyses, etc.) 2 years ago

ATTACH COPY OF ANY PREVIOUS CHEMICAL AND/OR BACTERIOLOGICAL ANALYSIS RESULTS ON THE WELL WATER, IF AVAILABLE

Water sample collected during this survey: YES

Where was the sample collected: from outside tap in front of house, water runs through rainfresh filter

Field Measurements: Conductivity 1168 Temperature 15.4 pH 8.13

E. SURFACE WATER

Are there any ponds, creeks etc. on the property? YES

If yes, indicate size and depth? Use? 50 x 25 depth unsure 7' in the middle

III. SEWAGE DISPOSAL SYSTEM

SYSTEM DETAILS

What type of sewage disposal system do you have:

☐ Holding Tank (sewage removed by regular pump-outs)

☑ Septic Tank and Leaching Bed

☐ Other method of on-site disposal. Specify ....

☐ Do not know

Date or year Constructed .... Contractor

How often do you have the holding tank or septic tank pumped out? ....

When was the last time? ....1.5 years ago..

Have you ever had any problems with your sewage disposal systems? (e.g. leaks from holding tank, failure of septic system including surficial release of sewage, visibly stained areas, unusual odours, soft ground, etc.) ....NONE...

IV. PROPERTY SKETCH AND PHOTOGRAPHS

Sketch the location of the septic system (including approximate leaching bed area), the well and the on-site structures, giving the best approximated distance between each of them. Include ground surface slope (in degrees or percentage). Note any indications of septic system failure such as stained areas, surficial release of sewage, unusual odours, soft ground, etc. Identify on-site and/or adjacent roads, ditches, surface water bodies. Record the GPS coordinates for the top of the well casing (x,y,z). Record height of top of well casing above ground surface. Include photographs of well head, etc.

Did not see well on visit

Completed by: T. Proks Date Sept 5, 2017

2017 Sept 5

PRIVATE WATER WELL SURVEY QUESTIONNAIRE

TYPE OF DWELLING: ☑ Residential ☐ Commercial ☐ Institutional ☐ Other: ....

Is the owner willing to participate in the survey? **Yes** ☑ **No** ☐

(If no, record address below)

I. OWNER / OCCUPANT INFORMATION AND GENERAL QUESTIONS:

OWNER:

Name: [redacted]

Address: 2391 Miller Rd

Number of Bathrooms ....

Telephone No. (business) ....

Telephone No. (home) ....

Number of Occupants ....

OCCUPANT (if other than Owner):

Name: ....

Address: ....

Number of Bathrooms ....

Telephone No. (business) ....

Telephone No. (home) ....

Number of Occupants ....

GENERAL QUESTIONS

How long have you owned/occupied this dwelling? ~1 year

Is the property used year-round or seasonally? Yes

Is well water used for drinking water supply? Yes ☑ No ☐

If no, why not? ....

Are there any other wells or water supplies used on the property? no

If no, how long has it been since well water was used for drinking? ....

If no, what is the origin of drinking water? ....

II. WATER WELL

A. WELL CONSTRUCTION DETAILS:

Do you have a copy of the MOE Water Well Record? ☐ Yes (Well Record # ....) ☐ No

ATTACH A COPY OF WATER WELL RECORD, IF POSSIBLE

Date or Year Constructed 2016

Contractor Marshal Fields

Type of Well: Drilled ☑ Dug ☐

Well Diameter (inches) ~4"

Present Well Depth: 65'

Original Well Depth ....

☐ Same as Present

Is Well Vented and How?:..........

Top of Well Casing is:

1) Above ground surface ☑ 2) Buried inside a well pit ☐ 3) Buried, but not in a well pit ☐

The accurate location of the well is Known ☑ Unknown ☐

GPS coordinates: E.......... N..........

Type of pump: Submersible ☑ Jet Pump ☐ Depth of Pump Intake (if known) ....

Well completed into: Bedrock ✓.......... Overburden (Soil) .... Both ....

B. WELL WATER LEVELS:

Indicate whether measured from ☐ ground level or ☐ from top of casing

Original water level depth in metres (on water well record) ....

Subsequent water level measurements (give depths in metres and dates) ....

....

....

C. WATER QUANTITY

Does your well supply enough water for your use? Yes ☑ No ☐

If no, is this the case: All the time ☐ Some of the time ☐ Seasonally ☐ Other ....

Use: Domestic: No ☐ Yes ☑ No. of persons using water from well ....

Domestic includes (circle all that apply) Drinking Washing Cooking

Pool: No ☑ Yes ☐ Lawn Watering/Garden: No ☐ Yes ☑

Livestock: No ☑ Yes ☐

Industrial: No ☑ Yes ☐ (provide details)..........

Irrigation: No ☑ Yes ☐ (provide details)..........

Other Uses .... Daily Usage (if known) ....

Have you ever experienced any problems with your well? NONE SO FAR

If so, when? ....

What was the cause of the problem? ☐ Drought ☐ Pump Failure ☐ Plugging

☐ Increased Usage ☐ Interference ☐ Other (Please Specify) ....

Did you ever have your well deepened or cleaned, or a new well constructed? ....NO..................

If so, why?...

Pump test conducted? ....Yes..

If yes, record pumping rate, duration and water levels (static, pumping and recovery)

....

..........................7gal/min..

....

....

....

D. WATER TREATMENT AND QUALITY

Fresh ☑ Sulphur ☐ Salty ☐ Iron Staining ☐ Soft ☐ Hard ☑

Water Treatment equipment: Softener ☑ UV ☐ Reverse Osmosis ☐ Filters ☑

Other equipment in use (if any): ......NO...

Has your well recently been chlorinated and, if so, when? .....NO.......................................

How would you describe the quality of your water? ☐ Poor ☑ Good ☐ Excellent

Has your water quality previously been tested? No ☑ Yes ☐

If yes, for what and how often? (bacteriological, chemical analyses, etc.) ....

....

ATTACH COPY OF ANY PREVIOUS CHEMICAL AND/OR BACTERIOLOGICAL ANALYSIS RESULTS ON THE WELL WATER, IF AVAILABLE

Water sample collected during this survey: ......Yes...

Where was the sample collected: ....from tap in the garage.......................

....

....

Field Measurements: Conductivity...1855..... Temperature ..19.5.......... pH...8.04.....

E. SURFACE WATER

Are there any ponds, creeks etc. on the property?....NO..

If yes, indicate size and depth? Use?....NO...

III. SEWAGE DISPOSAL SYSTEM

SYSTEM DETAILS

What type of sewage disposal system do you have:

☐ Holding Tank (sewage removed by regular pump-outs)

☑ Septic Tank and Leaching Bed

☐ Other method of on-site disposal. Specify ....

☐ Do not know

Date or year Constructed 2016 Contractor

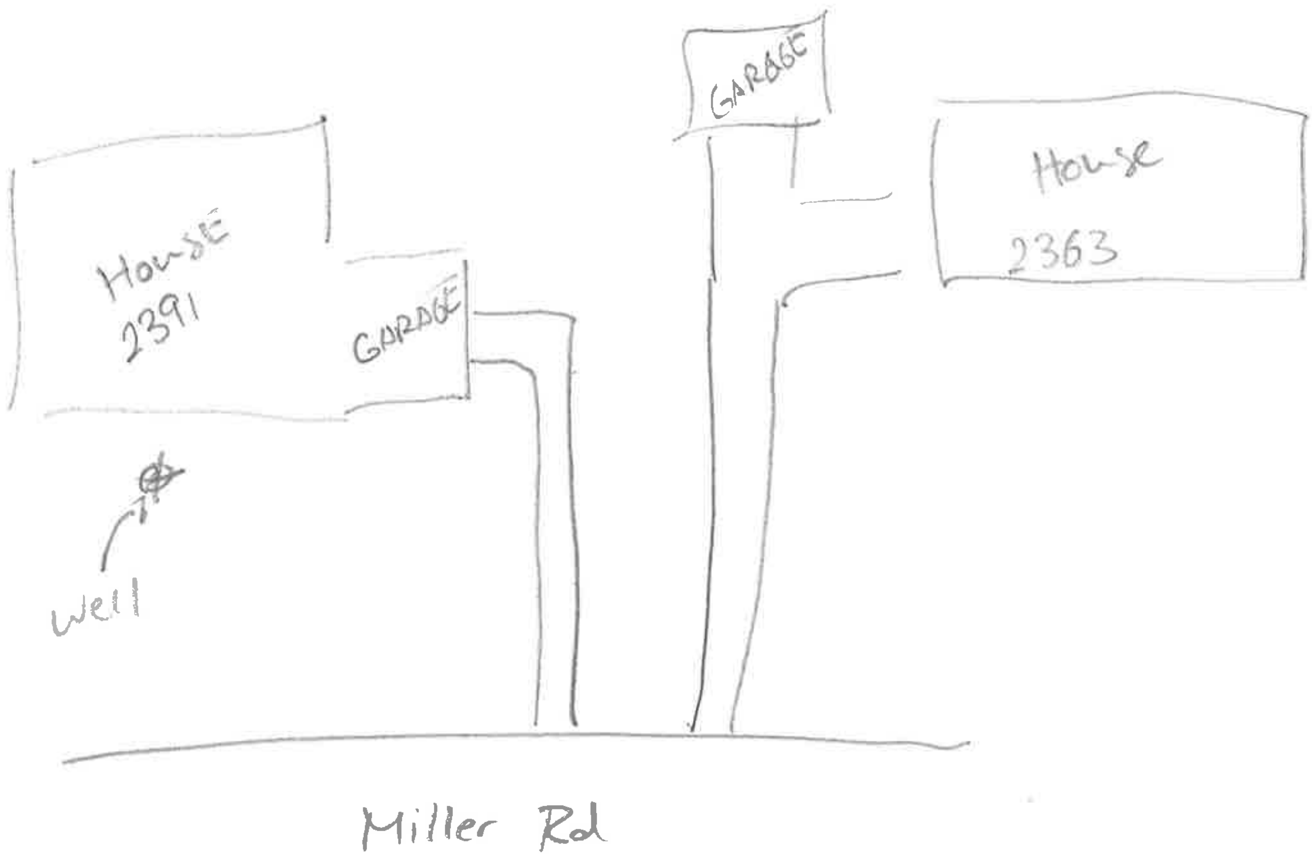
How often do you have the holding tank or septic tank pumped out? NOT YET

When was the last time? NOT YET

Have you ever had any problems with your sewage disposal systems? (e.g. leaks from holding tank, failure of septic system including surficial release of sewage, visibly stained areas, unusual odours, soft ground, etc.) NO

IV. PROPERTY SKETCH AND PHOTOGRAPHS

Sketch the location of the septic system (including approximate leaching bed area), the well and the on-site structures, giving the best approximated distance between each of them. Include ground surface slope (in degrees or percentage). Note any indications of septic system failure such as stained areas, surficial release of sewage, unusual odours, soft ground, etc. Identify on-site and/or adjacent roads, ditches, surface water bodies. Record the GPS coordinates for the top of the well casing (x,y,z). Record height of top of well casing above ground surface. Include photographs of well head, etc.



Completed by: T. Proks Date Sept 5, 2017

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2017 Sept 5

PRIVATE WATER WELL SURVEY QUESTIONNAIRE

TYPE OF DWELLING: ☑ Residential ☐ Commercial
☐ Institutional ☐ Other: ....

Is the owner willing to participate in the survey? **Yes** ☑ **No** ☐

(If no, record address below)

I. OWNER / OCCUPANT INFORMATION AND GENERAL QUESTIONS:

OWNER: [redacted]

Name: .... Telephone No. (business) ....
Address: 2261 2nd Concession Telephone No. (home) ....
Number of Bathrooms .... Number of Occupants 2

OCCUPANT (if other than Owner):

Name: .... Telephone No. (business) ....
Address: .... Telephone No. (home) ....
Number of Bathrooms .... Number of Occupants ....

GENERAL QUESTIONS

How long have you owned/occupied this dwelling? 1992
Is the property used year-round or seasonally?.. YES
Is well water used for drinking water supply? Yes ☑ No ☐
If no, why not? ....
Are there any other wells or water supplies used on the property? NO
If no, how long has it been since well water was used for drinking? ....
If no, what is the origin of drinking water? ....

II. WATER WELL

A. WELL CONSTRUCTION DETAILS:

Do you have a copy of the MOE Water Well Record? ☐ Yes (Well Record # ....)
☑ No

ATTACH A COPY OF WATER WELL RECORD, IF POSSIBLE

Date or Year Constructed 70's Contractor ....
Type of Well: Drilled ☑ Dug ☐ Well Diameter (inches) ....
Present Well Depth: 35'-40' ~45' Original Well Depth................ ☐ Same as Present

Is Well Vented and How?: ....

Top of Well Casing is:

1) Above ground surface ☑ 2) Buried inside a well pit ☐ 3) Buried, but not in a well pit ☐

The accurate location of the well is Known ☑ Unknown ☐ we didn't see where well was

GPS coordinates: E.............................. N..............................

Type of pump: Submersible ☑ Jet Pump ☐ Depth of Pump Intake (if known) ....

Well completed into: Bedrock ....✓.... Overburden (Soil) .... Both ....

B. WELL WATER LEVELS:

Indicate whether measured from ☐ ground level or ☐ from top of casing

Original water level depth in metres (on water well record) ....

Subsequent water level measurements (give depths in metres and dates) ....

....

....

C. WATER QUANTITY

Does your well supply enough water for your use? Yes ☑ No ☐

If no, is this the case: All the time ☐ Some of the time ☐ Seasonally ☐ Other ....

Use: Domestic: No ☐ Yes ☑ No. of persons using water from well ....2.........

Domestic includes (circle all that apply) Drinking Washing Cooking

Pool: No ☑ Yes ☐ Lawn Watering/Garden: No ☐ Yes ☑

Livestock: No ☑ Yes ☐

Industrial: No ☑ Yes ☐ (provide details)...

Irrigation: No ☑ Yes ☐ (provide details)...

Other Uses .... Daily Usage (if known) ....

Have you ever experienced any problems with your well? ....~~no~~, YES..........................

If so, when? E.coli from neighbouring sheep farm property (no longer exists)

What was the cause of the problem? ☐ Drought ☐ Pump Failure ☐ Plugging

☐ Increased Usage ☐ Interference ☐ Other (Please Specify) ....

Did you ever have your well deepened or cleaned, or a new well constructed? NO

If so, why?

Pump test conducted?

If yes, record pumping rate, duration and water levels (static, pumping and recovery)

D. WATER TREATMENT AND QUALITY

Fresh ☑ Sulphur ☐ Salty ☐ Iron Staining ☐ Soft ☐ Hard ☑

Water Treatment equipment: Softener ☐ UV ☐ Reverse Osmosis ☐ Filters ☑

Other equipment in use (if any):

Has your well recently been chlorinated and, if so, when? NO

How would you describe the quality of your water? ☐ Poor ☑ Good ☐ Excellent

Has your water quality previously been tested? No ☐ Yes ☑

If yes, for what and how often? (bacteriological, chemical analyses, etc.) 2 x year
from chickenplant across the road

ATTACH COPY OF ANY PREVIOUS CHEMICAL AND/OR BACTERIOLOGICAL ANALYSIS RESULTS ON THE WELL WATER, IF AVAILABLE

Water sample collected during this survey: ~~[illegible]~~ NO, did not want a sample collected

Where was the sample collected:

Field Measurements: Conductivity Temperature pH

E. SURFACE WATER

Are there any ponds, creeks etc. on the property? NO

If yes, indicate size and depth? Use?

III. SEWAGE DISPOSAL SYSTEM

SYSTEM DETAILS

What type of sewage disposal system do you have:

☐ Holding Tank (sewage removed by regular pump-outs)

☑ Septic Tank and Leaching Bed

☐ Other method of on-site disposal. Specify ....

☐ Do not know

Date or year Constructed ...94-95'... Contractor

How often do you have the holding tank or septic tank pumped out? ...~~2~~... every 2 years

When was the last time? ...2 years ago...

Have you ever had any problems with your sewage disposal systems? (e.g. leaks from holding tank, failure of septic system including surficial release of sewage, visibly stained areas, unusual odours, soft ground, etc.) ...no...

IV. PROPERTY SKETCH AND PHOTOGRAPHS

Sketch the location of the septic system (including approximate leaching bed area), the well and the on-site structures, giving the best approximated distance between each of them. Include ground surface slope (in degrees or percentage). Note any indications of septic system failure such as stained areas, surficial release of sewage, unusual odours, soft ground, etc. Identify on-site and/or adjacent roads, ditches, surface water bodies. Record the GPS coordinates for the top of the well casing (x,y,z). Record height of top of well casing above ground surface. Include photographs of well head, etc.

Did not see where
well was

Completed by: T. Proks Date Sept 5, 2017

2017 Sept 5

PRIVATE WATER WELL SURVEY
QUESTIONNAIRE

TYPE OF DWELLING: ☑ Residential ☐ Commercial
☐ Institutional ☐ Other: ....

Is the owner willing to participate in the survey? **Yes** ☑ **No** ☐

(If no, record address below)

I. OWNER / OCCUPANT INFORMATION AND GENERAL QUESTIONS:

OWNER:

Name: [redacted]

Address: 1750 Killaly

Number of Bathrooms ....

Telephone No. (business) ....

Telephone No. (home) ....

Number of Occupants 2

OCCUPANT (if other than Owner):

Name: ....

Address: ....

Number of Bathrooms ....

Telephone No. (business) ....

Telephone No. (home) ....

Number of Occupants ....

GENERAL QUESTIONS

How long have you owned/occupied this dwelling? 52 years

Is the property used year-round or seasonally?.. YES

Is well water used for drinking water supply? Yes ☑ No ☐

If no, why not? ....

Are there any other wells or water supplies used on the property? no

If no, how long has it been since well water was used for drinking? —

If no, what is the origin of drinking water? —

II. WATER WELL

Well ID #: A091778

A. WELL CONSTRUCTION DETAILS:

Do you have a copy of the MOE Water Well Record? ☐ Yes (Well Record # ....)
☑ No

ATTACH A COPY OF WATER WELL RECORD, IF POSSIBLE

Date or Year Constructed 2014/2015 Contractor Schooley Drilling

Type of Well: Drilled ☑ Dug ☐ Well Diameter (inches) 4"

Present Well Depth: 21' Original Well Depth .... ☐ Same as Present

Is Well Vented and How?: ....

Top of Well Casing is:

1) Above ground surface ☑ 2) Buried inside a well pit ☐ 3) Buried, but not in a well pit ☐

The accurate location of the well is Known ☑ Unknown ☐

GPS coordinates: E.......... N..........

Type of pump: Submersible ☑ Jet Pump ☐ Depth of Pump Intake (if known) ....

Well completed into: Bedrock ....✓.... Overburden (Soil) .... Both ....

B. WELL WATER LEVELS:

Indicate whether measured from ☐ ground level or ☐ from top of casing

Original water level depth in metres (on water well record) ....

Subsequent water level measurements (give depths in metres and dates) ....

....

....

C. WATER QUANTITY

Does your well supply enough water for your use? Yes ☑ No ☐

If no, is this the case: All the time ☐ Some of the time ☐ Seasonally ☐ Other ....

Use: Domestic: No ☐ Yes ☑ No. of persons using water from well ....

Domestic includes (circle all that apply) Drinking Washing Cooking

Pool: No ☑ Yes ☐ Lawn Watering/Garden: No ☐ Yes ☑

Livestock: No ☑ Yes ☐

Industrial: No ☑ Yes ☐ (provide details)..........

Irrigation: No ☑ Yes ☐ (provide details)..........

Other Uses .... Daily Usage (if known) ....

Have you ever experienced any problems with your well? ......NO..........

If so, when? ....

What was the cause of the problem? ☐ Drought ☐ Pump Failure ☐ Plugging

☐ Increased Usage ☐ Interference ☐ Other (Please Specify) ....

Did you ever have your well deepened or cleaned, or a new well constructed? NEW WELL

If so, why?

Pump test conducted?

If yes, record pumping rate, duration and water levels (static, pumping and recovery)

D. WATER TREATMENT AND QUALITY

Fresh ☑ Sulphur ☐ Salty ☐ Iron Staining ☑ Soft ☐ Hard ☑

Water Treatment equipment: Softener ☑ UV ☑ Reverse Osmosis ☑ Filters ☑

Other equipment in use (if any):

Has your well recently been chlorinated and, if so, when? NO

How would you describe the quality of your water? ☐ Poor ☐ Good ☑ Excellent

Has your water quality previously been tested? No ☐ Yes ☑

If yes, for what and how often? (bacteriological, chemical analyses, etc.)

ATTACH COPY OF ANY PREVIOUS CHEMICAL AND/OR BACTERIOLOGICAL ANALYSIS RESULTS ON THE WELL WATER, IF AVAILABLE

Water sample collected during this survey: yes

Where was the sample collected: from outside tap in back yard

Field Measurements: Conductivity 773 Temperature 19.3 pH 8.27

E. SURFACE WATER

Are there any ponds, creeks etc. on the property? NO

If yes, indicate size and depth? Use?

III. SEWAGE DISPOSAL SYSTEM

SYSTEM DETAILS

What type of sewage disposal system do you have:

☐ Holding Tank (sewage removed by regular pump-outs)

☑ Septic Tank and Leaching Bed

☐ Other method of on-site disposal. Specify ....

☐ Do not know

Date or year Constructed N/A Contractor

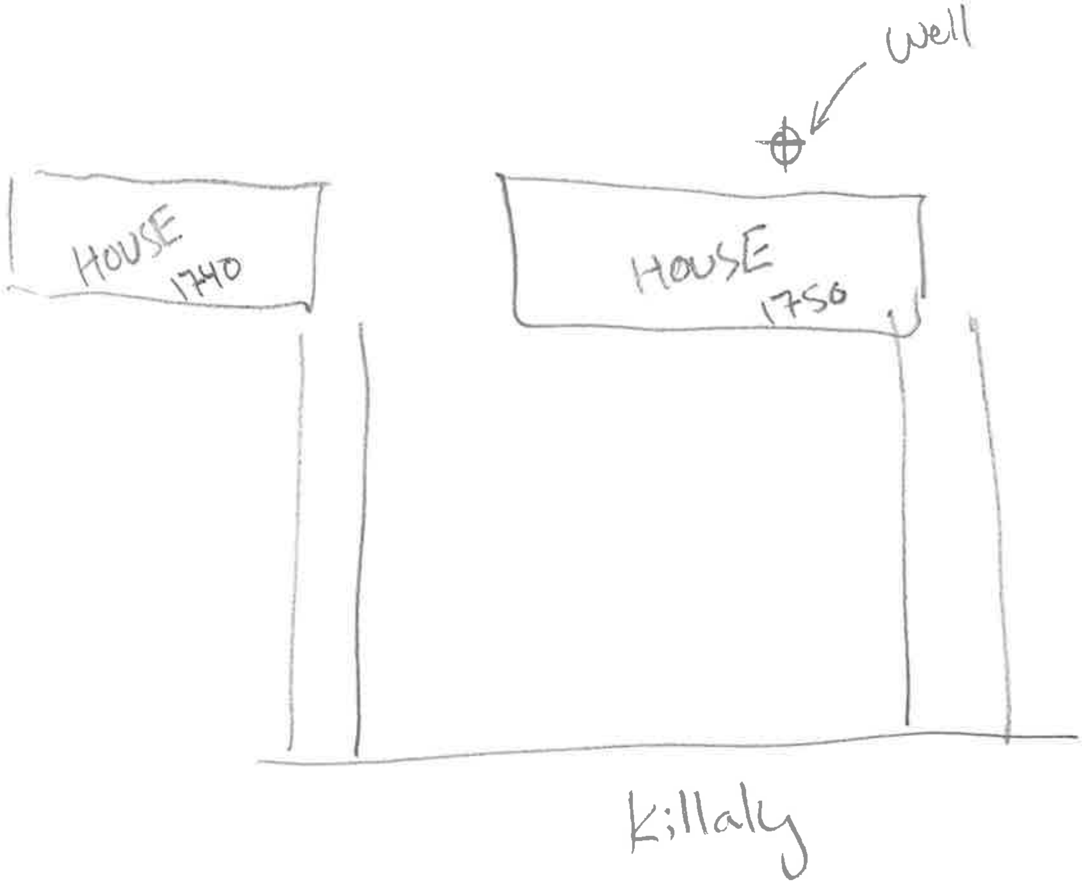
How often do you have the holding tank or septic tank pumped out? 10 years

When was the last time? 2-3 years ago

Have you ever had any problems with your sewage disposal systems? (e.g. leaks from holding tank, failure of septic system including surficial release of sewage, visibly stained areas, unusual odours, soft ground, etc.) NONE

IV. PROPERTY SKETCH AND PHOTOGRAPHS

Sketch the location of the septic system (including approximate leaching bed area), the well and the on-site structures, giving the best approximated distance between each of them. Include ground surface slope (in degrees or percentage). Note any indications of septic system failure such as stained areas, surficial release of sewage, unusual odours, soft ground, etc. Identify on-site and/or adjacent roads, ditches, surface water bodies. Record the GPS coordinates for the top of the well casing (x,y,z). Record height of top of well casing above ground surface. Include photographs of well head, etc.



Completed by: .... Date ....

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2017 Sept 5

PRIVATE WATER WELL SURVEY QUESTIONNAIRE

TYPE OF DWELLING: ☑ Residential ☐ Commercial ☐ Institutional ☐ Other: ....

Is the owner willing to participate in the survey? **Yes** ☑ **No** ☐

(If no, record address below)

I. OWNER / OCCUPANT INFORMATION AND GENERAL QUESTIONS:

OWNER:

Name: [redacted]

Address: 1408 Killaly

Number of Bathrooms ....

Telephone No. (business) ....

Telephone No. (home) ....

Number of Occupants ....

OCCUPANT (if other than Owner):

Name: ....

Address: ....

Number of Bathrooms ....

Telephone No. (business) ....

Telephone No. (home) ....

Number of Occupants ....

GENERAL QUESTIONS

How long have you owned/occupied this dwelling? 46 years

Is the property used year-round or seasonally?.. Yes

Is well water used for drinking water supply? Yes ☑ No ☐

If no, why not? ....

Are there any other wells or water supplies used on the property? NO

If no, how long has it been since well water was used for drinking? ....

If no, what is the origin of drinking water? ....

II. WATER WELL

A. WELL CONSTRUCTION DETAILS:

Do you have a copy of the MOE Water Well Record? ☐ Yes (Well Record # ....)
☑ No

ATTACH A COPY OF WATER WELL RECORD, IF POSSIBLE

Date or Year Constructed ~1949 Contractor UNSURE

Type of Well: Drilled ☑ Dug ☐ Well Diameter (inches) UNSURE

Present Well Depth: UNSURE Original Well Depth .... ☐ Same as Present

Is Well Vented and How?:..

Top of Well Casing is:

1) Above ground surface ☑ 2) Buried inside a well pit ☐ 3) Buried, but not in a well pit ☐

The accurate location of the well is Known ☑ Unknown ☐

GPS coordinates: E.............................. N..............................

Type of pump: Submersible ☐ Jet Pump ☑ Depth of Pump Intake (if known) Water Pump in Basement

Well completed into: Bedrock .... Overburden (Soil) .... Both ....
UNSURE

B. WELL WATER LEVELS:

Indicate whether measured from ☐ ground level or ☐ from top of casing

Original water level depth in metres (on water well record) ....

Subsequent water level measurements (give depths in metres and dates) ....

....

....

C. WATER QUANTITY

Does your well supply enough water for your use? Yes ☑ No ☐

If no, is this the case: All the time ☐ Some of the time ☐ Seasonally ☐ Other ....

Use: Domestic: No ☐ Yes ☑ No. of persons using water from well ....

Domestic includes (circle all that apply) Drinking Washing Cooking

Pool: No ☑ Yes ☐ Lawn Watering/Garden: No ☐ Yes ☐

Livestock: No ☑ Yes ☐

Industrial: No ☑ Yes ☐ (provide details)...

Irrigation: No ☑ Yes ☐ (provide details)...

Other Uses .... Daily Usage (if known) ....

Have you ever experienced any problems with your well? None, pump failure once

If so, when? ....

What was the cause of the problem? ☐ Drought ☑ Pump Failure ☐ Plugging

☐ Increased Usage ☐ Interference ☐ Other (Please Specify) ....

Did you ever have your well deepened or cleaned, or a new well constructed? No

If so, why?

Pump test conducted?

If yes, record pumping rate, duration and water levels (static, pumping and recovery)

D. WATER TREATMENT AND QUALITY

Fresh ☐ Sulphur ☑ Salty ☐ Iron Staining ☐ Soft ☐ Hard ☑

Water Treatment equipment: Softener ☐ UV ☐ Reverse Osmosis ☐ Filters ☐

Other equipment in use (if any): Collegan

Has your well recently been chlorinated and, if so, when?

How would you describe the quality of your water? ☐ Poor ☑ Good ☐ Excellent

Has your water quality previously been tested? No ☐ Yes ☑

If yes, for what and how often? (bacteriological, chemical analyses, etc.) tested when salt is replaced

ATTACH COPY OF ANY PREVIOUS CHEMICAL AND/OR BACTERIOLOGICAL ANALYSIS RESULTS ON THE WELL WATER, IF AVAILABLE

Water sample collected during this survey: Yes

Where was the sample collected: from outside tap @ side of house

Field Measurements: Conductivity 1250 Temperature 21.9 pH 8.55

E. SURFACE WATER

Are there any ponds, creeks etc. on the property? NO

If yes, indicate size and depth? Use?

III. SEWAGE DISPOSAL SYSTEM

SYSTEM DETAILS

What type of sewage disposal system do you have:

- ☐ Holding Tank (sewage removed by regular pump-outs)
- ☑ Septic Tank and Leaching Bed
- ☐ Other method of on-site disposal. Specify ....
- ☐ Do not know

Date or year Constructed .... Contractor New one put in ~10-15 years ago

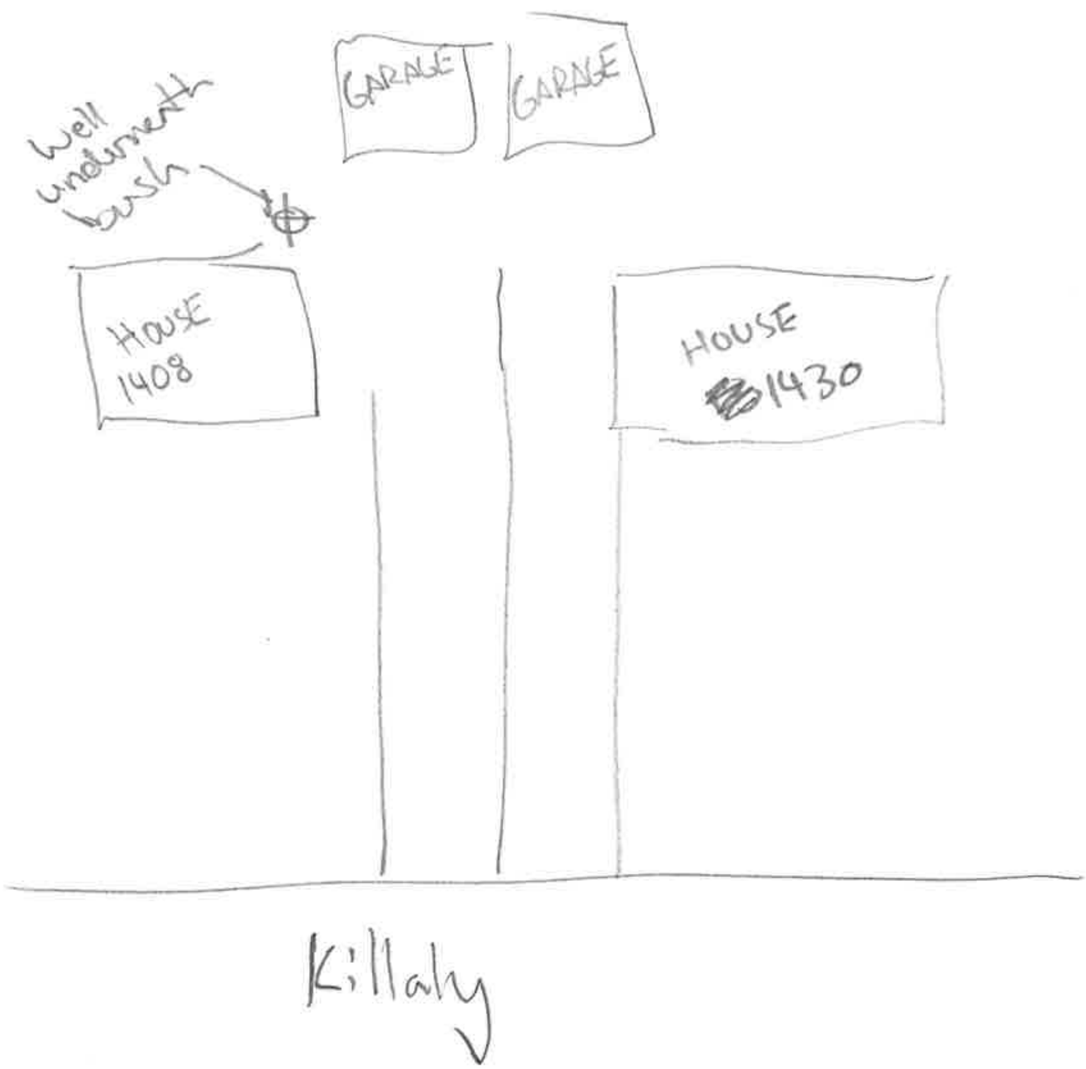
How often do you have the holding tank or septic tank pumped out?...

When was the last time?...

Have you ever had any problems with your sewage disposal systems? (e.g. leaks from holding tank, failure of septic system including surficial release of sewage, visibly stained areas, unusual odours, soft ground, etc.) ....

IV. PROPERTY SKETCH AND PHOTOGRAPHS

Sketch the location of the septic system (including approximate leaching bed area), the well and the on-site structures, giving the best approximated distance between each of them. Include ground surface slope (in degrees or percentage). Note any indications of septic system failure such as stained areas, surficial release of sewage, unusual odours, soft ground, etc. Identify on-site and/or adjacent roads, ditches, surface water bodies. Record the GPS coordinates for the top of the well casing (x,y,z). Record height of top of well casing above ground surface. Include photographs of well head, etc.



Completed by: T. Pioks Date Sept 5, 2017

2017 Sept 5

PRIVATE WATER WELL SURVEY QUESTIONNAIRE

TYPE OF DWELLING: ☑ Residential ☐ Commercial
☐ Institutional ☐ Other: ....

Is the owner willing to participate in the survey? **Yes** ☑ **No** ☐

(If no, record address below)

I. OWNER / OCCUPANT INFORMATION AND GENERAL QUESTIONS:

OWNER:

Name: [redacted]
Address: 1384 Killaly
Number of Bathrooms ....

Telephone No. (business) ....
Telephone No. (home) ....
Number of Occupants ....

OCCUPANT (if other than Owner):

Name: ....
Address: ....
Number of Bathrooms ....

Telephone No. (business) ....
Telephone No. (home) ....
Number of Occupants ....

GENERAL QUESTIONS

How long have you owned/occupied this dwelling? 4 years
Is the property used year-round or seasonally?.. Yes
Is well water used for drinking water supply? Yes ☐ No ☑
If no, why not? N/A
Are there any other wells or water supplies used on the property? NO
If no, how long has it been since well water was used for drinking? N/A
If no, what is the origin of drinking water? ~~M~~ Bottled

II. WATER WELL

A. WELL CONSTRUCTION DETAILS:

Do you have a copy of the MOE Water Well Record? ☐ Yes (Well Record # ....)
☑ No

ATTACH A COPY OF WATER WELL RECORD, IF POSSIBLE

Date or Year Constructed N/A Contractor N/A
Type of Well: Drilled ☑ Dug ☐ Well Diameter (inches) N/A
Present Well Depth: N/A Original Well Depth .... ☐ Same as Present

Is Well Vented and How?:..

Top of Well Casing is:

1) Above ground surface ☑ 2) Buried inside a well pit ☐ 3) Buried, but not in a well pit ☐

The accurate location of the well is Known ☑ Unknown ☐

GPS coordinates: E.........N/A............... N.........N/A.............

Type of pump: Submersible ☑ Jet Pump ☐ Depth of Pump Intake (if known) ....

Well completed into: Bedrock .... Overburden (Soil) .... Both ....
UNSURE

B. WELL WATER LEVELS:

Indicate whether measured from ☐ ground level or ☐ from top of casing

Original water level depth in metres (on water well record) ....

Subsequent water level measurements (give depths in metres and dates) ....

....

....

C. WATER QUANTITY

Does your well supply enough water for your use? Yes ☑ No ☐

If no, is this the case: All the time ☐ Some of the time ☐ Seasonally ☐ Other ....

Use: Domestic: No ☐ Yes ☑ No. of persons using water from well ....

Domestic includes (circle all that apply) Drinking Washing Cooking

Pool: No ☑ Yes ☐ Lawn Watering/Garden: No ☐ Yes ☐

Livestock: No ☑ Yes ☐

Industrial: No ☑ Yes ☐ (provide details)..

Irrigation: No ☑ Yes ☐ (provide details)..

Other Uses .... Daily Usage (if known) ....

Have you ever experienced any problems with your well? ....NO.......................................

If so, when? ....

What was the cause of the problem? ☐ Drought ☐ Pump Failure ☐ Plugging

☐ Increased Usage ☐ Interference ☐ Other (Please Specify) ....

Did you ever have your well deepened or cleaned, or a new well constructed? NO

If so, why?

Pump test conducted?

If yes, record pumping rate, duration and water levels (static, pumping and recovery)

D. WATER TREATMENT AND QUALITY

Fresh ☐ Sulphur ☑ Salty ☐ Iron Staining ☐ Soft ☐ Hard ☐

Water Treatment equipment: Softener ☐ UV ☐ Reverse Osmosis ☐ Filters ☐

Other equipment in use (if any):

Has your well recently been chlorinated and, if so, when? NO

How would you describe the quality of your water? ☐ Poor ☐ Good ☑ Excellent

Has your water quality previously been tested? No ☑ Yes ☐

If yes, for what and how often? (bacteriological, chemical analyses, etc.)

ATTACH COPY OF ANY PREVIOUS CHEMICAL AND/OR BACTERIOLOGICAL ANALYSIS RESULTS ON THE WELL WATER, IF AVAILABLE

Water sample collected during this survey: Yes

Where was the sample collected: from outside hose at side of house

Field Measurements: Conductivity 683 Temperature 22.8 pH 7.84

E. SURFACE WATER

Are there any ponds, creeks etc. on the property? NO

If yes, indicate size and depth? Use?

III. SEWAGE DISPOSAL SYSTEM

SYSTEM DETAILS

What type of sewage disposal system do you have:

- ☐ Holding Tank (sewage removed by regular pump-outs)
- ☑ Septic Tank and Leaching Bed
- ☐ Other method of on-site disposal. Specify ....
- ☐ Do not know

Date or year Constructed .... Contractor

How often do you have the holding tank or septic tank pumped out? ....

When was the last time? ....4 years ago....

Have you ever had any problems with your sewage disposal systems? (e.g. leaks from holding tank, failure of septic system including surficial release of sewage, visibly stained areas, unusual odours, soft ground, etc.) ....NO....

IV. PROPERTY SKETCH AND PHOTOGRAPHS

Sketch the location of the septic system (including approximate leaching bed area), the well and the on-site structures, giving the best approximated distance between each of them. Include ground surface slope (in degrees or percentage). Note any indications of septic system failure such as stained areas, surficial release of sewage, unusual odours, soft ground, etc. Identify on-site and/or adjacent roads, ditches, surface water bodies. Record the GPS coordinates for the top of the well casing (x,y,z). Record height of top of well casing above ground surface. Include photographs of well head, etc.

Completed by: T. Proks Date Sept 5, 2017

2017 Sept 5

PRIVATE WATER WELL SURVEY QUESTIONNAIRE

TYPE OF DWELLING: ☑ Residential ☐ Commercial ☐ Institutional ☐ Other: ....

Is the owner willing to participate in the survey? **Yes** ☑ **No** ☐

(If no, record address below)

I. OWNER / OCCUPANT INFORMATION AND GENERAL QUESTIONS:

OWNER: [redacted]

Name: .... Telephone No. (business) ....

Address: ....1080 Weaver Rd....... Telephone No. (home) ....

Number of Bathrooms .... Number of Occupants ....

OCCUPANT (if other than Owner):

Name: .... Telephone No. (business) ....

Address: .... Telephone No. (home) ....

Number of Bathrooms .... Number of Occupants ....

GENERAL QUESTIONS

How long have you owned/occupied this dwelling? ....30 years..........

Is the property used year-round or seasonally?.. ....yes..........

Is well water used for drinking water supply? Yes ☐ No ☑

If no, why not? ....Hard, sulphur..........

Are there any other wells or water supplies used on the property?..........NO..........

If no, how long has it been since well water was used for drinking? ...never used.........

If no, what is the origin of drinking water? .....cistern / bottled..........

II. WATER WELL

A. WELL CONSTRUCTION DETAILS:

Do you have a copy of the MOE Water Well Record? ☐ Yes (Well Record # ....) ☑ No

ATTACH A COPY OF WATER WELL RECORD, IF POSSIBLE

Date or Year Constructed ....N/A.............. Contractor ....N/A..........

Type of Well: Drilled ☐ Dug ☑ Well Diameter (inches) ....

Present Well Depth: ~15'......... Original Well Depth................ ☐ Same as Present

Is Well Vented and How?: N/A

Top of Well Casing is:

1) Above ground surface ☐ 2) Buried inside a well pit ☑ 3) Buried, but not in a well pit ☐

The accurate location of the well is Known ☑ Unknown ☐

GPS coordinates: E N/A N N/A

Type of pump: Submersible ☐ Jet Pump x2 ☑ Depth of Pump Intake (if known) ......

Well completed into: Bedrock ...... Overburden (Soil) ✓ Both ......

B. WELL WATER LEVELS:

Indicate whether measured from ☐ ground level or ☐ from top of casing

Original water level depth in metres (on water well record) N/A

Subsequent water level measurements (give depths in metres and dates) ......

C. WATER QUANTITY

Does your well supply enough water for your use? Yes ☑ No ☐

If no, is this the case: All the time ☐ Some of the time ☐ Seasonally ☐ Other ......

Use: Domestic: No ☐ Yes ☑ No. of persons using water from well ......

Domestic includes (circle all that apply) Drinking Washing Cooking

Pool: No ☐ Yes ☑ Lawn Watering/Garden: No ☐ Yes ☑

Livestock: No ☑ Yes ☐

Industrial: No ☑ Yes ☐ (provide details) ......

Irrigation: No ☑ Yes ☐ (provide details) ......

Other Uses ...... Daily Usage (if known) ......

Have you ever experienced any problems with your well? NONE

If so, when? ......

What was the cause of the problem? ☐ Drought ☐ Pump Failure ☐ Plugging

☐ Increased Usage ☐ Interference ☐ Other (Please Specify) ......

Did you ever have your well deepened or cleaned, or a new well constructed? NO

If so, why?

Pump test conducted? NO

If yes, record pumping rate, duration and water levels (static, pumping and recovery)

D. WATER TREATMENT AND QUALITY

Fresh ☐ Sulphur ☑ Salty ☐ Iron Staining ☐ Soft ☐ Hard ☑

Water Treatment equipment: Softener ☐ UV ☐ Reverse Osmosis ☐ Filters ☐

Other equipment in use (if any):

Has your well recently been chlorinated and, if so, when?

How would you describe the quality of your water? ☑ Poor ☐ Good ☐ Excellent

Has your water quality previously been tested? No ☑ Yes ☐

If yes, for what and how often? (bacteriological, chemical analyses, etc.)

ATTACH COPY OF ANY PREVIOUS CHEMICAL AND/OR BACTERIOLOGICAL ANALYSIS RESULTS ON THE WELL WATER, IF AVAILABLE

Water sample collected during this survey: Yes

Where was the sample collected: From dedicated submersible in dug well

Field Measurements: Conductivity 702 Temperature 19.9 pH 8.20

E. SURFACE WATER

Are there any ponds, creeks etc. on the property? NO

If yes, indicate size and depth? Use?

III. SEWAGE DISPOSAL SYSTEM

SYSTEM DETAILS

What type of sewage disposal system do you have:

- ☐ Holding Tank (sewage removed by regular pump-outs)
- ☑ Septic Tank and Leaching Bed
- ☐ Other method of on-site disposal. Specify ....
- ☐ Do not know

Date or year Constructed .... Contractor

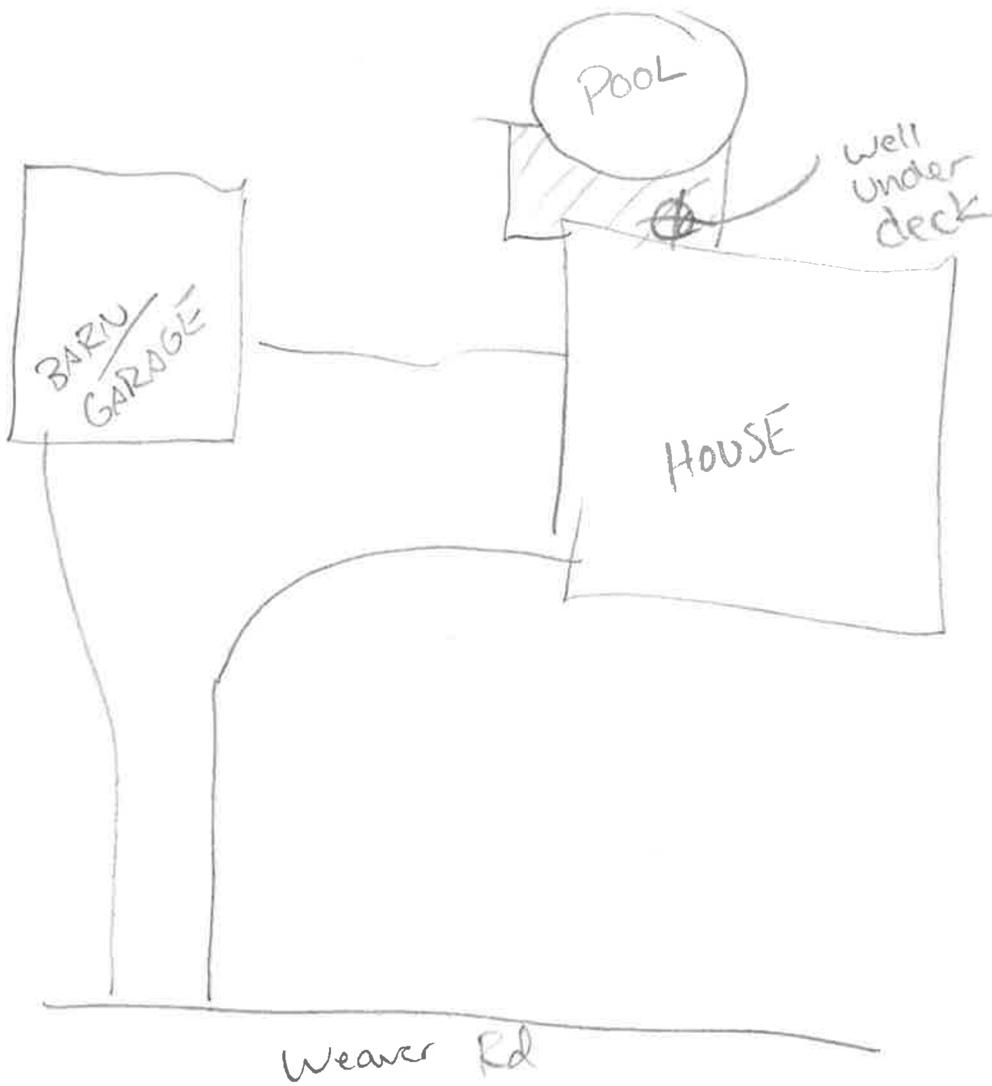
How often do you have the holding tank or septic tank pumped out? 5 years

When was the last time? 2 weeks ago

Have you ever had any problems with your sewage disposal systems? (e.g. leaks from holding tank, failure of septic system including surficial release of sewage, visibly stained areas, unusual odours, soft ground, etc.) main line damaged from roots.

IV. PROPERTY SKETCH AND PHOTOGRAPHS

Sketch the location of the septic system (including approximate leaching bed area), the well and the on-site structures, giving the best approximated distance between each of them. Include ground surface slope (in degrees or percentage). Note any indications of septic system failure such as stained areas, surficial release of sewage, unusual odours, soft ground, etc. Identify on-site and/or adjacent roads, ditches, surface water bodies. Record the GPS coordinates for the top of the well casing (x,y,z). Record height of top of well casing above ground surface. Include photographs of well head, etc.



Completed by: T. Proks Date Sept 5, 2017

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2017 ; Sept 5

PRIVATE WATER WELL SURVEY QUESTIONNAIRE

TYPE OF DWELLING: ☑ Residential ☐ Commercial
☐ Institutional ☐ Other: ....

Is the owner willing to participate in the survey? **Yes** ☑ **No** ☐

(If no, record address below)

I. OWNER / OCCUPANT INFORMATION AND GENERAL QUESTIONS:

OWNER:

Name: —— didn't get ——
Telephone No. (business) N/A
Address: 1162 Weaver Rd
Telephone No. (home) N/A
Number of Bathrooms N/A
Number of Occupants N/A

OCCUPANT (if other than Owner):

Name: N/A
Telephone No. (business) N/A
Address: N/A
Telephone No. (home) N/A
Number of Bathrooms N/A
Number of Occupants N/A

GENERAL QUESTIONS

How long have you owned/occupied this dwelling? Since 1964
Is the property used year-round or seasonally?.. Yes
Is well water used for drinking water supply? Yes ☑ No ☐
If no, why not? N/A
Are there any other wells or water supplies used on the property? N/A
If no, how long has it been since well water was used for drinking? N/A
If no, what is the origin of drinking water? N/A

II. WATER WELL

A. WELL CONSTRUCTION DETAILS:

Do you have a copy of the MOE Water Well Record? ☐ Yes (Well Record # ....)
☑ No

ATTACH A COPY OF WATER WELL RECORD, IF POSSIBLE

Date or Year Constructed unsure 15+ years Contractor N/A
Type of Well: Drilled ☑ Dug ☐ Well Diameter (inches) unsure
Present Well Depth: N/A Original Well Depth N/A ☐ Same as Present

Is Well Vented and How?: N/A

Top of Well Casing is:

1) Above ground surface ☑ 2) Buried inside a well pit ☐ 3) Buried, but not in a well pit ☐

The accurate location of the well is Known ☑ Unknown ☐

GPS coordinates: E N/A N N/A

Type of pump: Submersible ☐ Jet Pump ☑ Depth of Pump Intake (if known) ....

Well completed into: Bedrock .... Overburden (Soil) .... Both ....

B. WELL WATER LEVELS: N/A

Indicate whether measured from ☐ ground level or ☐ from top of casing

Original water level depth in metres (on water well record) ....

Subsequent water level measurements (give depths in metres and dates) ....

....

....

C. WATER QUANTITY

Does your well supply enough water for your use? Yes ☑ No ☐

If no, is this the case: All the time ☐ Some of the time ☐ Seasonally ☐ Other ....

Use: Domestic: No ☐ Yes ☑ No. of persons using water from well N/A

Domestic includes (circle all that apply) Drinking Washing Cooking

Pool: No ☑ Yes ☐ Lawn Watering/Garden: No ☐ Yes ☑

Livestock: No ☑ Yes ☐

Industrial: No ☑ Yes ☐ (provide details)....................

Irrigation: No ☑ Yes ☐ (provide details)....................

Other Uses N/A Daily Usage (if known) N/A

Have you ever experienced any problems with your well? NONE

If so, when? N/A

What was the cause of the problem? ☐ Drought ☐ Pump Failure ☐ Plugging

☐ Increased Usage ☐ Interference ☐ Other (Please Specify) ....

Did you ever have your well deepened or cleaned, or a new well constructed? ......NO..............
If so, why?..............N/A...
Pump test conducted? ......N/A...

If yes, record pumping rate, duration and water levels (static, pumping and recovery)
....................N/A...

....

....

....

....

D. WATER TREATMENT AND QUALITY

Fresh ☑ Sulphur ☐ Salty ☐ Iron Staining ☐ Soft ☐ Hard ☐

Water Treatment equipment: Softener ☐ UV ☐ Reverse Osmosis ☐ Filters ☐

Other equipment in use (if any): ....N/A..
Has your well recently been chlorinated and, if so, when? ....N/A...
How would you describe the quality of your water? ☐ Poor ☑ Good ☐ Excellent

Has your water quality previously been tested? No ☑ Yes ☐

If yes, for what and how often? (bacteriological, chemical analyses, etc.) ....N/A.................

....

ATTACH COPY OF ANY PREVIOUS CHEMICAL AND/OR BACTERIOLOGICAL ANALYSIS RESULTS ON THE WELL WATER, IF AVAILABLE

Water sample collected during this survey: ....NO..
Where was the sample collected: ......N/A..

....

....
Field Measurements: Conductivity....N/A....... Temperature .....N/A............. pH......N/A.......

E. SURFACE WATER

Are there any ponds, creeks etc. on the property? ....NONE...
If yes, indicate size and depth? Use?...........N/A...

III. SEWAGE DISPOSAL SYSTEM

SYSTEM DETAILS

What type of sewage disposal system do you have:

- ☐ Holding Tank (sewage removed by regular pump-outs)
- ☑ Septic Tank and Leaching Bed
- ☐ Other method of on-site disposal. Specify ....
- ☐ Do not know

Date or year Constructed N/A... Contractor N/A

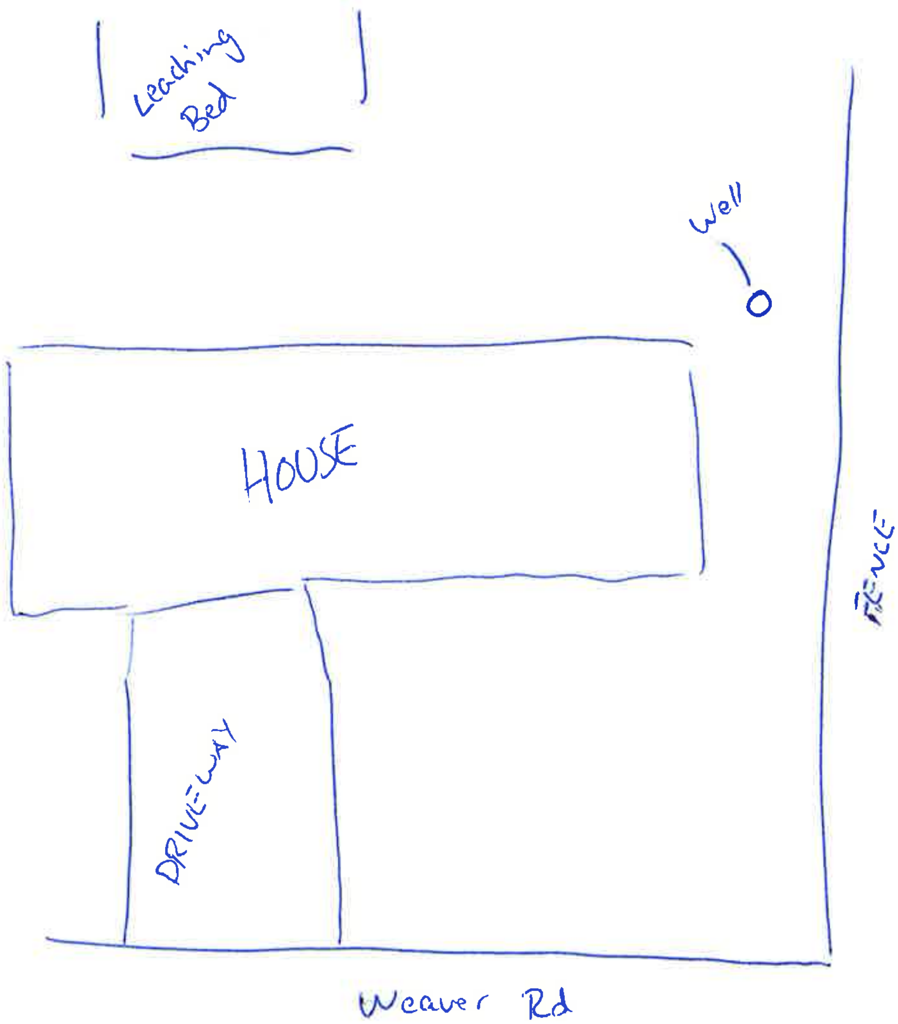
How often do you have the holding tank or septic tank pumped out? NOT OFTEN

When was the last time? DOESN'T KNOW

Have you ever had any problems with your sewage disposal systems? (e.g. leaks from holding tank, failure of septic system including surficial release of sewage, visibly stained areas, unusual odours, soft ground, etc.) NONE

IV. PROPERTY SKETCH AND PHOTOGRAPHS

Sketch the location of the septic system (including approximate leaching bed area), the well and the on-site structures, giving the best approximated distance between each of them. Include ground surface slope (in degrees or percentage). Note any indications of septic system failure such as stained areas, surficial release of sewage, unusual odours, soft ground, etc. Identify on-site and/or adjacent roads, ditches, surface water bodies. Record the GPS coordinates for the top of the well casing (x,y,z). Record height of top of well casing above ground surface. Include photographs of well head, etc.



Completed by: T. Proks Date Sept 5, 2017

Sept 5, 2017

2017

PRIVATE WATER WELL SURVEY QUESTIONNAIRE

TYPE OF DWELLING: ☐ Residential ☐ Commercial ☐ Institutional ☐ Other: ....

Is the owner willing to participate in the survey? **Yes** ☐ **No** ☐

(If no, record address below)

I. OWNER / OCCUPANT INFORMATION AND GENERAL QUESTIONS:

OWNER: [redacted]

Name: .... Telephone No. (business) ....

Address: 1430 Killaly Telephone No. (home) ....

Number of Bathrooms .... Number of Occupants ....

OCCUPANT (if other than Owner):

Name: .... Telephone No. (business) ....

Address: .... Telephone No. (home) ....

Number of Bathrooms .... Number of Occupants ....

GENERAL QUESTIONS

How long have you owned/occupied this dwelling? ....

Is the property used year-round or seasonally?.. ....

Is well water used for drinking water supply? Yes ☐ No ☐

If no, why not? ....

Are there any other wells or water supplies used on the property?...

If no, how long has it been since well water was used for drinking? ....

If no, what is the origin of drinking water? ....

II. WATER WELL

A. WELL CONSTRUCTION DETAILS:

Do you have a copy of the MOE Water Well Record? ☐ Yes (Well Record # .. ..)
☐ No

ATTACH A COPY OF WATER WELL RECORD, IF POSSIBLE

Date or Year Constructed .... Contractor ....

Type of Well: Drilled ☐ Dug ☐ Well Diameter (inches) ....

Present Well Depth: .... Original Well Depth .... ☐ Same as Present

Is Well Vented and How?:..

Top of Well Casing is:

1) Above ground surface ☐ 2) Buried inside a well pit ☐ 3) Buried, but not in a well pit ☐

The accurate location of the well is Known ☐ Unknown ☐

GPS coordinates: E............................... N..............................

Type of pump: Submersible ☐ Jet Pump ☐ Depth of Pump Intake (if known) ....

Well completed into: Bedrock .... Overburden (Soil) .... Both ....

B. WELL WATER LEVELS:

Indicate whether measured from ☐ ground level or ☐ from top of casing

Original water level depth in metres (on water well record) ....

Subsequent water level measurements (give depths in metres and dates) ....

....

....

C. WATER QUANTITY

Does your well supply enough water for your use? Yes ☐ No ☐

If no, is this the case: All the time ☐ Some of the time ☐ Seasonally ☐ Other ....

Use: Domestic: No ☐ Yes ☐ No. of persons using water from well ....

Domestic includes (circle all that apply) Drinking Washing Cooking

Pool: No ☐ Yes ☐ Lawn Watering/Garden: No ☐ Yes ☐

Livestock: No ☐ Yes ☐

Industrial: No ☐ Yes ☐ (provide details)...

Irrigation: No ☐ Yes ☐ (provide details)...

Other Uses .... Daily Usage (if known) ....

Have you ever experienced any problems with your well? ....

If so, when? ....

What was the cause of the problem? ☐ Drought ☐ Pump Failure ☐ Plugging

☐ Increased Usage ☐ Interference ☐ Other (Please Specify) ....

Did you ever have your well deepened or cleaned, or a new well constructed? ....
If so, why?..
Pump test conducted? ....

If yes, record pumping rate, duration and water levels (static, pumping and recovery)

....

....

....

....

....

D. WATER TREATMENT AND QUALITY

Fresh ☐ Sulphur ☐ Salty ☐ Iron Staining ☐ Soft ☐ Hard ☐

Water Treatment equipment: Softener ☐ UV ☐ Reverse Osmosis ☐ Filters ☐

Other equipment in use (if any): ....
Has your well recently been chlorinated and, if so, when? ....
How would you describe the quality of your water? ☐ Poor ☐ Good ☐ Excellent

Has your water quality previously been tested? No ☐ Yes ☐

If yes, for what and how often? (bacteriological, chemical analyses, etc.) ....

....

ATTACH COPY OF ANY PREVIOUS CHEMICAL AND/OR BACTERIOLOGICAL ANALYSIS RESULTS ON THE WELL WATER, IF AVAILABLE

Water sample collected during this survey: ....
Where was the sample collected: ....

....

....

Field Measurements: Conductivity.................. Temperature .... pH....................

E. SURFACE WATER

Are there any ponds, creeks etc. on the property? ....
If yes, indicate size and depth? Use? ....

III. SEWAGE DISPOSAL SYSTEM

SYSTEM DETAILS

What type of sewage disposal system do you have:

☐ Holding Tank (sewage removed by regular pump-outs)

☐ Septic Tank and Leaching Bed

☐ Other method of on-site disposal. Specify ....

☐ Do not know

Date or year Constructed .... Contractor

How often do you have the holding tank or septic tank pumped out? ....

When was the last time? ....

Have you ever had any problems with your sewage disposal systems? (e.g. leaks from holding tank, failure of septic system including surficial release of sewage, visibly stained areas, unusual odours, soft ground, etc.) ....

IV. PROPERTY SKETCH AND PHOTOGRAPHS

Sketch the location of the septic system (including approximate leaching bed area), the well and the on-site structures, giving the best approximated distance between each of them. Include ground surface slope (in degrees or percentage). Note any indications of septic system failure such as stained areas, surficial release of sewage, unusual odours, soft ground, etc. Identify on-site and/or adjacent roads, ditches, surface water bodies. Record the GPS coordinates for the top of the well casing (x,y,z). Record height of top of well casing above ground surface. Include photographs of well head, etc.

Completed by: .... Date ....

2017 Sept 5

PRIVATE WATER WELL SURVEY QUESTIONNAIRE

TYPE OF DWELLING: ☐ Residential ☐ Commercial ☐ Institutional ☐ Other: ....

Is the owner willing to participate in the survey? **Yes** ☐ **No** ☑

(If no, record address below)

I. OWNER / OCCUPANT INFORMATION AND GENERAL QUESTIONS:

OWNER: [redacted]

Name: .... Telephone No. (business) ....

Address: ...1094 Weaver.. Telephone No. (home) ....

Number of Bathrooms .... Number of Occupants ....

OCCUPANT (if other than Owner):

Name: .... Telephone No. (business) ....

Address: .... Telephone No. (home) ....

Number of Bathrooms .... Number of Occupants ....

GENERAL QUESTIONS

How long have you owned/occupied this dwelling? ....

Is the property used year-round or seasonally?.. ....

Is well water used for drinking water supply? Yes ☐ No ☐

If no, why not? ....

Are there any other wells or water supplies used on the property?...

If no, how long has it been since well water was used for drinking? ....

If no, what is the origin of drinking water? ....

II. WATER WELL

A. WELL CONSTRUCTION DETAILS:

Do you have a copy of the MOE Water Well Record? ☐ Yes (Well Record # .. ..)
☐ No

ATTACH A COPY OF WATER WELL RECORD, IF POSSIBLE

Date or Year Constructed .... Contractor ....

Type of Well: Drilled ☐ Dug ☐ Well Diameter (inches) ....

Present Well Depth: .... Original Well Depth .... ☐ Same as Present

Is Well Vented and How?: ....

Top of Well Casing is:

1) Above ground surface ☐ 2) Buried inside a well pit ☐ 3) Buried, but not in a well pit ☐

The accurate location of the well is Known ☐ Unknown ☐

GPS coordinates: E................................ N..............................

Type of pump: Submersible ☐ Jet Pump ☐ Depth of Pump Intake (if known) ....

Well completed into: Bedrock .... Overburden (Soil) .... Both ....

B. WELL WATER LEVELS:

Indicate whether measured from ☐ ground level or ☐ from top of casing

Original water level depth in metres (on water well record) ....

Subsequent water level measurements (give depths in metres and dates) ....

....

....

C. WATER QUANTITY

Does your well supply enough water for your use? Yes ☐ No ☐

If no, is this the case: All the time ☐ Some of the time ☐ Seasonally ☐ Other ....

Use: Domestic: No ☐ Yes ☐ No. of persons using water from well ....

Domestic includes (circle all that apply) Drinking Washing Cooking

Pool: No ☐ Yes ☐ Lawn Watering/Garden: No ☐ Yes ☐

Livestock: No ☐ Yes ☐

Industrial: No ☐ Yes ☐ (provide details)...

Irrigation: No ☐ Yes ☐ (provide details)..

Other Uses .... Daily Usage (if known) ....

Have you ever experienced any problems with your well? ....

If so, when? ....

What was the cause of the problem? ☐ Drought ☐ Pump Failure ☐ Plugging

☐ Increased Usage ☐ Interference ☐ Other (Please Specify) ....

Did you ever have your well deepened or cleaned, or a new well constructed? ....
If so, why?..
Pump test conducted? ....

If yes, record pumping rate, duration and water levels (static, pumping and recovery)

....

....

....

....

....

D. WATER TREATMENT AND QUALITY

Fresh ☐ Sulphur ☐ Salty ☐ Iron Staining ☐ Soft ☐ Hard ☐

Water Treatment equipment: Softener ☐ UV ☐ Reverse Osmosis ☐ Filters ☐

Other equipment in use (if any): ....
Has your well recently been chlorinated and, if so, when? ....
How would you describe the quality of your water? ☐ Poor ☐ Good ☐ Excellent

Has your water quality previously been tested? No ☐ Yes ☐

If yes, for what and how often? (bacteriological, chemical analyses, etc.) ....

....

ATTACH COPY OF ANY PREVIOUS CHEMICAL AND/OR BACTERIOLOGICAL ANALYSIS RESULTS ON THE WELL WATER, IF AVAILABLE

Water sample collected during this survey: ....
Where was the sample collected: ....

....

....

Field Measurements: Conductivity.................. Temperature .... pH.....................

E. SURFACE WATER

Are there any ponds, creeks etc. on the property? ....
If yes, indicate size and depth? Use?..

III. SEWAGE DISPOSAL SYSTEM

SYSTEM DETAILS

What type of sewage disposal system do you have:

☐ Holding Tank (sewage removed by regular pump-outs)

☐ Septic Tank and Leaching Bed

☐ Other method of on-site disposal. Specify ....

☐ Do not know

Date or year Constructed .... Contractor

How often do you have the holding tank or septic tank pumped out? ....

When was the last time? ....

Have you ever had any problems with your sewage disposal systems? (e.g. leaks from holding tank, failure of septic system including surficial release of sewage, visibly stained areas, unusual odours, soft ground, etc.) ....

IV. PROPERTY SKETCH AND PHOTOGRAPHS

Sketch the location of the septic system (including approximate leaching bed area), the well and the on-site structures, giving the best approximated distance between each of them. Include ground surface slope (in degrees or percentage). Note any indications of septic system failure such as stained areas, surficial release of sewage, unusual odours, soft ground, etc. Identify on-site and/or adjacent roads, ditches, surface water bodies. Record the GPS coordinates for the top of the well casing (x,y,z). Record height of top of well casing above ground surface. Include photographs of well head, etc.

Completed by: .... Date ....

2017 Sept 5

PRIVATE WATER WELL SURVEY
QUESTIONNAIRE

TYPE OF DWELLING: ☑ Residential ☐ Commercial
☐ Institutional ☐ Other: ....

Is the owner willing to participate in the survey? **Yes** ☑ **No** ☐

(If no, record address below)

I. OWNER / OCCUPANT INFORMATION AND GENERAL QUESTIONS:

OWNER: [redacted]

Name: .... Telephone No. (business) ....

Address: ....1645 2nd Concession........ Telephone No. (home) ....

Number of Bathrooms .... Number of Occupants ....

OCCUPANT (if other than Owner):

Name: .... Telephone No. (business) ....

Address: .... Telephone No. (home) ....

Number of Bathrooms .... Number of Occupants ....

GENERAL QUESTIONS

How long have you owned/occupied this dwelling? ....

Is the property used year-round or seasonally?.. ....

Is well water used for drinking water supply? Yes ☐ No ☐

If no, why not? ....

Are there any other wells or water supplies used on the property?...

If no, how long has it been since well water was used for drinking? ....

If no, what is the origin of drinking water? ....

II. WATER WELL

A. WELL CONSTRUCTION DETAILS:

Do you have a copy of the MOE Water Well Record? ☐ Yes (Well Record # .. ..)
☐ No

ATTACH A COPY OF WATER WELL RECORD, IF POSSIBLE

Date or Year Constructed .... Contractor ....

Type of Well: Drilled ☐ Dug ☐ Well Diameter (inches) ....

Present Well Depth: .... Original Well Depth .... ☐ Same as Present

Is Well Vented and How?: ....

Top of Well Casing is:

1) Above ground surface ☐ 2) Buried inside a well pit ☐ 3) Buried, but not in a well pit ☐

The accurate location of the well is Known ☐ Unknown ☐

GPS coordinates: E.............................. N..............................

Type of pump: Submersible ☐ Jet Pump ☐ Depth of Pump Intake (if known) ....

Well completed into: Bedrock .... Overburden (Soil) .... Both ....

B. WELL WATER LEVELS:

Indicate whether measured from ☐ ground level or ☐ from top of casing

Original water level depth in metres (on water well record) ....

Subsequent water level measurements (give depths in metres and dates) ....

....

....

C. WATER QUANTITY

Does your well supply enough water for your use? Yes ☐ No ☐

If no, is this the case: All the time ☐ Some of the time ☐ Seasonally ☐ Other ....

Use: Domestic: No ☐ Yes ☐ No. of persons using water from well ....

Domestic includes (circle all that apply) Drinking Washing Cooking

Pool: No ☐ Yes ☐ Lawn Watering/Garden: No ☐ Yes ☐

Livestock: No ☐ Yes ☐

Industrial: No ☐ Yes ☐ (provide details)...

Irrigation: No ☐ Yes ☐ (provide details)...

Other Uses .... Daily Usage (if known) ....

Have you ever experienced any problems with your well? ....

If so, when? ....

What was the cause of the problem? ☐ Drought ☐ Pump Failure ☐ Plugging

☐ Increased Usage ☐ Interference ☐ Other (Please Specify) ....

Did you ever have your well deepened or cleaned, or a new well constructed? ....
If so, why?..
Pump test conducted? ....

If yes, record pumping rate, duration and water levels (static, pumping and recovery)

....

....

....

....

....

D. WATER TREATMENT AND QUALITY

Fresh ☐ Sulphur ☐ Salty ☐ Iron Staining ☐ Soft ☐ Hard ☐

Water Treatment equipment: Softener ☐ UV ☐ Reverse Osmosis ☐ Filters ☐

Other equipment in use (if any): ....
Has your well recently been chlorinated and, if so, when? ....
How would you describe the quality of your water? ☐ Poor ☐ Good ☐ Excellent

Has your water quality previously been tested? No ☐ Yes ☐

If yes, for what and how often? (bacteriological, chemical analyses, etc.) ....

....

ATTACH COPY OF ANY PREVIOUS CHEMICAL AND/OR BACTERIOLOGICAL ANALYSIS RESULTS ON THE WELL WATER, IF AVAILABLE

Water sample collected during this survey: ....
Where was the sample collected: ....

....

....

Field Measurements: Conductivity.................. Temperature .... pH.....................

E. SURFACE WATER

Are there any ponds, creeks etc. on the property? ....
If yes, indicate size and depth? Use?..

III. SEWAGE DISPOSAL SYSTEM

SYSTEM DETAILS

What type of sewage disposal system do you have:

☐ Holding Tank (sewage removed by regular pump-outs)

☐ Septic Tank and Leaching Bed

☐ Other method of on-site disposal. Specify ....

☐ Do not know

Date or year Constructed .... Contractor

How often do you have the holding tank or septic tank pumped out? ....

When was the last time? ....

Have you ever had any problems with your sewage disposal systems? (e.g. leaks from holding tank, failure of septic system including surficial release of sewage, visibly stained areas, unusual odours, soft ground, etc.) ....

IV. PROPERTY SKETCH AND PHOTOGRAPHS

Sketch the location of the septic system (including approximate leaching bed area), the well and the on-site structures, giving the best approximated distance between each of them. Include ground surface slope (in degrees or percentage). Note any indications of septic system failure such as stained areas, surficial release of sewage, unusual odours, soft ground, etc. Identify on-site and/or adjacent roads, ditches, surface water bodies. Record the GPS coordinates for the top of the well casing (x,y,z). Record height of top of well casing above ground surface. Include photographs of well head, etc.

Completed by: .... Date ....

2017 Sept 5

PRIVATE WATER WELL SURVEY QUESTIONNAIRE

TYPE OF DWELLING: ☑ Residential ☐ Commercial ☐ Institutional ☐ Other: ....

Is the owner willing to participate in the survey? **Yes** ☑ **No** ☐

(If no, record address below)

I. OWNER / OCCUPANT INFORMATION AND GENERAL QUESTIONS:

OWNER: [redacted]

Name: .... Telephone No. (business) ....

Address: 2225 Miller Rd Telephone No. (home) ....

Number of Bathrooms .... Number of Occupants ....

OCCUPANT (if other than Owner):

Name: .... Telephone No. (business) ....

Address: .... Telephone No. (home) ....

Number of Bathrooms .... Number of Occupants ....

GENERAL QUESTIONS

How long have you owned/occupied this dwelling? ....

Is the property used year-round or seasonally?.. ....

Is well water used for drinking water supply? Yes ☐ No ☐

If no, why not? ....

Are there any other wells or water supplies used on the property?...

If no, how long has it been since well water was used for drinking? ....

If no, what is the origin of drinking water? ....

II. WATER WELL

A. WELL CONSTRUCTION DETAILS:

Do you have a copy of the MOE Water Well Record? ☐ Yes (Well Record # .. ..)
☐ No

ATTACH A COPY OF WATER WELL RECORD, IF POSSIBLE

Date or Year Constructed .... Contractor ....

Type of Well: Drilled ☐ Dug ☐ Well Diameter (inches) ....

Present Well Depth: .... Original Well Depth............... ☐ Same as Present

Is Well Vented and How?: ....

Top of Well Casing is:

1) Above ground surface ☐ 2) Buried inside a well pit ☐ 3) Buried, but not in a well pit ☐

The accurate location of the well is Known ☐ Unknown ☐

GPS coordinates: E.............................. N..............................

Type of pump: Submersible ☐ Jet Pump ☐ Depth of Pump Intake (if known) ....

Well completed into: Bedrock .... Overburden (Soil) .... Both ....

B. WELL WATER LEVELS:

Indicate whether measured from ☐ ground level or ☐ from top of casing

Original water level depth in metres (on water well record) ....

Subsequent water level measurements (give depths in metres and dates) ....

....

....

C. WATER QUANTITY

Does your well supply enough water for your use? Yes ☐ No ☐

If no, is this the case: All the time ☐ Some of the time ☐ Seasonally ☐ Other ....

Use: Domestic: No ☐ Yes ☐ No. of persons using water from well ....

Domestic includes (circle all that apply) Drinking Washing Cooking

Pool: No ☐ Yes ☐ Lawn Watering/Garden: No ☐ Yes ☐

Livestock: No ☐ Yes ☐

Industrial: No ☐ Yes ☐ (provide details)..

Irrigation: No ☐ Yes ☐ (provide details)...

Other Uses .... Daily Usage (if known) ....

Have you ever experienced any problems with your well? ....

If so, when? ....

What was the cause of the problem? ☐ Drought ☐ Pump Failure ☐ Plugging

☐ Increased Usage ☐ Interference ☐ Other (Please Specify) ....

Did you ever have your well deepened or cleaned, or a new well constructed? ....

If so, why?..

Pump test conducted? ....

If yes, record pumping rate, duration and water levels (static, pumping and recovery)

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D. WATER TREATMENT AND QUALITY

Fresh ☐ Sulphur ☐ Salty ☐ Iron Staining ☐ Soft ☐ Hard ☐

Water Treatment equipment: Softener ☐ UV ☐ Reverse Osmosis ☐ Filters ☐

Other equipment in use (if any): ....

Has your well recently been chlorinated and, if so, when? ....

How would you describe the quality of your water? ☐ Poor ☐ Good ☐ Excellent

Has your water quality previously been tested? No ☐ Yes ☐

If yes, for what and how often? (bacteriological, chemical analyses, etc.) ....

....

ATTACH COPY OF ANY PREVIOUS CHEMICAL AND/OR BACTERIOLOGICAL ANALYSIS RESULTS ON THE WELL WATER, IF AVAILABLE

Water sample collected during this survey: ....

Where was the sample collected: ....

....

....

Field Measurements: Conductivity.................. Temperature .... pH.....................

E. SURFACE WATER

Are there any ponds, creeks etc. on the property? ....

If yes, indicate size and depth? Use? ....

III. SEWAGE DISPOSAL SYSTEM

System Details

What type of sewage disposal system do you have:

☐ Holding Tank (sewage removed by regular pump-outs)

☐ Septic Tank and Leaching Bed

☐ Other method of on-site disposal. Specify ....

☐ Do not know

Date or year Constructed .... Contractor

How often do you have the holding tank or septic tank pumped out? ....

When was the last time? ....

Have you ever had any problems with your sewage disposal systems? (e.g. leaks from holding tank, failure of septic system including surficial release of sewage, visibly stained areas, unusual odours, soft ground, etc.) ....

IV. PROPERTY SKETCH AND PHOTOGRAPHS

Sketch the location of the septic system (including approximate leaching bed area), the well and the on-site structures, giving the best approximated distance between each of them. Include ground surface slope (in degrees or percentage). Note any indications of septic system failure such as stained areas, surficial release of sewage, unusual odours, soft ground, etc. Identify on-site and/or adjacent roads, ditches, surface water bodies. Record the GPS coordinates for the top of the well casing (x,y,z). Record height of top of well casing above ground surface. Include photographs of well head, etc.

Completed by: .... Date ....

2017 Sept 5

PRIVATE WATER WELL SURVEY QUESTIONNAIRE

TYPE OF DWELLING: ☐ Residential ☐ Commercial ☐ Institutional ☐ Other: ....

Is the owner willing to participate in the survey? **Yes** ☐ **No** ☐

(If no, record address below)

I. OWNER / OCCUPANT INFORMATION AND GENERAL QUESTIONS:

OWNER: [redacted]

Name: .... Telephone No. (business) ....

Address: 2276 2nd Concession Telephone No. (home) ....

Number of Bathrooms .... Number of Occupants ....

OCCUPANT (if other than Owner):

Name: .... Telephone No. (business) ....

Address: .... Telephone No. (home) ....

Number of Bathrooms .... Number of Occupants ....

GENERAL QUESTIONS

How long have you owned/occupied this dwelling? ....

Is the property used year-round or seasonally?.. ....

Is well water used for drinking water supply? Yes ☐ No ☐

If no, why not? ....

Are there any other wells or water supplies used on the property?..

If no, how long has it been since well water was used for drinking? ....

If no, what is the origin of drinking water? ....

II. WATER WELL

A. WELL CONSTRUCTION DETAILS:

Do you have a copy of the MOE Water Well Record? ☐ Yes (Well Record # .. ..)
☐ No

ATTACH A COPY OF WATER WELL RECORD, IF POSSIBLE

Date or Year Constructed .... Contractor ....

Type of Well: Drilled ☐ Dug ☐ Well Diameter (inches) ....

Present Well Depth: .... Original Well Depth................ ☐ Same as Present

Is Well Vented and How?: ....

Top of Well Casing is:

1) Above ground surface ☐ 2) Buried inside a well pit ☐ 3) Buried, but not in a well pit ☐

The accurate location of the well is Known ☐ Unknown ☐

GPS coordinates: E.............................. N..............................

Type of pump: Submersible ☐ Jet Pump ☐ Depth of Pump Intake (if known) ....

Well completed into: Bedrock .... Overburden (Soil) .... Both ....

B. WELL WATER LEVELS:

Indicate whether measured from ☐ ground level or ☐ from top of casing

Original water level depth in metres (on water well record) ....

Subsequent water level measurements (give depths in metres and dates) ....

....

....

C. WATER QUANTITY

Does your well supply enough water for your use? Yes ☐ No ☐

If no, is this the case: All the time ☐ Some of the time ☐ Seasonally ☐ Other ....

Use: Domestic: No ☐ Yes ☐ No. of persons using water from well ....

Domestic includes (circle all that apply) Drinking Washing Cooking

Pool: No ☐ Yes ☐ Lawn Watering/Garden: No ☐ Yes ☐

Livestock: No ☐ Yes ☐

Industrial: No ☐ Yes ☐ (provide details)...

Irrigation: No ☐ Yes ☐ (provide details)...

Other Uses .... Daily Usage (if known) ....

Have you ever experienced any problems with your well? ....

If so, when? ....

What was the cause of the problem? ☐ Drought ☐ Pump Failure ☐ Plugging

☐ Increased Usage ☐ Interference ☐ Other (Please Specify) ....

Did you ever have your well deepened or cleaned, or a new well constructed? ....
If so, why?..
Pump test conducted? ....

If yes, record pumping rate, duration and water levels (static, pumping and recovery)

....

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D. WATER TREATMENT AND QUALITY

Fresh ☐ Sulphur ☐ Salty ☐ Iron Staining ☐ Soft ☐ Hard ☐

Water Treatment equipment: Softener ☐ UV ☐ Reverse Osmosis ☐ Filters ☐

Other equipment in use (if any): ....
Has your well recently been chlorinated and, if so, when? ....
How would you describe the quality of your water? ☐ Poor ☐ Good ☐ Excellent

Has your water quality previously been tested? No ☐ Yes ☐

If yes, for what and how often? (bacteriological, chemical analyses, etc.) ....

....

ATTACH COPY OF ANY PREVIOUS CHEMICAL AND/OR BACTERIOLOGICAL ANALYSIS RESULTS ON THE WELL WATER, IF AVAILABLE

Water sample collected during this survey: ....
Where was the sample collected: ....

....

....

Field Measurements: Conductivity.................. Temperature .... pH....................

E. SURFACE WATER

Are there any ponds, creeks etc. on the property? ....
If yes, indicate size and depth? Use? ....

III. SEWAGE DISPOSAL SYSTEM

SYSTEM DETAILS

What type of sewage disposal system do you have:

☐ Holding Tank (sewage removed by regular pump-outs)

☐ Septic Tank and Leaching Bed

☐ Other method of on-site disposal. Specify ....

☐ Do not know

Date or year Constructed .... Contractor

How often do you have the holding tank or septic tank pumped out? ....

When was the last time? ....

Have you ever had any problems with your sewage disposal systems? (e.g. leaks from holding tank, failure of septic system including surficial release of sewage, visibly stained areas, unusual odours, soft ground, etc.) ....

IV. PROPERTY SKETCH AND PHOTOGRAPHS

Sketch the location of the septic system (including approximate leaching bed area), the well and the on-site structures, giving the best approximated distance between each of them. Include ground surface slope (in degrees or percentage). Note any indications of septic system failure such as stained areas, surficial release of sewage, unusual odours, soft ground, etc. Identify on-site and/or adjacent roads, ditches, surface water bodies. Record the GPS coordinates for the top of the well casing (x,y,z). Record height of top of well casing above ground surface. Include photographs of well head, etc.

Completed by: .... Date ....

2017

Sept 19

PRIVATE WATER WELL SURVEY QUESTIONNAIRE

2439 Moller Rd

TYPE OF DWELLING: ☐ Residential ☐ Commercial ☐ Institutional ☐ Other: .... 2 wells onsite not in use

Is the owner willing to participate in the survey? **Yes ☐** **No ☐** Cistern

(If no, record address below)

not hooked up yet, may connect to them in future for outdoor use

I. OWNER / OCCUPANT INFORMATION AND GENERAL QUESTIONS:

OWNER:

Name: .... Telephone No. (business) ....

Address: .... Telephone No. (home) ....

Number of Bathrooms .... Number of Occupants ....

OCCUPANT (if other than Owner):

Name: .... Telephone No. (business) ....

Address: .... Telephone No. (home) ....

Number of Bathrooms .... Number of Occupants ....

GENERAL QUESTIONS

How long have you owned/occupied this dwelling? ....

Is the property used year-round or seasonally?.. ....

Is well water used for drinking water supply? Yes ☐ No ☐

If no, why not? ....

Are there any other wells or water supplies used on the property?..

If no, how long has it been since well water was used for drinking? ....

If no, what is the origin of drinking water? ....

II. WATER WELL

A. WELL CONSTRUCTION DETAILS:

Do you have a copy of the MOE Water Well Record? ☐ Yes (Well Record # .. ..)
☐ No

ATTACH A COPY OF WATER WELL RECORD, IF POSSIBLE

Date or Year Constructed .... Contractor ....

Type of Well: Drilled ☐ Dug ☐ Well Diameter (inches) ....

Present Well Depth: .... Original Well Depth .... ☐ Same as Present

Is Well Vented and How?:..

Top of Well Casing is:

1) Above ground surface ☐ 2) Buried inside a well pit ☐ 3) Buried, but not in a well pit ☐

The accurate location of the well is Known ☐ Unknown ☐

GPS coordinates: E.............................. N.............................

Type of pump: Submersible ☐ Jet Pump ☐ Depth of Pump Intake (if known) ....

Well completed into: Bedrock .... Overburden (Soil) .... Both ....

B. WELL WATER LEVELS:

Indicate whether measured from ☐ ground level or ☐ from top of casing

Original water level depth in metres (on water well record) ....

Subsequent water level measurements (give depths in metres and dates) ....

....

....

C. WATER QUANTITY

Does your well supply enough water for your use? Yes ☐ No ☐

If no, is this the case: All the time ☐ Some of the time ☐ Seasonally ☐ Other ....

Use: Domestic: No ☐ Yes ☐ No. of persons using water from well ....

Domestic includes (circle all that apply) Drinking Washing Cooking

Pool: No ☐ Yes ☐ Lawn Watering/Garden: No ☐ Yes ☐

Livestock: No ☐ Yes ☐

Industrial: No ☐ Yes ☐ (provide details)..

Irrigation: No ☐ Yes ☐ (provide details)..

Other Uses .... Daily Usage (if known) ....

Have you ever experienced any problems with your well? ....

If so, when? ....

What was the cause of the problem? ☐ Drought ☐ Pump Failure ☐ Plugging

☐ Increased Usage ☐ Interference ☐ Other (Please Specify) ....

Did you ever have your well deepened or cleaned, or a new well constructed? ....
If so, why?..
Pump test conducted? ....

If yes, record pumping rate, duration and water levels (static, pumping and recovery)

....

....

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....

D. WATER TREATMENT AND QUALITY

Fresh ☐ Sulphur ☐ Salty ☐ Iron Staining ☐ Soft ☐ Hard ☐

Water Treatment equipment: Softener ☐ UV ☐ Reverse Osmosis ☐ Filters ☐

Other equipment in use (if any): ....
Has your well recently been chlorinated and, if so, when? ....
How would you describe the quality of your water? ☐ Poor ☐ Good ☐ Excellent

Has your water quality previously been tested? No ☐ Yes ☐

If yes, for what and how often? (bacteriological, chemical analyses, etc.) ....

....

ATTACH COPY OF ANY PREVIOUS CHEMICAL AND/OR BACTERIOLOGICAL ANALYSIS RESULTS ON THE WELL WATER, IF AVAILABLE

Water sample collected during this survey: ....
Where was the sample collected: ....

....

....

Field Measurements: Conductivity.................. Temperature .... pH.....................

E. SURFACE WATER

Are there any ponds, creeks etc. on the property? ....
If yes, indicate size and depth? Use?..

III. SEWAGE DISPOSAL SYSTEM

SYSTEM DETAILS

What type of sewage disposal system do you have:

☐ Holding Tank (sewage removed by regular pump-outs)

☐ Septic Tank and Leaching Bed

☐ Other method of on-site disposal. Specify ....

☐ Do not know

Date or year Constructed .... Contractor

How often do you have the holding tank or septic tank pumped out? ....

When was the last time? ....

Have you ever had any problems with your sewage disposal systems? (e.g. leaks from holding tank, failure of septic system including surficial release of sewage, visibly stained areas, unusual odours, soft ground, etc.) ....

IV. PROPERTY SKETCH AND PHOTOGRAPHS

Sketch the location of the septic system (including approximate leaching bed area), the well and the on-site structures, giving the best approximated distance between each of them. Include ground surface slope (in degrees or percentage). Note any indications of septic system failure such as stained areas, surficial release of sewage, unusual odours, soft ground, etc. Identify on-site and/or adjacent roads, ditches, surface water bodies. Record the GPS coordinates for the top of the well casing (x,y,z). Record height of top of well casing above ground surface. Include photographs of well head, etc.

Completed by: .... Date ....

2017

Sept 19

2229 ~~[illegible]~~ Hwy 3

No well
Cistern

PRIVATE WATER WELL SURVEY QUESTIONNAIRE

TYPE OF DWELLING: ☑ Residential ☐ Commercial
☐ Institutional ☒ ~~Other~~: ....

Is the owner willing to participate in the survey? **Yes** ☒ **No** ☐

(If no, record address below)

I. OWNER / OCCUPANT INFORMATION AND GENERAL QUESTIONS:

OWNER:

Name: .... Telephone No. (business) ....
Address: .... Telephone No. (home) ....
Number of Bathrooms .... Number of Occupants ....

OCCUPANT (if other than Owner):

Name: .... Telephone No. (business) ....
Address: .... Telephone No. (home) ....
Number of Bathrooms .... Number of Occupants ....

GENERAL QUESTIONS

How long have you owned/occupied this dwelling? ....
Is the property used year-round or seasonally?.. ....
Is well water used for drinking water supply? Yes ☐ No ☐
If no, why not? ....
Are there any other wells or water supplies used on the property?...
If no, how long has it been since well water was used for drinking? ....
If no, what is the origin of drinking water? ....

II. WATER WELL

A. WELL CONSTRUCTION DETAILS:

Do you have a copy of the MOE Water Well Record? ☐ Yes (Well Record # .. ..)
☐ No

ATTACH A COPY OF WATER WELL RECORD, IF POSSIBLE

Date or Year Constructed .... Contractor ....
Type of Well: Drilled ☐ Dug ☐ Well Diameter (inches) ....
Present Well Depth: .... Original Well Depth .... ☐ Same as Present

Is Well Vented and How?: ....

Top of Well Casing is:

1) Above ground surface ☐ 2) Buried inside a well pit ☐ 3) Buried, but not in a well pit ☐

The accurate location of the well is Known ☐ Unknown ☐

GPS coordinates: E.............................. N..............................

Type of pump: Submersible ☐ Jet Pump ☐ Depth of Pump Intake (if known) ....

Well completed into: Bedrock .... Overburden (Soil) .... Both ....

B. WELL WATER LEVELS:

Indicate whether measured from ☐ ground level or ☐ from top of casing

Original water level depth in metres (on water well record) ....

Subsequent water level measurements (give depths in metres and dates) ....

....

....

C. WATER QUANTITY

Does your well supply enough water for your use? Yes ☐ No ☐

If no, is this the case: All the time ☐ Some of the time ☐ Seasonally ☐ Other ....

Use: Domestic: No ☐ Yes ☐ No. of persons using water from well ....

Domestic includes (circle all that apply) Drinking Washing Cooking

Pool: No ☐ Yes ☐ Lawn Watering/Garden: No ☐ Yes ☐

Livestock: No ☐ Yes ☐

Industrial: No ☐ Yes ☐ (provide details)...

Irrigation: No ☐ Yes ☐ (provide details)..

Other Uses .... Daily Usage (if known) ....

Have you ever experienced any problems with your well? ....

If so, when? ....

What was the cause of the problem? ☐ Drought ☐ Pump Failure ☐ Plugging

☐ Increased Usage ☐ Interference ☐ Other (Please Specify) ....

Did you ever have your well deepened or cleaned, or a new well constructed? ....

If so, why?..

Pump test conducted? ....

If yes, record pumping rate, duration and water levels (static, pumping and recovery)

....

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D. WATER TREATMENT AND QUALITY

Fresh ☐ Sulphur ☐ Salty ☐ Iron Staining ☐ Soft ☐ Hard ☐

Water Treatment equipment: Softener ☐ UV ☐ Reverse Osmosis ☐ Filters ☐

Other equipment in use (if any): ....

Has your well recently been chlorinated and, if so, when? ....

How would you describe the quality of your water? ☐ Poor ☐ Good ☐ Excellent

Has your water quality previously been tested? No ☐ Yes ☐

If yes, for what and how often? (bacteriological, chemical analyses, etc.) ....

....

ATTACH COPY OF ANY PREVIOUS CHEMICAL AND/OR BACTERIOLOGICAL ANALYSIS RESULTS ON THE WELL WATER, IF AVAILABLE

Water sample collected during this survey: ....

Where was the sample collected: ....

....

....

Field Measurements: Conductivity.................. Temperature .... pH.....................

E. SURFACE WATER

Are there any ponds, creeks etc. on the property? ....

If yes, indicate size and depth? Use?...

III. SEWAGE DISPOSAL SYSTEM

SYSTEM DETAILS

What type of sewage disposal system do you have:

☐ Holding Tank (sewage removed by regular pump-outs)

☐ Septic Tank and Leaching Bed

☐ Other method of on-site disposal. Specify ....

☐ Do not know

Date or year Constructed .... Contractor

How often do you have the holding tank or septic tank pumped out? ....

When was the last time? ....

Have you ever had any problems with your sewage disposal systems? (e.g. leaks from holding tank, failure of septic system including surficial release of sewage, visibly stained areas, unusual odours, soft ground, etc.) ....

IV. PROPERTY SKETCH AND PHOTOGRAPHS

Sketch the location of the septic system (including approximate leaching bed area), the well and the on-site structures, giving the best approximated distance between each of them. Include ground surface slope (in degrees or percentage). Note any indications of septic system failure such as stained areas, surficial release of sewage, unusual odours, soft ground, etc. Identify on-site and/or adjacent roads, ditches, surface water bodies. Record the GPS coordinates for the top of the well casing (x,y,z). Record height of top of well casing above ground surface. Include photographs of well head, etc.

Completed by: .... Date ....

Sept 19

1826 Miller Rd
Think there is a well
~~[illegible]~~ but not used
Cistern

PRIVATE WATER WELL SURVEY QUESTIONNAIRE

TYPE OF DWELLING: ☐ Residential ☐ Commercial
☐ Institutional ☐ Other: ....

Is the owner willing to participate in the survey? **Yes** ☐ **No** ☐

(If no, record address below)

I. OWNER / OCCUPANT INFORMATION AND GENERAL QUESTIONS:

OWNER:

Name: .... Telephone No. (business) ....

Address: .... Telephone No. (home) ....

Number of Bathrooms .... Number of Occupants ....

OCCUPANT (if other than Owner):

Name: .... Telephone No. (business) ....

Address: .... Telephone No. (home) ....

Number of Bathrooms .... Number of Occupants ....

GENERAL QUESTIONS

How long have you owned/occupied this dwelling? ....

Is the property used year-round or seasonally?.. ....

Is well water used for drinking water supply? Yes ☐ No ☐

If no, why not? ....

Are there any other wells or water supplies used on the property?..

If no, how long has it been since well water was used for drinking? ....

If no, what is the origin of drinking water? ....

II. WATER WELL

A. WELL CONSTRUCTION DETAILS:

Do you have a copy of the MOE Water Well Record? ☐ Yes (Well Record # .. ..)
☐ No

ATTACH A COPY OF WATER WELL RECORD, IF POSSIBLE

Date or Year Constructed .... Contractor ....

Type of Well: Drilled ☐ Dug ☐ Well Diameter (inches) ....

Present Well Depth: .... Original Well Depth............... ☐ Same as Present

Is Well Vented and How?: ....

Top of Well Casing is:

1) Above ground surface ☐ 2) Buried inside a well pit ☐ 3) Buried, but not in a well pit ☐

The accurate location of the well is Known ☐ Unknown ☐

GPS coordinates: E............................... N...............................

Type of pump: Submersible ☐ Jet Pump ☐ Depth of Pump Intake (if known) ....

Well completed into: Bedrock .... Overburden (Soil) .... Both ....

B. WELL WATER LEVELS:

Indicate whether measured from ☐ ground level or ☐ from top of casing

Original water level depth in metres (on water well record) ....

Subsequent water level measurements (give depths in metres and dates) ....

....

....

C. WATER QUANTITY

Does your well supply enough water for your use? Yes ☐ No ☐

If no, is this the case: All the time ☐ Some of the time ☐ Seasonally ☐ Other ....

Use: Domestic: No ☐ Yes ☐ No. of persons using water from well ....

Domestic includes (circle all that apply) Drinking Washing Cooking

Pool: No ☐ Yes ☐ Lawn Watering/Garden: No ☐ Yes ☐

Livestock: No ☐ Yes ☐

Industrial: No ☐ Yes ☐ (provide details)..

Irrigation: No ☐ Yes ☐ (provide details)..

Other Uses .... Daily Usage (if known) ....

Have you ever experienced any problems with your well? ....

If so, when? ....

What was the cause of the problem? ☐ Drought ☐ Pump Failure ☐ Plugging

☐ Increased Usage ☐ Interference ☐ Other (Please Specify) ....

Did you ever have your well deepened or cleaned, or a new well constructed? ....
If so, why?..
Pump test conducted? ....

If yes, record pumping rate, duration and water levels (static, pumping and recovery)

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D. WATER TREATMENT AND QUALITY

Fresh ☐ Sulphur ☐ Salty ☐ Iron Staining ☐ Soft ☐ Hard ☐

Water Treatment equipment: Softener ☐ UV ☐ Reverse Osmosis ☐ Filters ☐

Other equipment in use (if any): ....
Has your well recently been chlorinated and, if so, when? ....
How would you describe the quality of your water? ☐ Poor ☐ Good ☐ Excellent

Has your water quality previously been tested? No ☐ Yes ☐

If yes, for what and how often? (bacteriological, chemical analyses, etc.) ....

....

ATTACH COPY OF ANY PREVIOUS CHEMICAL AND/OR BACTERIOLOGICAL ANALYSIS RESULTS ON THE WELL WATER, IF AVAILABLE

Water sample collected during this survey: ....
Where was the sample collected: ....
....
....
Field Measurements: Conductivity.................. Temperature .... pH....................

E. SURFACE WATER

Are there any ponds, creeks etc. on the property? ....
If yes, indicate size and depth? Use? ....

III. SEWAGE DISPOSAL SYSTEM

SYSTEM DETAILS

What type of sewage disposal system do you have:

☐ Holding Tank (sewage removed by regular pump-outs)

☐ Septic Tank and Leaching Bed

☐ Other method of on-site disposal. Specify ....

☐ Do not know

Date or year Constructed .... Contractor

How often do you have the holding tank or septic tank pumped out? ....

When was the last time? ....

Have you ever had any problems with your sewage disposal systems? (e.g. leaks from holding tank, failure of septic system including surficial release of sewage, visibly stained areas, unusual odours, soft ground, etc.) ....

IV. PROPERTY SKETCH AND PHOTOGRAPHS

Sketch the location of the septic system (including approximate leaching bed area), the well and the on-site structures, giving the best approximated distance between each of them. Include ground surface slope (in degrees or percentage). Note any indications of septic system failure such as stained areas, surficial release of sewage, unusual odours, soft ground, etc. Identify on-site and/or adjacent roads, ditches, surface water bodies. Record the GPS coordinates for the top of the well casing (x,y,z). Record height of top of well casing above ground surface. Include photographs of well head, etc.

Completed by: .... Date ....

2017 Sept 28

PRIVATE WATER WELL SURVEY QUESTIONNAIRE

TYPE OF DWELLING: ☐ Residential ☐ Commercial ☐ Institutional ☐ Other: .... Cistern Well on property, not connected

Is the owner willing to participate in the survey? **Yes** ☐ **No** ☐

(If no, record address below)

I. OWNER / OCCUPANT INFORMATION AND GENERAL QUESTIONS:

OWNER:

Name: .... Telephone No. (business) ....

Address: 1379 Killeen.. Telephone No. (home) ....

Number of Bathrooms .... Number of Occupants ....

OCCUPANT (if other than Owner):

Name: .... Telephone No. (business) ....

Address: .... Telephone No. (home) ....

Number of Bathrooms .... Number of Occupants ....

GENERAL QUESTIONS

How long have you owned/occupied this dwelling? ....

Is the property used year-round or seasonally?.. ....

Is well water used for drinking water supply? Yes ☐ No ☐

If no, why not? ....

Are there any other wells or water supplies used on the property?...

If no, how long has it been since well water was used for drinking? ....

If no, what is the origin of drinking water? ....

II. WATER WELL

A. WELL CONSTRUCTION DETAILS:

Do you have a copy of the MOE Water Well Record? ☐ Yes (Well Record # .. ..)
☐ No

ATTACH A COPY OF WATER WELL RECORD, IF POSSIBLE

Date or Year Constructed .... Contractor ....

Type of Well: Drilled ☐ Dug ☐ Well Diameter (inches) ....

Present Well Depth: .... Original Well Depth .... ☐ Same as Present

Is Well Vented and How?: ....

Top of Well Casing is:

1) Above ground surface ☐ 2) Buried inside a well pit ☐ 3) Buried, but not in a well pit ☐

The accurate location of the well is Known ☐ Unknown ☐

GPS coordinates: E.............................. N..............................

Type of pump: Submersible ☐ Jet Pump ☐ Depth of Pump Intake (if known) ....

Well completed into: Bedrock .... Overburden (Soil) .... Both ....

B. WELL WATER LEVELS:

Indicate whether measured from ☐ ground level or ☐ from top of casing

Original water level depth in metres (on water well record) ....

Subsequent water level measurements (give depths in metres and dates) ....

....

....

C. WATER QUANTITY

Does your well supply enough water for your use? Yes ☐ No ☐

If no, is this the case: All the time ☐ Some of the time ☐ Seasonally ☐ Other ....

Use: Domestic: No ☐ Yes ☐ No. of persons using water from well ....

Domestic includes (circle all that apply) Drinking Washing Cooking

Pool: No ☐ Yes ☐ Lawn Watering/Garden: No ☐ Yes ☐

Livestock: No ☐ Yes ☐

Industrial: No ☐ Yes ☐ (provide details)...

Irrigation: No ☐ Yes ☐ (provide details)...

Other Uses .... Daily Usage (if known) ....

Have you ever experienced any problems with your well? ....

If so, when? ....

What was the cause of the problem? ☐ Drought ☐ Pump Failure ☐ Plugging

☐ Increased Usage ☐ Interference ☐ Other (Please Specify) ....

Did you ever have your well deepened or cleaned, or a new well constructed? ....

If so, why?..

Pump test conducted? ....

If yes, record pumping rate, duration and water levels (static, pumping and recovery)

....

....

....

....

....

D. WATER TREATMENT AND QUALITY

Fresh ☐ Sulphur ☐ Salty ☐ Iron Staining ☐ Soft ☐ Hard ☐

Water Treatment equipment: Softener ☐ UV ☐ Reverse Osmosis ☐ Filters ☐

Other equipment in use (if any): ....

Has your well recently been chlorinated and, if so, when? ....

How would you describe the quality of your water? ☐ Poor ☐ Good ☐ Excellent

Has your water quality previously been tested? No ☐ Yes ☐

If yes, for what and how often? (bacteriological, chemical analyses, etc.) ....

....

ATTACH COPY OF ANY PREVIOUS CHEMICAL AND/OR BACTERIOLOGICAL ANALYSIS RESULTS ON THE WELL WATER, IF AVAILABLE

Water sample collected during this survey: ....

Where was the sample collected: ....

....

....

Field Measurements: Conductivity.................. Temperature .... pH.....................

E. SURFACE WATER

Are there any ponds, creeks etc. on the property? ....

If yes, indicate size and depth? Use?..

III. SEWAGE DISPOSAL SYSTEM

SYSTEM DETAILS

What type of sewage disposal system do you have:

☐ Holding Tank (sewage removed by regular pump-outs)

☐ Septic Tank and Leaching Bed

☐ Other method of on-site disposal. Specify ....

☐ Do not know

Date or year Constructed .... Contractor

How often do you have the holding tank or septic tank pumped out? ....

When was the last time? ....

Have you ever had any problems with your sewage disposal systems? (e.g. leaks from holding tank, failure of septic system including surficial release of sewage, visibly stained areas, unusual odours, soft ground, etc.) ....

IV. PROPERTY SKETCH AND PHOTOGRAPHS

Sketch the location of the septic system (including approximate leaching bed area), the well and the on-site structures, giving the best approximated distance between each of them. Include ground surface slope (in degrees or percentage). Note any indications of septic system failure such as stained areas, surficial release of sewage, unusual odours, soft ground, etc. Identify on-site and/or adjacent roads, ditches, surface water bodies. Record the GPS coordinates for the top of the well casing (x,y,z). Record height of top of well casing above ground surface. Include photographs of well head, etc.

Completed by: .... Date ....

2017 Sept 20

PRIVATE WATER WELL SURVEY QUESTIONNAIRE

TYPE OF DWELLING: ☐ Residential ☐ Commercial ☐ Institutional ☐ Other: ....

Is the owner willing to participate in the survey? **Yes** ☐ **No** ☐

(If no, record address below) CISTERN / NO WELL

I. OWNER / OCCUPANT INFORMATION AND GENERAL QUESTIONS:

OWNER:

[redacted]

Name: .... Telephone No. (business) ....

Address: 1446 Killaly Telephone No. (home) ....

Number of Bathrooms .... Number of Occupants ....

OCCUPANT (if other than Owner):

Name: .... Telephone No. (business) ....

Address: .... Telephone No. (home) ....

Number of Bathrooms .... Number of Occupants ....

GENERAL QUESTIONS

How long have you owned/occupied this dwelling? ....

Is the property used year-round or seasonally?.. ....

Is well water used for drinking water supply? Yes ☐ No ☐

If no, why not? ....

Are there any other wells or water supplies used on the property?.......................................

If no, how long has it been since well water was used for drinking? ....

If no, what is the origin of drinking water? ....

II. WATER WELL

A. WELL CONSTRUCTION DETAILS:

Do you have a copy of the MOE Water Well Record? ☐ Yes (Well Record # .. ..)
☐ No

ATTACH A COPY OF WATER WELL RECORD, IF POSSIBLE

Date or Year Constructed .... Contractor ....

Type of Well: Drilled ☐ Dug ☐ Well Diameter (inches) ....

Present Well Depth: .... Original Well Depth .... ☐ Same as Present

Is Well Vented and How?: ....

Top of Well Casing is:

1) Above ground surface ☐ 2) Buried inside a well pit ☐ 3) Buried, but not in a well pit ☐

The accurate location of the well is Known ☐ Unknown ☐

GPS coordinates: E.............................. N..............................

Type of pump: Submersible ☐ Jet Pump ☐ Depth of Pump Intake (if known) ....

Well completed into: Bedrock .... Overburden (Soil) .... Both ....

B. WELL WATER LEVELS:

Indicate whether measured from ☐ ground level or ☐ from top of casing

Original water level depth in metres (on water well record) ....

Subsequent water level measurements (give depths in metres and dates) ....

....

....

C. WATER QUANTITY

Does your well supply enough water for your use? Yes ☐ No ☐

If no, is this the case: All the time ☐ Some of the time ☐ Seasonally ☐ Other ....

Use: Domestic: No ☐ Yes ☐ No. of persons using water from well ....

Domestic includes (circle all that apply) Drinking Washing Cooking

Pool: No ☐ Yes ☐ Lawn Watering/Garden: No ☐ Yes ☐

Livestock: No ☐ Yes ☐

Industrial: No ☐ Yes ☐ (provide details)..

Irrigation: No ☐ Yes ☐ (provide details)...

Other Uses .... Daily Usage (if known) ....

Have you ever experienced any problems with your well? ....

If so, when? ....

What was the cause of the problem? ☐ Drought ☐ Pump Failure ☐ Plugging

☐ Increased Usage ☐ Interference ☐ Other (Please Specify) ....

Did you ever have your well deepened or cleaned, or a new well constructed? ....

If so, why?..

Pump test conducted? ....

If yes, record pumping rate, duration and water levels (static, pumping and recovery)

....

....

....

....

....

D. WATER TREATMENT AND QUALITY

Fresh ☐ Sulphur ☐ Salty ☐ Iron Staining ☐ Soft ☐ Hard ☐

Water Treatment equipment: Softener ☐ UV ☐ Reverse Osmosis ☐ Filters ☐

Other equipment in use (if any): ....

Has your well recently been chlorinated and, if so, when? ....

How would you describe the quality of your water? ☐ Poor ☐ Good ☐ Excellent

Has your water quality previously been tested? No ☐ Yes ☐

If yes, for what and how often? (bacteriological, chemical analyses, etc.) ....

....

ATTACH COPY OF ANY PREVIOUS CHEMICAL AND/OR BACTERIOLOGICAL ANALYSIS RESULTS ON THE WELL WATER, IF AVAILABLE

Water sample collected during this survey: ....

Where was the sample collected: ....

....

....

Field Measurements: Conductivity.................. Temperature .... pH....................

E. SURFACE WATER

Are there any ponds, creeks etc. on the property? ....

If yes, indicate size and depth? Use? ....

III. SEWAGE DISPOSAL SYSTEM

SYSTEM DETAILS

What type of sewage disposal system do you have:

☐ Holding Tank (sewage removed by regular pump-outs)

☐ Septic Tank and Leaching Bed

☐ Other method of on-site disposal. Specify ....

☐ Do not know

Date or year Constructed .... Contractor

How often do you have the holding tank or septic tank pumped out? ....

When was the last time? ....

Have you ever had any problems with your sewage disposal systems? (e.g. leaks from holding tank, failure of septic system including surficial release of sewage, visibly stained areas, unusual odours, soft ground, etc.) ....

IV. PROPERTY SKETCH AND PHOTOGRAPHS

Sketch the location of the septic system (including approximate leaching bed area), the well and the on-site structures, giving the best approximated distance between each of them. Include ground surface slope (in degrees or percentage). Note any indications of septic system failure such as stained areas, surficial release of sewage, unusual odours, soft ground, etc. Identify on-site and/or adjacent roads, ditches, surface water bodies. Record the GPS coordinates for the top of the well casing (x,y,z). Record height of top of well casing above ground surface. Include photographs of well head, etc.

Completed by: .... Date ....

APPENDIX G

Curricula Vitae

Education

PhD Osgoode Hall Law School, York University, 2013

LLM Osgoode Hall Law School, York University, 2005

MBA Centre for Innovative Management, Athabasca University, 2001

M.Sc. Earth Sciences, Brock University, 1997

B.Sc. Geological Sciences (Honours), University of Toronto, 1985

Certifications

Professional Geoscientist, P.Geo., Ontario

Certified Professional Accountant, CPA, Ontario

Certified Management Consultant, CMC

Project Management Professional, PMP

Languages

English – Fluent

St. Catharines

Senior Hydrogeologist and Principal

As a Senior Hydrogeologist with Golder, Dr. McFarland has more than 30 years of professional experience and a broad background in conducting, managing, and directing aggregate waste management, mining, power, oil and gas, and ground management and protection projects. He served as the project director for work programs for proposed mines, aggregate operations, and industrial facilities.

He has a broad background in licensing and permitting of pits and quarries. This includes the licensing for the expansion of the Lafarge Dundas Quarry, the expansion of the Lafarge Woodstock Quarry, the expansion of the Nelson Aggregate Quarry, the RW Tomlinson license application, the St. Mary's cement Bonis Quarry, the ongoing expansion of the Port Colborne Quarry, and the Lafarge Goodwood Pit and other sites. He is also involved in numerous PPTW applications for pits and quarries. In addition, he has extensive experience in site selection studies and resource evaluations for aggregate sites.

Sean acted as the Project Director and Senior Hydrogeologist for the 2014 and 2015 annual landfill monitoring reports for the Vale Port Colborne site and for eight landfill monitoring programs in Niagara Region. He was the Project Manager and Senior Hydrogeologist for the extensive Adams Mine landfill project, which involved the successful permitting of a 20 million tonne hydraulic containment engineered landfill facility, within a 200 m deep former open pit mine, following hydrogeological investigations collected over an 8-year period that involved extensive monitoring well installation, electronic instrumentation and testing, pump test analyses and groundwater flow modelling. He has also been an expert witness for hydrogeology at Environmental Assessment (EA) and Ontario Municipal board (OMB) hearings and has been involved in extensive contaminated site investigations including legal disputes.

Additional project experience includes hydrogeological assessments for the low level radioactive (LLRWM) facility concepts of waste management for the Canadian federal government Siting Task Force Secretariat (STFS) in limestone bedrock beneath the Great Lakes, and fractured and faulted Precambrian granitic gneiss at the Chalk River Nuclear Reactor site in northern Ontario, Canada. Further project experience in fractured rock includes the proposed Steetley Landfill, in limestone bedrock of the Niagara escarpment, including an extensive EA level hydrogeological investigation, over a 5-year period, and the existing Brow Landfill including an EPA level investigation, a long-term monitoring program and remediation.

Employment History

Golder Associates Ltd. – Mississauga, Ontario
Senior Geoscientist and Principal (1987 to Present)

Hydrogeologist then Senior Hydrogeologist (1987-present)
Managing Principal, Vice President, Canada (2005-2014)
Associate - 1997 appointment
Principal - 2003 appointment

Geologist and Hydrogeologist (1985 to 1987)
Characterization of proposed and existing metal and industrial mineral facilities and impact assessments for industrial facilities.

Regina Associates Ltd. – Kingston, Ontario
Geoscientist (1983 to 1987)

Characterization of proposed and existing metal and industrial mineral facilities in Ontario, Nova Scotia, Newfoundland, British Columbia, and the Northwest Territories; and hydrogeological impact assessments for industrial facilities.

PROJECT EXPERIENCE – AGGREGATE INDUSTRY

Aggregate Resource Evaluation
Regional Municipality of Peel, ON

Project Manager and geologist for evaluation of sand and gravel and bedrock resources in the Regional Municipality of Peel, Ontario for the provincial Ministry of Municipal Affairs and Housing (MMAH). The project was carried out as part of the development of the official plan for the Region.

Region of Peel
Regional Municipality of Peel, ON

Technical advisor for ARIP (Aggregate Resource Inventory Paper) report for the Regional Municipality of Peel. The project involves and evaluation of shale and gravel, limestone and shale resources in the Region and was submitted to the Ontario Geological Survey for publication as a government document ARIP Paper.

Navan Quarry
Navan, ON

Project Manager and geologist for evaluation of sand and gravel and bedrock resources in the Regional Municipality of Peel, Ontario for the provincial Ministry of Municipal Affairs and Housing (MMAH). The project was carried out as part of the development of the official plan for the Region.

Brockville Quarry
Brockville, ON

Project Manager and hydrogeologist for hydrogeological evaluation of the Permanent Lafarge Brockville Quarry. The results of the evaluation were used to negotiate the liability of the quarry to alleged water well interference associated with quarry expansion with the Ontario Ministry of the Environment.

Dufferin Aggregates
ON

Project Director and senior hydrogeologist for numerous aggregate projects at quarries and sand and gravel pits within Ontario including resource evaluations, hydrogeological investigations, and environmental assessments.

Due Diligence Studies
Southern Ontario

Project Manager and senior hydrogeologist for due diligence studies as part of the potential purchase of aggregate companies and operating pits and quarries in Ontario.

Site Selection Studies
Southern Ontario

Project Director for site selection studies for development of quarries and sand and gravel operations in Ontario.

Lafarge - North Quarry
Flamborough, ON

Project Director for hydrogeological program at the Lafarge (formerly Redland) Quarry Operations in Flamborough, Ontario, to meet the regulatory requirements of the Ontario Ministry of the Environment.

Proposed Halminen Quarry
Buckhorn, ON

Project Manager for a private application for a license for a proposed limestone quarry near Buckhorn, Ontario. The project involved management of multi-disciplinary project team public meetings, and application for a Class A licence under the Aggregate Resources Act.

Votorantim Cimentos
Bowmanville, ON

Project Director for the development of a limestone/dolostone mine under Lake Ontario. The work programs involve drilling and testing of a 275 m deep borehole under the lake, development of an underground mine plan, preparation of an EA document for regulatory approvals and public participation programs.

Milton Limestone Quarry Peer Review
Milton, ON

Project Director for the peer review of the hydrogeological and adaptive management plan report for the proposed Dufferin Aggregates Milton Quarry expansion. The work program involved meetings with the hydrogeological consultant and legal counsel and attendance at Ontario Municipal Board hearings.

SAROS Study
Greater Golder Horseshoe, ON

Evaluation of supply and demand of aggregate resources in the Greater Golden Horseshoe for the MMNR (Ministry of Natural Resources and Forestry). The project includes resource estimates for 25 quarries and 120 pits and unlicensed sand and gravel resources in the study area.

Nelson Quarry Expansion
Burlington, ON

Project Director for the proposed Nelson Quarry extension including extensive borehole drilling and monitoring well installations, water quality sampling, a surface water program, groundwater flow modeling, impact assessments, preparation of an Adaptive Management Plan (AMP), reporting and acting as an expert witness at an Ontario Municipal Board hearing.

Lafarge South Quarry Expansion
Dundas, ON

Project Director for a hydrogeological and hydrological work programs in support of a license application for the expansion of the Lafarge South Quarry near Dundas, Ontario (ongoing). The work program involves borehole drilling and monitoring well installations, geophysical borehole logging, water quality sampling and analyses, hydrological analyses of streams and wetlands, a karst assessment, a water well survey, geological and hydrogeological interpretation, groundwater flow modeling, agency interaction and attendance at public meetings.

Lafarge Fonthill Pit PTTW Renewal
Fonthill, ON

Project Director for a hydrogeological work program in support of a Permit to Take Water (PTTW) application for the Lafarge, The work program included interpretation of pumping wells records, evaluation of drawdown in water wells related to pumping, water quality analyses and preparation and submission of a report in support of the permit application.

Lafarge North Quarry Expansion Dundas, ON	Project Director for a hydrogeological work program conducted in support of a license application for the expansion of the Lafarge North Quarry. The work program involved borehole drilling and monitoring well installations, pumping tests, groundwater flow modelling, a water well survey, an impact assessment of potential effects on water wells and an adjacent provincially significant wetland, agency interaction and preparation of a report submitted in support of the license application. The application was approved with an Ontario Municipal Board hearing.
Lafarge PTTW Monitoring Programs ON	Project Director for hydrogeological monitoring programs for a portfolio of more than 50 pits and quarries in Ontario. The programs involved water level and water quality monitoring, evaluation of pumping records, effects assessments and preparation and submission of monitoring reports for compliance with the permits.
RW Tomlinson Quarry License Application Brechin, ON	Project Co-director for the hydrogeological work program for a hydrogeological work program performed in support of a license application for a dolostone quarry in the Carden Plain. The work program involved borehole drilling and monitoring well installation, geophysical borehole logging, packer testing, well response testing, pump testing, water quality sampling, groundwater flow monitoring, an impact assessment including potential effects on surrounding water wells and an adjacent wetland, development of a monitoring program preparation of a report in support of the application and agency interaction.
Proposed Lafarge Glen Morris Pit ON	Project Director and senior hydrogeologist for the hydrogeological work program in support of a license application for the proposed Glen Morris Pit. The work program included borehole drilling, monitoring well installations, groundwater level monitoring and the provision of data and preparation of a hydrogeological report.
Lafarge Wellington Quarry PTTW and ECA Renewal ON	Project Director and senior hydrogeologist for the Lafarge Wellington Quarry Renewal. The field program involved borehole drilling, packer testing, monitoring well installations, groundwater level monitoring, a field pumping test, development of a water budget and groundwater quality sampling. A hydrogeological impact assessment was developed to assess the potential impacts of quarry groundwater level drawdown related to quarry dewatering activities on surrounding private water wells and municipal wells. The work program included the modification of the regional source water protection to incorporate site data to assess the potential effects on the Guelph municipal wells.
Lafarge Regan Resource Drilling ON	Project Manager and senior geoscientist for resource drilling at the Lafarge Regan site using some drilling techniques. The results of the work program were provided to Lafarge for their resource assessment.
Lafarge Hagersville Quarry Hagersville, ON	Senior Hydrogeologist for the assessment of quarry dewatering and pumping for the Lafarge Hagersville Quarry as part of the PTTW monitoring program.

Arbour Farms License Application ON	Senior Hydrogeologist for the Arbour Farms license application for a pit below water. The work program included borehole drilling, installation of monitoring wells, groundwater level monitoring and assessment of potential effects on an adjacent water course. Three-dimensional groundwater flow and heat transport modeling was completed to assess the potential thermal impacts on the surrounding surface water courses.
Rankin Construction Port Colborne Quarry Extension Port Colborne, ON	Project Director for a multi-disciplinary work program for a license application for an extension of the Port Colborne Quarry. The work program involved hydrogeological, hydrological, blasting, noise, air, natural environment, planning, agricultural and archaeological studies, and a resource estimate. Senior Hydrogeologist for the hydrogeological work program that involved borehole drilling, monitoring well installations, groundwater quality sampling and analysis, an impact assessment and a monitoring and response program for potential impacts on surrounding water wells.
Lafarge Goodwood Pit Extension Goodwood, ON	Project Director and senior hydrogeologist for a license application for the Lafarge Goodwood Pit extension, for a Category 1 Class EA pit below water. The objective of the work program was to characterize the existing hydrogeological and hydrological conditions in the vicinity of the site, including the depth and elevation of the water table and assess potential effects of the operational and rehabilitation scenarios. The work program involved borehole drilling, monitoring well installations, groundwater level monitoring, development of a water budget and a hydrogeological impact assessment.
Lafarge Woodstock Quarry Expansion Woodstock, ON	Project Director and senior hydrogeologist for the hydrogeological investigation of the Woodstock quarry for support of a license amendment. The field program involved borehole drilling, packer testing, monitoring well installations, groundwater quality sampling and analysis, a field water well survey and development of a water budget. An impact assessment was conducted to assess the potential effect of quarry related groundwater level drawdown on surrounding water wells and surface water courses.
CRH Resource Evaluation and Due Diligence ON	Project Manager and senior geoscientist for a resource evaluation of a property near Orangeville, Ontario for potential acquisition for quarry development. The work program included borehole drilling, geological logging of the rock core, monitoring well installations to determine the depth of the water table, aggregate quality testing and reporting.
Limestone and Sandstone Resource Evaluation and Due Diligence Regional Municipality of Peel, ON	Project Director and senior hydrogeologist for a resource evaluation for a property developer for potential acquisition of an existing quarry near Mississauga. The work program involved borehole drilling, core logging, aggregate quality testing and reporting.
Stouffville Resource Drilling Stouffville, ON	Project Manager and senior hydrogeologist for the resource drilling at Lafarge Stouffville Quarry. The drilling was conducted using a sonic drill rig with continuous core sampling. The results were provided to the Lafarge geologist for the resource assessment.

Lakeridge Resource Drilling ON	Project Manager and senior geoscientist for the resource drilling at the Lafarge Lakeridge site. The drilling was conducted using sonic coring and the results provided to the Lafarge geologist for development of a resource assessment.
Votorantim Thomas Quarry License Application ON	Senior hydrogeologist for the hydrogeological component of the Votorantim Thomas Quarry Extension license application. The work program involved borehole drilling, packer testing, geophysical borehole logging monitoring well installations and groundwater quality sampling and analysis. Three-dimensional groundwater flow monitoring was conducted to assessment the potential hydrogeological impacts of the quarry.
Lafarge Pinkney Pit #3 ON	Senior Hydrogeologist for the hydrogeological work program for the Lafarge Pinkney Pit #3 license application. The work program involved borehole drilling, monitoring well installations and a hydrogeological impact assessment.
Lafarge Mosport Resource Drilling ON	Project Manager and senior geoscientist for the sonic borehole drilling at the Lafarge Mosport Pit. The results of the resource drilling were provided to the Lafarge geologist as part of the site resource assessment.
Lafarge Goodwood Resource Drilling ON	Project Manager and senior geoscientist for sonic borehole drilling of the resource near the Lafarge Goodwood Pit. The results of the drilling were provided to the Lafarge geologist for a resource assessment.
APAO (Aggregate Producers Association of Ontario) Water Consumption Study ON	Project Director for a study for the APAO to determine the consumption of water associated with pits and quarries.
Lafarge Sunningdale Pit Monitoring Program ON	Senior Hydrogeologist for the Lafarge Sunningdale Pit Monitoring Program. The work program includes hydrogeological monitoring, an assessment of potential impacts and preparation of an annual monitoring report.
Votorantim Resource Assessment ON	Project Manager and senior geoscientist for a resource assessment at a Votorantim Quarry in central Ontario. The work program involved borehole drilling and borehole geophysics were used to identify and correlate the geological formations and members at the site.
Cox Construction Monitoring Well Network Wellington County, ON	Project Manager and senior hydrogeologist for borehole drilling and monitoring well installations at a property in Wellington County to provide baseline date for potential future licensing as a quarry. The wells were installed in the thick sequence of Amabel Formation at this locates. Groundwater level monitoring was performed to determine the depth to water table.
Cox Construction Resource Evaluation and Due Diligence ON	Project Director for a drilling program to evaluate to the limestone resource for potential acquisition of a property for development. The work program involved borehole drilling, geological logging of the rock core, monitoring well installations, aggregate quality testing and reporting.

PROJECT EXPERIENCE – WASTE MANAGEMENT

Adams Mine
Kirkland Lake, ON

Project Hydrogeologist and Project Manager for the hydrogeological assessment of the Adams Mine near Kirkland Lake, Ontario over a five-year period as part of the proposed development of 20 million tonne engineered landfill facility for solid non-hazardous waste. The facility will receive waste from the Greater Toronto Area (GTA) via a rail line system. The landfill facility incorporates a hydraulic containment design, which prevents outward migration of contaminants from the landfill, which reduces environmental impacts and long-term operating costs. Provided expert witness testimony in an environmental assessment (EA) hearing.

Brow Landfill
Dundas, ON

Project Hydrogeologist then Project Manager for hydrogeological assessment for landfill expansion of the existing Redland Quarries Inc. (formerly Steetley Quarry Products Ltd.) solid industrial waste Brow Landfill in Flamborough, Ontario. Subsequent work included ongoing groundwater and surface water quality monitoring and preparation monitoring reports submitted to the MOE, followed by development of a closure plan and an ongoing compliance monitoring program.

South Quarry Landfill
Flamborough, ON

Project Hydrogeologist for hydrogeological assessment of the proposed Redland Quarries Inc. (formerly Steetley Quarry Products Ltd.) South Quarry in Flamborough, Ontario for the proposed development of an engineered landfill facility. Participated in environmental assessment (EA) hearings and assisted with the preparation of final arguments with legal counsel.

Siting Task Force Secretariat
Chalk River, ON

Project Hydrogeologist, then Project Manager for geological and hydrogeological characterizations of the Chalk River Nuclear laboratories property, near Chalk River, Ontario for siting of a proposed facility for the disposal of low-level nuclear waste for the federal Siting Task Force Secretariat (STFS).

Siting Task Force Secretariat
Port Hope, ON

Project Hydrogeologist then Project Manager for geological and hydrogeological characterization of the Lakeshore site in Port Hope, Ontario, for the federal Siting Task Force Secretariat (STFS). The work was carried out as part of the feasibility level I study for dispose of low-level waste in engineered caverns beneath Lake Ontario and the Cameco Uranium fuel processing facility in Port Hope.

Interim Waste Authority
Regional Municipality of Peel, ON

Project Hydrogeologist for geological and hydrogeological characterization comparative evaluation of five short-listed sites for siting of an engineered landfill facility as part of the provincial Interim Waste Authority (IWA) landfill site selection process for the Region of Peel.

Guelph-Wellington County WMMP
Wellington County, ON

Project Hydrogeologist for geological and hydrogeological characterization of five candidate sites and identification of a preferred site in Wellington County for siting of an engineered municipal landfill facility, as part of the joint City of Guelph - County of Wellington Waste Management Master Plan (WMMP).

Model City Landfill
Lewiston, NY

Project Hydrogeologist for hydrogeological investigation of the Model City hazardous waste landfill, near Lewiston, New York, carried out as part of landfill expansion.

Welland-Wainfleet WWMP
Townships of Welland and Wainfleet, ON

Project Hydrogeologist for the identification of preferred sites for development of a municipal landfill facility, as part of the Welland-Wainfleet Waste Management Master Plan (WMMP).

Brock South Landfill
Pickering, ON

Project Hydrogeologist for assessment of the proposed Brock South Landfill near Pickering, Ontario, to assess the suitability of the site for development of an engineered municipal landfill facility for Metropolitan Toronto.

Redland Queenston Quarry
Queenston, ON

Project Hydrogeologist for hydrogeological assessment of the Redland Quarries Inc., Queenston Quarry to determine the suitability of the site for disposal of waste rock saline shale, from the construction of the proposed diversion tunnels of the Sir Adam Beck III hydroelectric generating facility in Niagara Falls, Ontario.

Fly Ash Disposal Facility
ON

Project Hydrogeologist for hydrogeological investigations at four quarries located near Hagersville, Cayuga, Smithville, and Milton to determine their suitability for development an engineered landfill for disposal of fly ash from the Ontario Hydro Lakeview Power Generating Station.

Mohawk Street Landfill
Brantford, ON

Project Hydrogeologist for assessment of groundwater and surface water quality impacts at the municipal Mohawk Street Landfill in Brantford, Ontario.

Vale Industrial Landfill
Port Colborne, ON

Project director for the preparation of an annual report for the groundwater monitoring program for an industrial waste landfill at a former nickel refinery. The work program included interpretation of groundwater flow directions and water quality trends, evaluation of the extent of the leachate plume, and an impact assessment.

Vale Industrial Refinery Landfill Monitoring
Port Colborne, ON

Project Director and senior hydrogeologist for an evaluation of the effectiveness of the purge well system at a former nickel refinery and the development of mitigation and rehabilitation measures for well clogging. The work program involved step drawdown pumping tests, longer term pumping tests, hydraulic analysis of pumping test data, assessment of the decline of well efficiency due to scaling and bio fouling and the development of a work program for well rehabilitation and maintenance including acidification.

Municipal Landfill Annual Monitoring Programs
Niagara Region, ON

Project Director for the annual monitoring program for 8 landfills in bedrock and escarpment settings in Niagara Region. The work program involves field water quality sampling, groundwater level monitoring, and provision of progress and annual reports.

Proposed Walker Ingersoll Landfill
ON

Senior Hydrogeologist for the hydrogeological investigation for the proposed Walker Landfill near Ingersoll, Ontario. The field program involved borehole drilling, monitoring well installations, packer testing, geophysical borehole logging, downhole flow profiling, groundwater quality sampling and analysis, a karst study, and a water well survey. Three-dimensional groundwater flow modeling was conducted to assess the potential impacts of the landfill.

PROJECT EXPERIENCE – SHALE INDUSTRY

Canada Brick Mississauga, ON	Specialist for assessment of geological controls upon shale quality at the Canada Brick Britannia Road quarry site. The work was carried out in conjunction with quality control estimate of shale reservoir on the property.
Canada Brick Halton Region, ON	Project Manager for a hydrogeological work program in support on an application for a license for the Hanson Brick Tremaine Quarry in Halton Region, Ontario.
Brampton Brick Limited Halton and Peel Region, ON	Project Director for a hydrogeological and surface water program in support of a license application for a proposed shale quarry for a brick manufacturer. The work programs involved borehole drilling and monitoring well installations, surface water flow monitoring, water quality sampling, groundwater flow modelling and preparation of an Adaptive Management Plan (AMP).
Hanson Brick Limited Halton Region, ON	Project Director for the assessment of the potential gas migration from a landfill to an adjacent brick manufacturing facility containing a brick kiln. The program identified potential risks and a monitoring and response program.

PROJECT EXPERIENCE – MINING

Stanleigh Mine Elliot Lake, ON	Project Hydrogeologist for assessment of the Rio Algom Stanleigh Mine near Elliot Lake, Ontario. The project included development of a three-dimensional flow model of a low-level radioactive waste tailings facility in Precambrian bedrock of the Canadian Shield. The model was used to develop estimates of seepage rates from the facility and was submitted to the Atomic Energy Control Board (AECB) as part of the regulatory approvals process.
Voisey's Bay Mine Labrador	Technical specialist for hydrogeological modelling at the Voisey's Bay Mine site involving development of three-dimensional groundwater flow models of a proposed tailings basin, mine waste rock disposal facility, and an open pit mine at the Voisey's Bay Mine Site in Labrador. The modelling was carried out for the Voisey's Bay Nickel Company (VBNC) as part of the hydrogeological assessment of the mine. The work was subject to regulatory review and presented as evidence at an environmental assessment hearing.
Baley Gold Mine Baley, Russia	Project Hydrogeologist for an Environmental Impact Assessment (EIA) as part of a feasibility study for mine expansion. The hydrogeological component included evaluation of potential for water quality impacts for an open pit mine and tailings basin, reduction of flow in stream and interference with the municipal water well supply.
Asacha Gold Mine Kamchatka, Russia	Project Hydrogeologist of the proposed Asacha Gold Mine in northeastern Russia. The assessment focused upon chemical water quality and streamflow impacts associated dewatering of an underground mine and construction of a tailings basin. The results of the assessment formed part of the mine feasibility study.

Timmins Mine Water Study
Timmins, ON

Project Hydrogeologist for assessment of flooding of an extensive array of underground mine working beneath the City of Timmins. The assessment included evaluation of the potential impacts arising from the discharge of water from the flooded mine workings at surface within the city.

Cigar Lake Mine
Saskatchewan

Project Hydrogeologist for assessment of potential groundwater inflows into proposed shaft in northern Saskatchewan for the Cigar Lake Mining Corporation (CLMC). The results of the assessment were used as the basis for the engineering design at the shaft.

Denison Mines
Elliot Lake, ON

Project Hydrogeologist for an assessment of low-level nuclear waste tailings basin at the Denison Mines near Elliot Lake, Ontario. The hydrogeology study included assessment of seepage of uranium-impacted groundwater from the basin.

MaCassa Mines
Kirkland Lake, ON

Project Hydrogeologist for hydrogeological assessment at the Lac Minerals MaCassa Mine tailing basins in Precambrian bedrock near Kirkland Lake, Ontario. The work was carried out to evaluate the potential impacts during operation and following decommissioning of the facility.

PROJECT EXPERIENCE – CONTAMINATED INDUSTRIAL SITES

ICI
Nobel, ON

Hydrogeological assessment of groundwater and surface water quality at the former ICI explosives and war productions plant near Parry Sound, Ontario for ICI Canada. The program included assessment of groundwater and surface water quality impacts and removal of buried underground fuel storage tanks. The results of the investigations were submitted to the Ontario Ministry of the Environment as part of the site decommissioning.

Ford Motor Company
North York, ON

Dewatering of a groundwater collection gallery and discharge of the contaminated (chlorinated solvent) wastewater to the municipal sewer system (under special conditions), at the Ford Motor Company Plant in North York, Ontario.

Shell Oil
North York, ON

Dewatering of a groundwater collection gallery and discharge of the contaminated (chlorinated solvent) wastewater to the municipal sewer system (under special conditions), at the Ford Motor Company Plant in North York, Ontario.

Beaver Lumber
Cole Harbour, NS

Excavation of underground storage tank (fuel oil) at the Beaver Lumber store at Cole Harbour, Nova Scotia. The results of the investigation favoured Beaver Lumber, by indicating that damage to the store was due to lack of delivery of the fuel supplier rather than leakage from the site fuel storage tank.

ICI Surfactants
Oakville, ON

Hydrogeological impact assessment of cadmium concentrations in groundwater at the ICI Surfactants (formerly Atkemix) site in Oakville, Ontario. The results of the monitoring were submitted to the Ministry of Environment and Energy for regulatory purposes.

Bata Footwear
Batawa, ON

Participation in the hydrogeological investigation of chlorinated solvent contamination of a bedrock limestone aquifer at the Bata Footwear plant site in Batawa, Ontario. The results of the hydrogeological impact assessment were submitted to the Ministry of Environment and Energy and used during subsequent legal proceedings to determine financial liability of Bata Footwear for the groundwater contamination.

Niagara Recycling Centre
Niagara Falls, ON

Project Director and senior hydrogeologist for the annual operational and monitoring programs for a hydrogeological work program involving groundwater contaminated with chlorinated solvents at the Niagara Recycling Centre related to prior industrial land use. The work program involved operation of the groundwater injection remediation system, assessment of subsurface contamination and preparation of annual monitoring reports.

Rankin Construction Fill Management Plan
Port Colborne, ON

Project Director and senior geoscientist for the development of a fill management plan for Pit 1 at the Rankin Construction Port Colborne Quarry. The program included a plan to take excess fill from the area to fill Pit 1. This included a sampling and reporting program to meet MECP requirements.

PROJECT EXPERIENCE – OIL & GAS

Assessment of Natural Gas Storage Potential
Lake Erie, ON

Project Manager for an assessment of the potential for natural gas storage on Crown Lands beneath Lake Erie. The study involved the assessment of natural gas reservoirs to evaluate their suitability for use as gas storage facilities. Estimated available storage volumes were provided for each of the reservoirs.

Assessment of Natural Gas Storage Potential
Southwestern Ontario

Project Manager for an evaluation of the hydrocarbon resources in Southwestern Ontario for the Petroleum Resources Centre of the Ministry of Natural Resources. The study included the interpretation and mapping of pool boundaries for major pools, calculations of in place and recoverable reserves, tabulation of reservoir characteristics, and estimation of potential hydrocarbon resources in the Ordovician strata of southern Ontario.

PROJECT EXPERIENCE – MUNICIPAL GROUNDWATER STUDIES

Groundwater Study for the County of Victoria
ON

Project Director and senior hydrogeologist for a large-scale groundwater study for the County of Victoria with funding from the Provincial Water Protection Plan (PWPP). The work program involved a groundwater resource assessment, evaluation of existing groundwater usage, contamination assessment, development of management options and protection strategies, and an economic evaluation.

Groundwater Study for the City of Stratford
ON

Project Director and senior hydrogeologist for a Groundwater Study for the City of Stratford involving an assessment of groundwater resources, source of contamination, pump testing of deep wells in limestone bedrock, and development of groundwater management options and protection strategies.

Simcoe and South Simcoe Groundwater Studies
ON

Provided specialist hydrogeological services for both the North Simcoe Groundwater Study and South Simcoe Groundwater Study. The work program involved a characterization of the hydrogeology of the study areas and numerical groundwater modelling of Well Head Protection Areas for municipal wells (WHPAs).

PROJECT EXPERIENCE – KARST

Nelson Quarry Extension
ON

Project Director and Senior Hydrogeologist for karst assessment of the proposed Nelson Quarry extension that involved mapping of the Amabel Formation along the exposed cliff faces of the Mount Nemo outlier, identification of karstic springs in the Medad Valley and associated water courses, mapping of karst features along more than 1 km of exposed quarry faces. Examination of surface karst features including sinkholes and internal drainage were mapped in the area of the quarry. An ERI (Electrical Resistivity Imaging) survey was conducted over a linear distance to identify potential anomalies that could represent karstic features. Boreholes were drilled into the karstic features to evaluate karstic conditions. The boreholes were video logged along the length of the hole to evaluate karstic features such as solution enlarged fractures and voids. The flow in the boreholes were pumped and logged during an impeller flow meter to assess inflow into boreholes from potential karstic features. An array of eight wells and a pumping well were drilled to conduct a tracer test using fluorescein dye. The dye was injected into the wells and the travel time and dye concentrations were recorded to evaluate karstic flow paths and velocities. The results were incorporated in a report submitted as part of the regulatory approvals process and presented and defended at an Ontario Municipal Board hearing.

Proposed Redland Quarries Landfill
ON

Project Hydrogeologist for a karst study as part of a geological and hydrogeological evaluations of a proposed hydraulic containment engineered landfill facility in a quarry near Dundas, Ontario. The karst study involved examination and evaluation of karstic features in the vicinity of the quarry including solution-enhanced weathering and extensive network of surficial dolostone plain, and examination of epi-karst on more than 1 km of quarry faces including solution enlarged and materialized vertical joints. The results of groundwater level monitoring results were evaluated for patterns indicative of presence of karst including rapid rises in groundwater levels (‘spiking’). Pump tests were analysed to evaluate the drawdown and recovery responses characteristic of karst.

Proposed Dundas Quarry Extension
ON

Project Director and Senior Hydrogeologist for a karst assessment as part of a hydrogeological work program for the approval of an application for a large dolostone quarry near Dundas, Ontario. The work program involved an ERI surface geophysical survey along more than 500 m of line to test for potential karstic anomalies. Boreholes were drilled in the areas of identified anomalies to evaluate the potential presence of karst. The faces of the quarries were also examined for layers of karstic groundwater inflow. The results of the karst study have been peer reviewed and are currently being used in support of the license application for quarry expansion.

Karst Remediation
Hamilton, ON

Senior Hydrogeologist for a karst assessment of a remediated industry site in the area of the Eramosa Karst Conservation Area in Hamilton, Ontario. The work program involved a review of literature on karst in the area. An inspection of the karstic features includes sinkholes, internal drainage and inferred subsurface karstic flow pathways was undertaken in areas around the site. A report in support of a property transaction was provided to regulatory authorities and agencies.

Brow Landfill Monitoring Program
ON

Project Hydrogeologist for an assessment of leachate seepage from an industrial solid waste landfill along karstic flow pathways including epi-karst, solution weathered vertical joints and horizontal fracture networks. The assessment involved monitoring of the flow rates from leachate springs and water quality of springs.

Hydrocarbon Reserve Evaluation
Southwestern Ontario

Project Director and Senior Geologist/Hydrogeologist for the estimation of hydrocarbon reserves in Southern Ontario for the Petroleum Resource Centre of Ontario Ministry of Natural Resources. The work program involved extensive analysis of karstic reservoirs formed and dolomitization from solution weathering and collapse along vertical joints and horizontal sub horizontal fracture networks. Prepared a report summarizing the study and provided to the MNR as a commercial publication.

PROJECT EXPERIENCE – LAND DEVELOPMENT AND INFRASTRUCTURE

Peer Review, Town of Caledon
Caledon, ON

Peer review of the hydrogeological work program for a proposed residential development in Palgrave for the Town of Caledon planning department. The work program involved review of hydrogeological reports, discussions with the Town and preparation of a peer review reports with recommendations.

Peer Review, Town of Caledon
Caledon, ON

Peer review of the hydrogeological and geotechnical work program for a proposed residential development in Beaverhall for the Town of Caledon planning department. The work program involved review of hydrogeological reports, discussions with the Town and preparation of a peer review reports with recommendations.

Niacon Construction
Niagara-on-the-Lake, ON

Hydrogeological assessment of the potential impacts associated with the development of an infrastructure for a zipline facility along the Niagara river at Thompsons Point. The work program involved an evaluation of the potential for reduction of groundwater seepage along the Niagara Gorge and related environmental effects. A report was prepared that was submitted to agencies as part of the regulatory approvals process.

Time Developments
Niagara Falls, ON

Senior hydrogeologist for the hydrogeological assessment of the existing conditions and potential impacts associated with the development of a condominium adjacent to the Niagara River in Niagara Falls. The work program involved borehole drilling, monitoring wells installation, groundwater level monitoring and assessment of groundwater levels and flow directions. The results of the work program were incorporated into a geotechnical and hydrogeological report.

Time Developments
Niagara Falls, ON

Phase 1 and Phase 2 Environmental Site Assessments (ESA) for regulatory approval for condominium development on River Road in Niagara Falls, Ontario. The work program involved test pitting and surface sampling as well as collection and analysis of soil and water samples and evaluation of potential soil and water contamination.

AECOM
Oakville, ON

Hydrogeological assessment of the excavation and construction of a water pumping station in till and bedrock adjacent to a surface water course. The work program involved borehole drilling, monitoring well installations, hydraulic conductivity testing and a hydrogeological assessment of impacts on surrounding private wells associated with construction dewatering.

Geranium Homes Woodview Development
ON

Hydrogeological assessment in support of approval for a proposed residential development involving borehole drilling, monitoring well installations, hydraulic conductivity testing, groundwater level monitoring, determination of groundwater levels and flow directions and a hydrogeological impact assessment involving a water balance to evaluate reduction in infiltration and potential interference with surrounding water wells and effects on an adjacent provincially significant wetland. Participated in meetings with the TRCA as part of the approvals process. A report was prepared in support of the approvals process.

Geranium Homes Altona Development
ON

Hydrogeological assessment in support of approval for a proposed residential development. The work program involved borehole drilling, monitoring well installations, groundwater level monitoring, development of a water balance and a hydrogeological impact assessment. A report was prepared in support of the application.

Education

B.Sc.(Hons) Environmental Geoscience, Brock University, St. Catharines, 2012

Certifications

Professional Geoscientist - P.Geo., February 2017

Languages

English – Fluent

Golder Associates Ltd. – St. Catharines

Byron Zwiep B. Sc. (Hons), P.Geo. Environmental Scientist

Mr. Zwiep is an Environmental Scientist who is involved with environmental monitoring and investigations; he also has significant experience with groundwater and surface water monitoring, leachate and combustible gas monitoring. His responsibilities include project management, co-ordinating and conducting field monitoring events, data analysis and verification, and preparation of technical reports and landfill annual monitoring reports. He also has experience drilling and installing overburden and bedrock wells, slug testing and completion of landfill gas monitoring and sampling.

Employment History

Golder Associates Ltd. – St. Catharines
Environmental Scientist (2014 to Present)

AECOM – St. Catharines
Environmental Scientist (2012 to 2014)

AECOM – St. Catharines
Environmental Technician (September 2010 to December 2010)

PROJECT EXPERIENCE – CONTAMINATED LAND REMEDIATION

Stelco Hamilton, Nanticoke, Ontario, Canada	Project coordinator responsible for assisting in the project initiation phase including borehole layout, locate clearances and drilling program start up. Assisted with drilling, monitoring well development and subsequent groundwater sampling programs.
St. Lawrence Seaway Management Corporation Thorold, Ontario, Canada	Project manager responsible for the investigation and cleanout of a culvert that directs discharge water from adjacent properties under the Welland Canal. The culvert was used by various industries historically resulting in contamination of the sediments that partially blocked the canal. Design drawings and site supervision/inspection was completed.
Magellan Aerospace Fort Erie, Ontario, Canada	Provide ongoing troubleshooting and maintenance support for the operation of the groundwater treatment system on-site. Organized the monthly surface water and semi-annual groundwater sampling programs.
Regional Municipality of Niagara Recycling Centre Niagara Falls, Ontario, Canada	Project Manager responsible for the organization and implementation of the environmental monitoring program and maintenance related to the operations and maintenance and monitoring of the Groundwater Treatment System at the Niagara Region Recycling Centre. Also responsible for the production of the annual monitoring reports in 2015 through 2021.
Regional Municipality of Niagara Recycling Centre Niagara Falls, Ontario, Canada	Developed and implemented a geoprobe investigation involving the completion of fifteen boreholes to bedrock surface and associated soil sampling to identify a potential source of contamination for chlorinated solvent concentrations observed in shallow bedrock groundwater. Completed associated reporting and future recommendations for additional bedrock monitoring wells to further delineate the plume and understand the bedrock hydrogeology in greater detail
Pen Centre St. Catharines, Ontario, Canada	Field technician responsible for contractor oversight to complete a sewer inspection. Also, set up diversion in storm sewer to pump water over to sanitary sewer.
Regional Municipality of Niagara Recycling Centre Niagara Falls, Ontario, Canada	Completed a work program involving the installation of seven additional bedrock monitoring wells, well development, hydraulic conductivity testing, groundwater sampling and associated reporting to complete a chlorinated solvent plume delineation and provide a greater understanding of the shallow bedrock groundwater flow direction. Provided recommendations for the installation of additional bedrock monitoring wells and overburden sampling to identify source of contamination.
Loblaws Elmira, Ontario, Canada	Field program co-ordinator responsible for oversight of surfactant and persulfate injections. Completed well development and groundwater sampling to assess performance of remedial measures.
Confidential Client Scarborough, Ontario, Canada	Assisted with construction oversight during excavation. Completed soil sampling to determine soil quality of backfill. Carried out an air monitoring program to ensure health and safety of workers. Completed groundwater sampling programs to determine extent of contamination and effectiveness of a treatment system

Confidential Client Confidential Locations, Canada	Involved in sewer sampling project to determine the extent of groundwater intrusion into the sewer systems. Also completed multiple groundwater monitoring and sampling events. Completed data analysis to assist in the production of annual reports. Performed vacuum testing in a home to assess the extent of a sub slab depressurization system. Involved in performance testing to determine effectiveness of the remedial action plan.

PROJECT EXPERIENCE – WASTE MANAGEMENT

Regional Municipality of Niagara, Landfills in an Escarpment and Bedrock Setting Niagara Region, Ontario, Canada	Project Manager responsible for co-ordination and execution of all aspects of the landfill monitoring including scheduling, budget control, data analyses and interpretation, preparation of technical and annual reports and liaising with clients and regulatory agencies. Also, performed the role of Project Co-ordinator responsible for the organization and implementation of all field related monitoring requirements for seven landfills in the Region of Niagara including the: Glenridge Naturalization Site, Mountain Road Landfill, Quarry Road Landfill, Bridge Street Landfill, Station Road Landfill, Niagara Road 12 Landfill and Park Road Landfill. Tasks include groundwater, surface water, combustible gas and leachate level monitoring and sampling, assessment of field data in comparison to applicable environmental compliance approval requirements and other regulatory criteria.
Vale Canada Limited Port Colborne, Ontario, Canada	Assisted with the preparation of compliance annual monitoring report including data compilation and analysis as well as assessment of hydrogeological conditions for the 2014 and 2015 annual landfill monitoring reports.
Halton Waste Management Site Milton, Ontario, Canada	Program Manager for monthly, quarterly and bi-annual environmental monitoring programs. Completed bi-annual groundwater, surface water and leachate monitoring program including sampling of residential wells. Created task hazard analysis in addition to a health and safety plan for the site. Replaced 40 well casings to upgrade current monitoring network of wells. Involved in field monitoring aspects of current depressurization program.

PROJECT EXPERIENCE – HYDROGEOLOGY

Port Colborne Quarries Port Colborne, Ontario, Canada	Project coordinator responsible for developing and implementing a hydrogeological investigation to determine bedrock surface depth as well as bedrock geology underlying the Site. Provided project management support for hydrogeology and monitoring well installation portions of the project.
Time Development Group Niagara Falls, Ontario, Canada	Completed Phase I ESA site visit, well development, groundwater sampling and hydraulic conductivity testing. Assisted in development of hydrogeological work program and associated reporting. Co-ordinated Phase II ESA site work and assisted with associated reporting.
Vale Canada Limited Port Colborne, Ontario, Canada	Completed field program in order to assess the performance of Vale's interceptor purge wells. Assisted with preparation of report summarizing results of step and 24 hour pump tests.

Ministry of Transportation - MTO
Magnetewan First Nation, Ontario, Canada

Completed bedrock drilling program to determine location and quality of groundwater as a preliminary study to highway construction. Constructed borehole logs and assisted in preparation of the report.

TRAINING

Transportation of Dangerous Goods
AECOM, 2014

WHIMIS
Golder Associates Ltd., 2017

First Aid and CPR Level C
Red Cross, January 2017

40 Hour Hazardous Waste Operations and Emergency Response Training in Accordance with OSHA 29CFR 1910.120,
ACUTE, 2014

SUPPLEMENTAL SKILLS

PROFESSIONAL AFFILIATIONS

Association of Professional Geoscientists of Ontario

GOLDER

golder.com